

# User's Guide

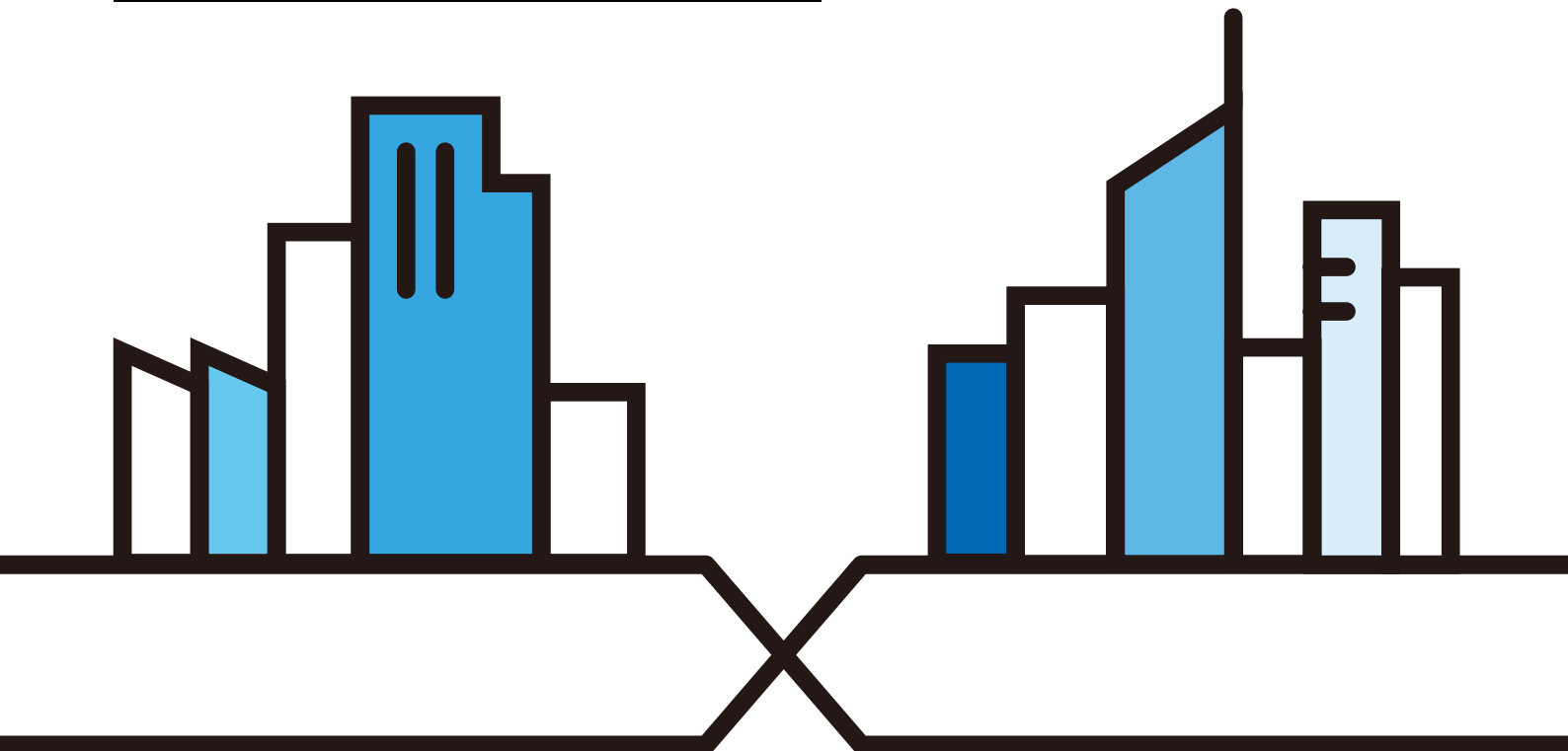
## XS3800-28

Layer 2 Managed 10 Gigabit Ethernet Switch

### Default Login Details

|                       |                                                                                             |
|-----------------------|---------------------------------------------------------------------------------------------|
| Out-of-Band MGMT Port | <a href="http://192.168.0.1">http://192.168.0.1</a>                                         |
| In-Band Ports         | <a href="http://DHCP-assigned IP or 192.168.1.1">http://DHCP-assigned IP or 192.168.1.1</a> |
| User Name             | admin                                                                                       |
| Password              | 1234                                                                                        |

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**IMPORTANT!**

**READ CAREFULLY BEFORE USE.**

**KEEP THIS GUIDE FOR FUTURE REFERENCE.**

Screenshots and graphics in this book may differ slightly from your product due to differences in your product firmware or your computer operating system. Every effort has been made to ensure that the information in this manual is accurate.

## **Related Documentation**

- CLI Reference Guide

This guide explains how to use the Command-Line Interface (CLI) to configure the Switch.

Note: It is recommended you use the Web Configurator to configure the Switch.

- Web Configurator Online Help

Click the help icon in any screen for help in configuring that screen and supplementary information.

- More Information

Go to **support.zyxel.com** to find other information on the Switch.



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# **PART I**

## **User's Guide**

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# CHAPTER 1

## Getting to Know Your Switch

This chapter introduces the main features and applications of the Switch.

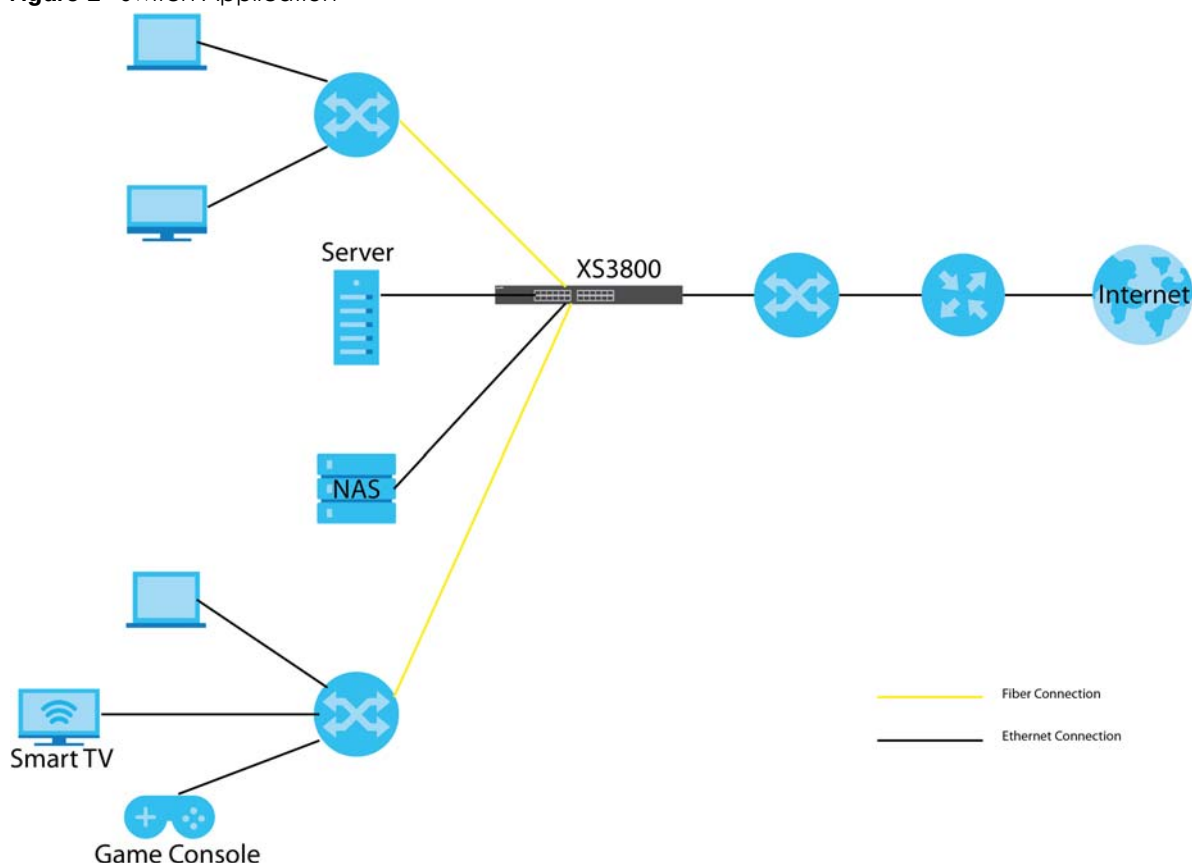
### 1.1 Introduction

Your Switch is a standalone, layer-2, 10 GigabitEthernet (GbE) switch supporting Multi-Gigabit. See [Section 1.1.1 on page 23](#) for more information about Multi-Gigabit. The Switch equips with dual AC power supply modules, and it's ideal for SMB (Small-and-Medium-Sized Businesses) and enterprises.

You could use 10 Gigabit SFP+ slots for fiber connections to the backbone switches, and you could use the 10 Gbps Ethernet ports for connections to other Ethernet devices requiring high-bandwidth, such as network-attached storage (NAS), game consoles, servers, and so on.

The Switch performs full layer-2 switching features and basic layer-3 basic routing features, such as static route (see [Chapter 44 on page 377](#)), and IGMP (see [Chapter 25 on page 223](#)).

**Figure 1** Switch Application



### 1.1.1 Multi-Gigabit

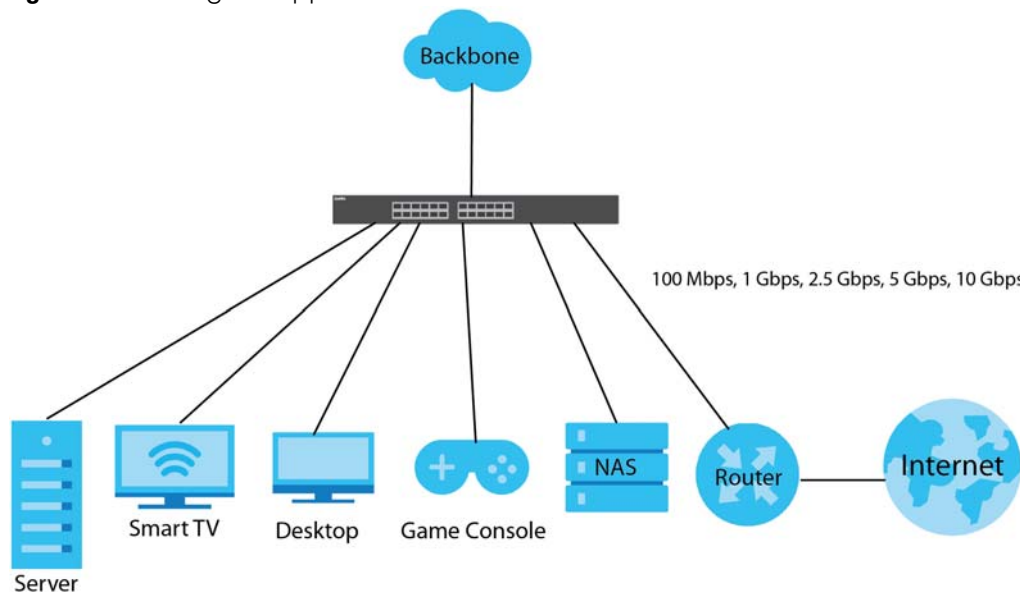
A 10 Gigabit port supports speeds of 10 Gbps if the connected device supports 10 Gbps and a Cat 6a (up to 100 m) or Cat 6 cable (up to 50 m) is used. The speed drops to 1G if these criteria are not met; it drops to 100 Mbps if a Cat 5 cable is used (up to 100 m).

If a network device such as a 5G network card, gaming computer, server, Network Attached Storage (NAS) or Access Point (AP) only supports 2.5 Gigabit or 5 Gigabit connectivity, then the maximum speed potential of these devices is never reached.

In addition, at the time of writing, most existing cabling is Cat 5e or Cat 6, further limiting maximum speed/distance potential.

Multi-Gigabit (IEEE 802.3bz) solves these problems by additionally supporting 2.5 Gigabit and 5 Gigabit Ethernet connections over Cat 5e and higher Ethernet cables. Multi-Gigabit ports are also backward compatible with 100 Mbps and 1 Gigabit ports.

**Figure 2** Multi-Gigabit Application



See the following table for the cables required and distance limitation to attain the corresponding speed.

Table 1 Cable Types

| CABLE       | TRANSMISSION SPEED    | MAXIMUM DISTANCE | BANDWIDTH CAPACITY |
|-------------|-----------------------|------------------|--------------------|
| Category 5  | 100 Mbps              | 100 m            | 100 MHz            |
| Category 5e | 1 Gbps/2.5 Gbps/5Gbps | 100 m            | 100 MHz            |
| Category 6  | 5 Gbps/10 Gbps        | 50 m             | 250 MHz            |
| Category 6a | 10 Gbps               | 100 m            | 500 MHz            |
| Category 7  | 10 Gbps               | 100 m            | 650 MHz            |

Note: Make sure to select the correct speed for the port in **Basic Setting > Port Setup**.

## 1.1.2 Management Method

With its built-in web configurator, managing and configuring the Switch is easy. In addition, the Switch can also be managed via Telnet, any terminal emulator program using the Command Line Interface (CLI), or third-party SNMP management.

## 1.1.3 Management Mode

NebulaFlex for 'hybrid mode' means you can set the Switch to operate in only one of either standalone or cloud mode (not both at the same time). The Nebula Control Center (NCC) is an alternative cloud-based network management system that allows you to remotely manage and monitor the Switch in cloud mode.

Note: Hybrid mode and NCC registration are reserved for future use.

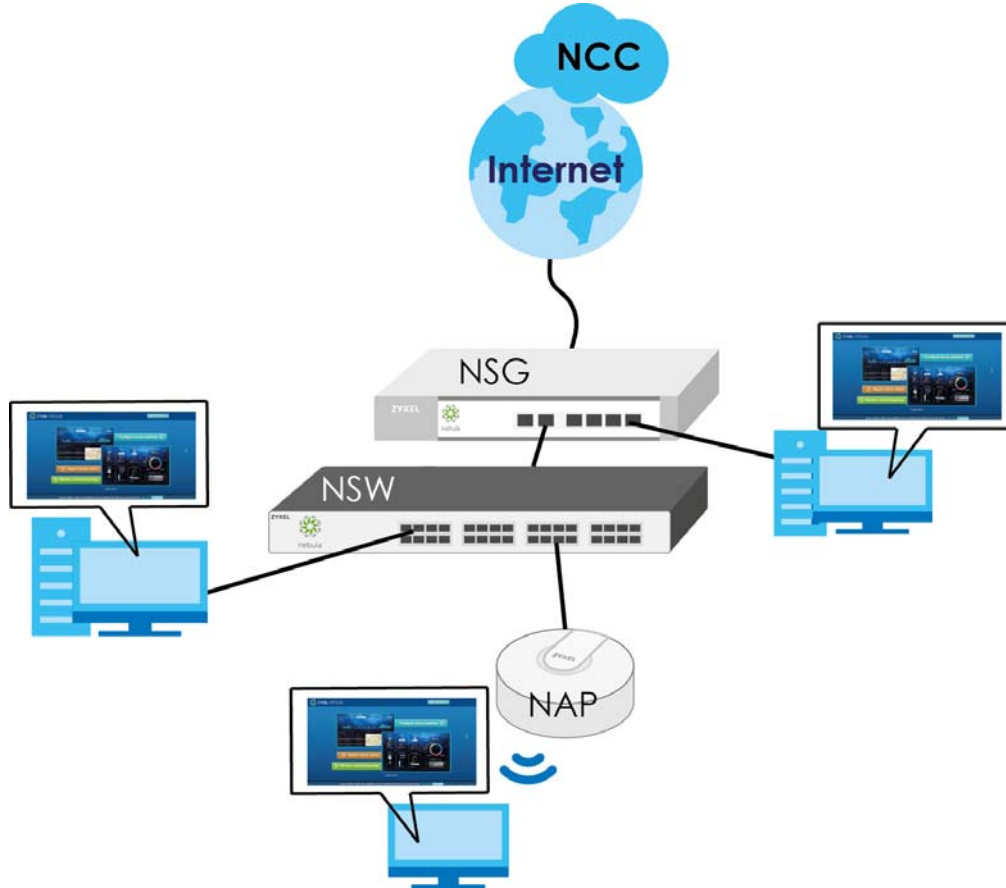
Use the web configurator to configure and manage the Switch directly in standalone mode. You may also access a minimized version of the web configurator in cloud mode.

### Nebula Cloud Management

To have Nebula manage the Switch, you must first register it at the Nebula web portal at <http://nebula.zyxel.com>, and ensure that **Nebula Control Center Discovery** is enabled in **Basic > Cloud Management > Nebula Control Center Discovery** in the Switch web configurator (enabled by default).

Note: See the Switch's datasheet for the feature differences between standalone and Nebula cloud management modes. You can find the Switch's datasheet at the Zyxel website.

See the NCC (Nebula Control Center) User's Guide for how to configure the Switch using Nebula.



### 1.1.4 Mode Changing

This section describes how to change the Switch's management mode.

Note: Hybrid mode and NCC registration are reserved for future use.

Note: When you change the Switch's management mode from standalone mode to Nebula-managed mode, the configuration settings of the Switch will be overwritten with what you have configured in Nebula.

When you change the Switch's management mode from Nebula-managed mode to standalone mode, the Switch will reset to its factory-default settings.

#### From Standalone to Nebula Cloud Management

To manage your Switch via Nebula, connect the Switch to the Internet, and register it to a site and organization at the Nebula web portal (<http://nebula.zyxel.com>).

See the following steps or the Switch Quick Start Guide for how to do device registration.

##### Go to the NCC to Register the Switch

- 1 Go to the Nebula web portal in one of three ways.

- Type <http://nebula.zyxel.com> in a supported web browser. See the Nebula User's Guide for more information about supported browsers.
  - Click the **Visit** button in the Switch's login page.
  - Click the **Nebula** icon in the upper right corner of the Switch's web configurator.
- 2 Click **Login** in the Nebula web portal. Enter your myZyxel account information. You'll be redirected to another screen where you can sign up for a myZyxel account if you don't have one.
  - 3 Use the Nebula setup wizard to create an organization and a site.
  - 4 Register the Switch by entering its MAC address and serial number. The serial number and MAC address can be found in the **Status** screen or the device back label on the Switch.

#### Use the Zyxel Nebula Mobile App to Register the Switch

- 1 Download and open the Zyxel Nebula Mobile app in your mobile device. Click **Sign Up** to create a myZyxel account or enter your existing account information to log in.
- 2 You should already have created an organization and a site.
- 3 Select a site and scan the Switch's QR code to add it to the site. You can find the QR code:
  - On a label on the Switch or
  - On its box or
  - In the web configurator at **Basic > Cloud Management > Nebula Switch Registration**.

See [Section 3.3 on page 40](#) for more information about the **CLOUD** LED or [Section 7.2 on page 68](#) for more information about the **Hybrid Mode** field in the **Status** screen to see if the Switch goes into Nebula cloud management mode successfully.

Note: The Switch goes into Nebula-managed mode automatically after it can access the Nebula web portal and is successfully registered there. Its login password and settings are then overwritten with what you have configured in the Nebula web portal.

### From Nebula-managed to Standalone

To return to direct management standalone mode, just click **Unregister** to remove the Switch from the organization/site in the Nebula web portal. The Switch will reboot and restore the factory default settings.

## 1.1.5 ZON Utility

With its built-in web configurator, including the Zyxel One Network (ZON) Neighbor Management feature ([Section 7.4 on page 73](#)), viewing, managing and configuring the Switch and its neighboring devices is easy.

In addition, Zyxel offers a proprietary software program called Zyxel One Network (ZON) Utility, it is a utility tool that assists you to set up and maintain network devices in a more simple and efficient way. You can download the ZON Utility at [www.zyxel.com](http://www.zyxel.com) and install it on a PC (Windows operating system). For more information on ZON Utility see [Section 7.3 on page 68](#).

The following table shows which firmware version supports ZON and Neighbor Management (Smart Connect) for each Switch. The firmware on each Switch is identified by the firmware trunk version,

followed by a unique model code and release number in brackets. For example, 4.60(ABML.0) is a firmware version for the Switch where 4.60 is the firmware trunk version, ABML identifies the Switch and .0 is the first release of trunk version 4.60.

Table 2 Models and Firmware Version

| SWITCH MODEL | FIRMWARE VERSION       |
|--------------|------------------------|
| XS3800-28    | 4.60(ABML.0) and later |

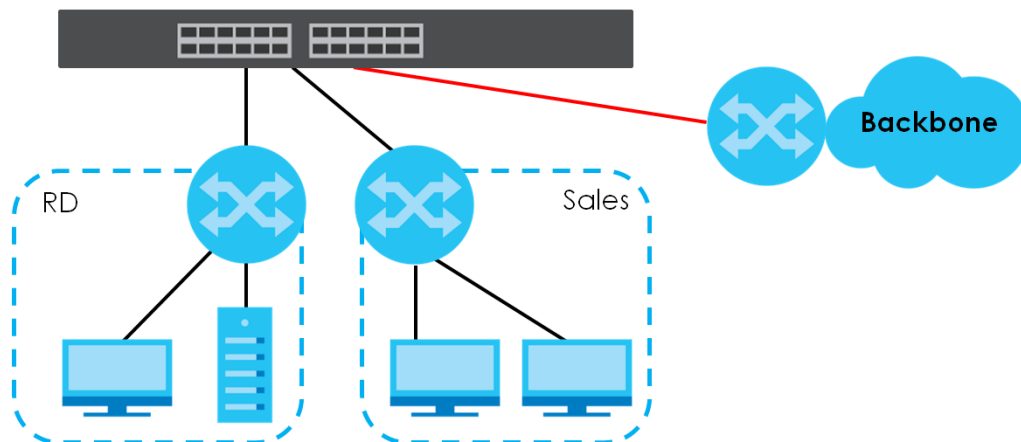
## 1.2 Applications

This section shows a few examples of using the Switch in various network environments.

### 1.2.1 Bridging Example

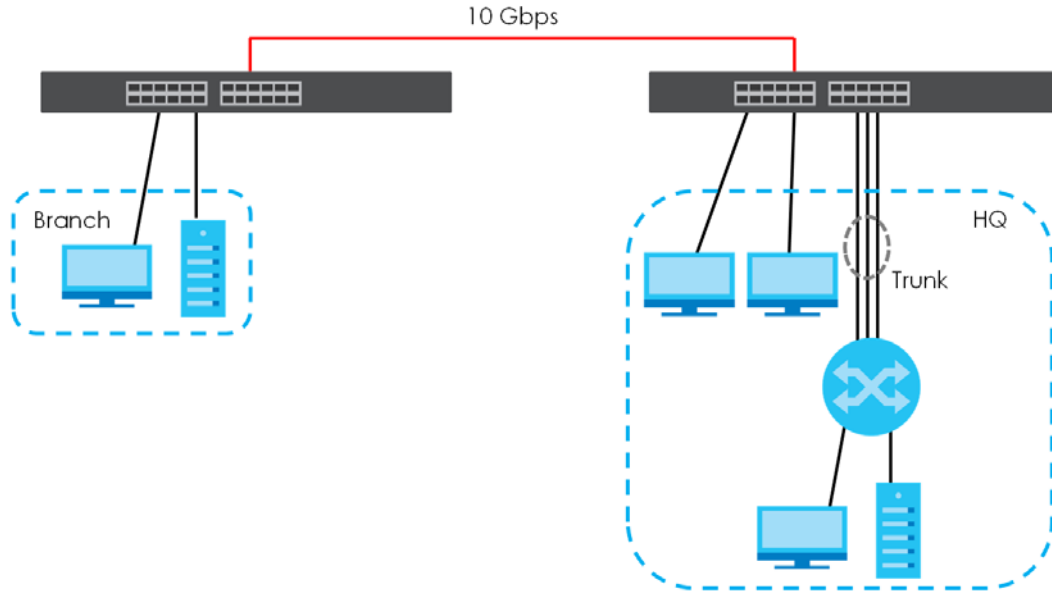
In this example the Switch connects different company departments (**RD** and **Sales**) to the corporate backbone. It can alleviate bandwidth contention and eliminate server and network bottlenecks. All users that need high bandwidth can connect to high-speed department servers via the Switch. You can provide a super-fast uplink connection by using the 10 Gigabit uplink ports on the Switch.

Figure 3 Bridging Application



### 1.2.2 High Performance Switching Example

The Switch is ideal for connecting two geographically dispersed networks that need high bandwidth. In the following example, a company uses the 10 Gigabit uplink ports to connect the headquarters to a branch office network. Within the headquarters network, a company can use trunking to group several physical ports into one logical higher-capacity link. Trunking can be used if for example, it is cheaper to use multiple lower-speed links than to under-utilize a high-speed, but more costly, single-port link.

**Figure 4** High Performance Switching

### 1.2.3 IEEE 802.1Q VLAN Application Example

A VLAN (Virtual Local Area Network) allows a physical network to be partitioned into multiple logical networks. Stations on a logical network belong to one or more groups. With VLAN, a station cannot directly talk to or hear from stations that are not in the same group(s) unless such traffic first goes through a router.

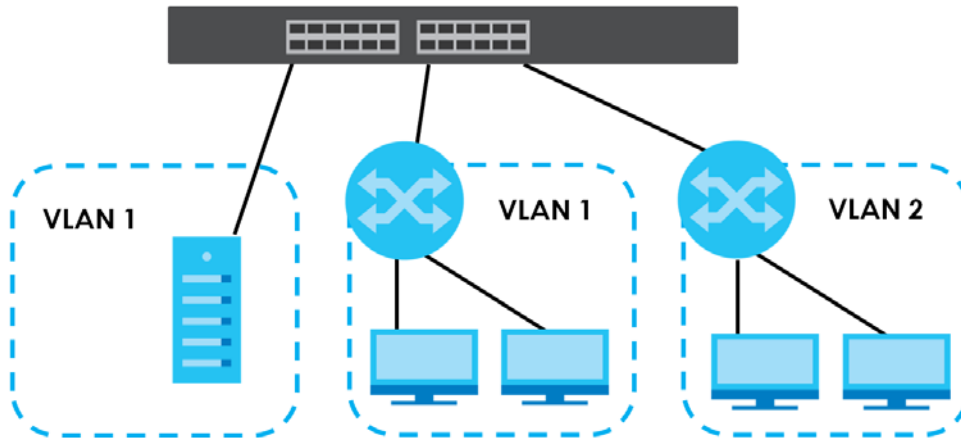
For more information on VLANs, refer to [Chapter 9 on page 109](#).

#### 1.2.3.1 Tag-based VLAN Example

Ports in the same VLAN group share the same frame broadcast domain, thus increasing network performance by reducing broadcast traffic. VLAN groups can be modified at any time by adding, moving or changing ports without any re-cabling.

Shared resources such as a server can be used by all ports in the same VLAN as the server. In the following figure only ports that need access to the server need to be part of VLAN 1. Ports can belong to other VLAN groups too.



**Figure 5** Shared Server Using VLAN Example

### 1.2.4 IPv6 Support

IPv6 (Internet Protocol version 6), is designed to enhance IP address size and features. The increase in IPv6 address size to 128 bits (from the 32-bit IPv4 address) allows up to  $3.4 \times 10^{38}$  IP addresses. At the time of writing, the Switch supports the following features.

- Static address assignment and stateless auto-configuration
- Neighbor Discovery Protocol (a protocol used to discover other IPv6 devices in a network)
- Remote Management using ping SNMP, telnet, HTTP and FTP services
- ICMPv6 to report errors encountered in packet processing and perform diagnostic functions, such as "ping"
- IPv4/IPv6 dual stack; the Switch can run IPv4 and IPv6 at the same time
- DHCPv6 client and relay
- Multicast Listener Discovery (MLD) snooping and proxy

For more information on IPv6, refer to [Appendix C on page 508](#) and the CLI Reference Guide.

## 1.3 Ways to Manage the Switch

Use any of the following methods to manage the Switch.

- Web Configurator. This is recommended for everyday management of the Switch using a (supported) web browser. See [Chapter 4 on page 42](#).
- Command Line Interface. Line commands offer an alternative to the Web Configurator and may be necessary to configure advanced features. See the CLI Reference Guide.
- FTP. Use File Transfer Protocol for firmware upgrades and configuration backup/restore. See [Section 51.11 on page 435](#).
- SNMP. The device can be monitored and/or managed by an SNMP manager. See [Section 52.3 on page 438](#).

## 1.4 Good Habits for Managing the Switch

Do the following things regularly to make the Switch more secure and to manage the Switch more effectively.

- Change the password. Use a password that's not easy to guess and that consists of different types of characters, such as numbers and letters.
- Write down the password and put it in a safe place.
- Back up the configuration (and make sure you know how to restore it). Restoring an earlier working configuration may be useful if the device becomes unstable or even crashes. If you forget your password, you will have to reset the Switch to its factory default settings. If you backed up an earlier configuration file, you would not have to totally re-configure the Switch. You could simply restore your last configuration.

# CHAPTER 2

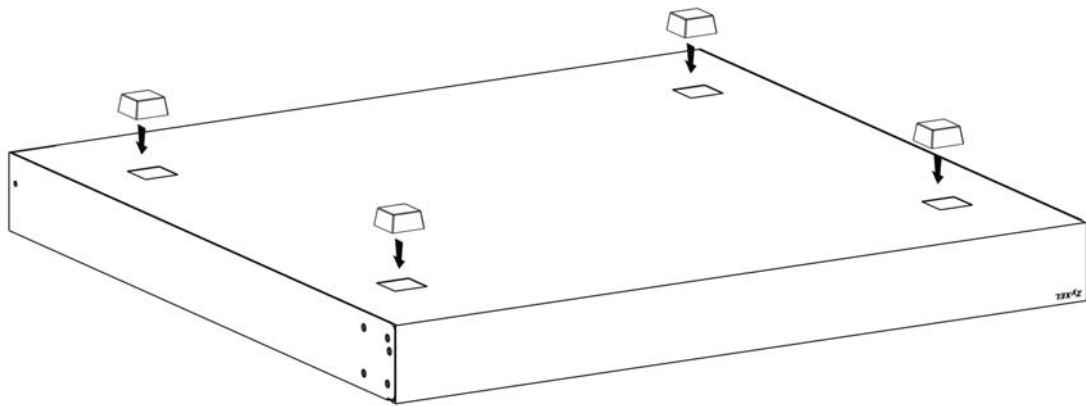
## Hardware Installation and Connection

This chapter shows you how to install and connect the Switch.

### 2.1 Freestanding Installation

- 1 Make sure the Switch is clean and dry.
- 2 Remove the adhesive backing from the rubber feet.
- 3 Attach the rubber feet to each corner on the bottom of the Switch. These rubber feet help protect the Switch from shock or vibration and ensure space between devices when stacking.

**Figure 6** Attaching Rubber Feet



- 4 Set the Switch on a smooth, level surface strong enough to support the weight of the Switch and the connected cables. Make sure there is a power outlet nearby.
- 5 Make sure there is at least 40 mm of clearance around the Switch to allow air circulation and the attachment of cables and the power cord.

**Do NOT block the ventilation holes nor store things on the Switch. Allow clearance for the ventilation holes to prevent your Switch from overheating. Overheating could affect the performance of your Switch, or even damage it.**

## 2.2 Rack Mounting

The Switch can be mounted on an EIA standard size, 19-inch rack or in a wiring closet with other equipment. Follow the steps below to mount your Switch on a standard EIA rack using a rack-mounting kit.

Note: Make sure there is enough clearance between each equipment on the rack for air circulation.

### 2.2.1 Installation Requirements

- Two mounting brackets.
- Eight M3 flat head screws and a #2 Philips screwdriver.
- Four M5 flat head screws and a #2 Philips screwdriver.

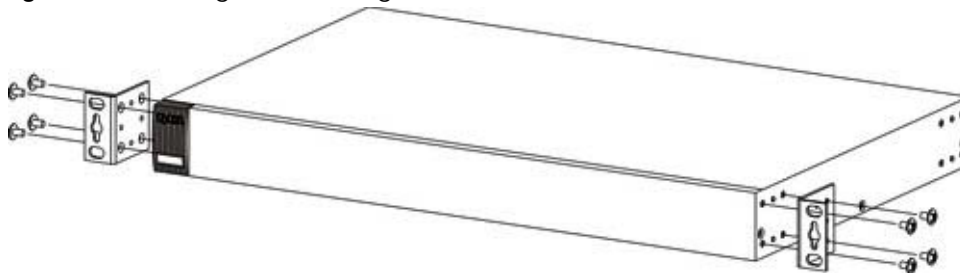
#### 2.2.1.1 Precautions

- Make sure the rack will safely support the combined weight of all the equipment it contains. The maximum weight a bracket can hold is 21.5 Kg.
- Make sure the position of the Switch does not make the rack unstable or top-heavy. Take all necessary precautions to anchor the rack securely before installing the unit.

### 2.2.2 Attaching the Mounting Brackets to the Switch

- 1 Position a mounting bracket on one side of the Switch, lining up the four screw holes on the bracket with the screw holes on the side of the Switch.

**Figure 7** Attaching the Mounting Brackets

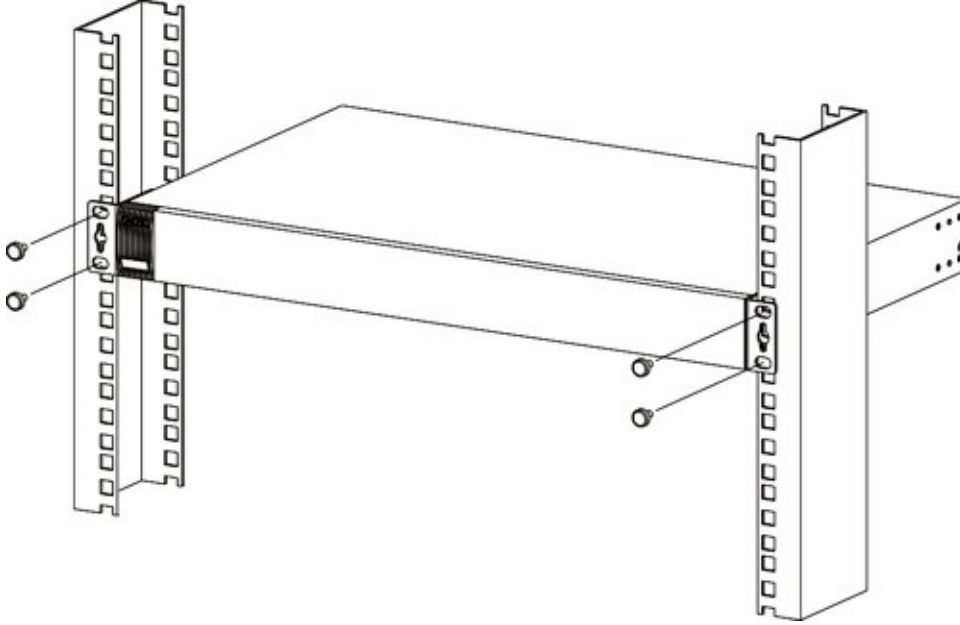


- 2 Using a #2 Philips screwdriver, install the M3 flat head screws through the mounting bracket holes into the Switch.
- 3 Repeat steps 1 and 2 to install the second mounting bracket on the other side of the Switch.
- 4 You may now mount the Switch on a rack. Proceed to the next section.

### 2.2.3 Mounting the Switch on a Rack

- 1 Position a mounting bracket (that is already attached to the Switch) on one side of the rack, lining up the two screw holes on the bracket with the screw holes on the side of the rack.

**Figure 8** Mounting the Switch on a Rack



- 2 Using a #2 Philips screwdriver, install the M5 flat head screws through the mounting bracket holes into the rack.

Note: Make sure you tighten all the four screws to prevent the Switch from getting slanted.

- 3 Repeat steps 1 and 2 to attach the second mounting bracket on the other side of the rack.

# CHAPTER 3

## Hardware Overview

This chapter describes the front panel and rear panel of the Switch and shows you how to make the hardware connections.

### 3.1 Front Panel Connections

The Switch supports 16 SFP+ slots and four 10 Gigabit Ethernet ports. The Switch also comes with eight dual personality interfaces of 10 Gigabit. A dual personality interface includes one Gigabit port and one slot for a SFP+ module with one port active at a time.

Ethernet ports support Multi-Gigabit (100 Mbps, 1 Gbps, 2.5 Gbps, 5 Gbps, and 10 Gbps). See [Section 1.1.1 on page 23](#) for more information about Multi-Gigabit.

The figure below shows the front panel of the Switch.

**Figure 9** Front Panel: XS3800-28



The following table describes the ports.

Table 3 Panel Connections

| CONNECTOR                                                              | DESCRIPTION                                                                                                                                                      |
|------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 16 10 GbE SFP+ Slots                                                   | Use SFP+ transceivers in these ports for high-bandwidth backbone connections. You can also insert an SFP+ Direct Attach Copper (DAC) in the SFP+ slot.           |
| 4 100 Mbps, 1 Gbps, 2.5 Gbps, 5 Gbps, and 10 Gbps RJ-45 Ethernet Ports | These are 10GBase-T auto-negotiating and auto-crossover Ethernet ports.<br>Connect these ports to a computer, a hub, a router, or an Ethernet switch.            |
| 8 10 GbE Combo Ports (Dual Personality Interfaces)                     | Each interface has one 10GBase-T copper RJ-45 port and one SFP slot, with one port active at a time.                                                             |
|                                                                        | • 8 10GBase-T Ports:<br>Connect these ports to a computer, an Ethernet switch or router.                                                                         |
|                                                                        | • 8 SFP+ Slots:<br>Use Small Form-Factor Pluggable (SFP) transceivers in these ports for fiber-optic connections to an Ethernet switch or router.                |
| RJ-45 out-of-band Management Port                                      | Connect to a computer using an RJ-45 Ethernet cable for local configuration of the Switch.                                                                       |
| Console Port                                                           | Only connect this port to your computer (using an RS-232 cable) if you want to configure the Switch using the command line interface (CLI) via the console port. |

Table 3 Panel Connections (continued)

| CONNECTOR | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|-----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Reset     | Press the <b>RESET</b> button to reboot the Switch without turning the power off. See Section 3.3 on page 40 for more information about the LED behavior.                                                                                                                                                                                                                                                                                                |
| RESTORE   | <p>Press the <b>RESTORE</b> button for three to six seconds to have the Switch automatically reboot and restore the last-saved custom default file. See Section 3.3 on page 40 for more information about the LED behavior.</p> <p>Press the <b>RESTORE</b> button for more than seven seconds to have the Switch automatically reboot and restore the factory default file. See Section 3.3 on page 40 for more information about the LED behavior.</p> |

### 3.1.1 SFP/SFP+ Slots

The transceiver slots are for Small Form-Factor Pluggable (SFP), SFP+ transceivers or DAC (Direct Attach Cables) cable. The SFP+ (SFP Plus) and the DAC cable are enhanced versions of the SFP and support data rates of up to 10 Gbps. A transceiver is a single unit that houses a transmitter and a receiver. Use a transceiver or a DAC cable to connect a fiber-optic cable to the Switch. The Switch does not come with transceivers nor DAC cables. You must use transceivers or DAC cables that comply with the Small Form-factor Pluggable (SFP) Transceiver MultiSource Agreement (MSA). See the SFF committee's INF-8074i specification Rev 1.0 for details.

You can change transceivers or the DAC cables while the Switch is operating. You can use different transceivers to connect to Ethernet switches with different types of fiber-optic connectors.

- Type: SFP connection interface
- Connection speed: 1 Gigabit per second (Mbps)
- Type: SFP+/DAC connection interface
- Connection speed: 1 or 10 Gigabit per second (Gbps)

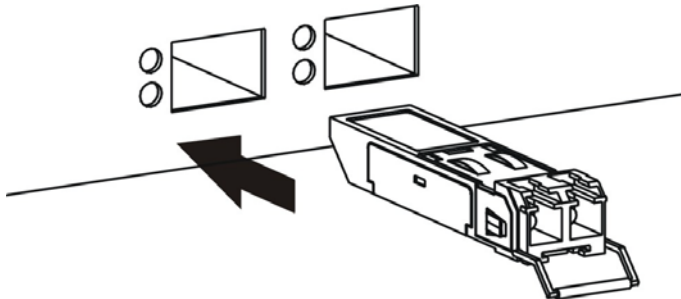
**To avoid possible eye injury, do not look into an operating fiber-optic module's connectors.**

#### 3.1.1.1 Transceiver Installation

Use the following steps to install a transceiver.

- 1 Insert the transceiver into the slot with the exposed section of PCB board facing down.

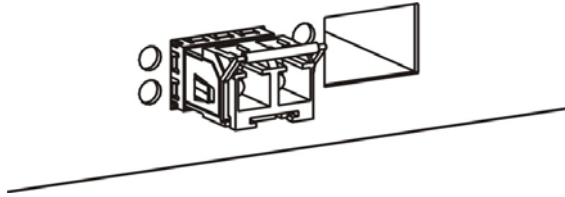
**Figure 10** Transceiver Installation Example



- 2 Press the transceiver firmly until it clicks into place.

- 3 The Switch automatically detects the installed transceiver. Check the LEDs to verify that it is functioning properly.

**Figure 11** Installed Transceiver

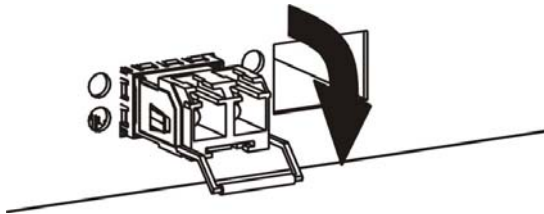


### 3.1.1.2 Transceiver Removal

Use the following steps to remove a transceiver.

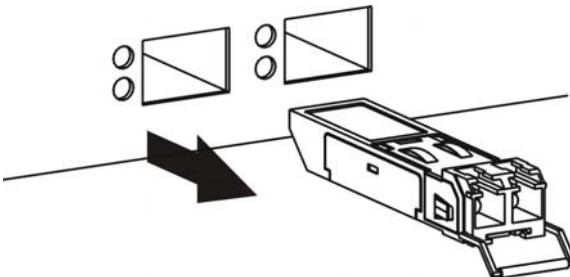
- 1 Open the transceiver's latch (latch styles vary).

**Figure 12** Opening the Transceiver's Latch Example



- 2 Pull the transceiver out of the slot.

**Figure 13** Transceiver Removal Example



### 3.1.2 Ethernet Ports

The Switch has 10GBase-T auto-negotiating, auto-crossover Ethernet ports. In Multi-Gigabit Ethernet, the speed can be 100 Mbps, 1 Gbps, 2.5 Gbps, 5 Gbps, or 10 Gbps. See [Section 1.1.1 on page 23](#) for more information about Multi-Gigabit. The duplex mode can be full duplex at 100 Mbps and full duplex only at 1000 Mbps.

An auto-negotiating port can detect and adjust to the optimum Ethernet speed (100 Mbps, 1 Gbps, 2.5 Gbps, 5 Gbps, and 10 Gbps) and full duplex mode of the connected device.

An auto-crossover (auto-MDI/MDI-X) port automatically works with a straight-through or crossover Ethernet cable.

When auto-negotiation is turned on, an Ethernet port negotiates with the peer automatically to determine the connection speed and duplex mode. If the peer Ethernet port does not support auto-



negotiation or turns off this feature, the Switch determines the connection speed by detecting the signal on the cable. When the Switch's auto-negotiation is turned off, an Ethernet port uses the pre-configured speed and duplex mode when making a connection, thus requiring you to make sure that the settings of the peer Ethernet port are the same in order to connect.

### 3.1.2.1 Default Ethernet Settings

The factory default negotiation settings for the Ethernet ports on the Switch are:

- Speed: Auto
- Duplex: Auto
- Flow control: Off
- Dual Personality Interface: Fiber-optic module first

### 3.1.3 Dual Personality Interfaces

A combo port is for uplink connections. It consists of a 10 Gigabit Ethernet port for Ethernet connection, and a SFP+ transceiver slot for fiber connection. The fiber connection takes priority if the corresponding Gigabit port is also connected.

- 100 Mbps/1 Gbps/2.5 Gbps/5 Gbps/10 Gbps - Connect these ports to high-bandwidth backbone network Ethernet switches using Category 5e/6/6a/7 copper cables, see [Table 1 on page 23](#) for more information about the cable differences.
- Transceiver Slots - Use SFP/SFP+ in these slots for connections to backbone Ethernet switches.

**Figure 14** Combo Port Example: 10 Gigabit Port and SFP+ Transceiver Slot



### 3.1.4 Management Port

The 1000Base-T Ethernet **MGMT** (management) port is used for local management. Connect directly to this port using an Ethernet cable. You can configure the Switch via Telnet or the web configurator.

The default IP address of the management port is 192.168.0.1 with a subnet mask of 255.255.255.0.

### 3.1.5 Console Port

For local management, you can use a computer with terminal emulation software configured to the following parameters:

- VT100 terminal emulation
- 115200 bps
- No parity, 8 data bits, 1 stop bit
- No flow control

Connect the male 9-pin end of the RS-232 console cable to the console port of the Switch. Connect the female end to a serial port (COM1, COM2 or other COM port) of your computer.

## 3.2 Rear Panel

The following figures show the rear panels of the Switch. The rear panels contain:

- Two AC power receptacles (**A** and **B**)

**Figure 15** Rear Panel: XS3800-28



### 3.2.1 Grounding

Grounding is a safety measure to have unused electricity return to the ground. It prevents damage to the Switch, and protects you from electrocution.

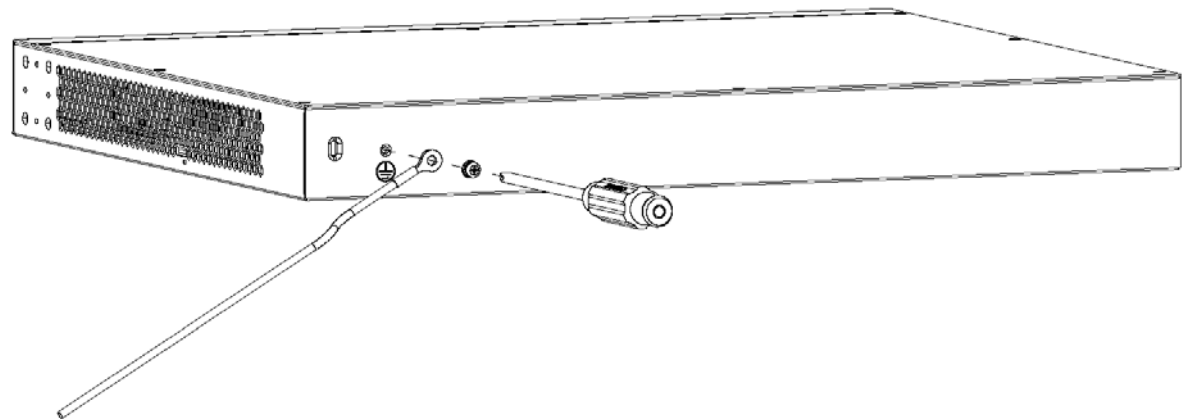
Note: The Switch must be grounded by qualified service personnel.

- 1 Remove the M4 ground screw from the Switch's rear panel.
- 2 Secure a green/yellow ground cable (16 AWG or smaller) to the Switch's rear panel using the M4 ground screw.
- 3 Attach the other end of the cable to the ground, either to the same ground electrode as the rack you installed the device on or to the main grounding electrode of the building.

Follow your country's regulations and safety instructions to electrically ground the device properly.

**Warning! Connect the ground cable before you connect any other cables or wiring.**

**Figure 16** Grounding



### 3.2.2 AC Power Connection

Make sure you are using the correct power source and that no objects obstruct the airflow of the fans.

The Switch uses two power supply modules, one of which is redundant, so if one power module fails the system can operate on the remaining module.

#### Connecting the Power

Use the following procedures to connect the Switch to a power source after you have installed it in a rack.

Note: Use the included power cord for the AC power connection.

- 1 Connect the female end of the power cord to the AC power socket.
- 2 Connect the other end of the cord to a power outlet.

#### Disconnecting the Power

The power input connectors can be disconnected from the power source individually.

- 1 Disconnect the power cord from the power outlet.
- 2 Disconnect the power cord from the AC power socket.

## 3.3 LEDs

The following table describes the LEDs.

Table 4 LEDs

| LED  | COLOR | STATUS   | DESCRIPTION                                                                                                                                                                                                                                                                                                    |
|------|-------|----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| PWR1 | Green | On       | The Switch is receiving power from the power module in the first power slot.                                                                                                                                                                                                                                   |
|      |       | Blinking | The Switch is returning to the last-saved custom default configuration settings.                                                                                                                                                                                                                               |
|      | Amber | On       | The Switch is returning to its factory default configuration settings.                                                                                                                                                                                                                                         |
|      |       | Blinking | The <b>PWR1</b> LED will blink in amber in the following situations: <ul style="list-style-type: none"><li>• The Switch detected a power supply failure with the power cable connected to the Switch and a power source.</li><li>• The fans are not functioning at a proper speed or malfunctioning.</li></ul> |
|      |       | Off      | The Switch is not receiving power from the power module in the first power slot.                                                                                                                                                                                                                               |

Table 4 LEDs (continued)

| LED            | COLOR                                                               | STATUS   | DESCRIPTION                                                                                                                                                                                                                                                                                                   |
|----------------|---------------------------------------------------------------------|----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| PWR2           | Green                                                               | On       | The Switch is receiving power from the power module in the second power slot.                                                                                                                                                                                                                                 |
|                |                                                                     | Blinking | The Switch is returning to the last-saved custom default configuration settings.                                                                                                                                                                                                                              |
|                | Amber                                                               | On       | The Switch is returning to its factory default configuration settings.                                                                                                                                                                                                                                        |
|                |                                                                     | Blinking | The <b>PWR2</b> LED will blink in amber in the following situations: <ul style="list-style-type: none"> <li>The Switch detected a power supply failure with the power cable connected to the Switch and a power source.</li> <li>The fans are not functioning at a proper speed or malfunctioning.</li> </ul> |
|                |                                                                     | Off      | The Switch is not receiving power from the power module in the second power slot.                                                                                                                                                                                                                             |
| SYS (System)   | Green                                                               | On       | The Switch is on and functioning properly.                                                                                                                                                                                                                                                                    |
|                |                                                                     | Blinking | The Switch is rebooting and performing self-diagnostic tests.                                                                                                                                                                                                                                                 |
|                | Red                                                                 | On       | The Switch is functioning abnormally.                                                                                                                                                                                                                                                                         |
|                |                                                                     | Off      | The power is off or the system is not ready/malfunctioning.                                                                                                                                                                                                                                                   |
| CLOUD          | Green                                                               | On       | The Switch has successfully connected to the NCC (Nebula Control Center).                                                                                                                                                                                                                                     |
|                |                                                                     | Blinking | The Switch cannot connect to the NCC because it is not registered.                                                                                                                                                                                                                                            |
|                | Amber                                                               | On       | The Switch is registered at the NCC but cannot connect to the NCC. Please check the Internet connection of the Switch.                                                                                                                                                                                        |
|                |                                                                     | Blinking | The Switch is not registered at the NCC and cannot connect to the NCC. Please check the Internet connection of the Switch and register the Switch at NCC.                                                                                                                                                     |
|                |                                                                     | Off      | The Switch is operating in standalone mode. Nebula Control Center Discovery is disabled in <b>Basic &gt; Cloud Management &gt; Nebula Control Center Discovery</b> in the Switch Web Configurator.                                                                                                            |
|                | Note: Hybrid mode and NCC registration are reserved for future use. |          |                                                                                                                                                                                                                                                                                                               |
| LOCATOR        | Blue                                                                | On       | The Switch is uploading firmware. While the Switch is doing this, don't turn off the power.                                                                                                                                                                                                                   |
|                |                                                                     | Blinking | Shows the actual location of the Switch between several devices in a rack. The default timer is 30 minutes when you are configuring the Switch.                                                                                                                                                               |
|                |                                                                     | Off      | The locator is not functioning or malfunctioning.                                                                                                                                                                                                                                                             |
| Ethernet Ports |                                                                     |          |                                                                                                                                                                                                                                                                                                               |
| 17-28          | Green                                                               | On       | The port has a successful 100 Mbps/1 Gbps/2.5 Gbps/5 Gbps connection.                                                                                                                                                                                                                                         |
|                |                                                                     | Blinking | The port is receiving or transmitting data at 100 Mbps/1 Gbps/2.5 Gbps/5 Gbps.                                                                                                                                                                                                                                |
|                | Blue                                                                | On       | The port has a successful 10 Gbps connection.                                                                                                                                                                                                                                                                 |
|                |                                                                     | Blinking | The port is receiving or transmitting data at 10 Gbps.                                                                                                                                                                                                                                                        |
|                |                                                                     | Off      | This link is disconnected or the port is disabled.                                                                                                                                                                                                                                                            |
| SFP+ Slots     |                                                                     |          |                                                                                                                                                                                                                                                                                                               |
| 1-16; 21-28    | Green                                                               | On       | The port has a successful 1000 Mbps connection.                                                                                                                                                                                                                                                               |
|                |                                                                     | Blinking | The port is receiving or transmitting data at 1000 Mbps.                                                                                                                                                                                                                                                      |
|                | Blue                                                                | On       | The port has a successful 10 Gbps connection.                                                                                                                                                                                                                                                                 |
|                |                                                                     | Blinking | The port is receiving or transmitting data 10 Gbps.                                                                                                                                                                                                                                                           |
|                |                                                                     | Off      | This link is disconnected.                                                                                                                                                                                                                                                                                    |

Table 4 LEDs (continued)

| LED                  | COLOR            | STATUS   | DESCRIPTION                                                                                                      |
|----------------------|------------------|----------|------------------------------------------------------------------------------------------------------------------|
| MGMT<br>(Management) | Green<br>(Right) | On       | The <b>MGMT</b> port is connected at 10/1000 Mbps.                                                               |
|                      |                  | Blinking | The system is transmitting or receiving to/from an Ethernet device at 10/1000 Mbps through the <b>MGMT</b> port. |
|                      | Amber<br>(Left)  | On       | The <b>MGMT</b> port is connected at 100 Mbps.                                                                   |
|                      |                  | Blinking | The system is transmitting or receiving to/from an Ethernet device at 100 Mbps through the <b>MGMT</b> port.     |
|                      |                  | Off      | The <b>MGMT</b> port is not connected to an Ethernet device, or the port is disabled.                            |

# CHAPTER 4

## The Web Configurator

This section introduces the configuration and functions of the web configurator.

### 4.1 Introduction

The web configurator is an HTML-based management interface that allows easy Switch setup and management via Internet browser. Supported browsers at the time of writing are:

- IE 8 or later
- Chrome 34.0.1847.131 or later
- Firefox 29.0.1 or later
- Opera 21.0 or later
- Safari 5.1.7 or later

The recommended screen resolution is 1024 by 768 pixels. In order to use the web configurator you need to allow:

- Web browser pop-up windows from your device. Web pop-up blocking is enabled by default in some browsers.
- JavaScript (enabled by default).
- Java permissions (enabled by default).

### 4.2 System Login

- 1 Start your web browser.
- 2 The Switch is a DHCP client by default. Type "http://DHCP-assigned IP" in the **Location** or **Address** field. Press [ENTER].

If the Switch is not connected to a DHCP server, type "http://" and the static IP address of the Switch (for example, the default management IP address is 192.168.1.1 through an in-band (non-**MGMT**) port and 192.168.0.1 through the **MGMT** port) in the **Location** or **Address** field. Press [ENTER]. Your computer must be in the same subnet in order to access this website address.

Also, you can use the ZON Utility to check your Switch's IP address.

- 3 The following screen appears.

**Figure 17** Web Configurator: Visit NCC & Login

**ZYXEL**

**Nebula Control Center**

Register your Switch and enjoy the power of cloud controller, manage your Switch anywhere, anytime from any device, and it is free.

**XS3800**

Enter User Name/Password and click to login.

**Visit** **Login**

- 4 Click the **Visit** button if you want to open the ZyXel Nebula Control Center (NCC) login page in a new tab or window. The NCC is an alternative cloud-based network management system that allows you to remotely manage and monitor the Switch. (see [Section 1.1.1 on page 20](#)).

**Figure 18** Visit NCC

**ZYXEL nebula**

**New Here?**

Create an account to access Nebula Control Center

**Login**

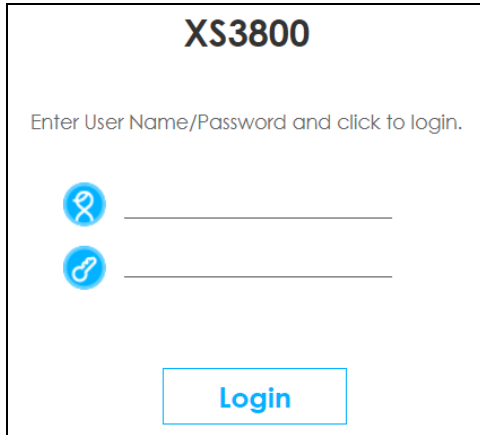
**Experience Live Demo**

Account: Nebula@zyxel.com

Password: NebulaDemo

**Live Demo**

- 5 Alternatively, click **Login** to log into the web configurator to manage the Switch directly. The default username is **admin** and associated default password is **1234**.

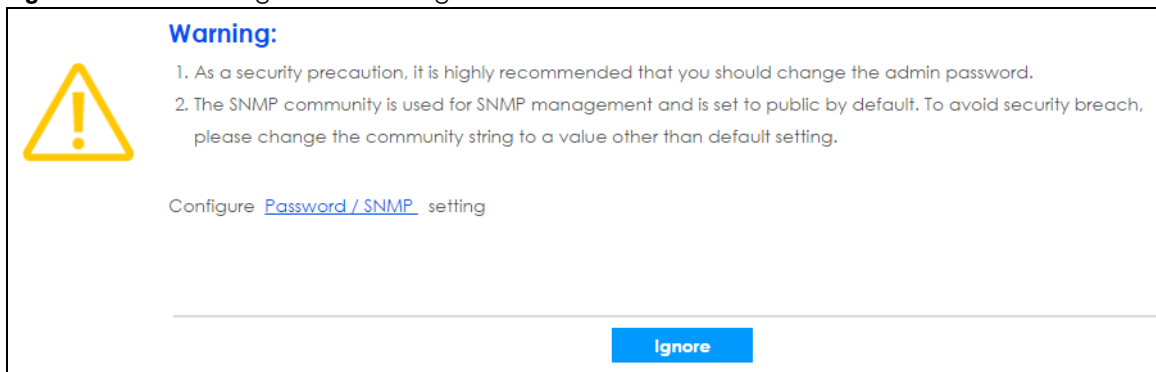
**Figure 19** Web Configurator: Login


**XS3800**

Enter User Name/Password and click to login.

**Login**

- 6 If you didn't change the default administrator password and/or SNMP community values, a warning screen displays each time you log into the web configurator. Click **Password / SNMP** to open a screen where you can change the administrator and SNMP passwords simultaneously. Otherwise, click **Ignore** to close it.

**Figure 20** Web Configurator: Warning


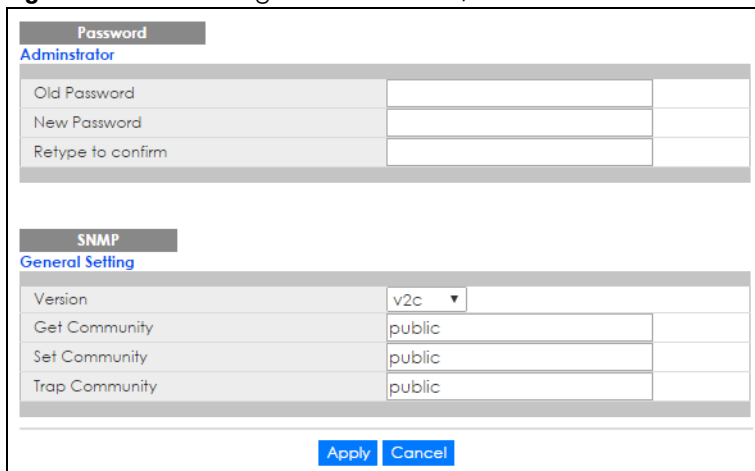
**Warning:**

1. As a security precaution, it is highly recommended that you should change the admin password.

2. The SNMP community is used for SNMP management and is set to public by default. To avoid security breach, please change the community string to a value other than default setting.

Configure [Password / SNMP](#) setting

**Ignore**

**Figure 21** Web Configurator: Password/SNMP


**Password**

**Administrator**

|                   |                          |                          |
|-------------------|--------------------------|--------------------------|
| Old Password      | <input type="password"/> | <input type="password"/> |
| New Password      | <input type="password"/> | <input type="password"/> |
| Retype to confirm | <input type="password"/> | <input type="password"/> |

**SNMP**

**General Setting**

|                |        |                      |
|----------------|--------|----------------------|
| Version        | v2c    | <input type="text"/> |
| Get Community  | public | <input type="text"/> |
| Set Community  | public | <input type="text"/> |
| Trap Community | public | <input type="text"/> |

**Apply** **Cancel**



Change the default administrator and/or SNMP passwords, and then click **Apply** to save your changes.

Table 5 Web Configurator: Password/SNMP

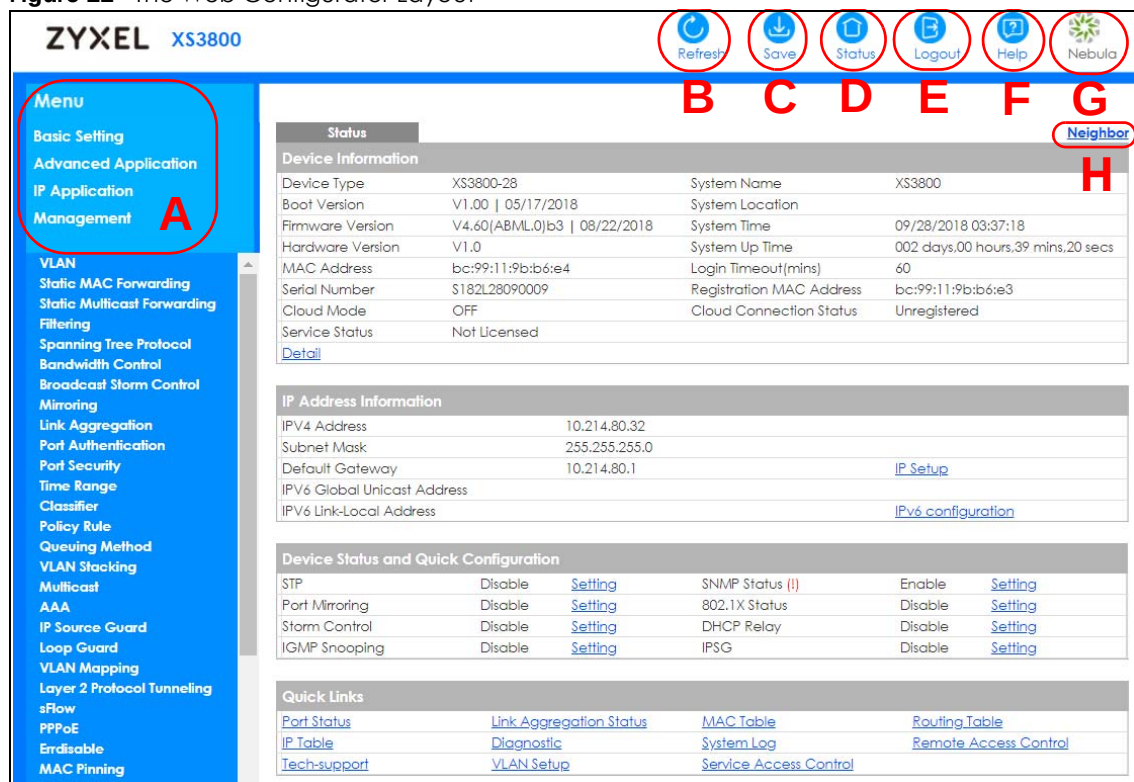
| LABEL             | DESCRIPTION                                                                                                                                                                                                                                                                                |
|-------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Administrator     | This is the default administrator account with the "admin" user name. You cannot change the default administrator user name. Only the administrator has read/write access.                                                                                                                 |
| Old Password      | Type the existing system password ( <b>1234</b> is the default password when shipped).                                                                                                                                                                                                     |
| New Password      | Enter your new system password.                                                                                                                                                                                                                                                            |
| Retype to confirm | Retype your new system password for confirmation                                                                                                                                                                                                                                           |
| General Setting   | Use this section to specify the SNMP version and community (password) values.                                                                                                                                                                                                              |
| Version           | Select the SNMP version for the Switch. The SNMP version on the Switch must match the version on the SNMP manager. Choose SNMP version 2c ( <b>v2c</b> ), SNMP version 3 ( <b>v3</b> ) or both ( <b>v3v2c</b> ).<br><br>Note: SNMP version 2c is backwards compatible with SNMP version 1. |
| Get Community     | Enter the <b>Get Community</b> string, which is the password for the incoming Get- and GetNext-requests from the management station.<br><br>The <b>Get Community</b> string is only used by SNMP managers using SNMP version 2c or lower.                                                  |
| Set Community     | Enter the <b>Set Community</b> string, which is the password for the incoming Set- requests from the management station.<br><br>The <b>Set Community</b> string is only used by SNMP managers using SNMP version 2c or lower.                                                              |
| Trap Community    | Enter the <b>Trap Community</b> string, which is the password sent with each trap to the SNMP manager.<br><br>The <b>Trap Community</b> string is only used by SNMP managers using SNMP version 2c or lower.                                                                               |
| Apply             | Click <b>Apply</b> to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the <b>Save</b> link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.         |
| Cancel            | Click <b>Cancel</b> to begin configuring this screen afresh.                                                                                                                                                                                                                               |

## 4.3 The Web Configurator Layout

The **Status** screen is the first screen that displays when you access the web configurator.

The following figure shows the navigating components of a web configurator screen.

**Figure 22** The Web Configurator Layout



**A** - Click the menu items to open submenu links, and then click on a submenu link to open the screen in the main window.

**B, C, D, E, F, G-** These are quick links which allow you to perform certain tasks no matter which screen you are currently working in.

**B** - Click this link to update the information in the screen you are viewing currently.

**C** - Click this link to save your configuration into the Switch's nonvolatile memory. Nonvolatile memory is saved in the configuration file from which the Switch booted from and it stays the same even if the Switch's power is turned off. See [Section 51.3 on page 426](#) for information on saving your settings to a specific configuration file.

**D** - Click this link to go to the status page of the Switch.

**E** - Click this link to log out of the web configurator.

**F** - Click this link to display web help pages. The help pages provide descriptions for all of the configuration screens.

**G** - Click this link to go to the NCC (Nebula Control Center) portal website.

**H** - Click this link to go to the ZON **Neighbor** Management screen where you can see and manage neighbor devices learned by the Switch.

In the navigation panel, click a main link to reveal a list of submenu links.

Table 6 Navigation Panel Sub-links Overview

| BASIC SETTING                                                                                                                                                                                                            | ADVANCED APPLICATION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | IP APPLICATION                                                                                                                                                                        | MANAGEMENT                                                                                                                                                                                                                                                                                                                    |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Menu</b><br>Basic Setting<br>Advanced Application<br>IP Application<br>Management<br><br>System Info<br>General Setup<br>Switch Setup<br>IP Setup<br>Port Setup<br>Interface Setup<br>IPv6<br>DNS<br>Cloud Management | <b>Menu</b><br>Basic Setting<br>Advanced Application<br>IP Application<br>Management<br><br>VLAN<br>Static MAC Forwarding<br>Static Multicast Forwarding<br>Filtering<br>Spanning Tree Protocol<br>Bandwidth Control<br>Broadcast Storm Control<br>Mirroring<br>Link Aggregation<br>Port Authentication<br>Port Security<br>Time Range<br>Classifier<br>Policy Rule<br>Queuing Method<br>VLAN Stacking<br>Multicast<br>AAA<br>IP Source Guard<br>Loop Guard<br>VLAN Mapping<br>Layer 2 Protocol Tunneling<br>sFlow<br>PPPoE<br>Erdisable<br>MAC Pinning<br>Private VLAN<br>Green Ethernet<br>LLDP<br>Anti-Arpscan<br>BPDU Guard<br>OAM<br>ZULD<br>NLB<br>Wol Relay | <b>Menu</b><br>Basic Setting<br>Advanced Application<br>IP Application<br>Management<br><br>Static Routing<br>Policy Routing<br>DiffServ<br>DHCP<br>VRRP<br>Router Setup<br>ARP Setup | <b>Menu</b><br>Basic Setting<br>Advanced Application<br>IP Application<br>Management<br><br>Maintenance<br>Access Control<br>Diagnostic<br>System Log<br>Syslog Setup<br>Cluster Management<br>MAC Table<br>IP Table<br>ARP Table<br>Routing Table<br>Path MTU Table<br>Configure Clone<br>IPv6 Neighbor Table<br>Port Status |

The following table describes the links in the navigation panel.

Table 7 Navigation Panel Links

| LINK           | DESCRIPTION                                                                                                                                                 |
|----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Basic Settings |                                                                                                                                                             |
| System Info    | This link takes you to a screen that displays general system and hardware monitoring information.                                                           |
| General Setup  | This link takes you to a screen where you can configure general identification information and time settings for the Switch.                                |
| Switch Setup   | This link takes you to a screen where you can set up global Switch parameters such as VLAN type, MAC address learning, GARP and priority queues.            |
| IP Setup       | This link takes you to a screen where you can configure the IP address, subnet mask (necessary for Switch management) and set up to 128 IP routing domains. |
| Port Setup     | This link takes you to screens where you can configure speed, flow control and priority settings for individual Switch ports.                               |

Table 7 Navigation Panel Links (continued)

| LINK                        | DESCRIPTION                                                                                                                                                                                                                                                                                    |
|-----------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Interface Setup             | This link takes you to a screen where you can create virtual interfaces on the Switch.                                                                                                                                                                                                         |
| IPv6                        | This link takes you to a screen where you can enable an IPv6 interface and configure the IPv6 settings on the Switch.                                                                                                                                                                          |
| Cloud Management            | This screen displays a link to a screen where you can enable or disable the <b>Nebula Center Control Discovery</b> feature. If it's enabled, you can have the Switch search for the NCC (Nebula Control Center).                                                                               |
| DNS                         | This link takes you to a screen where you can configure DNS (domain name server) IP addresses.                                                                                                                                                                                                 |
| Advanced Application        |                                                                                                                                                                                                                                                                                                |
| VLAN                        | This link takes you to screens where you can configure port-based or 802.1Q VLAN (depending on what you configured in the Switch Setup menu). You can also configure a protocol based VLAN or a subnet based VLAN in these screens.                                                            |
| Static MAC Forwarding       | This link takes you to screens where you can configure static MAC addresses for a port. These static MAC addresses do not age out.                                                                                                                                                             |
| Static Multicast Forwarding | This link takes you to a screen where you can configure static multicast MAC addresses for port(s). These static multicast MAC addresses do not age out.                                                                                                                                       |
| Filtering                   | This link takes you to a screen to set up filtering rules.                                                                                                                                                                                                                                     |
| Spanning Tree Protocol      | This link takes you to screens where you can configure the RSTP/MRSTP/MSTP to prevent network loops.                                                                                                                                                                                           |
| Bandwidth Control           | This link takes you to screens where you can cap the maximum bandwidth allowed on a port.                                                                                                                                                                                                      |
| Broadcast Storm Control     | This link takes you to a screen to set up broadcast filters.                                                                                                                                                                                                                                   |
| Mirroring                   | This link takes you to screens where you can copy traffic from one port or ports to another port in order that you can examine the traffic from the first port without interference.                                                                                                           |
| Link Aggregation            | This link takes you to screen where you can logically aggregate physical links to form one logical, higher-bandwidth link.                                                                                                                                                                     |
| Port Authentication         | This link takes you to a screen where you can configure IEEE 802.1x port authentication as well as MAC authentication for clients communicating via the Switch.                                                                                                                                |
| Port Security               | This link takes you to a screen where you can activate MAC address learning and set the maximum number of MAC addresses to learn on a port.                                                                                                                                                    |
| Time Range                  | This link takes you to a screen where you can configure time range for time-oriented features like Classifier.                                                                                                                                                                                 |
| Classifier                  | This link takes you to screens where you can configure the Switch to group packets based on the specified criteria.                                                                                                                                                                            |
| Policy Rule                 | This link takes you to a screen where you can configure the Switch to perform special treatment on the grouped packets.                                                                                                                                                                        |
| Queuing Method              | This link takes you to a screen where you can configure queuing with associated queue weights for each port.                                                                                                                                                                                   |
| VLAN Stacking               | This link takes you to screens where you can activate and configure VLAN stacking.                                                                                                                                                                                                             |
| Multicast                   | This link takes you to screen where you can configure various multicast features, IGMP snooping, MLD snooping-proxy and create multicast VLANs.                                                                                                                                                |
| AAA                         | This link takes you to a screen where you can configure authentication, authorization and accounting services via external servers. The external servers can be either RADIUS (Remote Authentication Dial-In User Service) or TACACS+ (Terminal Access Controller Access-Control System Plus). |
| IP Source Guard             | This link takes you to screens where you can configure filtering of unauthorized DHCP and ARP packets in your network.                                                                                                                                                                         |
| Loop Guard                  | This link takes you to a screen where you can configure protection against network loops that occur on the edge of your network.                                                                                                                                                               |

Table 7 Navigation Panel Links (continued)

| LINK                       | DESCRIPTION                                                                                                                                                                                                                |
|----------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| VLAN Mapping               | This link takes you to screens where you can configure VLAN mapping settings on the Switch.                                                                                                                                |
| Layer 2 Protocol Tunneling | This link takes you to a screen where you can configure L2PT (Layer 2 Protocol Tunneling) settings on the Switch.                                                                                                          |
| sFlow                      | This link takes you to screens where you can configure sFlow settings on the Switch.                                                                                                                                       |
| PPPoE                      | This link takes you to screens where you can configure how the Switch gives a PPPoE termination server additional subscriber information that the server can use to identify and authenticate a PPPoE client.              |
| Errdisable                 | This link takes you to a screens where you can view errdisable status and configure errdisable settings in CPU protection, errdisable detect, and errdisable recovery.                                                     |
| MAC Pinning                | This link takes you to a screen where you can set specific ports to have priority over other ports in MAC address learning.                                                                                                |
| Private VLAN               | This link takes you to a screen where you can block traffic between ports in a VLAN on the Switch.                                                                                                                         |
| Green Ethernet             | This link takes you to a screen where you can configure the Switch to reduce port power consumption.                                                                                                                       |
| LLDP                       | This link takes you to a screen where you can configure LLDP settings.                                                                                                                                                     |
| Anti-Arpscan               | This link takes you to screens where you can enable anti-arpscan on the Switch and ports, and view the port state. You can also create trusted hosts, view blocked hosts and unblock them.                                 |
| BPDU Guard                 | This link takes you to screens where you can enable BPDU guard on the Switch and ports, and view the port state.                                                                                                           |
| OAM                        | This link takes you to screens where you can enable Ethernet OAM on the Switch, view the configuration of ports on which Ethernet OAM is enabled and perform remote-loopback tests.                                        |
| ZULD                       | This link takes you to screens where you can enable ZULD on a port and configure related settings.                                                                                                                         |
| NLB                        | This link takes you to screens where you can configure to which MAC addresses and ports the Switch should forward the incoming NLB traffic, and map the IP address to the MAC address of a cluster for layer-3 forwarding. |
| Wol Relay                  | This link takes you to a screen where you can configure settings on Wake On LAN relay.                                                                                                                                     |
| IP Application             |                                                                                                                                                                                                                            |
| Static Routing             | This link takes you to a screen where you can configure static routes. A static route defines how the Switch should forward traffic by configuring the TCP/IP parameters manually.                                         |
| Policy Routing             | This link takes you to screens where you can configure policy routing rules.                                                                                                                                               |
| DiffServ                   | This link takes you to screens where you can enable DiffServ, configure marking rules and set DSCP-to-IEEE802.1p mappings.                                                                                                 |
| DHCP                       | This link takes you to screens where you can configure the DHCP settings.                                                                                                                                                  |
| VRRP                       | This link takes you to screens where you can configure redundant virtual router for your network.                                                                                                                          |
| Router Setup               | This link takes you to a screen where you can enable Equal-Cost MultiPath (ECMP) routing and set the criteria the Switch uses to determine the routing path for a packet.                                                  |
| ARP Setup                  | This link takes you to a screen where you can configure ARP learning mode on a per-port basis and create static ARP entries which do not age out.                                                                          |
| Management                 |                                                                                                                                                                                                                            |
| Maintenance                | This link takes you to screens where you can perform firmware and configuration file maintenance as well as reboot the system.                                                                                             |
| Access Control             | This link takes you to screens where you can change the system login password and configure SNMP and remote management.                                                                                                    |

Table 7 Navigation Panel Links (continued)

| LINK                | DESCRIPTION                                                                                                                                                    |
|---------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Diagnostic          | This link takes you to screens where you can ping IP addresses, run traceroute, test port(s).                                                                  |
| System Log          | This link takes you to a screen where you can view system logs.                                                                                                |
| Syslog Setup        | This link takes you to a screen where you can setup system logs and a system log server.                                                                       |
| Cluster Management  | This link takes you to a screen where you can configure clustering management and view its status.                                                             |
| MAC Table           | This link takes you to a screen where you can view the MAC address and VLAN ID of a device attach to a port. You can also view what kind of MAC address it is. |
| IP Table            | This link takes you to a screen where you can view the IP addresses and VLAN ID of a device attached to a port. You can also view what kind of device it is.   |
| ARP Table           | This link takes you to a screen where you can view the MAC address – IP address resolution table.                                                              |
| Routing Table       | This link takes you to a screen where you can view the routing table.                                                                                          |
| Path MTU Table      | This link takes you to a screen where you can view the IPv6 path MTU table.                                                                                    |
| Configure Clone     | This link takes you to a screen where you can copy attributes of one port to (an)other port(s).                                                                |
| IPv6 Neighbor Table | This link takes you to a screen where you can view the Switch's IPv6 neighbor table.                                                                           |
| Port Status         | This link takes you to a screen where you can view the port statistics.                                                                                        |

### 4.3.1 Change Your Password

After you log in for the first time, it is recommended you change the default administrator password. Click **Management > Access Control > Logins** to display the next screen.

Figure 23 Change Administrator Login Password

**Logins** [Access Control](#)

**Administrator**

Old Password

New Password

Retype to confirm

**Please record your new password whenever you change it. The system will lock you out if you have forgotten your password.**

**Edit Logins**

| Login | User Name | Password | Retype to confirm | Privilege |
|-------|-----------|----------|-------------------|-----------|
| 1     |           |          |                   |           |
| 2     |           |          |                   |           |
| 3     |           |          |                   |           |
| 4     |           |          |                   |           |

[Apply](#) [Cancel](#)

## 4.4 Saving Your Configuration

When you are done modifying the settings in a screen, click **Apply** to save your changes back to the run-time memory. Settings in the run-time memory are lost when the Switch's power is turned off.

Click the **Save** link in the upper right hand corner of the web configurator to save your configuration to nonvolatile memory. Nonvolatile memory refers to the Switch's storage that remains even if the Switch's power is turned off.

Note: Use the **Save** link when you are done with a configuration session.

## 4.5 Switch Lockout

You could block yourself (and all others) from using in-band-management (managing through the data ports) if you do one of the following:

- 1 Delete the management VLAN (default is VLAN 1).
- 2 Delete all port-based VLANs with the CPU port as a member. The "CPU port" is the management port of the Switch.
- 3 Filter all traffic to the CPU port.
- 4 Disable all ports.
- 5 Misconfigure the text configuration file.
- 6 Forget the password and/or IP address.
- 7 Prevent all services from accessing the Switch.
- 8 Change a service port number but forget it.
- 9 You forgot to log out of the Switch from a computer before logging in again on another computer.

Note: Be careful not to lock yourself and others out of the Switch. If you do lock yourself out, try using out-of-band management (via the management port) to configure the Switch.

## 4.6 Resetting the Switch

If you lock yourself (and others) from the Switch or forget the administrator password, you will need to reload the factory-default configuration file or reset the Switch back to the factory defaults.

### 4.6.1 Using the RESTORE Button

See [Table 3 on page 34](#) to see how to use the **RESTORE** button to restore the factory default file.

## 4.6.2 Reload the Configuration File

Uploading the factory-default configuration file replaces the current configuration file with the factory-default configuration file. This means that you will lose all previous configurations and the speed of the console port will be reset to the default of 9600bps with 8 data bit, no parity, one stop bit and flow control set to none. The password will also be reset to "1234" and the IP address to 192.168.1.1 or DHCP-assigned IP.

To upload the configuration file, do the following:

- 1 Connect to the console port using a computer with terminal emulation software. See [Section 3.2 on page 38](#) for details.
- 2 Disconnect and reconnect the Switch's power to begin a session. When you reconnect the Switch's power, you will see the initial screen.
- 3 When you see the message "Press any key to enter Debug Mode within 3 seconds ..." press any key to enter debug mode.
- 4 Type `atlc` after the "Enter Debug Mode" message.
- 5 Wait for the "Starting XMODEM upload" message before activating XMODEM upload on your terminal.
- 6 After a configuration file upload, type `atgo` to restart the Switch.

**Figure 24** Resetting the Switch: Via the Console Port

```

Bootbase Version: V1.00 | 02/21/2016 15:43:29
RAM: Size = 1048576 Kbytes
FLASH: 64M

ZyNOS Version: V4.50(ABBI.0) | 04/18/2017 11:41:8

Press any key to enter debug mode within 1 second.
.....
Enter Debug Mode
ras> atlc
Starting XMODEM upload (CRC mode)....
CCCCCCCCCCCCCCCC
Total 393216 bytes received.
Erasing..
.....
OK
ras> atgo

```

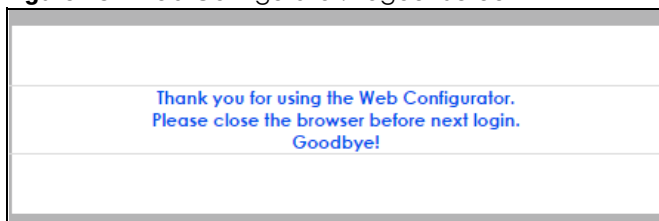
The Switch is now reinitialized with a default configuration file including the default password of "1234".

## 4.7 Logging Out of the Web Configurator

Click **Logout** in a screen to exit the web configurator. You have to log in with your password again after you log out. This is recommended after you finish a management session for security reasons.



**Figure 25** Web Configurator: Logout Screen



## 4.8 Help

The web configurator's online help has descriptions of individual screens and some supplementary information.

Click the **Help** link from a web configurator screen to view an online help description of that screen.

# CHAPTER 5

## Initial Setup Example

### 5.1 Overview

This chapter shows how to set up the Switch for an example network.

The following lists the configuration steps for the initial setup:

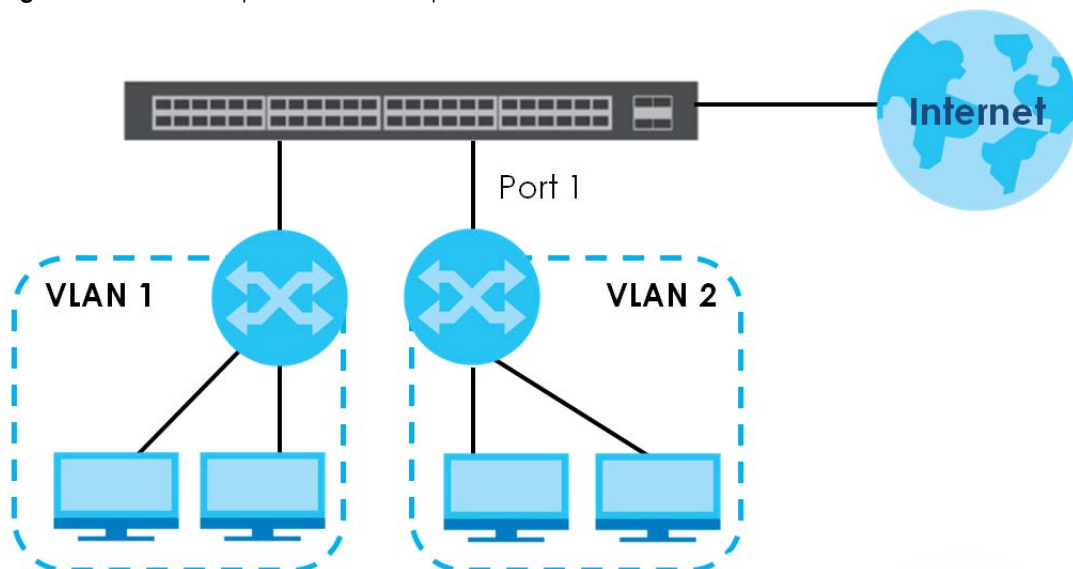
- [Creating a VLAN](#)
- [Setting Port VID](#)
- [Configuring Switch Management IP Address](#)

#### 5.1.1 Creating a VLAN

VLANs confine broadcast frames to the VLAN group in which the port(s) belongs. You can do this with port-based VLAN or tagged static VLAN with fixed port members.

In this example, you want to configure port 1 as a member of VLAN 2.

**Figure 26** Initial Setup Network Example: VLAN



- 1 Click **Advanced Application > VLAN > VLAN Configuration** in the navigation panel and click the **Static VLAN Setup** link.

| VLAN Configuration        |                            | VLAN Status |
|---------------------------|----------------------------|-------------|
| Static VLAN Setup         | <a href="#">Click Here</a> |             |
| VLAN Port Setup           | <a href="#">Click Here</a> |             |
| Subnet Based VLAN Setup   | <a href="#">Click Here</a> |             |
| Protocol Based VLAN Setup | <a href="#">Click Here</a> |             |
| Voice VLAN Setup          | <a href="#">Click Here</a> |             |
| MAC Based VLAN Setup      | <a href="#">Click Here</a> |             |

- 2 In the **Static VLAN** screen, select **ACTIVE**, enter a descriptive name in the **Name** field and enter 2 in the **VLAN Group ID** field for the **VLAN2** network.

| Static VLAN           |                                     | VLAN Configuration |
|-----------------------|-------------------------------------|--------------------|
| ACTIVE                | <input checked="" type="checkbox"/> |                    |
| Name                  | Example                             |                    |
| VLAN Group ID         | 2                                   |                    |
| VLAN Type             | Normal                              |                    |
| Association VLAN List |                                     |                    |

| Port | Control | Tagging                                        |
|------|---------|------------------------------------------------|
| 1    | Normal  | <input checked="" type="checkbox"/> Tx Tagging |
| 2    | Normal  | <input checked="" type="checkbox"/> Tx Tagging |
| 3    | Normal  | <input checked="" type="checkbox"/> Tx Tagging |
| 4    | Normal  | <input checked="" type="checkbox"/> Tx Tagging |
| 5    | Normal  | <input checked="" type="checkbox"/> Tx Tagging |
| 6    | Normal  | <input checked="" type="checkbox"/> Tx Tagging |
| 7    | Normal  | <input checked="" type="checkbox"/> Tx Tagging |
| 8    | Normal  | <input checked="" type="checkbox"/> Tx Tagging |
| 9    | Normal  | <input checked="" type="checkbox"/> Tx Tagging |
| 10   | Normal  | <input checked="" type="checkbox"/> Tx Tagging |
| 11   | Normal  | <input checked="" type="checkbox"/> Tx Tagging |

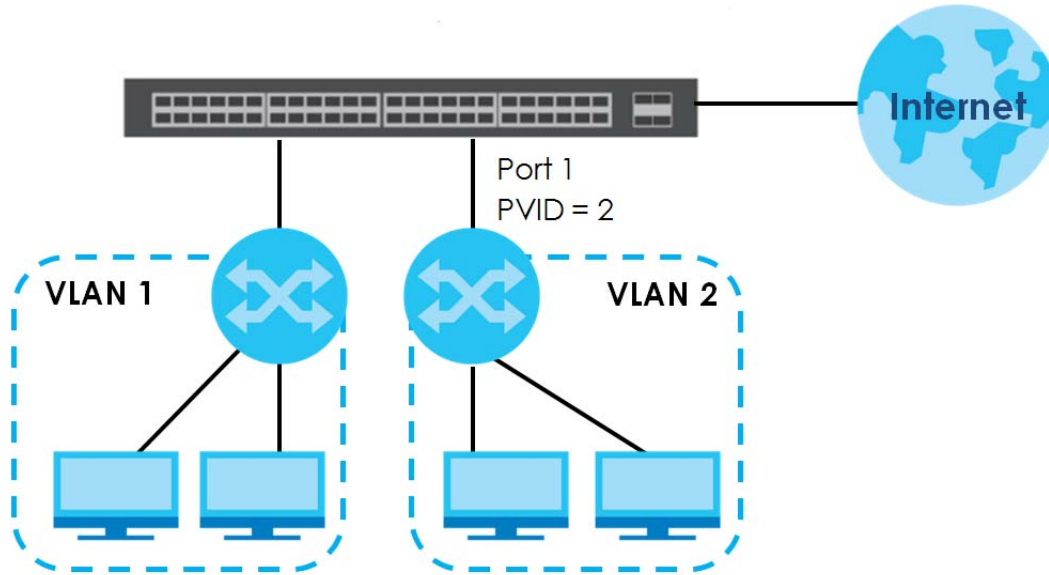
Note: The **VLAN Group ID** field in this screen and the **VID** field in the **IP Setup** screen refer to the same VLAN ID.

- 3 Since the **VLAN2** network is connected to port 1 on the Switch, select **Fixed** to configure port 1 to be a permanent member of the VLAN only.
- 4 To ensure that VLAN-unaware devices (such as computers and hubs) can receive frames properly, clear the **TX Tagging** check box to set the Switch to remove VLAN tags before sending.
- 5 Click **Add** to save the settings to the run-time memory. Settings in the run-time memory are lost when the Switch's power is turned off.

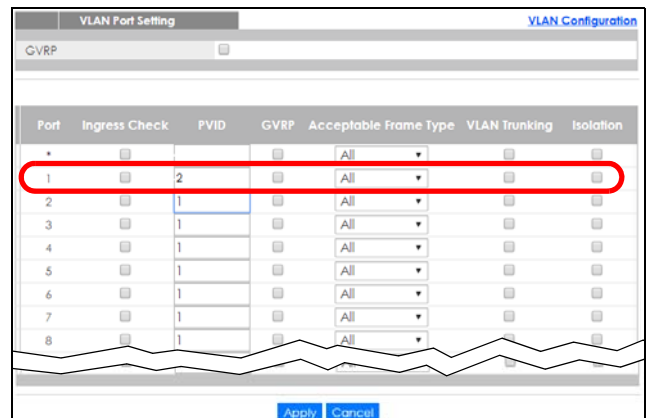
### 5.1.2 Setting Port VID

Use PVID to add a tag to incoming untagged frames received on that port so that the frames are forwarded to the VLAN group that the tag defines.

In the example network, configure 2 as the port VID on port 1 so that any untagged frames received on that port get sent to VLAN 2.

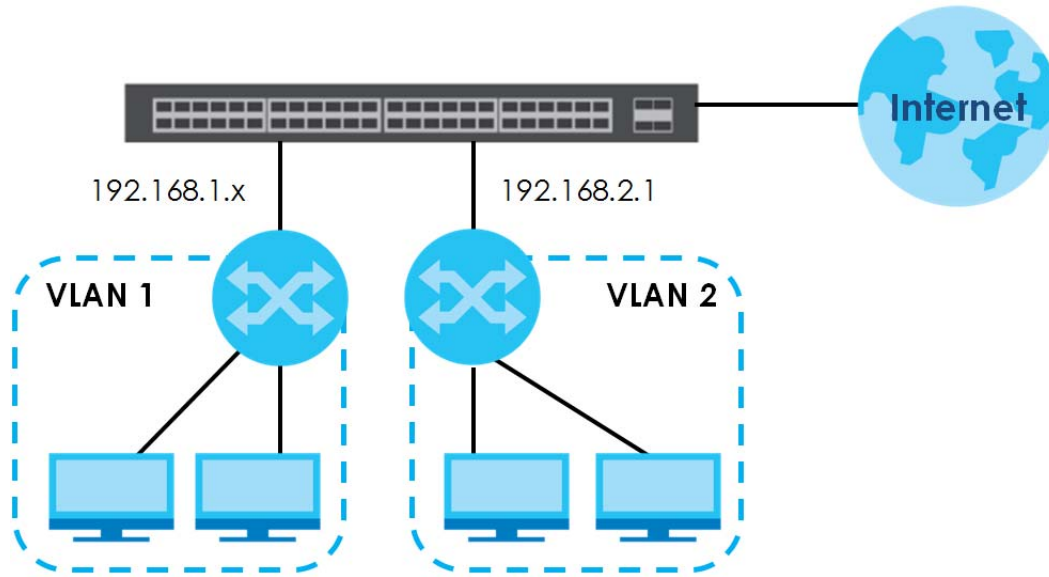
**Figure 27** Initial Setup Network Example: Port VID

- 1 Click **Advanced Applications > VLAN > VLAN Configuration** in the navigation panel. Then click the **VLAN Port Setup** link.
- 2 Enter 2 in the **PVID** field for port 1 and click **Apply** to save your changes back to the run-time memory. Settings in the run-time memory are lost when the Switch's power is turned off.



### 5.1.3 Configuring Switch Management IP Address

The default management IP address of the Switch is 192.168.1.1. You can configure another IP address in a different subnet for management purposes. The following figure shows an example.

**Figure 28** Initial Setup Example: Management IP Address

- 1 Connect your computer to any Ethernet port on the Switch. Make sure your computer is in the same subnet as the Switch.
- 2 Open your web browser and enter 192.168.1.1 (the default IP address) in the address bar to access the web configurator. See [Section 4.2 on page 42](#) for more information.
- 3 Click **Basic Setting > IP Setup > IP Configuration** in the navigation panel.
- 4 Configure the related fields in the **IP Configuration** screen.
- 5 For the **VLAN2** network, enter 192.168.2.1 as the IP address and 255.255.255.0 as the subnet mask.
- 6 In the **VID** field, enter the ID of the VLAN group to which you want this management IP address to belong. This is the same as the VLAN ID you configure in the **Static VLAN** screen.
- 7 Click **Add** to save your changes back to the run-time memory. Settings in the run-time memory are lost when the Switch's power is turned off.

The screenshot shows the 'IP Configuration' web interface. The 'Out-of-band Management IP Address' section is highlighted with a red box. It contains the following fields:

| Out-of-band Management IP Address |               |
|-----------------------------------|---------------|
| IP Address                        | 192.168.2.1   |
| IP Subnet Mask                    | 255.255.255.0 |
| Default Gateway                   | 0.0.0.0       |

Below the highlighted section, the 'IP Interface' section is visible, showing a table with the following data:

| Index | IP Address   | IP Subnet Mask | VID | Type |
|-------|--------------|----------------|-----|------|
| 1     | 10.214.80.32 | 255.255.255.0  | 1   | DHCP |

# CHAPTER 6

## Tutorials

### 6.1 Overview

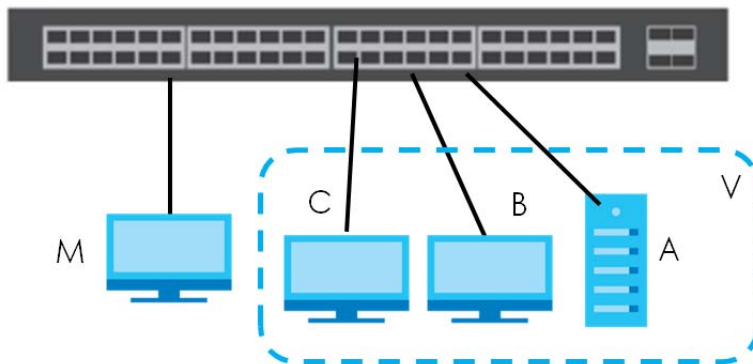
This chapter provides some examples of using the web configurator to set up and use the Switch. The tutorials include:

- [How to Use DHCPv4 Snooping on the Switch](#)
- [How to Use DHCPv4 Relay on the Switch](#)
- [How to Use Auto Configuration via a DHCP Server on the Switch](#)

### 6.2 How to Use DHCPv4 Snooping on the Switch

You only want DHCP server **A** connected to port 5 to assign IP addresses to all devices in VLAN network (**V**). Create a VLAN containing ports 5, 6 and 7. Connect a computer **M** to the Switch for management.

**Figure 29** Tutorial: DHCP Snooping Tutorial Overview



Note: For related information about DHCP snooping, see [Section 26.1 on page 235](#).

The settings in this tutorial are as the following.

Table 8 Tutorial: Settings in this Tutorial

| HOST                     | PORT CONNECTED | VLAN      | PVID | DHCP SNOOPING PORT TRUSTED |
|--------------------------|----------------|-----------|------|----------------------------|
| DHCP Server ( <b>A</b> ) | 5              | 1 and 100 | 100  | Yes                        |
| DHCP Client ( <b>B</b> ) | 6              | 1 and 100 | 100  | No                         |
| DHCP Client ( <b>C</b> ) | 7              | 1 and 100 | 100  | No                         |

- 1 Access the Switch through **http://192.168.1.1** by default. Log into the Switch by entering the username (default: **admin**) and password (default: **1234**).
- 2 Go to **Advanced Application > VLAN > VLAN Configuration > Static VLAN Setup**, and create a VLAN with ID of 100. Add ports 5, 6 and 7 in the VLAN by selecting **Fixed** in the **Control** field as shown.

Deselect **Tx Tagging** because you don't want outgoing traffic to contain this VLAN tag.

Click **Add**.

**Figure 30** Tutorial: Create a VLAN and Add Ports to It

**Static VLAN** VLAN Configuration

ACTIVE ☒

Name

VLAN Group ID

VLAN Type ☒ Normal ☐ Private

Association VLAN List

| Port | Control                                                             | Tagging                                        |
|------|---------------------------------------------------------------------|------------------------------------------------|
| *    | Normal                                                              | <input checked="" type="checkbox"/> Tx Tagging |
| 1    | <input checked="" type="radio"/> Normal <input type="radio"/> Fixed | <input checked="" type="checkbox"/> Tx Tagging |
| 2    | <input checked="" type="radio"/> Normal <input type="radio"/> Fixed | <input checked="" type="checkbox"/> Tx Tagging |
| 3    | <input checked="" type="radio"/> Normal <input type="radio"/> Fixed | <input checked="" type="checkbox"/> Tx Tagging |
| 4    | <input checked="" type="radio"/> Normal <input type="radio"/> Fixed | <input checked="" type="checkbox"/> Tx Tagging |
| 5    | <input type="radio"/> Normal <input checked="" type="radio"/> Fixed | <input type="checkbox"/> Tx Tagging            |
| 6    | <input type="radio"/> Normal <input checked="" type="radio"/> Fixed | <input type="checkbox"/> Tx Tagging            |
| 7    | <input type="radio"/> Normal <input checked="" type="radio"/> Fixed | <input type="checkbox"/> Tx Tagging            |
| 8    | <input checked="" type="radio"/> Normal <input type="radio"/> Fixed | <input checked="" type="checkbox"/> Tx Tagging |
| 9    | <input checked="" type="radio"/> Normal <input type="radio"/> Fixed | <input checked="" type="checkbox"/> Tx Tagging |
| 24   | <input checked="" type="radio"/> Normal <input type="radio"/> Fixed | <input checked="" type="checkbox"/> Tx Tagging |
| 25   | <input checked="" type="radio"/> Normal <input type="radio"/> Fixed | <input checked="" type="checkbox"/> Tx Tagging |
| 26   | <input checked="" type="radio"/> Normal <input type="radio"/> Fixed | <input checked="" type="checkbox"/> Tx Tagging |
| 27   | <input checked="" type="radio"/> Normal <input type="radio"/> Fixed | <input checked="" type="checkbox"/> Tx Tagging |
| 28   | <input checked="" type="radio"/> Normal <input type="radio"/> Fixed | <input checked="" type="checkbox"/> Tx Tagging |

- 3 Go to **Advanced Application > VLAN > VLAN Configuration > VLAN Port Setup**, and set the PVID of the ports 5, 6 and 7 to 100. This tags untagged incoming frames on ports 5, 6 and 7 with the tag 100.

**Figure 31** Tutorial: Tag Untagged Frames

| Port | Ingress Check            | PVID | GVRP                     | Acceptable Frame Type | VLAN Trunking            | Isolation                |
|------|--------------------------|------|--------------------------|-----------------------|--------------------------|--------------------------|
| *    | <input type="checkbox"/> |      | <input type="checkbox"/> | All                   | <input type="checkbox"/> | <input type="checkbox"/> |
| 1    | <input type="checkbox"/> | 1    | <input type="checkbox"/> | All                   | <input type="checkbox"/> | <input type="checkbox"/> |
| 2    | <input type="checkbox"/> | 1    | <input type="checkbox"/> | All                   | <input type="checkbox"/> | <input type="checkbox"/> |
| 3    | <input type="checkbox"/> | 1    | <input type="checkbox"/> | All                   | <input type="checkbox"/> | <input type="checkbox"/> |
| 4    | <input type="checkbox"/> | 1    | <input type="checkbox"/> | All                   | <input type="checkbox"/> | <input type="checkbox"/> |
| 5    | <input type="checkbox"/> | 100  | <input type="checkbox"/> | All                   | <input type="checkbox"/> | <input type="checkbox"/> |
| 6    | <input type="checkbox"/> | 100  | <input type="checkbox"/> | All                   | <input type="checkbox"/> | <input type="checkbox"/> |
| 7    | <input type="checkbox"/> | 100  | <input type="checkbox"/> | All                   | <input type="checkbox"/> | <input type="checkbox"/> |
| 8    | <input type="checkbox"/> | 1    | <input type="checkbox"/> | All                   | <input type="checkbox"/> | <input type="checkbox"/> |

Apply Cancel

- 4 Go to **Advanced Application > IP Source Guard > IPv4 Source Guard Setup > DHCP Snooping > Configure**, activate and specify VLAN 100 as the DHCP VLAN as shown. Click **Apply**.

**Figure 32** Tutorial: Specify DHCP VLAN

**DHCP Snooping Configure**

Active ☒ ☐ Disable

DHCP Vlan

**Database**

Agent URL

Timeout interval  seconds

Write delay interval  seconds

Renew DHCP Snooping URL  Renew

Apply Cancel

- 5 Click the **Port** link at the top right corner.

**DHCP Snooping Port VLAN**

- 6 The **DHCP Snooping Port Configure** screen appears. Select **Trusted** in the **Server Trusted state** field for port 5 because the DHCP server is connected to port 5. Keep ports 6 and 7 **Untrusted** because they are connected to DHCP clients. Click **Apply**.



**Figure 33** Tutorial: Set the DHCP Server Port to Trusted

| Port | Server Trusted state | Rate (pps) |
|------|----------------------|------------|
| *    | Untrusted ▼          |            |
| 1    | Untrusted ▼          | 0          |
| 2    | Untrusted ▼          | 0          |
| 3    | Untrusted ▼          | 0          |
| 4    | Untrusted ▼          | 0          |
| 5    | Trusted ▼            | 0          |
| 6    | Untrusted ▼          | 0          |
| 7    | Untrusted ▼          | 0          |
| 8    | Untrusted ▼          | 0          |
| 9    | Untrusted ▼          | 0          |

Apply Cancel

- 7 Go to **Advanced Application > IP Source Guard > IPv4 Source Guard Setup > DHCP Snooping > Configure > VLAN**, show VLAN 100 by entering 100 in the **Start VID** and **End VID** fields and click **Apply**. Then select **Yes** in the **Enabled** field of the VLAN 100 entry shown at the bottom section of the screen.
- If you want to add more information in the DHCP request packets such as source VLAN ID or system name, you can also select an **Option82 Profile** in the entry. See [Section 26.11.1.3 on page 256](#).

**Figure 34** Tutorial: Enable DHCP Snooping on this VLAN

VLAN Search by VID: 100 Search

The Number of Search Results: 1

| VID | Enabled | Option 82 Profile |
|-----|---------|-------------------|
| *   | No ▼    | ▼                 |
| 100 | Yes ▼   | ▼                 |

Apply Cancel

- 8 Click **Save** at the top right corner of the web configurator to save the configuration permanently.



- 9 Connect your DHCP server to port 5 and a computer (as DHCP client) to either port 6 or 7. The computer should be able to get an IP address from the DHCP server. If you put the DHCP server on port 6 or 7, the computer will not be able to get an IP address.
- 10 To check if DHCP snooping works, go to **Advanced Application > IP Source Guard > IPv4 Source Guard Setup**, you should see an IP assignment with the type **DHCP-Snooping** as shown.

**Figure 35** Tutorial: Check the Binding If DHCP Snooping Works

| IP Source Guard |            |      |                   |      |             |               | IPSG Static Binding DHCP Snooping ARP Inspection |
|-----------------|------------|------|-------------------|------|-------------|---------------|--------------------------------------------------|
| Index           | IP Address | VLAN | MAC Address       | Port | Lease       | Type          |                                                  |
| 1               | 10.10.1.16 | 100  | 00:02:00:00:00:1c | 7    | 6d23h17m 0s | dchp-snooping |                                                  |

You can also telnet. Use the command "show dhcp snooping binding" to see the DHCP snooping binding table as shown next.

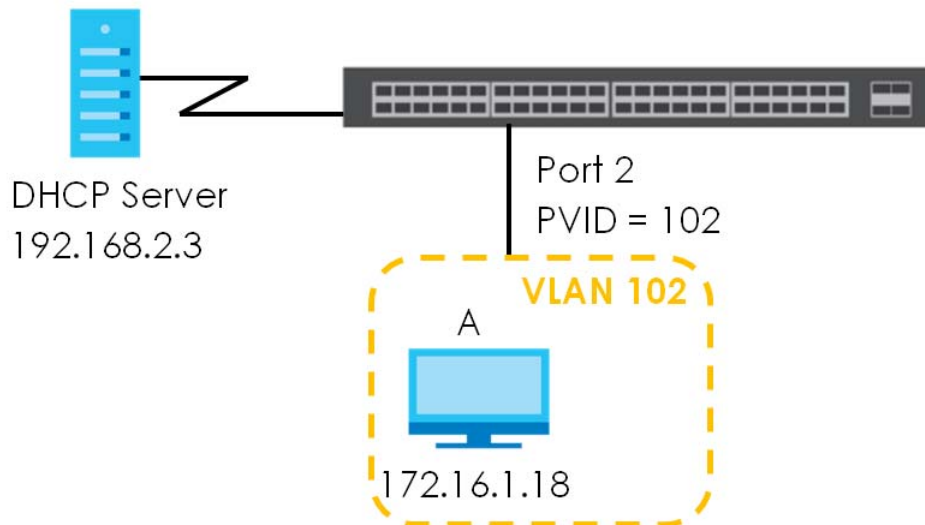
| sysname#                    | show dhcp snooping binding |            |             |               |      |      |
|-----------------------------|----------------------------|------------|-------------|---------------|------|------|
|                             | MacAddress                 | IpAddress  | Lease       | Type          | VLAN | Port |
|                             | 00:02:00:00:00:1c          | 10.10.1.16 | 6d23h59m20s | dhcp-snooping | 100  | 7    |
| Total number of bindings: 1 |                            |            |             |               |      |      |

## 6.3 How to Use DHCPv4 Relay on the Switch

This tutorial describes how to configure your Switch to forward DHCP client requests to a specific DHCP server. The DHCP server can then assign a specific IP address based on the information in the DHCP requests.

### 6.3.1 DHCP Relay Tutorial Introduction

In this example, you have configured your DHCP server (192.168.2.3) and want to have it assign a specific IP address (say 172.16.1.18) to DHCP client **A** based on the system name, VLAN ID and port number in the DHCP request. Client **A** connects to the Switch's port 2 in VLAN 102.

**Figure 36** Tutorial: DHCP Relay Scenario

### 6.3.2 Creating a VLAN

Follow the steps below to configure port 2 as a member of VLAN 102.

- 1 Access the web configurator through the Switch's management port.

- 2 Go to **Basic Setting > Switch Setup** and set the VLAN type to **802.1Q**. Click **Apply** to save the settings to the run-time memory.

**Figure 37** Tutorial: Set VLAN Type to 802.1Q

| Switch Setup                                                               |                 |                                                                             |              |
|----------------------------------------------------------------------------|-----------------|-----------------------------------------------------------------------------|--------------|
| VLAN Type                                                                  |                 | <input checked="" type="radio"/> 802.1Q<br><input type="radio"/> Port Based |              |
| Bridge Control Protocol Transparency                                       | Active          | <input type="checkbox"/>                                                    |              |
| MAC Address Learning                                                       | Aging Time      | 300                                                                         | seconds      |
| ARP Aging Time                                                             | Aging Time      | 300                                                                         | seconds      |
| GARP Timer                                                                 | Join Timer      | 200                                                                         | milliseconds |
|                                                                            | Leave Timer     | 600                                                                         | milliseconds |
|                                                                            | Leave All Timer | 10000                                                                       | milliseconds |
| Priority Queue Assignment                                                  | Priority7       | 7                                                                           | ▼            |
|                                                                            | Priority6       | 6                                                                           | ▼            |
|                                                                            | Priority5       | 5                                                                           | ▼            |
|                                                                            | Priority4       | 4                                                                           | ▼            |
|                                                                            | Priority3       | 3                                                                           | ▼            |
|                                                                            | Priority2       | 1                                                                           | ▼            |
|                                                                            | Priority1       | 0                                                                           | ▼            |
|                                                                            | Priority0       | 2                                                                           | ▼            |
| <input type="button" value="Apply"/> <input type="button" value="Cancel"/> |                 |                                                                             |              |

- 3 Click **Advanced Application > VLAN > VLAN Configuration > Static VLAN Setup**.
- 4 In the **Static VLAN** screen, select **ACTIVE**, enter a descriptive name (VLAN 102 for example) in the **Name** field and enter 102 in the **VLAN Group ID** field.
- 5 Select **Fixed** to configure port 2 to be a permanent member of this VLAN.
- 6 Clear the **TX Tagging** check box to set the Switch to remove VLAN tags before sending.
- 7 Click **Add** to save the settings to the run-time memory. Settings in the run-time memory are lost when the Switch's power is turned off.

**Figure 38** Tutorial: Create a Static VLAN

**Static VLAN** [VLAN Configuration](#)

ACTIVE ☒

Name VLAN 102

VLAN Group ID 102

VLAN Type ☒ Normal ☐ Private

Association VLAN List

| Port | Control                                                                                             | Tagging                                        |
|------|-----------------------------------------------------------------------------------------------------|------------------------------------------------|
| *    | Normal                                                                                              | <input checked="" type="checkbox"/> Tx Tagging |
| 1    | <input checked="" type="radio"/> Normal <input type="radio"/> Fixed <input type="radio"/> Forbidden | <input checked="" type="checkbox"/> Tx Tagging |
| 2    | <input type="radio"/> Normal <input checked="" type="radio"/> Fixed <input type="radio"/> Forbidden | <input type="checkbox"/> Tx Tagging            |
| 3    | <input checked="" type="radio"/> Normal <input type="radio"/> Fixed <input type="radio"/> Forbidden | <input checked="" type="checkbox"/> Tx Tagging |
| 4    | <input checked="" type="radio"/> Normal <input type="radio"/> Fixed <input type="radio"/> Forbidden | <input checked="" type="checkbox"/> Tx Tagging |
| 5    | <input checked="" type="radio"/> Normal <input type="radio"/> Fixed <input type="radio"/> Forbidden | <input checked="" type="checkbox"/> Tx Tagging |
| 6    | <input checked="" type="radio"/> Normal <input type="radio"/> Fixed <input type="radio"/> Forbidden | <input checked="" type="checkbox"/> Tx Tagging |
| 7    | <input checked="" type="radio"/> Normal <input type="radio"/> Fixed <input type="radio"/> Forbidden | <input checked="" type="checkbox"/> Tx Tagging |
| 8    | <input checked="" type="radio"/> Normal <input type="radio"/> Fixed <input type="radio"/> Forbidden | <input checked="" type="checkbox"/> Tx Tagging |

[Add](#) [Cancel](#) [Clear](#)

- 8 Click the **VLAN Configuration** link in the **Static VLAN Setup** screen and then the **VLAN Port Setup** link in the **VLAN Configuration** screen.

**Figure 39** Tutorial: Click the VLAN Port Setting Link

**VLAN Configuration** [VLAN Status](#)

|                           |                            |
|---------------------------|----------------------------|
| Static VLAN Setup         | <a href="#">Click Here</a> |
| VLAN Port Setup           | <a href="#">Click Here</a> |
| Subnet Based VLAN Setup   | <a href="#">Click Here</a> |
| Protocol Based VLAN Setup | <a href="#">Click Here</a> |
| Voice VLAN Setup          | <a href="#">Click Here</a> |
| MAC Based VLAN Setup      | <a href="#">Click Here</a> |

- 9 Enter 102 in the **PVID** field for port 2 to add a tag to incoming untagged frames received on that port so that the frames are forwarded to the VLAN group that the tag defines.
- 10 Click **Apply** to save your changes back to the run-time memory.

**Figure 40** Tutorial: Add Tag for Frames Received on Port 2

| Port | Ingress Check            | PVID | GVRP                     | Acceptable Frame Type | VLAN Trunking            | Isolation                |
|------|--------------------------|------|--------------------------|-----------------------|--------------------------|--------------------------|
| *    | <input type="checkbox"/> |      | <input type="checkbox"/> | All                   | <input type="checkbox"/> | <input type="checkbox"/> |
| 1    | <input type="checkbox"/> | 1    | <input type="checkbox"/> | All                   | <input type="checkbox"/> | <input type="checkbox"/> |
| 2    | <input type="checkbox"/> | 102  | <input type="checkbox"/> | All                   | <input type="checkbox"/> | <input type="checkbox"/> |
| 3    | <input type="checkbox"/> | 1    | <input type="checkbox"/> | All                   | <input type="checkbox"/> | <input type="checkbox"/> |
| 4    | <input type="checkbox"/> | 1    | <input type="checkbox"/> | All                   | <input type="checkbox"/> | <input type="checkbox"/> |
| 5    | <input type="checkbox"/> | 100  | <input type="checkbox"/> | All                   | <input type="checkbox"/> | <input type="checkbox"/> |

Apply Cancel

- 11 Click the **Save** link in the upper right corner of the web configurator to save your configuration permanently.

### 6.3.3 Configuring DHCPv4 Relay

Follow the steps below to enable DHCP relay on the Switch and allow the Switch to add relay agent information (such as the VLAN ID) to DHCP requests.

- 1 Click **IP Application > DHCP > DHCPv4** and then the **Global** link to open the **DHCP Relay** screen.
- 2 Select the **Active** check box.
- 3 Enter the DHCP server's IP address (192.168.2.3 in this example) in the **Remote DHCP Server 1** field.
- 4 Select **default1** or **default2** in the **Option 82 Profile** field.
- 5 Click **Apply** to save your changes back to the run-time memory.

**Figure 41** Tutorial: Set DHCP Server and Relay Information

| DHCP Relay           |                                     | Status | Port |
|----------------------|-------------------------------------|--------|------|
| Active               | <input checked="" type="checkbox"/> |        |      |
| Remote DHCP Server 1 | 192.168.2.3                         |        |      |
| Remote DHCP Server 2 | 0.0.0.0                             |        |      |
| Remote DHCP Server 3 | 0.0.0.0                             |        |      |
| Option 82 Profile    | default1                            |        |      |

Apply Cancel

- 6 Click the **Save** link in the upper right corner of the web configurator to save your configuration permanently.
- 7 The DHCP server can then assign a specific IP address based on the DHCP request.

### 6.3.4 Troubleshooting

Check the client **A**'s IP address. If it did not receive the IP address 172.16.1.18, make sure:

- 1 Client **A** is connected to the Switch's port 2 in VLAN 102.
- 2 You configured the correct VLAN ID, port number and system name for DHCP relay on both the DHCP server and the Switch.
- 3 You clicked the **Save** link on the Switch to have your settings take effect.

## 6.4 How to Use Auto Configuration via a DHCP Server on the Switch

Follow the steps below to set up configurations on a DHCP server, TFTP server, and the Switch, so you can load an auto configuration file automatically from a TFTP server when you reboot the Switch.

Note that you can set up a DHCP server and TFTP server either on the same device or different devices. Also, make sure the Switch can communicate with the TFTP server.

Note: Steps order could vary according to different programs you use.

Note: You need to set up configurations on a DHCP server and TFTP server first to use auto configuration.

### Setting up a DHCP Server

- 1 Set up a dynamic IP addresses pool so the DHCP server will assign an IP address to the Switch in that range.
- 2 Set up a TFTP server IP address, so the Switch will know where to load the auto configuration file.
- 3 Set up the filename of the auto configuration file, so the Switch will know which file to load when you reboot the Switch.
  - Enter the filename of an auto configuration file. The Switch will load this auto configuration file when rebooting with DHCP option 60 disabled.
  - If you want to load the auto configuration file with DHCP option 60 enabled and a Vendor Class Identifier assigned when you reboot the Switch, follow the instruction below. Otherwise, skip this step.  
Enter the filename of the an auto configuration file. Set up a Vendor Class Identifier. To have the Switch load this auto configuration file, two conditions listed above must be met. Please refer to the following steps to see how to set up a Vendor Class Identifier on the Switch.

### Setting up a TFTP Server

- 1 Select a directory on the TFTP server.
- 2 Put the configuration files in that directory.

## Setting up the Switch

- 1 Open the web configurator. Go to the **Management > Maintenance** screen, and click the **Click Here** button next to the **Auto Configuration** field.

**Figure 42** Tutorial: Auto Configuration Screen

| Maintenance                 |                            |
|-----------------------------|----------------------------|
| Current: Configuration 1    |                            |
| Firmware Upgrade            | <a href="#">Click Here</a> |
| Restore Configuration       | <a href="#">Click Here</a> |
| Backup Configuration        | <a href="#">Click Here</a> |
| Auto Configuration          | <a href="#">Click here</a> |
| Erase Running-Configuration | <a href="#">Click Here</a> |
| Save Configuration          | Config 1   Config 2        |
|                             | Custom Default             |
| Reboot System               | Config 1   Config 2        |
|                             | Factory Default            |
|                             | Custom Default             |
| Tech-Support                | <a href="#">Click Here</a> |
| Certificates                | <a href="#">Click Here</a> |

- 2 Select the checkbox in the **Active** field to enable auto configuration. Select **DHCP** in the **Mode** field, and enter the VLAN ID where the DHCP server belongs to in the **DHCP VLAN ID** field. Click **Apply** to save your changes. See [Section 43.6 on page 360](#) for more information about auto configuration.

**Figure 43** Tutorial: Enable Auto Configuration

| Auto Configuration                           |                                     | <a href="#">Maintenance</a> |
|----------------------------------------------|-------------------------------------|-----------------------------|
| Mode                                         | None                                |                             |
| State                                        | None                                |                             |
| Filename                                     | None                                |                             |
|                                              |                                     |                             |
| Active                                       | <input checked="" type="checkbox"/> |                             |
| Mode                                         | DHCP ▼                              |                             |
| DHCP VLAN ID                                 | 1                                   |                             |
| HTTPS URL                                    |                                     |                             |
| <a href="#">Apply</a> <a href="#">Cancel</a> |                                     |                             |

- 3 Go to the **Basic Setting > IP Setup > IP Configuration** screen. Select the checkbox in the **DHCP Client** field.
- 4 If you want to load the auto configuration file with DHCP option 60 enabled and a Vendor Class Identifier assigned when you reboot the Switch, follow the instruction below. Otherwise, skip this step. In the **Basic Setting > IP Setup > IP Configuration** screen, select the checkbox in the **Option-60** field, and enter a Vendor Class Identifier in the **Class-ID** field. In this example, we use "ZyxelCorp". Click **Apply** to save your changes. See [Section 8.4 on page 85](#) for more information.

**Figure 44** Tutorial: Enable DHCP Client & Option 60

**IP Configuration** [IP Status](#)

|                    |                                                                            |
|--------------------|----------------------------------------------------------------------------|
| Default Gateway    | 0.0.0.0                                                                    |
| Default Management | <input checked="" type="radio"/> In-band <input type="radio"/> Out-of-band |

[Apply](#) [Cancel](#)

**Out-of-band Management IP Address**

|                 |               |
|-----------------|---------------|
| IP Address      | 192.168.0.1   |
| IP Subnet Mask  | 255.255.255.0 |
| Default Gateway | 0.0.0.0       |

[Apply](#) [Cancel](#)

**IP Interface**

|            |                                              |                                     |
|------------|----------------------------------------------|-------------------------------------|
| IP Address | <input checked="" type="radio"/> DHCP Client |                                     |
|            | Option-60                                    | <input checked="" type="checkbox"/> |
|            | Class-ID                                     | ZyxelCorp                           |
|            | <input type="radio"/> Static IP Address      |                                     |
|            | IP Address                                   | 0.0.0.0                             |
|            | IP Subnet Mask                               | 0.0.0.0                             |
| VID        |                                              |                                     |

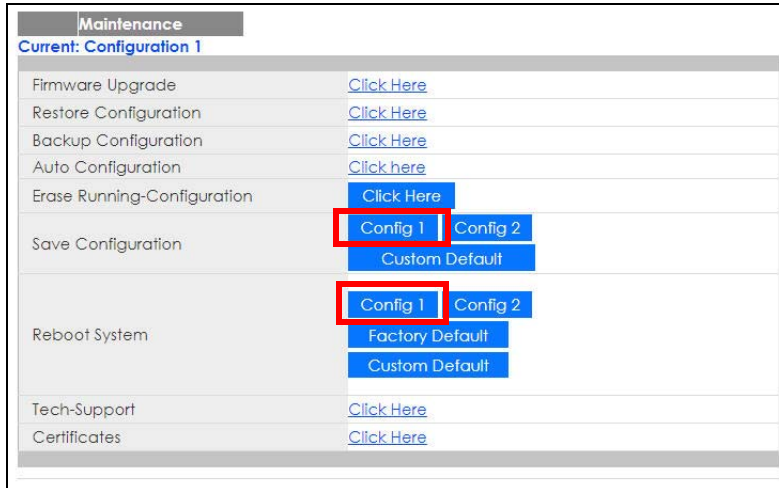
[Add](#) [Cancel](#)

| Index | IP Address   | IP Subnet Mask | VID | Type |                          |
|-------|--------------|----------------|-----|------|--------------------------|
| 1     | 192.168.0.32 | 255.255.255.0  | 1   | DHCP | <input type="checkbox"/> |

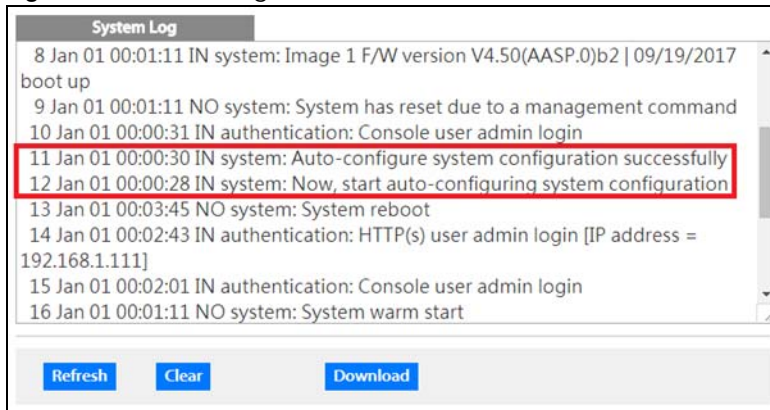
[Delete](#) [Cancel](#)

- 5 You need to save the current configuration in a configuration file, so the Switch will load the auto configuration file from the TFTP server automatically when rebooting. Go to the **Management > Maintenance** screen. Click the **Config 1**, **Config2**, or **Custom Default** button next to the **Save Configuration** field. See [Section 43.2.2 on page 356](#) for more information.
- 6 Click the same button next to **Reboot System** field to reboot the Switch, and load the auto configuration setting as configured before. For example, if you save the auto configuration setting to **Config 1**, you need to click the **Config 1** button next to the **Reboot System** field. See [Section 43.2.3 on page 357](#) for more information.



**Figure 45** Tutorial: Save Configuration & Reboot System

- 7 Go to the **Management > System Log** screen to see if auto configuration was performed successfully.

**Figure 46** Tutorial: Log

- 8 Check the screens to see if it's the configuration file you want to load. If it's not, go through the steps above to check your configurations. If it is, click **Save** at the top right corner of the web configurator to save the configuration permanently.

**Figure 47** Tutorial: Save

---

# **PART II**

## **Technical Reference**

---

# CHAPTER 7

## Status and ZON Utility

### 7.1 Overview

This chapter describes the screens for System Status, ZON Utility, and ZON Neighbor Management.

### 7.2 Status

The **Status** screen displays when you log into the Switch or click **Status** at the top right corner of the web configurator. The **Status** screen displays general device information, system status, and its IP addresses.

**Figure 48** Status

Status

Neighbor

Device Information

|                  |                             |                          |                                   |
|------------------|-----------------------------|--------------------------|-----------------------------------|
| Device Type      | XS3800-28                   | System Name              | XS3800                            |
| Boot Version     | V1.00   05/17/2018          | System Location          |                                   |
| Firmware Version | V4.60(ABML0)b3   08/22/2018 | System Time              | 09/07/2018 08:34:56               |
| Hardware Version | V1.0                        | System Up Time           | 000 days,00 hours,37 mins,17 secs |
| MAC Address      | bc:99:11:9b:b6:e4           | Login Timeout(mins)      | 60                                |
| Serial Number    | S182L28090009               | Registration MAC Address | bc:99:11:9b:b6:e3                 |
| Cloud Mode       | OFF                         | Cloud Connection Status  | Unregistered                      |

Detail

IP Address Information

|                             |               |                                    |
|-----------------------------|---------------|------------------------------------|
| IPv4 Address                | 10.214.80.33  |                                    |
| Subnet Mask                 | 255.255.255.0 |                                    |
| Default Gateway             | 10.214.80.1   | <a href="#">IP Setup</a>           |
| IPv6 Global Unicast Address |               |                                    |
| IPv6 Link-Local Address     |               | <a href="#">IPv6 configuration</a> |

Device Status and Quick Configuration

|                |         |                         |                 |         |                         |
|----------------|---------|-------------------------|-----------------|---------|-------------------------|
| STP            | Disable | <a href="#">Setting</a> | SNMP Status (!) | Enable  | <a href="#">Setting</a> |
| Port Mirroring | Disable | <a href="#">Setting</a> | 802.1X Status   | Disable | <a href="#">Setting</a> |
| Storm Control  | Disable | <a href="#">Setting</a> | DHCP Relay      | Disable | <a href="#">Setting</a> |
| IGMP Snooping  | Disable | <a href="#">Setting</a> | IPSG            | Disable | <a href="#">Setting</a> |

Quick Links

|                              |                                         |                                        |                                       |
|------------------------------|-----------------------------------------|----------------------------------------|---------------------------------------|
| <a href="#">Port Status</a>  | <a href="#">Link Aggregation Status</a> | <a href="#">MAC Table</a>              | <a href="#">Routing Table</a>         |
| <a href="#">IP Table</a>     | <a href="#">Diagnostic</a>              | <a href="#">System Log</a>             | <a href="#">Remote Access Control</a> |
| <a href="#">Tech-support</a> | <a href="#">VLAN Setup</a>              | <a href="#">Service Access Control</a> |                                       |

The following table describes the fields in the above screen.

Table 9 Status

| LABEL                    | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|--------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Device Information       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Device Type              | This field displays the model name of this Switch.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| System Name              | This field displays the name used to identify the Switch on any network.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Boot Version             | This field displays the version number and date of the boot module that is currently on the Switch.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| System Location          | This field displays the geographic location of your Switch. You can change the setting in the <b>Basic Setting &gt; General</b> Setup screen.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Firmware Version         | This field displays the version number and date of the firmware the Switch is currently running.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| System Time              | This field displays the current date and time in the UAG. The format is mm-dd-yyyy hh:mm:ss.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Hardware Version         | This field displays the hardware version number of the Switch. The integer is the model version, and the decimal is the version of the hardware change. For example, V1.0 is a hardware version for the Switch where 1 identifies the XS3800-28, and .0 is the first hardware change.                                                                                                                                                                                                                                                                                                                                                                                                                               |
| System Up Time           | This field displays how long the Switch has been running since it last restarted or was turned on.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| MAC Address              | This field displays the MAC addresses of the Switch.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Login Timeout(mins)      | This field displays how many minutes a management session can be left idle before the session times out. After it times out you have to log in with your password again.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Serial Number            | This field displays the serial number of this Switch. The serial number is used for device tracking and control.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Registration MAC Address | This field displays the MAC address of the Switch that you must use to register at myZyxel or the NCC (Nebula Control Center).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Cloud Mode               | This field displays whether the Switch is in Standalone or Nebula cloud management mode.<br><br>Note: Hybrid mode and NCC registration are reserved for future use.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Cloud Connection Status  | This field displays the registration and connection status between the Switch and the NCC (Nebula Control Center). See <a href="#">Section 3.3 on page 39</a> for more information on the Cloud LED.<br><br>In <b>standalone</b> mode, the status will display <b>Disconnected</b> or <b>Unregistered</b> .<br><br>In <b>cloud</b> mode the status will display <b>Connected</b> or <b>Disconnected</b> .<br><br><b>Connected</b> - The Switch is registered with and connected to the NCC.<br><br><b>Disconnected</b> - The Switch is not connected to the NCC.<br><br><b>Unregistered</b> - The Switch is not registered with the NCC.<br><br>Note: Hybrid mode and NCC registration are reserved for future use. |
| Detail                   | Click this link to go to the <b>Basic Setting &gt; System Info</b> screen to check other detailed information, such as system resource usage and the Switch temperature, fan speeds or voltage.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| IP Address Information   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| IPv4 Address             | This field displays the Switch's current IPv4 address.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Subnet Mask              | This field displays the Switch's subnet mask.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Default Gateway          | This field displays the IP address of the Switch's default gateway.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |

Table 9 Status

| LABEL                                 | DESCRIPTION                                                                                                                                                                                                                                                           |
|---------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| IP Setup                              | Click the link to go to the <b>Basic Setting &gt; IP Setup</b> screen.                                                                                                                                                                                                |
| IPv6 Global Unicast Address           | This field displays the Switch's IPv6 global unicast address.                                                                                                                                                                                                         |
| IPv6 Link-Local Address               | This field displays the Switch's IPv6 link-local address.                                                                                                                                                                                                             |
| IPv6 configuration                    | Click the link to go to the <b>Basic Setting &gt; IPv6</b> screen.                                                                                                                                                                                                    |
| Device Status and Quick Configuration | This section shows whether a feature is enabled or not on the Switch. You can click a feature's <b>Setting</b> link to go to the configuration screen for the feature.<br><br>Hover your cursor over a red exclamation mark to display information about the feature. |
| Quick Links                           | This section provides the shortcut link to a specific configuration screen.                                                                                                                                                                                           |

## 7.3 Zyxel One Network (ZON) Utility

ZON Utility is a program designed to help you deploy and manage a network more efficiently. It detects devices automatically and allows you to do basic settings on devices in the network without having to be near it.

The ZON Utility issues requests via Zyxel Discovery Protocol (ZDP) and in response to the query, the device responds back with basic information including IP address, firmware version, location, system and model name in the same broadcast domain. The information is then displayed in the ZON Utility screen and you can perform tasks like basic configuration of the devices and batch firmware upgrade in it. You can download the ZON Utility at [www.zyxel.com](http://www.zyxel.com) and install it on a PC (Windows operating system).

### 7.3.1 Requirements

Before installing the ZON Utility on your PC, please make sure it meets the requirements listed below.

#### Operating System

At the time of writing, the ZON Utility is compatible with:

- Windows 7 (both 32-bit / 64-bit versions)
- Windows 8 (both 32-bit / 64-bit versions)
- Windows 8.1 (both 32-bit / 64-bit versions)
- Window 10 (both 32-bit / 64-bit versions)

Note: To check for your Windows operating system version, right-click on **My Computer > Properties**. You should see this information in the **General** tab.

#### Hardware

Here are the minimum hardware requirements to use the ZON Utility on your PC.

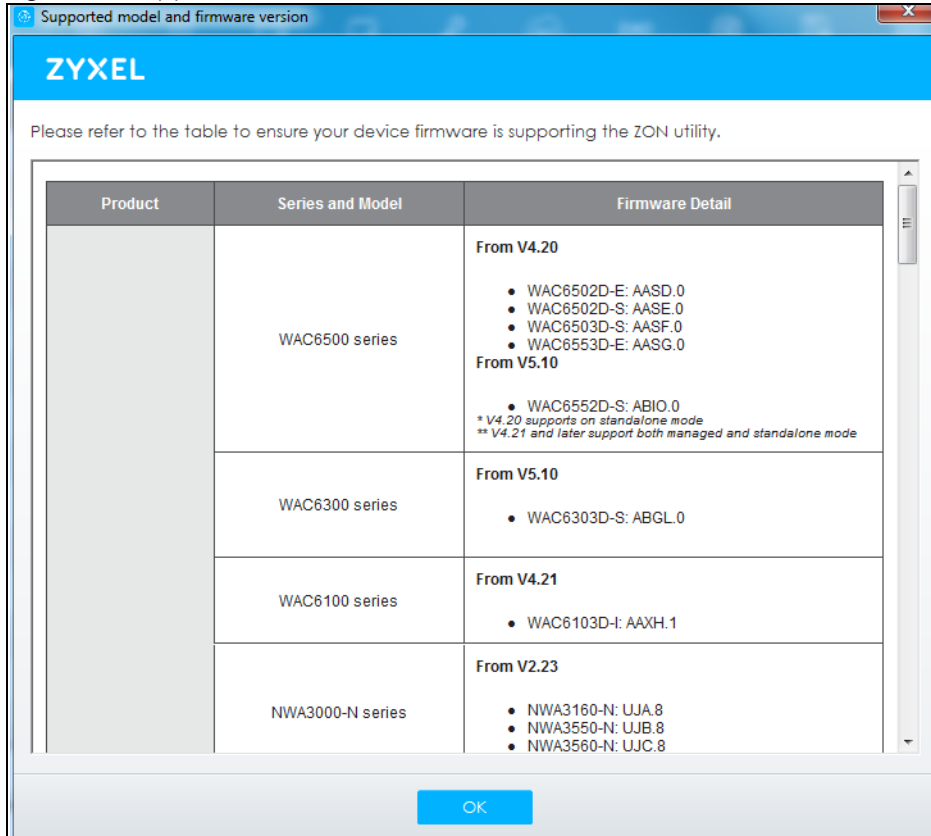
- Core i3 processor
- 2GB RAM

- 100MB free hard disk
- WXGA (Wide XGA 1280x800)

## 7.3.2 Run the ZON Utility

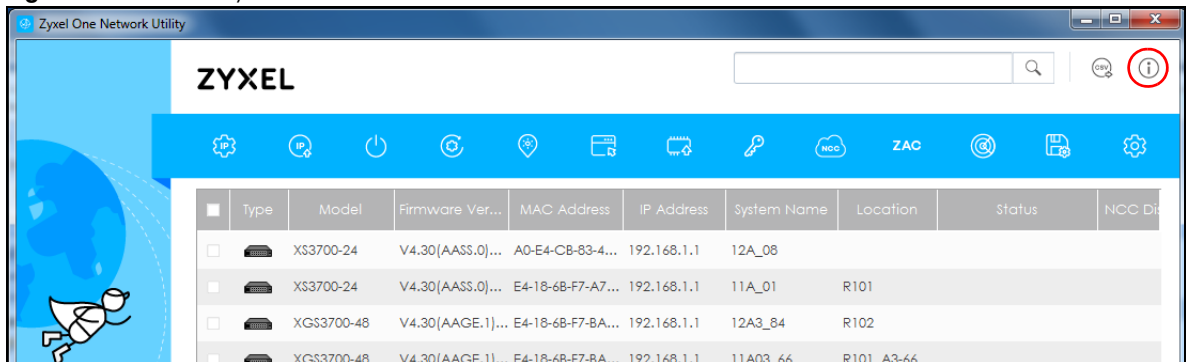
- 1 Double-click the ZON Utility to run it.
- 2 The first time you run the ZON Utility, you will see if your device and firmware version support the ZON Utility. Click the **OK** button to close this screen.

**Figure 49** Supported Devices and Versions



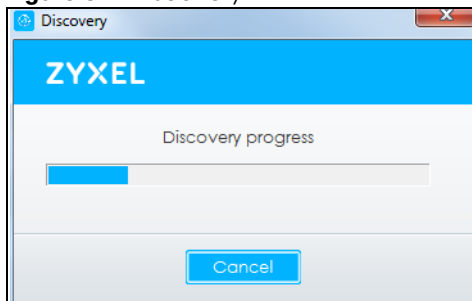
If you want to check the supported models and firmware versions later, you can click the **Show information about ZON** icon in the upper right hand corner of the screen. Then select the **Supported model and firmware version** link. If your device is not listed here, see the device release notes for ZON utility support. The release notes are in the firmware zip file on the Zyxel web site.

**Figure 50** ZON Utility Screen



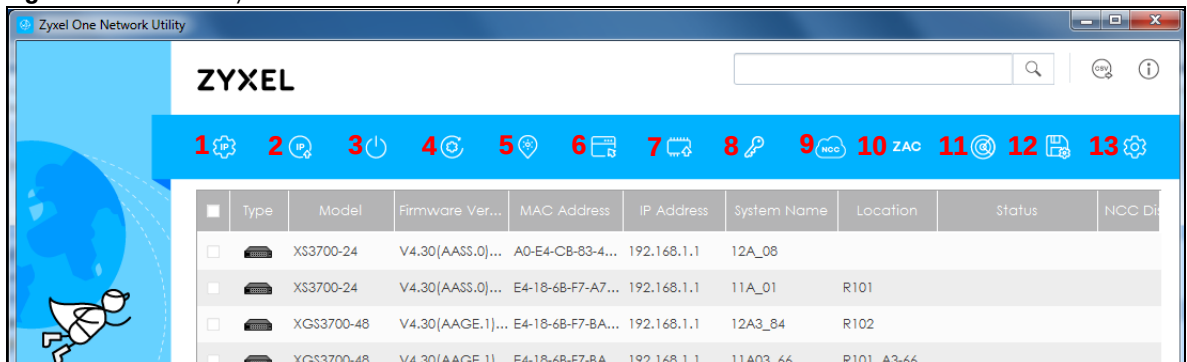
- 3 Select a network adapter to which your supported devices are connected.
- 4 Click the **Go** button for the ZON Utility to discover all supported devices in your network.

**Figure 51** Discovery



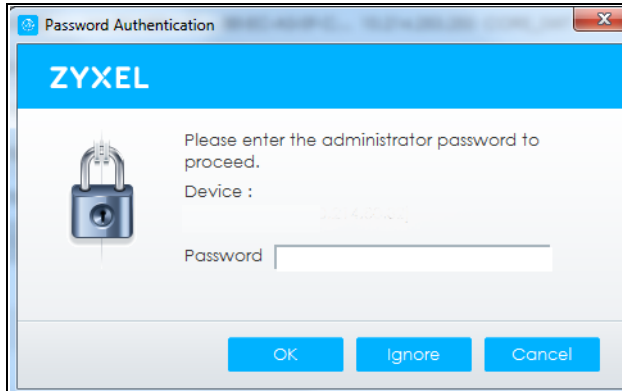
- 5 The ZON Utility screen shows the devices discovered.

**Figure 52** ZON Utility Screen



- 6 Select a device and then use the icons to perform actions. Some functions may not be available for your devices.

Note: You must know the selected device admin password before taking actions on the device using the ZON utility icons.

**Figure 53** Password Prompt

The following table describes the icons numbered from left to right in the ZON Utility screen.

**Table 10** ZON Utility Icons

| ICON                             | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                             |
|----------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 IP configuration               | Change the selected device's IP address.                                                                                                                                                                                                                                                                                                                                                                |
| 2 Renew IP Address               | Update a DHCP-assigned dynamic IP address.                                                                                                                                                                                                                                                                                                                                                              |
| 3 Reboot Device                  | Use this icon to restart the selected device(s). This may be useful when troubleshooting or upgrading new firmware.                                                                                                                                                                                                                                                                                     |
| 4 Reset Configuration to Default | If you forget your password or cannot access the Web Configurator, you can use this icon to reload the factory-default configuration file. This means that you will lose all configurations that you had previously.                                                                                                                                                                                    |
| 5 Locator LED                    | Use this icon to locate the selected device by causing its Locator LED to blink.                                                                                                                                                                                                                                                                                                                        |
| 6 Web GUI                        | Use this to access the selected device web configurator from your browser. You will need a username and password to log in.                                                                                                                                                                                                                                                                             |
| 7 Firmware Upgrade               | Use this icon to upgrade new firmware to selected device(s) of the same model.<br><br><b>Online upgrade:</b> If there's the latest firmware available, it'll show in the drop-down menu. You don't need to download the firmware first to upgrade firmware.<br><br><b>Local upgrade:</b> Make sure you have downloaded the firmware from the Zyxel website to your computer and unzipped it in advance. |
| 8 Change Password                | Use this icon to change the admin password of the selected device. You must know the current admin password before changing to a new one.                                                                                                                                                                                                                                                               |
| 9 Configure NCC Discovery        | You must have Internet access to use this feature. Use this icon to enable or disable the Nebula Control Center (NCC) discovery feature on the selected device. If it's enabled, the selected device will try to connect to the NCC. Once the selected device is connected to and has registered in the NCC, it'll go into the Nebula cloud management mode.                                            |
| 10 ZAC                           | Use this icon to run the Zyxel AP Configurator of the selected AP.                                                                                                                                                                                                                                                                                                                                      |
| 11 Clear and Rescan              | Use this icon to clear the list and discover all devices on the connected network again.                                                                                                                                                                                                                                                                                                                |
| 12 Save Configuration            | Use this icon to save configuration changes to permanent memory on a selected device.                                                                                                                                                                                                                                                                                                                   |
| 13 Settings                      | Use this icon to select a network adaptor for the computer on which the ZON utility is installed, and the utility language.                                                                                                                                                                                                                                                                             |



The following table describes the fields in the ZON Utility main screen.

Table 11 ZON Utility Fields

| LABEL            | DESCRIPTION                                                                                                                                                                                                                                                                                                               |
|------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Type             | This field displays an icon of the kind of device discovered.                                                                                                                                                                                                                                                             |
| Model            | This field displays the model name of the discovered device.                                                                                                                                                                                                                                                              |
| Firmware Version | This field displays the firmware version of the discovered device.                                                                                                                                                                                                                                                        |
| MAC Address      | This field displays the MAC address of the discovered device.                                                                                                                                                                                                                                                             |
| IP Address       | This field displays the IP address of an internal interface on the discovered device that first received an ZDP discovery request from the ZON utility.                                                                                                                                                                   |
| System Name      | This field displays the system name of the discovered device.                                                                                                                                                                                                                                                             |
| Location         | This field displays where the discovered device is.                                                                                                                                                                                                                                                                       |
| Status           | This field displays whether changes to the discovered device have been done successfully. As the Switch does not support <b>IP Configuration</b> , <b>Renew IP address</b> and <b>Locator LED</b> , this field displays "Update failed", "Not support Renew IP address" and "Not support Flash Locator LED" respectively. |
| NCC Discovery    | This field displays if the discovered device supports the Nebula Control Center (NCC) discovery feature. If it's enabled, the selected device will try to connect to the NCC. Once the selected device is connected to and has registered in the NCC, it'll go into the Nebula cloud management mode.                     |
| Serial Number    | Enter the admin password of the discovered device to display its serial number.                                                                                                                                                                                                                                           |
| Hardware Version | This field displays the hardware version of the discovered device.                                                                                                                                                                                                                                                        |

## 7.4 ZON Neighbor Management Screen

The ZON Neighbor Management screen allows you to view and manage the Switch's neighboring devices more conveniently. It uses Layer Link Discovery Protocol (LLDP) to discover all neighbor devices connected to the Switch including non-Zyxel devices. You can perform tasks on the neighboring devices like login, reboot (turn the power off and then back on again), and reset to factory default settings in the Neighbor Management screen. For more information on LLDP, see [Section 37.2 on page 328](#).

Click **Status > Neighbor** to see the following screen.

Figure 54 Status > Neighbor

| Neighbor                |    |       |             |             |                            |
|-------------------------|----|-------|-------------|-------------|----------------------------|
| Local                   |    |       | Remote      |             |                            |
| Port                    | 2  | Port  | 1/10        | System Name | XGS3700                    |
| Desc.                   | -  | Desc. | -           | Location    | -                          |
| PoE Draw                | -  | Model | XGS3700-24  | Firmware    | V4.30(AAGC.1)   03/15/2017 |
| Port                    | 23 | Port  | 26          | System Name | XGS4600                    |
| Desc.                   | -  | Desc. | -           | Location    | -                          |
| PoE Draw                | -  | Model | XGS4600-32F | Firmware    | V4.40(ABBL1)   12/28/2016  |
| <a href="#">Refresh</a> |    |       |             |             |                            |

The following table describes the fields in the above screen.

Table 12 Status > Neighbor

| LABEL            | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Local            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Port             | This shows the port of the Switch, on which the neighboring device is discovered.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Desc.            | This shows the port description of the Switch.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| PoE Draw         | This shows the power consumption that the neighboring device connected to this port draws from the Switch. This allows you to plan and use within the power budget of the Switch.                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Remote           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Port             | This show the number of the neighbor device's port which is connected to the Switch.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Desc.            | This shows the description of the neighbor device's port which is connected to the Switch.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Model            | This shows the model name of the neighbor device. This field will show "-" for non-Zyxel devices.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| System Name      | This shows the system name of the neighbor device.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Location         | This shows the geographic location of the neighbor device.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Firmware         | This shows the firmware version of the neighbor device. This field will show "-" for non-Zyxel devices.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| IP               | This shows the IP address of the neighbor device. The IP address is a <b>hyper link</b> that you can click to log into and manage the neighbor device through its web configurator. This field will show "-" for non-Zyxel devices.                                                                                                                                                                                                                                                                                                                                                               |
| MAC              | This shows the MAC address of the neighbor device. This field will show "-" for non-Zyxel devices.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| PWR Cycle        | <p>Click the <b>Cycle</b> button to turn OFF the power of the neighbor device and turn it back ON again. A count down button (from 5 to 0) starts.</p> <p>Note: The Switch must support power sourcing (PSE) or the network device is a powered device (PD).</p> <p>Note: If multiple neighbor devices use the same port, the <b>Cycle</b> button is displayed only on the first device, others will show "-" instead.</p>                                                                                                                                                                        |
| Reset to Default | <p>Click the <b>Reset</b> button to reset the neighbor device to its factory default settings. A warning message "<b>Are you sure you want to load factory default?</b>" appears prompting you to confirm the action. After confirming the action a count down button (from 5 to 0) starts.</p> <p>Note: The <b>Switch</b> must support power sourcing (PSE) or the network device is a powered device (PD).</p> <p>Note: If multiple neighbor devices use the same port, the <b>Reset</b> button is not available and will show "-" instead.</p> <p>Note: You can only reset Zyxel products.</p> |

# CHAPTER 8

## Basic Setting

This chapter describes how to configure the **Basic Setting** screens.

### 8.1 System Information

In the navigation panel, click **Basic Setting** > **System Info** to display the screen as shown.

You can check the firmware version number and monitor the Switch temperature, fan speeds and voltage in this screen.

**Figure 55** Basic Setting > System Info

| System Info       |                             |  |  |
|-------------------|-----------------------------|--|--|
| System Name       | XS3800                      |  |  |
| Product Model     | XS3800-28                   |  |  |
| ZyNOS F/W Version | V4.60(ABML0)b3   08/22/2018 |  |  |
| Ethernet Address  | bc:99:11:9b:b6:e4           |  |  |

| CPU Utilization |      |
|-----------------|------|
| Current (%)     | 4.77 |

| Memory Utilization |              |             |                 |
|--------------------|--------------|-------------|-----------------|
| Name               | Total (byte) | Used (byte) | Utilization (%) |
| common             | 59922816     | 9272720     | 15              |

| Hardware Monitor                                                                   |         |        |        |           |        |
|------------------------------------------------------------------------------------|---------|--------|--------|-----------|--------|
| Temperature Unit <input type="button" value="C"/> <input type="button" value="F"/> |         |        |        |           |        |
| Temperature (C)                                                                    | Current | MAX    | MIN    | Threshold | Status |
| CPU/MAC                                                                            | 41.0    | 41.0   | 29.0   | 76.0      | Normal |
| BOARD                                                                              | 40.0    | 41.0   | 31.0   | 113.0     | Normal |
| PHY                                                                                | 41.0    | 42.0   | 33.0   | 99.0      | Normal |
| FAN Speed (RPM)                                                                    | Current | MAX    | MIN    | Threshold | Status |
| FAN1                                                                               | 6467    | 6467   | 6345   | 500       | Normal |
| FAN2                                                                               | 6375    | 6405   | 6286   | 500       | Normal |
| FAN3                                                                               | 6228    | 6228   | 6143   | 500       | Normal |
| Voltage (V)                                                                        | Current | MAX    | MIN    | Threshold | Status |
| 1.88V_84887                                                                        | 1.894   | 1.894  | 1.894  | +/-4%     | Normal |
| 1V_84888                                                                           | 1.001   | 1.001  | 1.001  | +/-5%     | Normal |
| 1.88V                                                                              | 1.894   | 1.907  | 1.894  | +/-4%     | Normal |
| 1.0V                                                                               | 1.025   | 1.025  | 1.025  | +/-5%     | Normal |
| 1.8V                                                                               | 1.790   | 1.790  | 1.790  | +/-6%     | Normal |
| 1.0V_H3                                                                            | 0.990   | 0.990  | 0.990  | +/-5%     | Normal |
| 1V5_DDR                                                                            | 1.503   | 1.516  | 1.503  | +/-6%     | Normal |
| VTT_DDR                                                                            | 0.755   | 0.755  | 0.755  | +/-5%     | Normal |
| 3.3V                                                                               | 3.274   | 3.274  | 3.274  | +/-6%     | Normal |
| 2.5V                                                                               | 2.513   | 2.513  | 2.513  | +/-6%     | Normal |
| 12V                                                                                | 11.406  | 11.406 | 11.343 | +/-10%    | Normal |
| Power Source                                                                       |         |        |        |           | Status |
| PSU_1                                                                              |         |        |        |           | N/A    |
| PSU_2                                                                              |         |        |        |           | Active |

The following table describes the labels in these screens.

**Table 13** Basic Setting > System Info

| LABEL              | DESCRIPTION                                                                                                                                                            |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| System Name        | This field displays the descriptive name of the Switch for identification purposes.                                                                                    |
| Product Model      | This field displays the product model of the Switch. Use this information when searching for firmware upgrade or looking for other support information in the website. |
| ZyNOS F/W Version  | This field displays the version number of the Switch 's current firmware including the date created.                                                                   |
| Ethernet Address   | This field refers to the Ethernet MAC (Media Access Control) address of the Switch.                                                                                    |
| CPU Utilization    | CPU utilization quantifies how busy the system is. <b>Current (%)</b> displays the current percentage of CPU utilization.                                              |
| Memory Utilization | Memory Utilization shows how much DRAM memory is available and in use. It also displays the current percentage of memory utilization.                                  |

Table 13 Basic Setting &gt; System Info

| LABEL            | DESCRIPTION                                                                                                                                                                                                                                                                                                  |
|------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Name             | This field displays the name of memory pool.                                                                                                                                                                                                                                                                 |
| Total            | This field displays the total number of bytes in this memory pool.                                                                                                                                                                                                                                           |
| Used (byte)      | This field displays the number of bytes being used in this memory pool.                                                                                                                                                                                                                                      |
| Utilization (%)  | This field displays the percentage (%) of memory being used in this memory pool.                                                                                                                                                                                                                             |
| Hardware Monitor |                                                                                                                                                                                                                                                                                                              |
| Temperature Unit | The Switch has temperature sensors that are capable of detecting and reporting if the temperature rises above the threshold. You may choose the temperature unit (Centigrade or Fahrenheit) in this field.                                                                                                   |
| Temperature (C)  | <b>BOARD</b> , <b>MAC</b> and <b>PHY</b> refer to the location of the temperature sensors on the Switch printed circuit board.                                                                                                                                                                               |
| Current          | This shows the current temperature at this sensor.                                                                                                                                                                                                                                                           |
| MAX              | This field displays the maximum temperature measured at this sensor.                                                                                                                                                                                                                                         |
| MIN              | This field displays the minimum temperature measured at this sensor.                                                                                                                                                                                                                                         |
| Threshold        | This field displays the upper temperature limit at this sensor.                                                                                                                                                                                                                                              |
| Status           | This field displays <b>Normal</b> for temperatures below the threshold and <b>Error</b> for those above.                                                                                                                                                                                                     |
| Fan Speed (RPM)  | A properly functioning fan is an essential component (along with a sufficiently ventilated, cool operating environment) in order for the device to stay within the temperature threshold. Each fan has a sensor that is capable of detecting and reporting if the fan speed falls below the threshold shown. |
| Current          | This field displays this fan's current speed in Revolutions Per Minute (RPM).                                                                                                                                                                                                                                |
| MAX              | This field displays this fan's maximum speed measured in Revolutions Per Minute (RPM).                                                                                                                                                                                                                       |
| MIN              | This field displays this fan's minimum speed measured in Revolutions Per Minute (RPM). "<41" is displayed for speeds too small to measure (under 2000 RPM).                                                                                                                                                  |
| Threshold        | This field displays the minimum speed at which a normal fan should work.                                                                                                                                                                                                                                     |
| Status           | <b>Normal</b> indicates that this fan is functioning above the minimum speed. <b>Error</b> indicates that this fan is functioning below the minimum speed.                                                                                                                                                   |
| Voltage (V)      | The power supply for each voltage has a sensor that is capable of detecting and reporting if the voltage falls out of the tolerance range.                                                                                                                                                                   |
| Current          | This is the current voltage reading.                                                                                                                                                                                                                                                                         |
| MAX              | This field displays the maximum voltage measured at this point.                                                                                                                                                                                                                                              |
| MIN              | This field displays the minimum voltage measured at this point.                                                                                                                                                                                                                                              |
| Threshold        | This field displays the percentage tolerance of the voltage with which the Switch still works.                                                                                                                                                                                                               |
| Status           | <b>Normal</b> indicates that the voltage is within an acceptable operating range at this point; otherwise <b>Error</b> is displayed.                                                                                                                                                                         |
| Power Source     | <b>PSU_1</b> is <b>PWR1</b> , and <b>PSU_2</b> is <b>PWR2</b> .                                                                                                                                                                                                                                              |
| Status           | This field displays the AC power supply status.                                                                                                                                                                                                                                                              |

## 8.2 General Setup

Use this screen to configure general settings such as the system name and time. Click **Basic Setting > General Setup** in the navigation panel to display the screen as shown.

**Figure 56** Basic Setting > General Setup

| General Setup                                                              |                                         |
|----------------------------------------------------------------------------|-----------------------------------------|
| System Name                                                                | XS3800                                  |
| Location                                                                   |                                         |
| Contact Person's Name                                                      |                                         |
|                                                                            |                                         |
| Use Time Server when Bootup                                                | NTP(RFC-1305) ▼                         |
| Time Server IP Address                                                     | 1.pool.ntp.org                          |
| Current Time                                                               | 09 : 14 : 04 UTC                        |
| New Time (hh:mm:ss)                                                        | 09 : 14 : 04                            |
| Current Date                                                               | 2018 - 09 - 07                          |
| New Date (yyyy-mm-dd)                                                      | 2018 - 09 - 07                          |
| Time Zone                                                                  | UTC ▼                                   |
| Daylight Saving Time                                                       | <input type="checkbox"/>                |
| Start Date                                                                 | First ▼ Sunday ▼ of January ▼ at 0:00 ▼ |
| End Date                                                                   | First ▼ Sunday ▼ of January ▼ at 0:00 ▼ |
| It will take 60 seconds if time server is unreachable.                     |                                         |
| <input type="button" value="Apply"/> <input type="button" value="Cancel"/> |                                         |

The following table describes the labels in this screen.

**Table 14** Basic Setting > General Setup

| LABEL                       | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|-----------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| System Name                 | Type a descriptive name for identification purposes. This name consists of up to 64 printable ASCII characters; spaces are allowed.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Location                    | Type the geographic location of your Switch. You can use up to 32 printable ASCII characters; spaces are allowed.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Contact Person's Name       | Type the name of the person in charge of this Switch. You can use up to 32 printable ASCII characters; spaces are allowed.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Use Time Server when Bootup | <p>Type the time service protocol that your timeserver uses. Not all time servers support all protocols, so you may have to use trial and error to find a protocol that works. The main differences between them are the time format.</p> <p>When you select the <b>Daytime (RFC 867)</b> format, the Switch displays the day, month, year and time with no time zone adjustment. When you use this format, it is recommended that you use a Daytime timeserver within your geographical time zone.</p> <p><b>Time (RFC-868)</b> format displays a 4-byte integer giving the total number of seconds since 1970/1/1 at 0:0:0.</p> <p><b>NTP (RFC-1305)</b> is similar to Time (RFC-868).</p> <p><b>None</b> is the default value. Enter the time manually. Each time you turn on the Switch, the time and date will be reset to 1970-1-1 0:0.</p> |
| Time Server IP Address      | Type the IP address or domain name of your timeserver. The Switch searches for the timeserver for up to 60 seconds. If you select a timeserver that is unreachable, then this screen will appear locked for 60 seconds. Please wait.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Current Time                | This field displays the time you open this menu (or refresh the menu).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| New Time (hh:min:ss)        | Enter the new time in hour, minute and second format. The new time then appears in the <b>Current Time</b> field after you click <b>Apply</b> .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Current Date                | This field displays the date you open this menu.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| New Date (yyyy-mm-dd)       | Enter the new date in year, month and day format. The new date then appears in the <b>Current Date</b> field after you click <b>Apply</b> .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |

Table 14 Basic Setting &gt; General Setup (continued)

| LABEL                | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Time Zone            | Select the time difference between UTC (Universal Time Coordinated, formerly known as GMT, Greenwich Mean Time) and your time zone from the drop-down list box.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Daylight Saving Time | <p>Daylight saving is a period from late spring to early fall when many countries set their clocks ahead of normal local time by one hour to give more daytime light in the evening.</p> <p>Select this option if you use Daylight Saving Time.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Start Date           | <p>Configure the day and time when Daylight Saving Time starts if you selected <b>Daylight Saving Time</b>. The time is displayed in the 24 hour format. Here are a couple of examples:</p> <p>Daylight Saving Time starts in most parts of the United States on the second Sunday of March. Each time zone in the United States starts using Daylight Saving Time at 2 A.M. local time. So in the United States you would select <b>Second, Sunday, March</b> and <b>2:00</b>.</p> <p>Daylight Saving Time starts in the European Union on the last Sunday of March. All of the time zones in the European Union start using Daylight Saving Time at the same moment (1 A.M. GMT or UTC). So in the European Union you would select <b>Last, Sunday, March</b> and the last field depends on your time zone. In Germany for instance, you would select <b>2:00</b> because Germany's time zone is one hour ahead of GMT or UTC (GMT+1).</p> |
| End Date             | <p>Configure the day and time when Daylight Saving Time ends if you selected <b>Daylight Saving Time</b>. The time field uses the 24 hour format. Here are a couple of examples:</p> <p>Daylight Saving Time ends in the United States on the last Sunday of October. Each time zone in the United States stops using Daylight Saving Time at 2 A.M. local time. So in the United States you would select <b>First, Sunday, November</b> and <b>2:00</b>.</p> <p>Daylight Saving Time ends in the European Union on the last Sunday of October. All of the time zones in the European Union stop using Daylight Saving Time at the same moment (1 A.M. GMT or UTC). So in the European Union you would select <b>Last, Sunday, October</b> and the last field depends on your time zone. In Germany for instance, you would select <b>2:00</b> because Germany's time zone is one hour ahead of GMT or UTC (GMT+1).</p>                      |
| Apply                | Click <b>Apply</b> to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the <b>Save</b> link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Cancel               | Click <b>Cancel</b> to begin configuring this screen afresh.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |

## 8.3 Switch Setup

### 8.3.1 Introduction to VLANs

A VLAN (Virtual Local Area Network) allows a physical network to be partitioned into multiple logical networks. Devices on a logical network belong to one group. A device can belong to more than one group. With VLAN, a device cannot directly talk to or hear from devices that are not in the same group(s); the traffic must first go through a router.

In MTU (Multi-Tenant Unit) applications, VLAN is vital in providing isolation and security among the subscribers. When properly configured, VLAN prevents one subscriber from accessing the network resources of another on the same LAN, thus a user will not see the printers and hard disks of another user on the same network.

VLAN also increases network performance by limiting broadcasts to a smaller and more manageable logical broadcast domain. In traditional switched environments, all broadcast packets go to each and every individual port. With VLAN, all broadcasts are confined to a specific broadcast domain.

Note: VLAN is unidirectional; it only governs outgoing traffic.

See [Chapter 9 on page 109](#) for information on port-based and 802.1Q tagged VLANs.

Click **Basic Setting > Switch Setup** in the navigation panel to display the screen as shown. The VLAN setup screens change depending on whether you choose **802.1Q** or **Port Based** in the **VLAN Type** field in this screen (in Standalone mode). Refer to the chapter on VLAN.

**Figure 57** Basic Setting > Switch Setup

The following table describes the labels in this screen.

Table 15 Basic Setting > Switch Setup

| LABEL                                                                                                                                                                                                                                                                                                                                                                     | DESCRIPTION                                                                                                                                                                                                                                                                                                     |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| VLAN Type                                                                                                                                                                                                                                                                                                                                                                 | Choose <b>802.1Q</b> or <b>Port Based</b> . The <b>VLAN Setup</b> screen changes depending on whether you choose <b>802.1Q</b> VLAN type or <b>Port Based</b> VLAN type in this screen. See <a href="#">Chapter 9 on page 109</a> for more information.                                                         |
| Bridge Control Protocol Transparency                                                                                                                                                                                                                                                                                                                                      | Select <b>Active</b> to allow the Switch to handle bridging control protocols (STP, for example). You also need to define how to treat a BPDU in the <b>Port Setup</b> screen.                                                                                                                                  |
| MAC Address Learning                                                                                                                                                                                                                                                                                                                                                      | MAC address learning reduces outgoing traffic broadcasts. For MAC address learning to occur on a port, the port must be active.                                                                                                                                                                                 |
| Aging Time                                                                                                                                                                                                                                                                                                                                                                | Enter a time from 10 to 1000000 seconds. This is how long all dynamically learned MAC addresses remain in the MAC address table before they age out (and must be relearned).                                                                                                                                    |
| ARP Aging Time                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                 |
| Aging Time                                                                                                                                                                                                                                                                                                                                                                | Enter a time from 60 to 1000000 seconds. This is how long dynamically learned ARP entries remain in the ARP table before they age out (and must be relearned). The setting here applies to ARP entries which are newly added in the ARP table after you click <b>Apply</b> .                                    |
| GARP Timer: Switches join VLANs by making a declaration. A declaration is made by issuing a <b>Join</b> message using GARP. Declarations are withdrawn by issuing a <b>Leave</b> message. A <b>Leave All</b> message terminates all registrations. GARP timers set declaration timeout values. See <a href="#">Chapter 9 on page 109</a> for more background information. |                                                                                                                                                                                                                                                                                                                 |
| Join Timer                                                                                                                                                                                                                                                                                                                                                                | Join Timer sets the duration of the Join Period timer for GVRP in milliseconds. Each port has a <b>Join Period</b> timer. The allowed <b>Join Time</b> range is between 100 and 65535 milliseconds; the default is 200 milliseconds. See <a href="#">Chapter 9 on page 109</a> for more background information. |



Table 15 Basic Setting &gt; Switch Setup (continued)

| LABEL                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | DESCRIPTION                                                                                                                                                                                                                                                                        |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Leave Timer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Leave Time sets the duration of the <b>Leave Period</b> timer for GVRP in milliseconds. Each port has a single <b>Leave Period</b> timer. Leave Time must be two times larger than <b>Join Timer</b> ; the default is 600 milliseconds.                                            |
| Leave All Timer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Leave All Timer sets the duration of the Leave All Period timer for GVRP in milliseconds. Each port has a single Leave All Period timer. Leave All Timer must be larger than Leave Timer.                                                                                          |
| Priority Queue Assignment<br><br>IEEE 802.1p defines up to eight separate traffic types by inserting a tag into a MAC-layer frame that contains bits to define class of service. Frames without an explicit priority tag are given the default priority of the ingress port. Use the following fields to configure the priority level-to-physical queue mapping.<br><br>The Switch has eight physical queues that you can map to the 8 priority levels. On the Switch, traffic assigned to higher index queues gets through faster while traffic in lower index queues is dropped if the network is congested. |                                                                                                                                                                                                                                                                                    |
| Priority Level (The following descriptions are based on the traffic types defined in the IEEE 802.1d standard (which incorporates the 802.1p).<br><br>To map a priority level to a physical queue, select a physical queue from the drop-down menu on the right.                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                    |
| Priority 7                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Typically used for network control traffic such as router configuration messages.                                                                                                                                                                                                  |
| Priority 6                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Typically used for voice traffic that is especially sensitive to jitter (jitter is the variations in delay).                                                                                                                                                                       |
| Priority 5                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Typically used for video that consumes high bandwidth and is sensitive to jitter.                                                                                                                                                                                                  |
| Priority 4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Typically used for controlled load, latency-sensitive traffic such as SNA (Systems Network Architecture) transactions.                                                                                                                                                             |
| Priority 3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Typically used for "excellent effort" or better than best effort and would include important business traffic that can tolerate some delay.                                                                                                                                        |
| Priority 2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | This is for "spare bandwidth".                                                                                                                                                                                                                                                     |
| Priority 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | This is typically used for non-critical "background" traffic such as bulk transfers that are allowed but that should not affect other applications and users.                                                                                                                      |
| Priority 0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Typically used for best-effort traffic.                                                                                                                                                                                                                                            |
| Apply                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Click <b>Apply</b> to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the <b>Save</b> link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Click <b>Cancel</b> to begin configuring this screen afresh.                                                                                                                                                                                                                       |

## 8.4 IP Setup

Use the **IP Setup** screen to configure the default gateway device, the default domain name server and add IP domains.

### 8.4.1 IP Interfaces

The Switch needs an IP address for it to be managed over the network. The factory default IP address is 192.168.1.1. The subnet mask specifies the network number portion of an IP address. The factory default subnet mask is 255.255.255.0.

On the Switch, an IP address is not bound to any physical ports. Since each IP address on the Switch must be in a separate subnet, the configured IP address is also known as IP interface (or routing domain). In addition, this allows routing between subnets based on the IP address without additional routers.

You can configure multiple routing domains on the same VLAN as long as the IP address ranges for the domains do not overlap. To change the IP address of the Switch in a routing domain, simply add a new routing domain entry with a different IP address in the same subnet.

You can configure up to 256 IP domains which are used to access and manage the Switch from the ports belonging to the pre-defined VLAN(s).

Note: You must configure a VLAN first. Each VLAN can have multiple management IP addresses, and you can log into the Switch via different management IP addresses simultaneously.

**Figure 58** Basic Setting > IP Setup

| IP Status         |             |                |     | IP Configuration |                                      |                                      |
|-------------------|-------------|----------------|-----|------------------|--------------------------------------|--------------------------------------|
| Index             | IP Address  | IP Subnet Mask | VID | Type             | Renew                                | Release                              |
| <a href="#">1</a> | 10.2.1.23   | 255.255.255.0  | 123 | Static           |                                      |                                      |
| <a href="#">2</a> | 172.21.40.2 | 255.255.252.0  | 1   | DHCP             | <input type="button" value="Click"/> | <input type="button" value="Click"/> |
| <a href="#">3</a> | 192.168.1.1 | 255.255.255.0  | 1   | Static           |                                      |                                      |

The following table describes the labels in this screen.

Table 16 Basic Setting > IP Setup

| LABEL          | DESCRIPTION                                                                                                           |
|----------------|-----------------------------------------------------------------------------------------------------------------------|
| Index          | This field displays the index number of an entry.                                                                     |
| IP Address     | This field displays IP address of the Switch in the IP domain.                                                        |
| IP Subnet Mask | This field displays the subnet mask of the Switch in the IP domain.                                                   |
| VID            | This field displays the VLAN identification number of the IP domain on the Switch.                                    |
| Type           | This shows whether this IP address is dynamically assigned from a DHCP server or manually assigned ( <b>Static</b> ). |
| Renew          | Click this to renew the dynamic IP address.                                                                           |
| Release        | Click this to release the dynamic IP address.                                                                         |

## 8.4.2 IP Status Details

Use this screen to view IP status details. Click a number in the **Index** column in the **IP Status** screen to display the screen as shown next.

**Figure 59** Basic Setting > IP Setup > IP Status Details: Static

| IP Status Detail |               | IP Status |
|------------------|---------------|-----------|
| Type             | Static        |           |
| VID              | 1             |           |
| IP Address       | 192.168.1.1   |           |
| IP Subnet Mask   | 255.255.255.0 |           |

The following table describes the labels in this screen.

Table 17 Basic Setting > IP Setup > IP Status Details: Static

| LABEL          | DESCRIPTION                                                                                                                         |
|----------------|-------------------------------------------------------------------------------------------------------------------------------------|
| Type           | This shows whether the IP address is dynamically assigned from a DHCP server or manually assigned ( <b>Static</b> or <b>DHCP</b> ). |
| VID            | This is the VLAN identification number to which an IP routing domain belongs.                                                       |
| IP Address     | This is the IP address of your Switch in dotted decimal notation for example 192.168.1.1.                                           |
| IP Subnet Mask | This is the IP subnet mask of your Switch in dotted decimal notation for example 255.255.255.0.                                     |

Figure 60 Basic Setting > IP Setup > IP Status Details: DHCP

| IP Status Detail |                     | IP Status |
|------------------|---------------------|-----------|
| Type             | DHCP                |           |
| VID              | 1                   |           |
| IP Address       | 172.21.45.0         |           |
| IP Subnet Mask   | 255.255.252.0       |           |
| Lease Time       | 86400 seconds       |           |
| Renew Time       | 43200 seconds       |           |
| Rebind Time      | 75600 seconds       |           |
| Lease Time Start | 2016-01-01 00:12:55 |           |
| Lease Time End   | 2016-01-02 00:12:55 |           |
| Default Gateway  | 172.21.45.254       |           |
| DNS Server       | 172.21.45.1         |           |
| DNS Server       | 172.21.45.1         |           |

The following table describes the labels in this screen.

Table 18 Basic Setting > IP Setup > IP Status Details: DHCP

| LABEL            | DESCRIPTION                                                                                                                                                                                   |
|------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Type             | This shows whether the IP address is dynamically assigned from a DHCP server or manually assigned ( <b>Static</b> or <b>DHCP</b> ).                                                           |
| VID              | This is the VLAN identification number to which an IP routing domain belongs.                                                                                                                 |
| IP Address       | This is the IP address of your Switch in dotted decimal notation for example 192.168.1.1.                                                                                                     |
| IP Subnet Mask   | This is the IP subnet mask of your Switch in dotted decimal notation for example 255.255.255.0.                                                                                               |
| Lease Time       | This displays the length of time in seconds that this interface can use the current dynamic IP address from the DHCP server.                                                                  |
| Renew Time       | This displays the length of time from the lease start that the Switch will request to renew its current dynamic IP address from the DHCP server.                                              |
| Rebind Time      | This displays the length of time from the lease start that the Switch will request to get any dynamic IP address from the DHCP server.                                                        |
| Lease Time Start | This displays the date and time that the current dynamic IP address assignment from the DHCP server began. You should configure date and time in <b>Basic Setting &gt; General Setup</b> .    |
| Lease Time End   | This displays the date and time that the current dynamic IP address assignment from the DHCP server will end. You should configure date and time in <b>Basic Setting &gt; General Setup</b> . |
| Default Gateway  | This displays the IP address of the default gateway assigned by the DHCP server. 0.0.0.0 means no gateway is assigned.                                                                        |
| DNS Server       | This displays the IP address of the primary and secondary DNS servers assigned by the DHCP server. 0.0.0.0 means no DNS server is assigned.                                                   |

### 8.4.3 IP Configuration

Use this screen to configure the default gateway device, the default domain name server and add IP domains.

**Figure 61** Basic Setting > IP Setup > IP Configuration

IP Configuration

IP Status

|                    |                                                                            |
|--------------------|----------------------------------------------------------------------------|
| Default Gateway    | 0.0.0.0                                                                    |
| Default Management | <input checked="" type="radio"/> In-band <input type="radio"/> Out-of-band |

Apply

Cancel

Out-of-band Management IP Address

|                 |               |
|-----------------|---------------|
| IP Address      | 192.168.0.1   |
| IP Subnet Mask  | 255.255.255.0 |
| Default Gateway | 0.0.0.0       |

Apply

Cancel

IP Interface

|            |                                              |                                     |
|------------|----------------------------------------------|-------------------------------------|
| IP Address | <input checked="" type="radio"/> DHCP Client |                                     |
|            | Option-60                                    | <input checked="" type="checkbox"/> |
|            | Class-ID                                     | Zyxel Corporation                   |
|            | <input type="radio"/> Static IP Address      |                                     |
|            | IP Address                                   | 0.0.0.0                             |
|            | IP Subnet Mask                               | 0.0.0.0                             |
| VID        |                                              |                                     |

Add

Cancel

| Index | IP Address   | IP Subnet Mask | VID | Type   |                          |
|-------|--------------|----------------|-----|--------|--------------------------|
| 1     | 192.168.1.1  | 255.255.255.0  | 100 | Static | <input type="checkbox"/> |
| 2     | 10.214.80.33 | 255.255.255.0  | 1   | DHCP   | <input type="checkbox"/> |

Delete

Cancel

The following table describes the labels in this screen.

Table 19 Basic Setting > IP Setup > IP Configuration

| LABEL                                                                     | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|---------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Default Gateway                                                           | Type the IP address of the default outgoing gateway in dotted decimal notation, for example 192.168.1.254.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Default Management                                                        | Specify which traffic flow ( <b>In-Band</b> or <b>Out-of-band</b> ) the Switch is to send packets originating from itself (such as SNMP traps) or packets with unknown source.<br><br>Select <b>Out-of-band</b> to have the Switch send the packets to the management port labelled <b>MGMT</b> . This means that device(s) connected to the other port(s) do not receive these packets.<br><br>Select <b>In-Band</b> to have the Switch send the packets to all ports except the management port (labelled <b>MGMT</b> ) to which connected device(s) do not receive these packets.                                    |
| Apply                                                                     | Click <b>Apply</b> to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the <b>Save</b> link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.                                                                                                                                                                                                                                                                                                                                      |
| Cancel                                                                    | Click <b>Cancel</b> to reset the fields to your previous configuration.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Out-of-band Management IP Address                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Use these fields to set the settings for the out-of-band management port. |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| IP Address                                                                | Enter the out-of-band management IP address of your Switch in dotted decimal notation. For example, 192.168.0.1.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| IP Subnet Mask                                                            | Enter the IP subnet mask of your Switch in dotted decimal notation, for example, 255.255.255.0.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Default Gateway                                                           | Enter the IP address of the default outgoing gateway in dotted decimal notation, for example, 192.168.0.254                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Apply                                                                     | Click <b>Apply</b> to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the <b>Save</b> link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.                                                                                                                                                                                                                                                                                                                                      |
| Cancel                                                                    | Click <b>Cancel</b> to reset the fields to your previous configuration.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| IP Interface                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Use these fields to create or edit IP routing domains on the Switch.      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| DHCP Client                                                               | Select this option if you have a DHCP server that can assign the Switch an IP address, subnet mask, a default gateway IP address and a domain name server IP address automatically.                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Option-60                                                                 | DHCP Option 60 is used by the Switch for identification to the DHCP server using the VCI (Vendor Class Identifier) on the DHCP server. The Switch adds it in the initial DHCP discovery message that a DHCP client broadcasts in search of an IP address. The DHCP server can assign different IP addresses or options to clients with the specific VCI or reject the request from clients without the specific VCI.<br><br>Select this and enter the device identity you want the Switch to add in the DHCP discovery frames that go to the DHCP server. This allows the Switch to identify itself to the DHCP server. |
| Class-ID                                                                  | Type a string of up to 32 characters to identify this Switch to the DHCP server. For example, Zyxel-TW.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Static IP Address                                                         | Select this option if you don't have a DHCP server or if you wish to assign static IP address information to the Switch. You need to fill in the following fields when you select this option.                                                                                                                                                                                                                                                                                                                                                                                                                          |
| IP Address                                                                | Enter the IP address of your Switch in dotted decimal notation, for example, 192.168.1.1. This is the IP address of the Switch in an IP routing domain.                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| IP Subnet Mask                                                            | Enter the IP subnet mask of an IP routing domain in dotted decimal notation, for example, 255.255.255.0.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| VID                                                                       | Enter the VLAN identification number to which an IP routing domain belongs.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |

Table 19 Basic Setting &gt; IP Setup &gt; IP Configuration (continued)

| LABEL          | DESCRIPTION                                                                                                                                                                                                                                                                                                 |
|----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Add            | Click this to create a new entry.<br><br>This saves your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the <b>Save</b> link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel         | Click <b>Cancel</b> to reset the fields to your previous configuration.                                                                                                                                                                                                                                     |
| Index          | This field displays the index number of an entry.                                                                                                                                                                                                                                                           |
| IP Address     | This field displays IP address of the Switch in the IP domain.                                                                                                                                                                                                                                              |
| IP Subnet Mask | This field displays the subnet mask of the Switch in the IP domain.                                                                                                                                                                                                                                         |
| VID            | This field displays the VLAN identification number of the IP domain on the Switch.                                                                                                                                                                                                                          |
| Type           | This field displays the type of IP address status.                                                                                                                                                                                                                                                          |
|                | Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries.                                                                                                                                                                     |
| Delete         | Click <b>Delete</b> to remove the selected entry from the summary table.<br><br>Note: Deleting all IP subnets locks you out of the Switch.                                                                                                                                                                  |
| Cancel         | Click <b>Cancel</b> to clear the check boxes.                                                                                                                                                                                                                                                               |

## 8.5 Port Setup

Use this screen to configure Switch port settings. Click **Basic Setting** > **Port Setup** in the navigation panel to display the configuration screen.

**Figure 62** Basic Setting > Port Setup

| Port Setup |                                     |      |                |                          |                 |              |            |
|------------|-------------------------------------|------|----------------|--------------------------|-----------------|--------------|------------|
| Port       | Active                              | Name | Speed / Duplex | Flow Control             | 802.1p Priority | BPDU Control | Media Type |
| *          | <input type="checkbox"/>            |      | Auto ▼         | <input type="checkbox"/> | 0 ▼             | Peer ▼       | sfp_plus ▼ |
| 1          | <input checked="" type="checkbox"/> |      | Auto ▼         | <input type="checkbox"/> | 0 ▼             | Peer ▼       | sfp_plus ▼ |
| 2          | <input checked="" type="checkbox"/> |      | Auto ▼         | <input type="checkbox"/> | 0 ▼             | Peer ▼       | sfp_plus ▼ |
| 3          | <input checked="" type="checkbox"/> |      | Auto ▼         | <input type="checkbox"/> | 0 ▼             | Peer ▼       | sfp_plus ▼ |
| 4          | <input checked="" type="checkbox"/> |      | Auto ▼         | <input type="checkbox"/> | 0 ▼             | Peer ▼       | sfp_plus ▼ |
| 5          | <input checked="" type="checkbox"/> |      | Auto ▼         | <input type="checkbox"/> | 0 ▼             | Peer ▼       | sfp_plus ▼ |
| 6          | <input checked="" type="checkbox"/> |      | Auto ▼         | <input type="checkbox"/> | 0 ▼             | Peer ▼       | sfp_plus ▼ |
| 7          | <input checked="" type="checkbox"/> |      | Auto ▼         | <input type="checkbox"/> | 0 ▼             | Peer ▼       | sfp_plus ▼ |
| 8          | <input checked="" type="checkbox"/> |      | Auto ▼         | <input type="checkbox"/> | 0 ▼             | Peer ▼       | sfp_plus ▼ |
| 9          | <input checked="" type="checkbox"/> |      | Auto ▼         | <input type="checkbox"/> | 0 ▼             | Peer ▼       | sfp_plus ▼ |
| 10         | <input checked="" type="checkbox"/> |      | Auto ▼         | <input type="checkbox"/> | 0 ▼             | Peer ▼       | sfp_plus ▼ |
| 20         | <input checked="" type="checkbox"/> |      | Auto ▼         | <input type="checkbox"/> | 0 ▼             | Peer ▼       | sfp_plus ▼ |
| 21         | <input checked="" type="checkbox"/> |      | Auto ▼         | <input type="checkbox"/> | 0 ▼             | Peer ▼       | sfp_plus ▼ |
| 22         | <input checked="" type="checkbox"/> |      | Auto ▼         | <input type="checkbox"/> | 0 ▼             | Peer ▼       | sfp_plus ▼ |
| 23         | <input checked="" type="checkbox"/> |      | Auto ▼         | <input type="checkbox"/> | 0 ▼             | Peer ▼       | sfp_plus ▼ |
| 24         | <input checked="" type="checkbox"/> |      | Auto ▼         | <input type="checkbox"/> | 0 ▼             | Peer ▼       | sfp_plus ▼ |
| 25         | <input checked="" type="checkbox"/> |      | Auto ▼         | <input type="checkbox"/> | 0 ▼             | Peer ▼       | sfp_plus ▼ |
| 26         | <input checked="" type="checkbox"/> |      | Auto ▼         | <input type="checkbox"/> | 0 ▼             | Peer ▼       | sfp_plus ▼ |
| 27         | <input checked="" type="checkbox"/> |      | Auto ▼         | <input type="checkbox"/> | 0 ▼             | Peer ▼       | sfp_plus ▼ |
| 28         | <input checked="" type="checkbox"/> |      | Auto ▼         | <input type="checkbox"/> | 0 ▼             | Peer ▼       | sfp_plus ▼ |

The following table describes the labels in this screen.

**Table 20** Basic Setting > Port Setup

| LABEL  | DESCRIPTION                                                                                                                                                                                                                                                                                                                |
|--------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Port   | This is the port index number.                                                                                                                                                                                                                                                                                             |
| *      | <p>Settings in this row apply to all ports.</p> <p>Use this row only if you want to make some settings the same for all ports. Use this row first to set the common settings and then make adjustments on a port-by-port basis.</p> <p>Note: Changes in this row are copied to all the ports as soon as you make them.</p> |
| Active | Select this check box to enable a port. The factory default for all ports is enabled. A port must be enabled for data transmission to occur.                                                                                                                                                                               |
| Name   | <p>Type a descriptive name that identifies this port. You can enter up to 64 alpha-numerical characters.</p> <p>Note: Due to space limitations, the port name may be truncated in some web configurator screens.</p>                                                                                                       |

Table 20 Basic Setting &gt; Port Setup (continued)

| LABEL           | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|-----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Speed/Duplex    | <p>Select the speed and the duplex mode of the Ethernet connection on this port. The choices are <b>Auto</b>, <b>Auto-1G</b>, <b>2.5G / Full Duplex</b>, <b>5G / Full Duplex</b>, and <b>100M / Full Duplex</b> for a 100Base-T connection. <b>1G / Full Duplex</b> is supported by both 1000Base-T and 1000Base-X connections. <b>10G / Full Duplex</b> is supported by the 10 Gigabit Ethernet connections on the Switch that has a 10 Gigabit interface.</p> <p>Selecting <b>Auto-1G</b> or <b>Auto</b> (auto-negotiation) allows one port to negotiate with a peer port automatically to obtain the connection speed and duplex mode that both ends support. When auto-negotiation is turned on, a port on the Switch negotiates with the peer automatically to determine the connection speed and duplex mode. If the peer port does not support auto-negotiation or turns off this feature, the Switch determines the connection speed by detecting the signal on the cable and using half duplex mode. When the Switch's auto-negotiation is turned off, a port uses the pre-configured speed and duplex mode when making a connection, thus requiring you to make sure that the settings of the peer port are the same in order to connect.</p> |
| Flow Control    | <p>A concentration of traffic on a port decreases port bandwidth and overflows buffer memory causing packet discards and frame losses. <b>Flow Control</b> is used to regulate transmission of signals to match the bandwidth of the receiving port.</p> <p>The Switch uses IEEE 802.3x flow control in full duplex mode and backpressure flow control in half duplex mode.</p> <p>IEEE 802.3x flow control is used in full duplex mode to send a pause signal to the sending port, causing it to temporarily stop sending signals when the receiving port memory buffers fill.</p> <p>Back Pressure flow control is typically used in half duplex mode to send a "collision" signal to the sending port (mimicking a state of packet collision) causing the sending port to temporarily stop sending signals and resend later. Select <b>Flow Control</b> to enable it.</p>                                                                                                                                                                                                                                                                                                                                                                            |
| 802.1p Priority | <p>This priority value is added to incoming frames without a (802.1p) priority queue tag. See <b>Priority Queue Assignment</b> in <a href="#">Table 15 on page 84</a> for more information.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| BPDU Control    | <p>Configure the way to treat BPDUs received on this port. You must activate bridging control protocol transparency in the Switch <b>Setup</b> screen first.</p> <p>Select <b>Peer</b> to process any BPDU (Bridge Protocol Data Units) received on this port.</p> <p>Select <b>Tunnel</b> to forward BPDUs received on this port.</p> <p>Select <b>Discard</b> to drop any BPDU received on this port.</p> <p>Select <b>Network</b> to process a BPDU with no VLAN tag and forward a tagged BPDU.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Media Type      | <p>You can insert either an SFP+ transceiver or an SFP+ Direct Attach Copper (DAC) cable into the 10 Gigabit interface of the Switch.</p> <p>Select the media type (<b>sfp_plus</b> or <b>dac10g</b>) of the SFP+ module that is attached to the 10 Gigabit interface.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Apply           | <p>Click <b>Apply</b> to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the <b>Save</b> link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Cancel          | <p>Click <b>Cancel</b> to begin configuring this screen afresh.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |

## 8.6 Interface Setup

An IPv6 address is configured on a per-interface basis. The interface can be a physical interface (for example, an Ethernet port) or a virtual interface (for example, a VLAN). The Switch supports the VLAN interface type for IPv6 and loopback interface type for IPv4 at the time of writing.



Use this screen to set IPv4 loopback interfaces for routing protocols or IPv6 interfaces on which you can configure an IPv6 address to access and manage the Switch. Click **Basic Setting > Interface Setup** in the navigation panel to display the configuration screen.

**Figure 63** Basic Setting > Interface Setup

| Index | Interface Type | Interface ID | Interface |                          |
|-------|----------------|--------------|-----------|--------------------------|
| 1     | VLAN           | 123          | VLAN123   | <input type="checkbox"/> |
| 2     | Loopback       | 1            | Loopback1 | <input type="checkbox"/> |

The following table describes the labels in this screen.

Table 21 Basic Setting > Interface Setup

| LABEL          | DESCRIPTION                                                                                                                                                                                                                                                                                                        |
|----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Interface Type | Select the type of interface for which you want to configure. The Switch supports the loopback interface type for IPv4 and the VLAN interface type for IPv6 at the time of writing.                                                                                                                                |
| Interface ID   | Specify a unique identification number (from 1 to 4094) for the VLAN interface or a unique identification number (from 0 to 7) for the loopback interface.<br><br>Note: To have IPv6 function properly, you should configure a static VLAN with the same ID number in the <b>Advanced Setup &gt; VLAN</b> screens. |
| Add            | Click this to create a new entry.<br><br>This saves your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the <b>Save</b> link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.        |
| Cancel         | Click <b>Cancel</b> to reset the fields to your previous configuration.                                                                                                                                                                                                                                            |
| Index          | This field displays the index number of an entry.                                                                                                                                                                                                                                                                  |
| Interface Type | This field displays the type of interface.                                                                                                                                                                                                                                                                         |
| Interface ID   | This field displays the identification number of the interface.                                                                                                                                                                                                                                                    |
| Interface      | This field displays the interface's descriptive name which is generated automatically by the Switch. The name is from a combination of the interface type and ID number.                                                                                                                                           |
|                | Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries.                                                                                                                                                                            |
| Delete         | Click <b>Delete</b> to remove the selected entry from the summary table.                                                                                                                                                                                                                                           |
| Cancel         | Click <b>Cancel</b> to clear the check boxes.                                                                                                                                                                                                                                                                      |

## 8.7 IPv6

Use this screen to view the IPv6 interface status and configure Switch's management IPv6 addresses. See [Appendix C on page 508](#) for more information about IPv6.

Click **Basic Setting** > **IPv6** in the navigation panel to display the IPv6 status screen as shown next.

**Figure 64** Basic Setting > IPv6 Status

| IPv6 Status       |           | <a href="#">IPv6 Configuration</a> |
|-------------------|-----------|------------------------------------|
| Index             | Interface | Active                             |
| <a href="#">1</a> | VLAN123   | No                                 |

The following table describes the labels in this screen.

Table 22 Basic Setting > IPv6 Status

| LABEL     | DESCRIPTION                                                                                                         |
|-----------|---------------------------------------------------------------------------------------------------------------------|
| Index     | This field displays the index number of an IPv6 interface. Click on an index number to view more interface details. |
| Interface | This is the name of the IPv6 interface you created.                                                                 |
| Active    | This field displays whether the IPv6 interface is activated or not.                                                 |

## 8.7.1 IPv6 Interface Status

Use this screen to view a specific IPv6 interface status and detailed information. Click an interface index number in the **Basic Setting** > **IPv6** screen. The following screen opens.

**Figure 65** Basic Setting > IPv6 Interface Status

IPv6 Interface Status

[IPv6 Status](#)

Interface: VLAN123

|                                  |         |
|----------------------------------|---------|
| IPv6 Active                      | disable |
| MTU Size                         |         |
| ICMPv6 Rate Limit Bucket Size    |         |
| ICMPv6 Rate Limit Error Interval |         |
| Link Local Address               |         |
| Global Unicast Address(es)       |         |
| Joined Group Address(es)         |         |
| ND DAD Active                    |         |
| Number of DAD Attempts           |         |
| NS-Interval (millisecond)        |         |
| ND Reachable Time (millisecond)  |         |

|                      |                    |
|----------------------|--------------------|
| DHCPv6 Client Active | No                 |
| Identity Association | IA Type            |
|                      | IAID               |
|                      | T1                 |
|                      | T2                 |
|                      | State              |
|                      | SID                |
|                      | Address            |
|                      | Preferred Lifetime |
|                      | Valid Lifetime     |
| DNS                  |                    |
| Domain List          |                    |

Restart DHCPv6 Client
[Click Here](#)

The following table describes the labels in this screen.

Table 23 Basic Setting > IPv6 Interface Status

| LABEL                            | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|----------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| IPv6 Active                      | This field displays whether the IPv6 interface is activated or not.                                                                                                                                                                                                                                                                                                                                                                                                     |
| MTU Size                         | This field displays the Maximum Transmission Unit (MTU) size for IPv6 packets on this interface.                                                                                                                                                                                                                                                                                                                                                                        |
| ICMPv6 Rate Limit Bucket Size    | This field displays the maximum number of ICMPv6 error messages which are allowed to transmit in a given time interval. If the bucket is full, subsequent error messages are suppressed.                                                                                                                                                                                                                                                                                |
| ICMPv6 Rate Limit Error Interval | This field displays the time period (in milliseconds) during which ICMPv6 error messages of up to the bucket size can be transmitted. 0 means no limit.                                                                                                                                                                                                                                                                                                                 |
| Link Local Address               | This field displays the Switch's link-local IP address and prefix generated by the interface. It also shows whether the IP address is preferred, which means it is a valid address and can be used as a sender or receiver address.                                                                                                                                                                                                                                     |
| Global Unicast Address(es)       | This field displays the Switch's global unicast address to identify this interface.                                                                                                                                                                                                                                                                                                                                                                                     |
| Joined Group Address(es)         | This field displays the IPv6 multicast addresses of groups the Switch's interface joins.                                                                                                                                                                                                                                                                                                                                                                                |
| ND DAD Active                    | This field displays whether Neighbor Discovery (ND) Duplicate Address Detection (DAD) is enabled on the interface.                                                                                                                                                                                                                                                                                                                                                      |
| Number of DAD Attempts           | This field displays the number of consecutive neighbor solicitations the Switch sends for this interface.                                                                                                                                                                                                                                                                                                                                                               |
| NS-Interval (millisecond)        | This field displays the time interval (in milliseconds) at which neighbor solicitations are re-sent for this interface.                                                                                                                                                                                                                                                                                                                                                 |
| ND Reachable Time (millisecond)  | This field displays how long (in milliseconds) a neighbor is considered reachable for this interface.                                                                                                                                                                                                                                                                                                                                                                   |
| DHCPv6 Client Active             | This field displays whether the Switch acts as a DHCPv6 client to get an IPv6 address from a DHCPv6 server.                                                                                                                                                                                                                                                                                                                                                             |
| Identity Association             | An Identity Association (IA) is a collection of addresses assigned to a DHCP client, through which the server and client can manage a set of related IP addresses. Each IA must be associated with exactly one interface.                                                                                                                                                                                                                                               |
| IA Type                          | The IA type is the type of address in the IA. Each IA holds one type of address. <b>IA_NA</b> means an identity association for non-temporary addresses and <b>IA_TA</b> is an identity association for temporary addresses.                                                                                                                                                                                                                                            |
| IAID                             | Each IA consists of a unique IAID and associated IP information.                                                                                                                                                                                                                                                                                                                                                                                                        |
| T1                               | This field displays the DHCPv6 T1 timer. After T1, the Switch sends the DHCPv6 server a Renew message.<br><br>An IA_NA option contains the T1 and T2 fields, but an IA_TA option does not. The DHCPv6 server uses T1 and T2 to control the time at which the client contacts with the server to extend the lifetimes on any addresses in the IA_NA before the lifetimes expire.                                                                                         |
| T2                               | This field displays the DHCPv6 T2 timer. If the time T2 is reached and the server does not respond, the Switch sends a Rebind message to any available server.                                                                                                                                                                                                                                                                                                          |
| State                            | This field displays the state of the TA. It shows <ul style="list-style-type: none"> <li>• <b>Active</b> when the Switch obtains addresses from a DHCPv6 server and the TA is created.</li> <li>• <b>Renew</b> when the TA's address lifetime expires and the Switch sends out a Renew message.</li> <li>• <b>Rebind</b> when the Switch doesn't receive a response from the original DHCPv6 server and sends out a Rebind message to another DHCPv6 server.</li> </ul> |
| SID                              | This field displays the DHCPv6 server's unique ID.                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Address                          | This field displays the Switch's global address which is assigned by the DHCPv6 server.                                                                                                                                                                                                                                                                                                                                                                                 |
| Preferred Lifetime               | This field displays how long (in seconds) that the global address remains preferred.                                                                                                                                                                                                                                                                                                                                                                                    |

Table 23 Basic Setting &gt; IPv6 Interface Status (continued)

| LABEL                 | DESCRIPTION                                                                                                                                 |
|-----------------------|---------------------------------------------------------------------------------------------------------------------------------------------|
| Valid Lifetime        | This field displays how long (in seconds) that the global address is valid.                                                                 |
| DNS                   | This field displays the DNS server address assigned by the DHCPv6 server.                                                                   |
| Domain List           | This field displays the address record when the Switch queries the DNS server to resolve domain names.                                      |
| Restart DHCPv6 Client | Click <b>Click Here</b> to send a new DHCP request to the DHCPv6 server and update the IPv6 address and DNS information for this interface. |

## 8.7.2 IPv6 Configuration

Use this screen to configure IPv6 settings on the Switch. Click the **IPv6 Configuration** link in the **Basic Setting > IPv6** screen. The following screen opens.

Figure 66 Basic Setting &gt; IPv6 &gt; IPv6 Configuration

| IPv6 Configuration      |                               | <a href="#">IPv6 Status</a> |
|-------------------------|-------------------------------|-----------------------------|
| IPv6 Global Setup       |                               | <a href="#">Click Here</a>  |
| IPv6 Interface Setup    |                               | <a href="#">Click Here</a>  |
| IPv6 Addressing         | IPv6 Link-Local Address Setup | <a href="#">Click Here</a>  |
|                         | IPv6 Global Address Setup     | <a href="#">Click Here</a>  |
| IPv6 Neighbor Discovery | IPv6 Neighbor Discovery Setup | <a href="#">Click Here</a>  |
|                         | IPv6 Router Discovery Setup   | <a href="#">Click Here</a>  |
|                         | IPv6 Prefix Setup             | <a href="#">Click Here</a>  |
| IPv6 Neighbor Setup     |                               | <a href="#">Click Here</a>  |
| DHCPv6 Client Setup     |                               | <a href="#">Click Here</a>  |

The following table describes the labels in this screen.

Table 24 Basic Setting &gt; IPv6 &gt; IPv6 Configuration

| LABEL                         | DESCRIPTION                                                                                            |
|-------------------------------|--------------------------------------------------------------------------------------------------------|
| IPv6 Global Setup             | Click the link to go to a screen where you can configure the global IPv6 settings on the Switch.       |
| IPv6 Interface Setup          | Click the link to go to a screen where you can enable an IPv6 interface on the Switch.                 |
| IPv6 Addressing               |                                                                                                        |
| IPv6 Link-Local Address Setup | Click the link to go to a screen where you can configure the IPv6 link-local address for an interface. |
| IPv6 Global Address Setup     | Click the link to go to a screen where you can configure the IPv6 global address for an interface.     |
| IPv6 Neighbor Discovery       |                                                                                                        |
| IPv6 Neighbor Discovery Setup | Click the link to go to a screen where you can configure the IPv6 neighbor discovery settings.         |
| IPv6 Router Discovery Setup   | Click the link to go to a screen where you can configure the IPv6 router discovery settings.           |
| IPv6 Prefix Setup             | Click the link to go to a screen where you can configure the Switch's IPv6 prefix list.                |

Table 24 Basic Setting &gt; IPv6 &gt; IPv6 Configuration (continued)

| LABEL               | DESCRIPTION                                                                                                             |
|---------------------|-------------------------------------------------------------------------------------------------------------------------|
| IPv6 Neighbor Setup | Click the link to go to a screen where you can create a static IPv6 neighbor entry in the Switch's IPv6 neighbor table. |
| DHCPv6 Client Setup | Click the link to go to a screen where you can configure the Switch DHCP settings.                                      |

### 8.7.3 IPv6 Global Setup

Use this screen to configure the global IPv6 settings. Click the link next to **IPv6 Global Setup** in the **IPv6 Configuration** screen to display the screen as shown next.

Figure 67 Basic Setting &gt; IPv6 &gt; IPv6 Configuration &gt; IPv6 Global Setup

| IPv6 Global Setup                |      | <a href="#">IPv6 Configuration</a> |
|----------------------------------|------|------------------------------------|
| IPv6 Hop Limit                   | 64   |                                    |
| ICMPv6 Rate Limit Bucket Size    | 100  |                                    |
| ICMPv6 Rate Limit Error Interval | 1000 | milliseconds                       |

Apply Cancel Clear

The following table describes the labels in this screen.

Table 25 Basic Setting &gt; IPv6 &gt; IPv6 Configuration &gt; IPv6 Global Setup

| LABEL                            | DESCRIPTION                                                                                                                                                                                                                                                                       |
|----------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| IPv6 Hop Limit                   | Specify the maximum number of hops (from 1 to 255) in router advertisements. This is the maximum number of hops on which an IPv6 packet is allowed to transmit before it is discarded by an IPv6 router, which is similar to the TTL field in IPv4.                               |
| ICMPv6 Rate Limit Bucket Size    | Specify the maximum number of ICMPv6 error messages (from 1 to 200) which are allowed to transmit in a given time interval. If the bucket is full, subsequent error messages are suppressed.                                                                                      |
| ICMPv6 Rate Limit Error Interval | Specify the time period (from 0 to 2147483647 milliseconds) during which ICMPv6 error messages of up to the bucket size can be transmitted. 0 means no limit.                                                                                                                     |
| Apply                            | Click <b>Apply</b> to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the <b>Save</b> link on the top navigation panel to save your changes to the nonvolatile memory when you are done configuring. |
| Cancel                           | Click <b>Cancel</b> to begin configuring this screen afresh.                                                                                                                                                                                                                      |
| Clear                            | Click <b>Clear</b> to reset the fields to the factory defaults.                                                                                                                                                                                                                   |

### 8.7.4 IPv6 Interface Setup

Use this screen to turn on or off an IPv6 interface and enable stateless autoconfiguration on it. Click the link next to **IPv6 Interface Setup** in the **IPv6 Configuration** screen to display the screen as shown next.

**Figure 68** Basic Setting > IPv6 > IPv6 Configuration > IPv6 Interface Setup

| Index | Interface | Active |
|-------|-----------|--------|
| 1     | VLAN123   | No     |

The following table describes the labels in this screen.

**Table 26** Basic Setting > IPv6 > IPv6 Configuration > IPv6 Interface Setup

| LABEL     | DESCRIPTION                                                                                                                                                                                                                                                                       |
|-----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Interface | Select the IPv6 interface you want to configure.                                                                                                                                                                                                                                  |
| Active    | Select this option to enable the interface.                                                                                                                                                                                                                                       |
| Apply     | Click <b>Apply</b> to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the <b>Save</b> link on the top navigation panel to save your changes to the nonvolatile memory when you are done configuring. |
| Cancel    | Click <b>Cancel</b> to begin configuring this screen afresh.                                                                                                                                                                                                                      |
| Clear     | Click <b>Clear</b> to reset the fields to the factory defaults.                                                                                                                                                                                                                   |
| Index     | This is the interface index number. Click on an index number to change the settings.                                                                                                                                                                                              |
| Interface | This is the name of the IPv6 interface you created.                                                                                                                                                                                                                               |
| Active    | This field displays whether the IPv6 interface is activated or not.                                                                                                                                                                                                               |

## 8.7.5 IPv6 Link-Local Address Setup

A link-local address uniquely identifies a device on the local network (the LAN). It is similar to a "private IP address" in IPv4. You can have the same link-local address on multiple interfaces on a device. A link-local unicast address has a predefined prefix of fe80::/10.

Use this screen to configure the interface's link-local address and default gateway. Click the link next to **IPv6 Link-Local Address Setup** in the **IPv6 Configuration** screen to display the screen as shown next.

**Figure 69** Basic Setting > IPv6 > IPv6 Configuration > IPv6 Link-Local Address Setup

| Index | Interface | IPv6 Link-Local Address | IPv6 Default Gateway |
|-------|-----------|-------------------------|----------------------|
| 1     | VLAN123   |                         |                      |

The following table describes the labels in this screen.

Table 27 Basic Setting > IPv6 > IPv6 Configuration > IPv6 Link-Local Address Setup

| LABEL                   | DESCRIPTION                                                                                                                                                                                                                                                                       |
|-------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Interface               | Select the IPv6 interface you want to configure.                                                                                                                                                                                                                                  |
| Link-Local Address      | Manually configure a static IPv6 link-local address for the interface.                                                                                                                                                                                                            |
| Default Gateway         | Set the default gateway IPv6 address for the interface. When an interface cannot find a routing information for a frame's destination, it forwards the packet to the default gateway.                                                                                             |
| Apply                   | Click <b>Apply</b> to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the <b>Save</b> link on the top navigation panel to save your changes to the nonvolatile memory when you are done configuring. |
| Cancel                  | Click <b>Cancel</b> to begin configuring this screen afresh.                                                                                                                                                                                                                      |
| Clear                   | Click <b>Clear</b> to reset the fields to the factory defaults.                                                                                                                                                                                                                   |
| Index                   | This is the interface index number. Click on an index number to change the settings.                                                                                                                                                                                              |
| Interface               | This is the name of the IPv6 interface you created.                                                                                                                                                                                                                               |
| IPv6 Link-Local Address | This is the static IPv6 link-local address for the interface.                                                                                                                                                                                                                     |
| IPv6 Default Gateway    | This is the default gateway IPv6 address for the interface.                                                                                                                                                                                                                       |

## 8.7.6 IPv6 Global Address Setup

Use this screen to configure the interface's IPv6 global address. Click the link next to **IPv6 Global Address Setup** in the **IPv6 Configuration** screen to display the screen as shown next.

Figure 70 Basic Setting > IPv6 > IPv6 Configuration > IPv6 Global Address Setup

The following table describes the labels in this screen.

Table 28 Basic Setting > IPv6 > IPv6 Configuration > IPv6 Global Address Setup

| LABEL               | DESCRIPTION                                                                                                                                   |
|---------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|
| Interface           | Select the IPv6 interface you want to configure.                                                                                              |
| IPv6 Global Address | Manually configure a static IPv6 global address for the interface.                                                                            |
| Prefix Length       | Specify an IPv6 prefix length that specifies how many most significant bits (start from the left) in the address compose the network address. |
| EUI-64              | Select this option to have the interface ID be generated automatically using the EUI-64 format.                                               |
| Add                 | Click <b>Add</b> to create a new entry or update an existing one.                                                                             |

Table 28 Basic Setting &gt; IPv6 &gt; IPv6 Configuration &gt; IPv6 Global Address Setup (continued)

| LABEL                                 | DESCRIPTION                                                                                                                             |
|---------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|
| Cancel                                | Click <b>Cancel</b> to begin configuring this screen afresh.                                                                            |
| Clear                                 | Click <b>Clear</b> to reset the fields to the factory defaults.                                                                         |
| Index                                 | This is the interface index number. Click on an index number to change the settings.                                                    |
| Interface                             | This is the name of the IPv6 interface you created.                                                                                     |
| IPv6 Global Address/<br>Prefix Length | This field displays the IPv6 global address and prefix length for the interface.                                                        |
| EUI-64                                | This shows whether the interface ID of the global address is generated using the EUI-64 format.                                         |
|                                       | Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries. |
| Delete                                | Check the entry(ies) that you want to remove and then click <b>Delete</b> to remove the selected entry(ies) from the summary table.     |
| Cancel                                | Click <b>Cancel</b> to clear the check boxes.                                                                                           |

### 8.7.7 IPv6 Neighbor Discovery Setup

Use this screen to configure neighbor discovery settings for each interface. Click the link next to **IPv6 Neighbor Discovery Setup** in the **IPv6 Configuration** screen to display the screen as shown next.

Figure 71 Basic Setting &gt; IPv6 &gt; IPv6 Configuration &gt; IPv6 Neighbor Discovery Setup

| Index | Interface | DAD Attempts | NS Interval | Reachable Time |
|-------|-----------|--------------|-------------|----------------|
| 1     | VLAN123   | 1            | 1000        | 30000          |

The following table describes the labels in this screen.

Table 29 Basic Setting &gt; IPv6 &gt; IPv6 Configuration &gt; IPv6 Neighbor Discovery Setup

| LABEL        | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|--------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Interface    | Select the IPv6 interface you want to configure.                                                                                                                                                                                                                                                                                                                                                                                            |
| DAD Attempts | <p>The Switch uses Duplicate Address Detection (DAD) with neighbor solicitation and advertisement messages to check whether an IPv6 address is already in use before assigning it to an interface, such as the link-local address it creates through stateless address autoconfiguration.</p> <p>Specify the number of consecutive neighbor solicitations (from 0 to 600) the Switch sends for this interface. Enter 0 to turn off DAD.</p> |
| NS Interval  | Specify the time interval (from 1000 to 3600000 milliseconds) at which neighbor solicitations are re-sent for this interface.                                                                                                                                                                                                                                                                                                               |



Table 29 Basic Setting &gt; IPv6 &gt; IPv6 Configuration &gt; IPv6 Neighbor Discovery Setup (continued)

| LABEL          | DESCRIPTION                                                                                                                                                                                                                                                                       |
|----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Reachable Time | Specify how long (from 1000 to 3600000 milliseconds) a neighbor is considered reachable for this interface.                                                                                                                                                                       |
| Apply          | Click <b>Apply</b> to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the <b>Save</b> link on the top navigation panel to save your changes to the nonvolatile memory when you are done configuring. |
| Cancel         | Click <b>Cancel</b> to begin configuring this screen afresh.                                                                                                                                                                                                                      |
| Clear          | Click <b>Clear</b> to reset the fields to the factory defaults.                                                                                                                                                                                                                   |
| Index          | This is the interface index number. Click on an index number to change the settings.                                                                                                                                                                                              |
| Interface      | This is the name of the IPv6 interface you created.                                                                                                                                                                                                                               |
| DAD Attempts   | This field displays the number of consecutive neighbor solicitations the Switch sends for this interface.                                                                                                                                                                         |
| NS Interval    | This field displays the time interval (in milliseconds) at which neighbor solicitations are re-sent for this interface.                                                                                                                                                           |
| Reachable Time | This field displays how long (in milliseconds) a neighbor is considered reachable for this interface.                                                                                                                                                                             |

## 8.7.8 IPv6 Router Discovery Setup

Use this screen to configure router discovery settings for each interface. Click the link next to **IPv6 Router Discovery Setup** in the **IPv6 Configuration** screen to display the screen as shown next.

Figure 72 Basic Setting &gt; IPv6 &gt; IPv6 Configuration &gt; IPv6 Router Discovery Setup

The screenshot displays the 'IPv6 Router Discovery Setup' configuration page. At the top, there is a navigation bar with 'IPv6 Router Discovery Setup' and a link to 'IPv6 Configuration'. The main form contains the following fields:

- Interface:** A dropdown menu showing 'VLAN123'.
- Flags:** Two checkboxes, 'Managed Config Flag' and 'Other Config Flag', both of which are unchecked.
- Minimum Interval:** A text input field with '200' and a unit label 'seconds'.
- Maximum Interval:** A text input field with '600' and a unit label 'seconds'.
- Lifetime:** A text input field with '1800' and a unit label 'seconds'.
- Suppress:** An unchecked checkbox.

Below the form are three buttons: 'Apply', 'Cancel', and 'Clear'. At the bottom of the screen is a table summarizing the configuration:

| Index | Interface | Flags | Minimum Interval | Maximum Interval | Lifetime | Suppress |
|-------|-----------|-------|------------------|------------------|----------|----------|
| 1     | VLAN123   |       | 200              | 600              | 1800     | No       |

The following table describes the labels in this screen.

Table 30 Basic Setting > IPv6 > IPv6 Configuration > IPv6 Router Discovery Setup

| LABEL            | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Interface        | Select the IPv6 interface you want to configure.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Flags            | <p>Select the <b>Managed Config Flag</b> option to have the Switch set the "managed address configuration" flag (the M flag) to 1 in IPv6 router advertisements, which means IPv6 hosts use DHCPv6 to obtain IPv6 stateful addresses. Deselect the option to set the flag to 0 and the host will not use DHCPv6 to obtain IPv6 stateful addresses.</p> <p>Select the <b>Other Config Flag</b> option to have the Switch set the "Other stateful configuration" flag (the O flag) to 1 in IPv6 router advertisements, which means IPv6 hosts use DHCPv6 to obtain additional configuration settings, such as DNS information. Deselect the option to set the flag to 0 and the host will not use DHCPv6 to obtain additional configuration settings.</p> |
| Minimum Interval | <p>Specify the minimum time interval (from 3 to 1350 seconds) at which the Switch sends router advertisements for this interface.</p> <p>Note: The minimum time interval cannot be greater than three-quarters of the maximum time interval.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Maximum Interval | Specify the maximum time interval (from 4 to 1800 seconds) at which the Switch sends router advertisements for this interface.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Lifetime         | Specify how long (from 0 to 9000 seconds) the router in router advertisements can be used as a default router for this interface.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Suppress         | Select this option to set the Switch to not send router advertisements and responses to router solicitations on this interface.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Apply            | Click <b>Apply</b> to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the <b>Save</b> link on the top navigation panel to save your changes to the nonvolatile memory when you are done configuring.                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Cancel           | Click <b>Cancel</b> to begin configuring this screen afresh.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Clear            | Click <b>Clear</b> to reset the fields to the factory defaults.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Index            | This is the interface index number. Click on an index number to change the settings.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Interface        | This is the name of the IPv6 interface you created.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Flags            | This field displays whether IPv6 hosts use DHCPv6 to obtain IPv6 stateful addresses ( <b>M</b> ) and/or additional configuration settings ( <b>O</b> ).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Minimum Interval | This field displays the minimum time interval at which the Switch sends router advertisements for this interface.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Maximum Interval | This field displays the maximum time interval at which the Switch sends router advertisements for this interface.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Lifetime         | This field displays how long the router in router advertisements can be used as a default router for this interface.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Suppress         | This field displays whether the Switch sends router advertisements and responses to router solicitations on this interface ( <b>No</b> ) or not ( <b>Yes</b> ).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |

### 8.7.9 IPv6 Prefix Setup

Use this screen to configure the Switch's IPv6 prefix list for each interface. Click the link next to **IPv6 Prefix Setup** in the **IPv6 Configuration** screen to display the screen as shown next.

**Figure 73** Basic Setting > IPv6 > IPv6 Configuration > IPv6 Prefix Setup

**IPv6 Prefix Setup** [IPv6 Configuration](#)

Interface:

Prefix:

Prefix Length:

Valid Lifetime:  seconds

Preferred Lifetime:  seconds

Flags:

- ☐ No-Autoconfig Flag
- ☐ No-Onlink Flag
- ☐ No-Advertise Flag

[Add](#) [Cancel](#) [Clear](#)

| Index | Interface | Prefix/Prefix Length | Valid Lifetime | Preferred Lifetime |  |
|-------|-----------|----------------------|----------------|--------------------|--|
|       |           |                      |                |                    |  |

[Delete](#) [Cancel](#)

The following table describes the labels in this screen.

**Table 31** Basic Setting > IPv6 > IPv6 Configuration > IPv6 Prefix Setup

| LABEL                | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                            |
|----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Interface            | Select the IPv6 interface you want to configure.                                                                                                                                                                                                                                                                                                                                       |
| Prefix               | Set the IPv6 prefix that the Switch includes in router advertisements for this interface.                                                                                                                                                                                                                                                                                              |
| Prefix Length        | Set the prefix length that the Switch includes in router advertisements for this interface.                                                                                                                                                                                                                                                                                            |
| Valid Lifetime       | Specify how long (from 0 to 4294967295 seconds) the prefix is valid for on-link determination.                                                                                                                                                                                                                                                                                         |
| Preferred Lifetime   | Specify how long (from 0 to 4294967295 seconds) that addresses generated from the prefix via stateless address autoconfiguration remain preferred.<br>The preferred lifetime cannot exceed the valid lifetime.                                                                                                                                                                         |
| Flags                | Select <b>No-Autoconfig Flag</b> to not allow IPv6 hosts to use this prefix for stateless address autoconfiguration.<br>Select <b>No-Onlink Flag</b> to not allow the specified prefix to be used for on-link determination.<br>Select <b>No-Advertise Flag</b> to set the Switch to not include the specified IPv6 prefix, prefix length in router advertisements for this interface. |
| Add                  | Click this to create a new entry or to update an existing one.<br><br>This saves your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the <b>Save</b> link on the top navigation panel to save your changes to the nonvolatile memory when you are done configuring.                                                |
| Cancel               | Click <b>Cancel</b> to begin configuring this screen afresh.                                                                                                                                                                                                                                                                                                                           |
| Clear                | Click <b>Clear</b> to reset the fields to the factory defaults.                                                                                                                                                                                                                                                                                                                        |
| Index                | This is the interface index number. Click on an index number to change the settings.                                                                                                                                                                                                                                                                                                   |
| Interface            | This is the name of the IPv6 interface you created.                                                                                                                                                                                                                                                                                                                                    |
| Prefix/Prefix Length | This field displays the IPv6 prefix and prefix length that the Switch includes in router advertisements for this interface.                                                                                                                                                                                                                                                            |
| Valid Lifetime       | This field displays the IPv6 prefix valid lifetime.                                                                                                                                                                                                                                                                                                                                    |

Table 31 Basic Setting &gt; IPv6 &gt; IPv6 Configuration &gt; IPv6 Prefix Setup (continued)

| LABEL              | DESCRIPTION                                                                                                                                                     |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Preferred Lifetime | This field displays the preferred lifetime of an IPv6 address generated from the prefix.                                                                        |
|                    | Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries.                         |
| Delete             | Check the entry(ies) that you want to remove in the <b>Delete</b> column and then click <b>Delete</b> to remove the selected entry(ies) from the summary table. |
| Cancel             | Click <b>Cancel</b> to clear the <b>Delete</b> check boxes.                                                                                                     |

### 8.7.10 IPv6 Neighbor Setup

Use this screen to create a static IPv6 neighbor entry in the Switch's IPv6 neighbor table to store the neighbor information permanently. Click the link next to **IPv6 Neighbor Setup** in the **IPv6 Configuration** screen to display the screen as shown next.

Figure 74 Basic Setting &gt; IPv6 &gt; IPv6 Configuration &gt; IPv6 Neighbor Setup

The following table describes the labels in this screen.

Table 32 Basic Setting &gt; IPv6 &gt; IPv6 Configuration &gt; IPv6 Neighbor Setup

| LABEL            | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Interface Type   | Select the type of IPv6 interface for which you want to configure. The Switch supports the VLAN interface type for IPv6 at the time of writing.                                                                                                                                                                                                                                                                                                  |
| Interface ID     | Specify a unique identification number (from 1 to 4094) for the interface.<br><br>Note: A static IPv6 neighbor entry displays in the <b>Management &gt; IPv6 Neighbor Table</b> screen only when the interface ID is also created in the <b>Basic Setup &gt; Interface Setup</b> screen.<br><br>Note: To have IPv6 function properly, you should configure a static VLAN with the same ID number in the <b>Advanced Setup &gt; VLAN</b> screens. |
| Neighbor Address | Specify the IPv6 address of the neighboring device which can be reached through the interface.                                                                                                                                                                                                                                                                                                                                                   |
| MAC              | Specify the MAC address of the neighboring device which can be reached through the interface.                                                                                                                                                                                                                                                                                                                                                    |

Table 32 Basic Setting &gt; IPv6 &gt; IPv6 Configuration &gt; IPv6 Neighbor Setup (continued)

| LABEL            | DESCRIPTION                                                                                                                                                                                                                                                                                                                             |
|------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Add              | Click this to create a new entry or to update an existing one.<br><br>This saves your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the <b>Save</b> link on the top navigation panel to save your changes to the nonvolatile memory when you are done configuring. |
| Cancel           | Click <b>Cancel</b> to begin configuring this screen afresh.                                                                                                                                                                                                                                                                            |
| Clear            | Click <b>Clear</b> to reset the fields to the factory defaults.                                                                                                                                                                                                                                                                         |
| Index            | This is the interface index number. Click on an index number to change the settings.                                                                                                                                                                                                                                                    |
| Interface        | This is the name of the IPv6 interface you created.                                                                                                                                                                                                                                                                                     |
| Neighbor Address | This field displays the IPv6 address of the neighboring device which can be reached through the interface                                                                                                                                                                                                                               |
| MAC              | This field displays the MAC address of the neighboring device which can be reached through the interface.                                                                                                                                                                                                                               |
|                  | Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries.                                                                                                                                                                                                 |
| Delete           | Check the entry(ies) that you want to remove and then click <b>Delete</b> to remove the selected entry(ies) from the summary table.                                                                                                                                                                                                     |
| Cancel           | Click <b>Cancel</b> to clear the check boxes.                                                                                                                                                                                                                                                                                           |

### 8.7.11 DHCPv6 Client Setup

Use this screen to configure the Switch's DHCP settings when it is acting as a DHCPv6 client. Click the link next to **IPv6 Neighbor Setup** in the **IPv6 Configuration** screen to display the screen as shown next.

Figure 75 Basic Setting &gt; IPv6 &gt; IPv6 Configuration &gt; DHCPv6 Client Setup

**DHCPv6 Client Setup**
[IPv6 Configuration](#)

Interface VLAN123 ▾  
IA Type ☐ IA-NA ☐ Rapid-Commit  
Options ☐ DNS ☐ Domain-List  
Information Refresh Minimum 86400 seconds

Apply Cancel Clear

| Index             | Interface | IA-NA | Rapid-Commit | DNS | Domain-List | Information Refresh Minimum |
|-------------------|-----------|-------|--------------|-----|-------------|-----------------------------|
| <a href="#">1</a> | VLAN123   | No    | No           | No  | No          | 86400                       |

The following table describes the labels in this screen.

Table 33 Basic Setting > IPv6 > IPv6 Configuration > DHCPv6 Client Setup

| LABEL                       | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|-----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Interface                   | Select the IPv6 interface you want to configure.                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| IA Type                     | Select <b>IA-NA</b> to set the Switch to get a non-temporary IP address from the DHCPv6 server for this interface.<br><br>Optionally, you can also select <b>Rapid-Commit</b> to have the Switch send its DHCPv6 Solicit message with a Rapid Commit option to obtain information from the DHCPv6 server by a rapid two-message exchange. The Switch discards any Reply messages that do not include a Rapid Commit option. The DHCPv6 server should also support the Rapid Commit option to have it work well. |
| Options                     | Select <b>DNS</b> to have the Switch obtain DNS server IPv6 addresses and/or select <b>Domain-List</b> to have the Switch obtain a list of domain names from the DHCP server.                                                                                                                                                                                                                                                                                                                                   |
| Information Refresh Minimum | Specify the time interval (from 600 to 4294967295 seconds) at which the Switch exchanges other configuration information with a DHCPv6 server again.                                                                                                                                                                                                                                                                                                                                                            |
| Apply                       | Click <b>Apply</b> to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the <b>Save</b> link on the top navigation panel to save your changes to the nonvolatile memory when you are done configuring.                                                                                                                                                                                                                               |
| Cancel                      | Click <b>Cancel</b> to begin configuring this screen afresh.                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Clear                       | Click <b>Clear</b> to reset the fields to the factory defaults.                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Index                       | This is the interface index number. Click on an index number to change the settings.                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Interface                   | This is the name of the IPv6 interface you created.                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| IA-NA                       | This field displays whether the Switch obtains a non-temporary IP address from the DHCPv6 server.                                                                                                                                                                                                                                                                                                                                                                                                               |
| Rapid-Commit                | This field displays whether the Switch obtains information from the DHCPv6 server by a rapid two-message exchange.                                                                                                                                                                                                                                                                                                                                                                                              |
| DNS                         | This field displays whether the Switch obtains DNS server IPv6 addresses from the DHCPv6 server.                                                                                                                                                                                                                                                                                                                                                                                                                |
| Domain-List                 | This field displays whether the Switch obtains a list of domain names from the DHCP server.                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Information Refresh Minimum | This field displays the time interval (in seconds) at which the Switch exchanges other configuration information with a DHCPv6 server again.                                                                                                                                                                                                                                                                                                                                                                    |

## 8.8 DNS

DNS (Domain Name System) is for mapping a domain name to its corresponding IP address and vice versa. Use the **DNS** screen to configure and view the default DNS servers on the Switch.

Figure 76 Basic Setting > DNS

**DNS**

Static Domain Name Server

| Preference | Server Address |
|------------|----------------|
| 1          |                |
| 2          |                |

Apply Cancel

Domain Name Server Table

| Index | Server Address | Source |
|-------|----------------|--------|
| 1     | 172.21.1.1     | DHCPv4 |

The following table describes the labels in this screen.

Table 34 Basic Setting > DNS

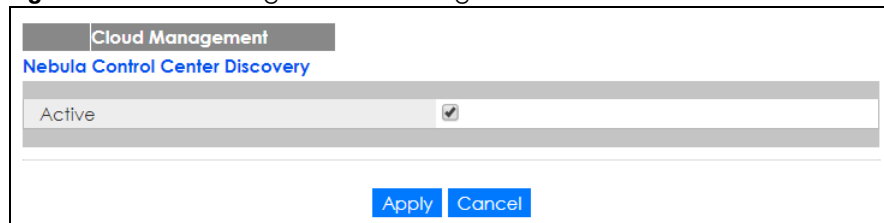
| LABEL                     | DESCRIPTION                                                                                                                                                                                                                                                                       |
|---------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Static Domain Name Server |                                                                                                                                                                                                                                                                                   |
| Preference                | This is the priority of the DNS server address.                                                                                                                                                                                                                                   |
| Server Address            | Enter a domain name server IPv6/IPv4 address in order to be able to use a domain name instead of an IP address.                                                                                                                                                                   |
| Apply                     | Click <b>Apply</b> to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the <b>Save</b> link on the top navigation panel to save your changes to the nonvolatile memory when you are done configuring. |
| Cancel                    | Click <b>Cancel</b> to reset the fields to your previous configuration.                                                                                                                                                                                                           |
| Domain Name Server Table  |                                                                                                                                                                                                                                                                                   |
| Index                     | This field displays priority of the DNS server address.                                                                                                                                                                                                                           |
| Server Address            | This field displays the IP address of the DNS server.                                                                                                                                                                                                                             |
| Source                    | This field displays whether the DNS server address is configured manually ( <b>Static</b> ) or obtained automatically using DHCPv4/DHCPv6 ( <b>Dynamic</b> ).                                                                                                                     |

## 8.9 Nebula Center Control Discovery

Click **Basic Setting > Cloud Management** to display this screen.

Note: Hybrid mode and NCC registration are reserved for future use.

Figure 77 Basic Setting > Cloud Management



Select **Active** to turn on NCC discovery on the Switch. If the Switch has Internet access and has been registered in the NCC, it will go into cloud management mode.

In cloud management mode, then NCC will first check if the firmware on the Switch needs to be upgraded. If it does, the Switch will upgrade the firmware immediately. If the firmware doesn't need to be upgraded, but there is newer firmware available for the Switch, then it will be upgraded according to the firmware upgrade schedule for the Switch on the NCC. Below is the process for upgrading firmware:

- 1 Download firmware via the NCC
- 2 Upgrade the firmware and reboot.

Note: While the Switch is rebooting, don't turn off the power.

Clear **Active** to turn off NCC discovery on the Switch. The Switch will not discover the NCC and remain in standalone mode. See [Section 1.1.1 on page 20](#) for more information.



# CHAPTER 9

## VLAN

The type of screen you see here depends on the **VLAN Type** you selected in the **Switch Setup** screen which is only available in standalone mode. This chapter shows you how to configure 802.1Q tagged and port-based VLANs.

### 9.1 Introduction to IEEE 802.1Q Tagged VLANs

A tagged VLAN uses an explicit tag (VLAN ID) in the MAC header to identify the VLAN membership of a frame across bridges - they are not confined to the switch on which they were created. The VLANs can be created statically by hand or dynamically through GVRP. The VLAN ID associates a frame with a specific VLAN and provides the information that switches need to process the frame across the network. A tagged frame is four bytes longer than an untagged frame and contains two bytes for the TPID (Tag Protocol Identifier, residing within the type/length field of the Ethernet frame) and two bytes for the TCI (Tag Control Information, starting after the source address field of the Ethernet frame).

The CFI (Canonical Format Indicator) is a single-bit flag, always set to zero for Ethernet switches. If a frame received at an Ethernet port has a CFI set to 1, then that frame should not be forwarded as it is to an untagged port. The remaining twelve bits define the VLAN ID, giving a possible maximum number of 4,096 VLANs. Note that user priority and VLAN ID are independent of each other. A frame with VID (VLAN Identifier) of null (0) is called a priority frame, meaning that only the priority level is significant and the default VID of the ingress port is given as the VID of the frame. Of the 4096 possible VIDs, a VID of 0 is used to identify priority frames and the value 4095 (FFF) is reserved, so the maximum possible number of VLAN configurations is 4,094.

| TPID    | User Priority | CFI   | VLAN ID |
|---------|---------------|-------|---------|
| 2 Bytes | 3 Bits        | 1 Bit | 12 bits |

#### 9.1.1 Forwarding Tagged and Untagged Frames

Each port on the Switch is capable of passing tagged or untagged frames. To forward a frame from an 802.1Q VLAN-aware switch to an 802.1Q VLAN-unaware switch, the Switch first decides where to forward the frame and then strips off the VLAN tag. To forward a frame from an 802.1Q VLAN-unaware switch to an 802.1Q VLAN-aware switch, the Switch first decides where to forward the frame, and then inserts a VLAN tag reflecting the ingress port's default VID. The default PVID is VLAN 1 for all ports, but this can be changed.

A broadcast frame (or a multicast frame for a multicast group that is known by the system) is duplicated only on ports that are members of the VID (except the ingress port itself), thus confining the broadcast to a specific domain.

## 9.2 Automatic VLAN Registration

GARP and GVRP are the protocols used to automatically register VLAN membership across switches.

### 9.2.1 GARP

GARP (Generic Attribute Registration Protocol) allows network switches to register and de-register attribute values with other GARP participants within a bridged LAN. GARP is a protocol that provides a generic mechanism for protocols that serve a more specific application, for example, GVRP.

#### 9.2.1.1 GARP Timers

Switches join VLANs by making a declaration. A declaration is made by issuing a Join message using GARP. Declarations are withdrawn by issuing a Leave message. A Leave All message terminates all registrations. GARP timers set declaration timeout values.

### 9.2.2 GVRP

GVRP (GARP VLAN Registration Protocol) is a registration protocol that defines a way for switches to register necessary VLAN members on ports across the network. Enable this function to permit VLAN groups beyond the local Switch.

Please refer to the following table for common IEEE 802.1Q VLAN terminology.

Table 35 IEEE 802.1Q VLAN Terminology

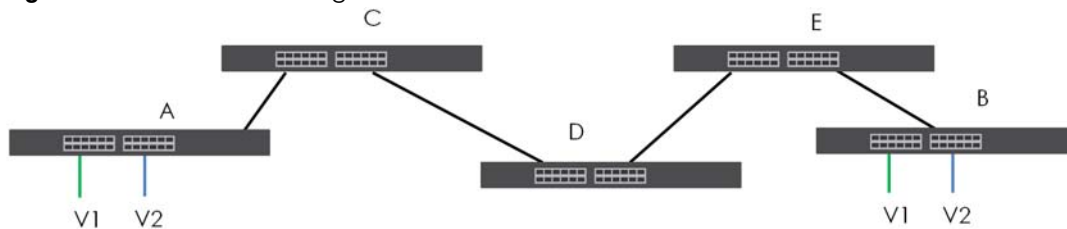
| VLAN PARAMETER              | TERM                   | DESCRIPTION                                                                                                                                |
|-----------------------------|------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|
| VLAN Type                   | Permanent VLAN         | This is a static VLAN created manually.                                                                                                    |
|                             | Dynamic VLAN           | This is a VLAN configured by a GVRP registration/deregistration process.                                                                   |
| VLAN Administrative Control | Registration Fixed     | Fixed registration ports are permanent VLAN members.                                                                                       |
|                             | Registration Forbidden | Ports with registration forbidden are forbidden to join the specified VLAN.                                                                |
|                             | Normal Registration    | Ports dynamically join a VLAN using GVRP.                                                                                                  |
| VLAN Tag Control            | Tagged                 | Ports belonging to the specified VLAN tag all outgoing frames transmitted.                                                                 |
|                             | Untagged               | Ports belonging to the specified VLAN don't tag all outgoing frames transmitted.                                                           |
| VLAN Port                   | Port VID               | This is the VLAN ID assigned to untagged frames that this port received.                                                                   |
|                             | Acceptable Frame Type  | You may choose to accept both tagged and untagged incoming frames, just tagged incoming frames or just untagged incoming frames on a port. |
|                             | Ingress filtering      | If set, the Switch discards incoming frames for VLANs that do not have this port as a member.                                              |

## 9.3 Port VLAN Trunking

Enable **VLAN Trunking** on a port to allow frames belonging to unknown VLAN groups to pass through that port. This is useful if you want to set up VLAN groups on end devices without having to configure the same VLAN groups on intermediary devices.

The following figure describes **VLAN Trunking**. Suppose you want to create VLAN groups 1 and 2 (V1 and V2) on devices A and B. Without **VLAN Trunking**, you must configure VLAN groups 1 and 2 on all intermediary switches C, D and E; otherwise they will drop frames with unknown VLAN group tags. However, with **VLAN Trunking** enabled on a port(s) in each intermediary switch you only need to create VLAN groups in the end devices (A and B). C, D and E automatically allow frames with VLAN group tags 1 and 2 (VLAN groups that are unknown to those switches) to pass through their VLAN trunking port(s).

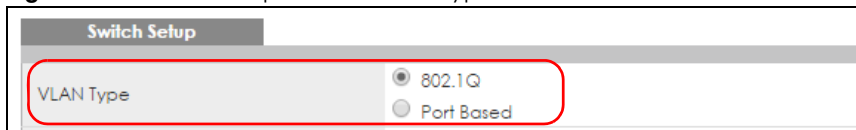
**Figure 78** Port VLAN Trunking



## 9.4 Select the VLAN Type

Select a VLAN type in the **Basic Setting > Switch Setup** screen.

**Figure 79** Switch Setup: Select VLAN Type



## 9.5 802.1Q Static VLAN

Make sure **802.1Q** is selected in the **Basic Setting > Switch Setup** screen.

Use a static VLAN to decide whether an incoming frame on a port should be

- sent to a VLAN group as normal depending on its VLAN tag.
- sent to a group whether it has a VLAN tag or not.
- blocked from a VLAN group regardless of its VLAN tag.

You can also tag all outgoing frames (that were previously untagged) from a port with the specified VID.

## 9.5.1 VLAN Status

See [Section 9.1 on page 109](#) for more information on 802.1Q VLAN. Click **Advanced Application > VLAN** from the navigation panel to display the **VLAN Status** screen as shown next.

**Figure 80** Advanced Application > VLAN: VLAN Status

| Index             | VID | Name | Tagged Port | Untagged Port | Elapsed Time | Status |
|-------------------|-----|------|-------------|---------------|--------------|--------|
| <a href="#">1</a> | 1   | 1    |             | 1-28          | 27:05:44     | Static |

The following table describes the labels in this screen.

**Table 36** Advanced Application > VLAN: VLAN Status

| LABEL                        | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| VLAN Search by VID           | Use a comma (,) to separate individual VLANs or a dash (-) to indicates a range of VLANs. For example, "3,4" or "3-9".                                                                                                                                                                                                                                                                                                                                                                                   |
| Search                       | Click this to display the specified range of VLANs in the section below.                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| The Number of VLAN           | This is the number of VLANs configured on the Switch.                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| The Number of Search Results | This is the number of VLANs that match the searching criteria and display in the list below.<br>This field displays only when you use the <b>Search</b> button to look for certain VLANs.                                                                                                                                                                                                                                                                                                                |
| Index                        | This is the VLAN index number. Click on an index number to view more VLAN details.                                                                                                                                                                                                                                                                                                                                                                                                                       |
| VID                          | This is the VLAN identification number that was configured in the <b>Static VLAN</b> screen.                                                                                                                                                                                                                                                                                                                                                                                                             |
| Name                         | This field shows the name of the VLAN.                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Tagged Port                  | This field shows the tagged ports that are participating in the VLAN.                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Untagged Port                | This field shows the untagged ports that are participating in the VLAN.                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Elapsed Time                 | This field shows how long it has been since a normal VLAN was registered or a static VLAN was set up.                                                                                                                                                                                                                                                                                                                                                                                                    |
| Status                       | This field shows how this VLAN was added to the Switch. <ul style="list-style-type: none"> <li>• <b>Dynamic</b> - using GVRP</li> <li>• <b>Static</b> - manually added as a normal VLAN</li> <li>• <b>Private</b> - manually added as a private VLAN (primary, isolated or community)</li> <li>• <b>Voice</b> - manually added as a Voice VLAN</li> <li>• <b>RMirror</b> - manually added as a remote port mirroring VLAN</li> <li>• <b>MVR</b> - added via Multicast VLAN Registration (MVR)</li> </ul> |
| Change Pages                 | Click <b>Previous</b> or <b>Next</b> to show the previous/next screen if all status information cannot be seen in one screen.                                                                                                                                                                                                                                                                                                                                                                            |

## 9.5.2 VLAN Details

Use this screen to view detailed port settings and status of the VLAN group. See [Section 9.1 on page 109](#) for more information on 802.1Q VLAN. Click on an index number in the **VLAN Status** screen to display VLAN details.

**Figure 81** Advanced Application > VLAN > VLAN Detail

| VLAN Detail |             |   |   |   |    |    |    |    |    |    |    |    |    |    | <a href="#">VLAN Status</a> |        |
|-------------|-------------|---|---|---|----|----|----|----|----|----|----|----|----|----|-----------------------------|--------|
| VID         | Port Number |   |   |   |    |    |    |    |    |    |    |    |    |    | Elapsed Time                | Status |
|             | 2           | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 | 24 | 26 | 28 |                             |        |
|             | 1           | 3 | 5 | 7 | 9  | 11 | 13 | 15 | 17 | 19 | 21 | 23 | 25 | 27 |                             |        |
| 1           | U           | U | U | U | U  | U  | U  | U  | U  | U  | U  | U  | U  | U  | 28:25:34                    | Static |
|             | U           | U | U | U | U  | U  | U  | U  | U  | U  | U  | U  | U  | U  |                             |        |

| Private VLAN Status |                |      |           |
|---------------------|----------------|------|-----------|
| Primary VLAN        | Secondary VLAN | Type | Port List |
|                     |                |      |           |

Change Pages
[Previous](#)
[Next](#)

The following table describes the labels in this screen.

Table 37 Advanced Application > VLAN > VLAN Detail

| LABEL               | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|---------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| VLAN Status         | Click this to go to the <b>VLAN Status</b> screen.                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| VID                 | This is the VLAN identification number that was configured in the <b>Static VLAN</b> screen.                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Port Number         | This column displays the ports that are participating in a VLAN. A tagged port is marked as <b>T</b> , an untagged port is marked as <b>U</b> and ports not participating in a VLAN are marked as <b>–</b> .                                                                                                                                                                                                                                                                                                    |
| Elapsed Time        | This field shows how long it has been since a normal VLAN was registered or a static VLAN was set up.                                                                                                                                                                                                                                                                                                                                                                                                           |
| Status              | <p>This field shows how this VLAN was added to the Switch.</p> <ul style="list-style-type: none"> <li>• <b>Dynamic</b> - using GVRP</li> <li>• <b>Static</b> - manually added as a normal VLAN</li> <li>• <b>Private</b> - manually added as a private VLAN (primary, isolated or community)</li> <li>• <b>Voice</b> - manually added as a Voice VLAN</li> <li>• <b>RMirror</b> - manually added as a remote port mirroring VLAN</li> <li>• <b>MVR</b> - added via Multicast VLAN Registration (MVR)</li> </ul> |
| Private VLAN Status | These fields show private VLAN information for the selected VLAN. See <a href="#">Section 35.1 on page 321</a> for more information on private VLANs.                                                                                                                                                                                                                                                                                                                                                           |
| Primary VLAN        | This field shows the primary VLAN ID in the selected VLAN.                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Secondary VLAN      | This field shows the secondary VLAN ID in the selected VLAN.                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Type                | This field shows the type of private VLAN: <b>Primary</b> , <b>Community</b> or <b>Isolated</b> .                                                                                                                                                                                                                                                                                                                                                                                                               |
| Port List           | This shows the ports mapped to the private VLAN using the <b>Advanced Application &gt; Private VLAN</b> or <b>Advanced Application &gt; VLAN &gt; Static VLAN</b> screen.                                                                                                                                                                                                                                                                                                                                       |
| Change Pages        | Click <b>Previous</b> or <b>Next</b> to show the previous/next screen if all status information cannot be seen in one screen.                                                                                                                                                                                                                                                                                                                                                                                   |

## 9.6 Private VLAN Status

Use this screen to view all private VLANs created on the Switch. Click **Advanced Application > VLAN > Private VLAN Status** to see the following screen.

**Figure 82** Advanced Application > VLAN > Private VLAN Status

| Private VLAN Status |                |      | <a href="#">VLAN Status</a> |
|---------------------|----------------|------|-----------------------------|
| Primary VLAN        | Secondary VLAN | Type | Port List                   |
|                     |                |      |                             |

Change Pages
[Previous](#)
[Next](#)

The following table describes the labels in this screen.

Table 38 Advanced Application &gt; VLAN &gt; Private VLAN Status

| LABEL               | DESCRIPTION                                                                                                                                                               |
|---------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Private VLAN Status | These fields show information for the all private VLANs. See also <b>Advanced Application &gt; Private VLAN</b> .                                                         |
| Primary VLAN        | This field shows the primary VLAN ID in a private VLAN.                                                                                                                   |
| Secondary VLAN      | This field shows the secondary VLAN ID in a private VLAN.                                                                                                                 |
| Type                | This field shows the type of private VLAN: <b>Primary</b> , <b>Community</b> or <b>Isolated</b> .                                                                         |
| Port List           | This shows the ports mapped to the private VLAN using the <b>Advanced Application &gt; Private VLAN</b> or <b>Advanced Application &gt; VLAN &gt; Static VLAN</b> screen. |
| Change Pages        | Use the <b>Previous</b> and <b>Next</b> buttons to display different pages.                                                                                               |

## 9.7 VLAN Configuration

Use this screen to view IEEE 802.1Q VLAN parameters for the Switch. Click **Advanced Application > VLAN > VLAN Configuration** to see the following screen.

**Figure 83** Advanced Application > VLAN > VLAN Configuration

| VLAN Configuration        |                            | <a href="#">VLAN Status</a> |
|---------------------------|----------------------------|-----------------------------|
| Static VLAN Setup         | <a href="#">Click Here</a> |                             |
| VLAN Port Setup           | <a href="#">Click Here</a> |                             |
| Subnet Based VLAN Setup   | <a href="#">Click Here</a> |                             |
| Protocol Based VLAN Setup | <a href="#">Click Here</a> |                             |
| Voice VLAN Setup          | <a href="#">Click Here</a> |                             |
| MAC Based VLAN Setup      | <a href="#">Click Here</a> |                             |

The following table describes the labels in the above screen.

Table 39 Advanced Application > VLAN > VLAN Configuration

| LABEL                     | DESCRIPTION                                                                  |
|---------------------------|------------------------------------------------------------------------------|
| Static VLAN Setup         | Click <b>Click Here</b> to configure the Static VLAN for the Switch.         |
| VLAN Port Setup           | Click <b>Click Here</b> to configure the VLAN Port for the Switch.           |
| Subnet Based VLAN Setup   | Click <b>Click Here</b> to configure the Subnet Based VLAN for the Switch.   |
| Protocol Based VLAN Setup | Click <b>Click Here</b> to configure the Protocol Based VLAN for the Switch. |
| Voice VLAN Setup          | Click <b>Click Here</b> to configure the Voice VLAN for the Switch.          |
| MAC Based VLAN Setup      | Click <b>Click Here</b> to configure the MAC Based VLAN for the Switch.      |

### 9.7.1 Configure a Static VLAN

Use this screen to configure a static VLAN for the Switch. Click the **Static VLAN Setup** link in the **VLAN Configuration** screen to display the screen as shown next.

**Figure 84** Advanced Application > VLAN > VLAN Configuration > Static VLAN Setup

Static VLAN

VLAN Configuration

ACTIVE

☐

Name

VLAN Group ID

VLAN Type

☒ Normal
 ☐ Private

Association VLAN List

| Port | Control                                 |                             |                                 | Tagging                                        |
|------|-----------------------------------------|-----------------------------|---------------------------------|------------------------------------------------|
| *    | Normal                                  |                             |                                 | <input checked="" type="checkbox"/> Tx Tagging |
| 1    | <input checked="" type="radio"/> Normal | <input type="radio"/> Fixed | <input type="radio"/> Forbidden | <input checked="" type="checkbox"/> Tx Tagging |
| 2    | <input checked="" type="radio"/> Normal | <input type="radio"/> Fixed | <input type="radio"/> Forbidden | <input checked="" type="checkbox"/> Tx Tagging |
| 3    | <input checked="" type="radio"/> Normal | <input type="radio"/> Fixed | <input type="radio"/> Forbidden | <input checked="" type="checkbox"/> Tx Tagging |
| 4    | <input checked="" type="radio"/> Normal | <input type="radio"/> Fixed | <input type="radio"/> Forbidden | <input checked="" type="checkbox"/> Tx Tagging |
| 5    | <input checked="" type="radio"/> Normal | <input type="radio"/> Fixed | <input type="radio"/> Forbidden | <input checked="" type="checkbox"/> Tx Tagging |
| 6    | <input checked="" type="radio"/> Normal | <input type="radio"/> Fixed | <input type="radio"/> Forbidden | <input checked="" type="checkbox"/> Tx Tagging |
| 7    | <input checked="" type="radio"/> Normal | <input type="radio"/> Fixed | <input type="radio"/> Forbidden | <input checked="" type="checkbox"/> Tx Tagging |
| 8    | <input checked="" type="radio"/> Normal | <input type="radio"/> Fixed | <input type="radio"/> Forbidden | <input checked="" type="checkbox"/> Tx Tagging |
| 9    | <input checked="" type="radio"/> Normal | <input type="radio"/> Fixed | <input type="radio"/> Forbidden | <input checked="" type="checkbox"/> Tx Tagging |
| 10   | <input checked="" type="radio"/> Normal | <input type="radio"/> Fixed | <input type="radio"/> Forbidden | <input checked="" type="checkbox"/> Tx Tagging |
| 11   | <input checked="" type="radio"/> Normal | <input type="radio"/> Fixed | <input type="radio"/> Forbidden | <input checked="" type="checkbox"/> Tx Tagging |
| 12   | <input checked="" type="radio"/> Normal | <input type="radio"/> Fixed | <input type="radio"/> Forbidden | <input checked="" type="checkbox"/> Tx Tagging |
| 13   | <input checked="" type="radio"/> Normal | <input type="radio"/> Fixed | <input type="radio"/> Forbidden | <input checked="" type="checkbox"/> Tx Tagging |
| 14   | <input checked="" type="radio"/> Normal | <input type="radio"/> Fixed | <input type="radio"/> Forbidden | <input checked="" type="checkbox"/> Tx Tagging |

Add

Cancel

Clear

| VID                 | Active | Name    | VLAN Type | Association VLAN List |                          |
|---------------------|--------|---------|-----------|-----------------------|--------------------------|
| <a href="#">1</a>   | Yes    | 1       | Normal    |                       | <input type="checkbox"/> |
| <a href="#">123</a> | Yes    | VLAN123 | Normal    |                       | <input type="checkbox"/> |

Delete

Cancel

The following table describes the related labels in this screen.

Table 40 Advanced Application &gt; VLAN &gt; VLAN Configuration &gt; Static VLAN Setup

| LABEL         | DESCRIPTION                                                                                                                                       |
|---------------|---------------------------------------------------------------------------------------------------------------------------------------------------|
| ACTIVE        | Select this check box to activate the VLAN settings.                                                                                              |
| Name          | Enter a descriptive name for the VLAN group for identification purposes. This name consists of up to 64 printable characters; spaces are allowed. |
| VLAN Group ID | Enter the VLAN ID for this static entry; the valid range is between 1 and 4094.                                                                   |
| VLAN Type     | Select <b>Normal</b> (static) or <b>Private</b> . For <b>Private</b> VLANs, select <b>Primary</b> , <b>Isolated</b> or <b>Community</b> .         |



Table 40 Advanced Application &gt; VLAN &gt; VLAN Configuration &gt; Static VLAN Setup (continued)

| LABEL                 | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|-----------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Association VLAN List | <p><b>Primary</b> private VLANs can associate with several (secondary) <b>Community</b> private VLANs and up to one (secondary) <b>Isolated</b> private VLAN.</p> <p>You only configure <b>VLAN Association List</b> for <b>Primary</b> private VLANs. Use a dash to associate consecutive VLANs and a comma (no spaces) to associate non-consecutive VLANs. For example, 51-53 includes 51, 52 and 53, but 51,53 does not include 52.</p> <p>Secondary private VLANs can only be associated with one primary private VLAN.</p> |
| Port                  | The port number identifies the port you are configuring.                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| *                     | <p>Settings in this row apply to all ports.</p> <p>Use this row only if you want to make some settings the same for all ports. Use this row first to set the common settings and then make adjustments on a port-by-port basis.</p> <p>Note: Changes in this row are copied to all the ports as soon as you make them.</p>                                                                                                                                                                                                      |
| Control               | <p>Select <b>Normal</b> for the port to dynamically join this VLAN group using GVRP. This is the default selection.</p> <p>Select <b>Fixed</b> for the port to be a permanent member of this VLAN group.</p> <p>Select <b>Forbidden</b> if you want to prohibit the port from joining this VLAN group.</p>                                                                                                                                                                                                                      |
| Tagging               | Select <b>TX Tagging</b> if you want the port to tag all outgoing frames transmitted with this VLAN Group ID.                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Add                   | <p>Click this to create a new entry or to update an existing one.</p> <p>This saves your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the <b>Save</b> link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.</p>                                                                                                                                                                                 |
| Cancel                | Click <b>Cancel</b> to begin configuring this screen afresh.                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Clear                 | Click <b>Clear</b> to reset the fields to the factory defaults.                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| VID                   | This field displays the ID number of the VLAN group. Click the number to edit the VLAN settings.                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Active                | This field indicates whether the VLAN settings are enabled ( <b>Yes</b> ) or disabled ( <b>No</b> ).                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Name                  | This field displays the descriptive name for this VLAN group.                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| VLAN Type             | This field displays the <b>Normal</b> or <b>Private (Primary, Isolated or Community)</b> type VLAN configured in the top part of this screen.                                                                                                                                                                                                                                                                                                                                                                                   |
| Association VLAN List | This field displays which secondary private VLANs are associated with a primary private VLAN configured in the top part of this screen.                                                                                                                                                                                                                                                                                                                                                                                         |
|                       | Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries.                                                                                                                                                                                                                                                                                                                                                                                         |
| Delete                | Click <b>Delete</b> to remove the selected entry from the summary table.                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Cancel                | Click <b>Cancel</b> to clear the <b>Delete</b> check boxes.                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |

## 9.7.2 Configure VLAN Port Settings

Use the VLAN Port Setting screen to configure the static VLAN (IEEE 802.1Q) settings on a port. See [Section 9.1 on page 109](#) for more information on 802.1Q VLAN. Click the **VLAN Port Setup** link in the **VLAN Configuration** screen.

**Figure 85** Advanced Application > VLAN > VLAN Configuration > VLAN Port Setup

| Port | Ingress Check            | PVID | GVRP                     | Acceptable Frame Type | VLAN Trunking            | Isolation                |
|------|--------------------------|------|--------------------------|-----------------------|--------------------------|--------------------------|
| *    | <input type="checkbox"/> |      | <input type="checkbox"/> | All ▼                 | <input type="checkbox"/> | <input type="checkbox"/> |
| 1    | <input type="checkbox"/> | 1    | <input type="checkbox"/> | All ▼                 | <input type="checkbox"/> | <input type="checkbox"/> |
| 2    | <input type="checkbox"/> | 1    | <input type="checkbox"/> | All ▼                 | <input type="checkbox"/> | <input type="checkbox"/> |
| 3    | <input type="checkbox"/> | 1    | <input type="checkbox"/> | All ▼                 | <input type="checkbox"/> | <input type="checkbox"/> |
| 4    | <input type="checkbox"/> | 1    | <input type="checkbox"/> | All ▼                 | <input type="checkbox"/> | <input type="checkbox"/> |
| 5    | <input type="checkbox"/> | 1    | <input type="checkbox"/> | All ▼                 | <input type="checkbox"/> | <input type="checkbox"/> |
| 6    | <input type="checkbox"/> | 1    | <input type="checkbox"/> | All ▼                 | <input type="checkbox"/> | <input type="checkbox"/> |
| 7    | <input type="checkbox"/> | 1    | <input type="checkbox"/> | All ▼                 | <input type="checkbox"/> | <input type="checkbox"/> |
| 8    | <input type="checkbox"/> | 1    | <input type="checkbox"/> | All ▼                 | <input type="checkbox"/> | <input type="checkbox"/> |
| 9    | <input type="checkbox"/> | 1    | <input type="checkbox"/> | All ▼                 | <input type="checkbox"/> | <input type="checkbox"/> |
| 10   | <input type="checkbox"/> | 1    | <input type="checkbox"/> | All ▼                 | <input type="checkbox"/> | <input type="checkbox"/> |
| 11   | <input type="checkbox"/> | 1    | <input type="checkbox"/> | All ▼                 | <input type="checkbox"/> | <input type="checkbox"/> |
| 12   | <input type="checkbox"/> | 1    | <input type="checkbox"/> | All ▼                 | <input type="checkbox"/> | <input type="checkbox"/> |

Apply Cancel

The following table describes the labels in this screen.

Table 41 Advanced Application &gt; VLAN &gt; VLAN Configuration &gt; VLAN Port Setup

| LABEL         | DESCRIPTION                                                                                                                                                                                                                                                                                                 |
|---------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| GVRP          | GVRP (GARP VLAN Registration Protocol) is a registration protocol that defines a way for switches to register necessary VLAN members on ports across the network.<br>Select this check box to permit VLAN groups beyond the local Switch.                                                                   |
| Port          | This field displays the port number of the Switch.                                                                                                                                                                                                                                                          |
| *             | Settings in this row apply to all ports.<br>Use this row only if you want to make some settings the same for all ports. Use this row first to set the common settings and then make adjustments on a port-by-port basis.<br>Note: Changes in this row are copied to all the ports as soon as you make them. |
| Ingress Check | If this check box is selected for a port, the Switch discards incoming frames for VLANs that do not include this port in its member set.<br>Clear this check box to disable ingress filtering.                                                                                                              |
| PVID          | A PVID (Port VLAN ID) is a tag that adds to incoming untagged frames received on a port so that the frames are forwarded to the VLAN group that the tag defines.<br>Enter a number between 1 and 4094 as the port VLAN ID.                                                                                  |
| GVRP          | Select this check box to allow GVRP on this port.                                                                                                                                                                                                                                                           |

Table 41 Advanced Application &gt; VLAN &gt; VLAN Configuration &gt; VLAN Port Setup (continued)

| LABEL                 | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|-----------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Acceptable Frame Type | <p>Specify the type of frames allowed on a port. Choices are <b>All</b>, <b>Tag Only</b> and <b>Untag Only</b>.</p> <p>Select <b>All</b> from the drop-down list box to accept all untagged or tagged frames on this port. This is the default setting.</p> <p>Select <b>Tag Only</b> to accept only tagged frames on this port. All untagged frames will be dropped.</p> <p>Select <b>Untag Only</b> to accept only untagged frames on this port. All tagged frames will be dropped.</p> |
| VLAN Trunking         | Enable <b>VLAN Trunking</b> on ports connected to other switches or routers (but not ports directly connected to end users) to allow frames belonging to unknown VLAN groups to pass through the Switch.                                                                                                                                                                                                                                                                                  |
| Isolation             | Select this to allows this port to communicate only with the CPU management port and the ports on which the isolation feature is not enabled.                                                                                                                                                                                                                                                                                                                                             |
| Apply                 | Click <b>Apply</b> to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the <b>Save</b> link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.                                                                                                                                                                                                        |
| Cancel                | Click <b>Cancel</b> to begin configuring this screen afresh.                                                                                                                                                                                                                                                                                                                                                                                                                              |

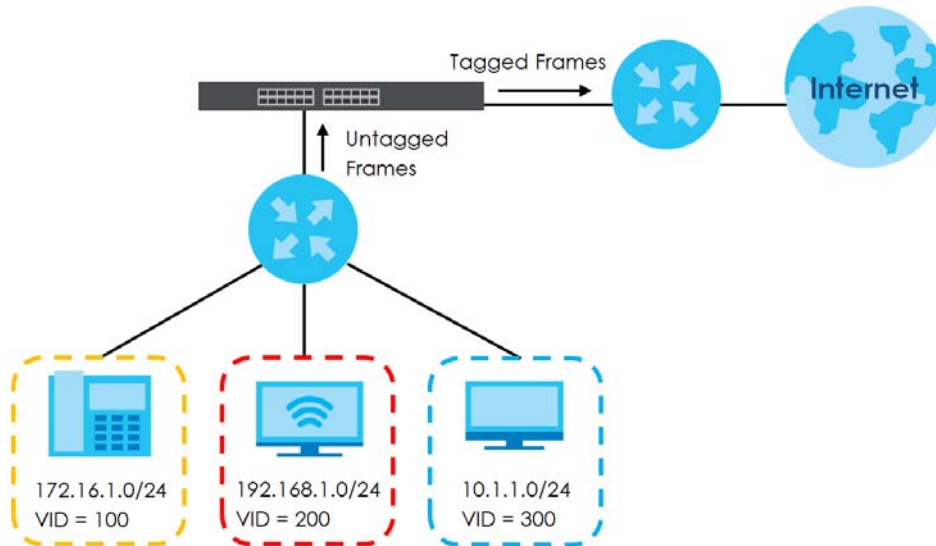
### 9.7.3 Subnet Based VLANs

Subnet based VLANs allow you to group traffic into logical VLANs based on the source IP subnet you specify. When a frame is received on a port, the Switch checks if a tag is added already and the IP subnet it came from. The untagged packets from the same IP subnet are then placed in the same subnet based VLAN. One advantage of using subnet based VLANs is that priority can be assigned to traffic from the same IP subnet.

Note: Subnet based VLAN applies to un-tagged packets and is applicable only when you use IEEE 802.1Q tagged VLAN.

For example, an ISP (Internet Service Provider) may divide different types of services it provides to customers into different IP subnets. Traffic for voice services is designated for IP subnet 172.16.1.0/24, video for 192.168.1.0/24 and data for 10.1.1.0/24. The Switch can then be configured to group incoming traffic based on the source IP subnet of incoming frames.

You can then configure a subnet based VLAN with priority 6 and VID of 100 for traffic received from IP subnet 172.16.1.0/24 (voice services). You can also have a subnet based VLAN with priority 5 and VID of 200 for traffic received from IP subnet 192.168.1.0/24 (video services). Lastly, you can configure VLAN with priority 3 and VID of 300 for traffic received from IP subnet 10.1.1.0/24 (data services). All untagged incoming frames will be classified based on their source IP subnet and prioritized accordingly. That is, video services receive the highest priority and data the lowest.

**Figure 86** Subnet Based VLAN Application Example

### 9.7.3.1 Configuring Subnet Based VLAN

Click the **Subnet Based VLAN Setup** link in the **VLAN Configuration** screen to display the configuration screen as shown.

**Figure 87** Advanced Application > VLAN > VLAN Configuration > Subnet Based VLAN Setup

The screenshot shows the 'Subnet Based VLAN' configuration page. At the top, there's a 'Subnet Based VLAN' header with a link to 'VLAN Configuration'. Below the header are two checkboxes: 'Active' and 'DHCP-Vlan Override'. An 'Apply' button is centered below these. A form for adding a new VLAN is shown, with fields for 'Active' (checkbox), 'Name', 'IP', 'Mask-Bits', 'VID', and 'Priority'. Below the form are 'Add' and 'Cancel' buttons. At the bottom, there's a table with columns: 'Index', 'Active', 'Name', 'IP', 'Mask-Bits', 'VID', 'Priority', and a delete icon. Below the table are 'Delete' and 'Cancel' buttons.

The following table describes the labels in this screen.

Table 42 Advanced Application &gt; VLAN &gt; VLAN Configuration &gt; Subnet Based VLAN Setup

| LABEL              | DESCRIPTION                                                                                                                                                                                                                                                                  |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Active             | Select this check box to activate this subnet based VLANs on the Switch.                                                                                                                                                                                                     |
| DHCP-Vlan Override | When DHCP snooping is enabled DHCP clients can renew their IP address through the DHCP VLAN or via another DHCP server on the subnet based VLAN.<br><br>Select this checkbox to force the DHCP clients in this IP subnet to obtain their IP addresses through the DHCP VLAN. |

Table 42 Advanced Application &gt; VLAN &gt; VLAN Configuration &gt; Subnet Based VLAN Setup (continued)

| LABEL     | DESCRIPTION                                                                                                                                                                                                                                                                                                                              |
|-----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Apply     | Click <b>Apply</b> to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the <b>Save</b> link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.                                                       |
| Active    | Select this check box to activate the IP subnet VLAN you are creating or editing.                                                                                                                                                                                                                                                        |
| Name      | Enter up to 32 alphanumeric characters to identify this subnet based VLAN.                                                                                                                                                                                                                                                               |
| IP        | Enter the IP address of the subnet for which you want to configure this subnet based VLAN.                                                                                                                                                                                                                                               |
| Mask-Bits | Enter the bit number of the subnet mask. To find the bit number, convert the subnet mask to binary format and add all the 1's together. Take "255.255.255.0" for example. 255 converts to eight 1s in binary. There are three 255s, so add three eights together and you get the bit number (24).                                        |
| VID       | Enter the ID of a VLAN with which the untagged frames from the IP subnet specified in this subnet based VLAN are tagged. This must be an existing VLAN which you defined in the <b>Advanced Application &gt; VLAN &gt; Static VLAN</b> screen.                                                                                           |
| Priority  | Select the priority level that the Switch assigns to frames belonging to this VLAN.                                                                                                                                                                                                                                                      |
| Add       | Click this to create a new entry or to update an existing one.<br><br>This saves your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the <b>Save</b> link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel    | Click <b>Cancel</b> to begin configuring this screen afresh.                                                                                                                                                                                                                                                                             |
| Index     | This is the index number identifying this subnet based VLAN. Click on any of these numbers to edit an existing subnet based VLAN.                                                                                                                                                                                                        |
| Active    | This field shows whether the subnet based VLAN is active or not.                                                                                                                                                                                                                                                                         |
| Name      | This field shows the name of the subnet based VLAN.                                                                                                                                                                                                                                                                                      |
| IP        | This field shows the IP address of the subnet for this subnet based VLAN.                                                                                                                                                                                                                                                                |
| Mask-Bits | This field shows the subnet mask in bit number format for this subnet based VLAN.                                                                                                                                                                                                                                                        |
| VID       | This field shows the VLAN ID of the frames which belong to this subnet based VLAN.                                                                                                                                                                                                                                                       |
| Priority  | This field shows the priority which is assigned to frames belonging to this subnet based VLAN.                                                                                                                                                                                                                                           |
|           | Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries.                                                                                                                                                                                                  |
| Delete    | Click this to delete the subnet based VLANs which you marked for deletion.                                                                                                                                                                                                                                                               |
| Cancel    | Click <b>Cancel</b> to clear the check boxes.                                                                                                                                                                                                                                                                                            |

## 9.7.4 Protocol Based VLANs

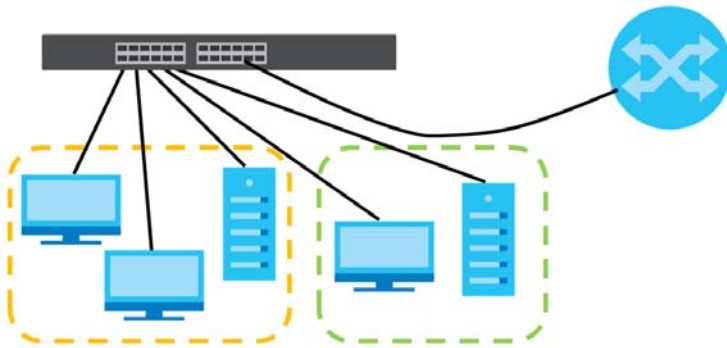
Protocol based VLANs allow you to group traffic into logical VLANs based on the protocol you specify. When an upstream frame is received on a port (configured for a protocol based VLAN), the Switch checks if a tag is added already and its protocol. The untagged packets of the same protocol are then placed in the same protocol based VLAN. One advantage of using protocol based VLANs is that priority can be assigned to traffic of the same protocol.

Note: Protocol based VLAN applies to un-tagged packets and is applicable only when you use IEEE 802.1Q tagged VLAN.

For example, ports 1, 2, 3 and 4 belong to static VLAN 100, and ports 4, 5, 6, 7 belong to static VLAN 120. You can configure a protocol based VLAN A with priority 2 for ARP traffic received on port 1, 2 and 3. You can also have a protocol based VLAN B with priority 3 for Apple Talk traffic received on port 6 and 7. All upstream ARP traffic from port 1, 2 and 3 will be grouped together, and all upstream Apple Talk

traffic from port 6 and 7 will be in another group and have higher priority than ARP traffic when they go through the uplink port to a backbone switch C.

**Figure 88** Protocol Based VLAN Application Example



### 9.7.4.1 Configuring Protocol Based VLAN

Click the **Protocol Based VLAN Setup** link in the **VLAN Configuration** screen to display the configuration screen as shown.

**Figure 89** Advanced Application > VLAN > VLAN Configuration > Protocol Based VLAN Setup

The following table describes the labels in this screen.

Table 43 Advanced Application > VLAN > VLAN Configuration > Protocol Based VLAN Setup

| LABEL  | DESCRIPTION                                                                                                                                                                                                                                    |
|--------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Active | Select this check box to activate this protocol based VLAN.                                                                                                                                                                                    |
| Port   | Type a port number to be included in this protocol based VLAN.<br><br>This port must belong to a static VLAN in order to participate in a protocol based VLAN. See <a href="#">Chapter 9 on page 109</a> for more details on setting up VLANs. |
| Name   | Enter up to 32 alphanumeric characters to identify this protocol based VLAN.                                                                                                                                                                   |

Table 43 Advanced Application &gt; VLAN &gt; VLAN Configuration &gt; Protocol Based VLAN Setup

| LABEL         | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                        |
|---------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Ethernet-type | Use the drop down list box to select a predefined protocol to be included in this protocol based VLAN or select <b>Others</b> and type the protocol number in hexadecimal notation. For example, the IP protocol in hexadecimal notation is 0800, and Novell IPX protocol is 8137.<br><br>Note: Protocols in the hexadecimal number range of 0x0000 to 0x05ff are not allowed to be used for protocol based VLANs. |
| VID           | Enter the ID of a VLAN to which the port belongs. This must be an existing VLAN which you defined in the <b>Advanced Application &gt; VLAN &gt; Static VLAN</b> screen.                                                                                                                                                                                                                                            |
| Priority      | Select the priority level that the Switch will assign to frames belonging to this VLAN.                                                                                                                                                                                                                                                                                                                            |
| Add           | Click this to create a new entry or to update an existing one.<br><br>This saves your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the <b>Save</b> link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.                                                                           |
| Cancel        | Click <b>Cancel</b> to begin configuring this screen afresh.                                                                                                                                                                                                                                                                                                                                                       |
| Index         | This is the index number identifying this protocol based VLAN. Click on any of these numbers to edit an existing protocol based VLAN.                                                                                                                                                                                                                                                                              |
| Active        | This field shows whether the protocol based VLAN is active or not.                                                                                                                                                                                                                                                                                                                                                 |
| Port          | This field shows which port belongs to this protocol based VLAN.                                                                                                                                                                                                                                                                                                                                                   |
| Name          | This field shows the name of the protocol based VLAN.                                                                                                                                                                                                                                                                                                                                                              |
| Ethernet-type | This field shows which Ethernet protocol is part of this protocol based VLAN.                                                                                                                                                                                                                                                                                                                                      |
| VID           | This field shows the VLAN ID of the port.                                                                                                                                                                                                                                                                                                                                                                          |
| Priority      | This field shows the priority which is assigned to frames belonging to this protocol based VLAN.                                                                                                                                                                                                                                                                                                                   |
|               | Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries.                                                                                                                                                                                                                                                                            |
| Delete        | Click this to delete the protocol based VLANs which you marked for deletion.                                                                                                                                                                                                                                                                                                                                       |
| Cancel        | Click <b>Cancel</b> to clear the check boxes.                                                                                                                                                                                                                                                                                                                                                                      |

### 9.7.4.2 Create an IP-based VLAN Example

This example shows you how to create an IP VLAN which includes ports 1, 4 and 8. Follow these steps using the screen below:

- 1 Activate this protocol based VLAN.
- 2 Type the port number you want to include in this protocol based VLAN. Type **1**.
- 3 Give this protocol-based VLAN a descriptive name. Type **IP-VLAN**.
- 4 Select the protocol. Leave the default value **IP**.
- 5 Type the VLAN ID of an existing VLAN. In our example we already created a static VLAN with an ID of 5. Type **5**.
- 6 Leave the priority set to **0** and click **Add**.

**Figure 90** Protocol Based VLAN Configuration Example

**Protocol Based VLAN** [VLAN Configuration](#)

Active ☒

Port

Name

Ethernet-type ☒ IP ☐ Others  (Hex)

VID

Priority

[Add](#) [Cancel](#) **EXAMPLE**

| Index | Active | Port | Name | Ethernet-type | VID | Priority |                          |
|-------|--------|------|------|---------------|-----|----------|--------------------------|
|       |        |      |      |               |     |          | <input type="checkbox"/> |

[Delete](#) [Cancel](#)

To add more ports to this protocol based VLAN.

- 1 Click the index number of the protocol based VLAN entry. Click **1**
- 2 Change the value in the **Port** field to the next port you want to add.
- 3 Click **Add**.

## 9.8 Voice VLAN

Voice VLAN ensures that the sound quality of an IP phone is preserved from deteriorating when the data traffic on the Switch ports is high. It groups the voice traffic with defined priority into an assigned VLAN which enables the separation of voice and data traffic coming onto the Switch port.

You can set priority level to the Voice VLAN and add MAC address of IP phones from specific manufacturers by using its ID from the Organizationally Unique Identifiers (OUI).

Click the **Voice VLAN Setup** link in the **VLAN Configuration** screen to display the configuration screen as shown.



**Figure 91** Advanced Application > VLAN > VLAN Configuration > Voice VLAN Setup

**Voice VLAN Setup** [VLAN Configuration](#)

**Voice VLAN Global Setup**

Voice VLAN ☒ Disable

Priority

[Apply](#) [Cancel](#) [Clear](#)

**Voice VLAN OUI Setup**

OUI address

OUI mask

Description

[Add](#) [Cancel](#)

| Index | OUI address | OUI mask | Description |
|-------|-------------|----------|-------------|
|       |             |          |             |

[Delete](#) [Cancel](#)

The following table describes the fields in the above screen.

Table 44 Advanced Application &gt; VLAN &gt; VLAN Configuration &gt; Voice VLAN Setup

| LABEL                   | DESCRIPTION                                                                                                                                                                                                                                                                        |
|-------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Voice VLAN Global Setup |                                                                                                                                                                                                                                                                                    |
| Voice VLAN              | Click the Voice VLAN radio button if you want to enable the Voice VLAN feature. Type a VLAN ID number in the box next to the radio button that is associated with the Voice VLAN. Click <b>Disable</b> radio button if you do not want to enable the Voice VLAN feature.           |
| Priority                | Select the priority level of the Voice VLAN from 0 to 7. Default setting is 5. The higher the numeric value you assign, the higher the priority for this Voice VLAN.                                                                                                               |
| Apply                   | Click <b>Apply</b> to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the <b>Save</b> link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel                  | Click <b>Cancel</b> to begin configuring this screen afresh.                                                                                                                                                                                                                       |
| Clear                   | Click <b>Clear</b> to reset the fields to default settings.                                                                                                                                                                                                                        |
| Voice VLAN OUI Setup    |                                                                                                                                                                                                                                                                                    |
| OUI address             | Type the IP Phone manufacturer's OUI MAC address. The first three bytes is the manufacturer identifier, the last three bytes is a unique station ID.                                                                                                                               |
| OUI mask                | Type the IP Phone manufacturer's OUI mask address.                                                                                                                                                                                                                                 |
| Description             | Type an description up to 32 characters for the Voice VLAN device. For example: Siemens.                                                                                                                                                                                           |
| Add                     | Click <b>Add</b> to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the <b>Save</b> link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.   |
| Cancel                  | Click <b>Cancel</b> to begin configuring this screen afresh.                                                                                                                                                                                                                       |
| Index                   | This field displays the index number of the Voice VLAN.                                                                                                                                                                                                                            |
| OUI address             | This field displays the OUI address of the Voice VLAN.                                                                                                                                                                                                                             |
| OUI mask                | This field displays the OUI mask address of the Voice VLAN.                                                                                                                                                                                                                        |
| Description             | This field displays the description of the Voice VLAN with OUI address.                                                                                                                                                                                                            |

Table 44 Advanced Application &gt; VLAN &gt; VLAN Configuration &gt; Voice VLAN Setup

| LABEL  | DESCRIPTION                                                                                                                             |
|--------|-----------------------------------------------------------------------------------------------------------------------------------------|
|        | Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries. |
| Delete | Click <b>Delete</b> to remove the selected entry from the summary table.                                                                |
| Cancel | Click <b>Cancel</b> to clear the check boxes.                                                                                           |

## 9.9 MAC Based VLAN

The MAC-based VLAN feature assigns incoming untagged packets to a VLAN and classifies the traffic based on the source MAC address of the packet. When untagged packets arrive at the switch, the source MAC address of the packet is looked up in a MAC to VLAN mapping table. If an entry is found, the corresponding VLAN ID is assigned to the packet. The assigned VLAN ID is verified against the VLAN table. If the VLAN is valid, ingress processing on the packet continues; otherwise, the packet is dropped.

This feature allows users to change ports without having to reconfigure the VLAN. You can assign priority to the MAC-based VLAN and define a MAC to VLAN mapping table by entering a specified source MAC address in the MAC-based VLAN setup screen. You can also delete a MAC-based VLAN entry in the same screen.

Click the **MAC-based VLAN Setup** link in the **VLAN Configuration** screen to see the following screen.

Figure 92 Advanced Application &gt; VLAN &gt; VLAN Configuration &gt; MAC-based VLAN Setup

The following table describes the fields in the above screen.

Table 45 Advanced Application &gt; VLAN &gt; VLAN Configuration &gt; MAC-based VLAN Setup

| LABEL       | DESCRIPTION                                                                                                                                                                  |
|-------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Name        | Type a name up to 32 alpha numeric characters for the MAC-based VLAN entry.                                                                                                  |
| MAC Address | Type a MAC address that is bind to the MAC-based VLAN entry. This is the source MAC address of the data packet that is looked up when untagged packets arrive at the Switch. |
| VID         | Type an ID (from 1 to 4094) for the VLAN ID that is associated with the MAC-based VLAN entry.                                                                                |
| Priority    | Type a priority (0-7) for the MAC-based VLAN entry. The higher the numeric value you assign, the higher the priority for this MAC-based VLAN entry.                          |
| Add         | Click <b>Add</b> to save the new MAC-based VLAN entry.                                                                                                                       |

Table 45 Advanced Application &gt; VLAN &gt; VLAN Configuration &gt; MAC-based VLAN Setup

| LABEL       | DESCRIPTION                                                                                                                             |
|-------------|-----------------------------------------------------------------------------------------------------------------------------------------|
| Cancel      | Click <b>Cancel</b> to clear the fields in the MAC-based VLAN entry.                                                                    |
| Index       | This field displays the index number of the MAC-based VLAN entry.                                                                       |
| Name        | This field displays the name of the MAC-based VLAN entry.                                                                               |
| MAC Address | This field displays the source MAC address that is bind to the MAC-based VLAN entry.                                                    |
| VID         | This field displays the VLAN ID of the MAC-based VLAN entry.                                                                            |
| Priority    | This field displays the priority level of the MAC-based VLAN entry.                                                                     |
|             | Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries. |
| Delete      | Click <b>Delete</b> to remove the selected entry from the summary table.                                                                |
| Cancel      | Click <b>Cancel</b> to clear the check boxes.                                                                                           |

## 9.10 Port-based VLAN Setup

Port-based VLANs are VLANs where the packet forwarding decision is based on the destination MAC address and its associated port.

Port-based VLANs require allowed outgoing ports to be defined for each port. Therefore, if you wish to allow two subscriber ports to talk to each other, for example, between conference rooms in a hotel, you must define the egress (an egress port is an outgoing port, that is, a port through which a data packet leaves) for both ports.

Port-based VLANs are specific only to the Switch on which they were created.

Note: When you activate port-based VLAN, the Switch uses a default VLAN ID of 1. You cannot change it.

Note: In screens (such as **IP Setup** and **Filtering**) that require a VID, you must enter 1 as the VID.

The port-based VLAN setup screen is shown next. The **CPU** management port forms a VLAN with all Ethernet ports.

### 9.10.1 Configure a Port-based VLAN

Select **Port Based** as the **VLAN Type** in the **Switch Setup** screen and then click **VLAN** from the navigation panel to display the following screen. Select either **All Connected** or **Port Isolated** from the drop-down list depending on your VLAN and VLAN security requirements. If VLAN members need to communicate directly with each other, then select **All Connected**. Select **Port Isolated** if you want to restrict users from communicating directly. Click **Apply** to save your settings.

The following screen shows users on a port-based, all-connected VLAN configuration.

**Figure 93** Advanced Application > VLAN > Port Based VLAN Setup (All Connected)

Port Based VLAN Setup

Setting Wizard

All connected ▾

Apply

Incoming

|    | 1                                   | 2                                   | 3                                   | 4                                   | 5                                   | 6                                   | 7                                   | 8                                   | 9                                   | 10                                  | 11                                  | 12                                  | 13                                  | 14                                  | 15                                  | 16                                  | 17                                  | 18                                  | 19                                  | 20                                  | 21                                  | 22                                  | 23                                  | 24                                  | 25                                  | 26                                  | 27                                  | 28 |  |
|----|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|----|--|
| 1  | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | 1  |  |
| 2  | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | 2  |  |
| 3  | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | 3  |  |
| 4  | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | 4  |  |
| 5  | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | 5  |  |
| 6  | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | 6  |  |
| 7  | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | 7  |  |
| 8  | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | 8  |  |
| 9  | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | 9  |  |
| 10 | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | 10 |  |
| 11 | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | 11 |  |
| 12 | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | 12 |  |
| 13 | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <                                   |                                     |                                     |                                     |                                     |                                     |                                     |                                     |                                     |                                     |                                     |                                     |                                     |                                     |                                     |                                     |                                     |                                     |                                     |                                     |                                     |                                     |                                     |                                     |                                     |    |  |

The following screen shows users on a port-based, port-isolated VLAN configuration.

**Figure 94** Advanced Application > VLAN: Port Based VLAN Setup (Port Isolation)

**Port Based VLAN Setup**

Setting Wizard: Port Isolation Apply

**Incoming**

|     | 1                                   | 2                                   | 3                                   | 4                                   | 5                                   | 6                                   | 7                                   | 8                                   | 9                                   | 10                                  | 11                                  | 12                                  | 13                                  | 14                                  | 15                                  | 16                                  | 17                                  | 18                                  | 19                                  | 20                                  | 21                                  | 22                                  | 23                                  | 24                                  | 25                                  | 26                                  | 27                                  | 28  |  |
|-----|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|-----|--|
| 1   | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | 1   |  |
| 2   | <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | 2   |  |
| 3   | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | 3   |  |
| 4   | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | 4   |  |
| 5   | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | 5   |  |
| 6   | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | 6   |  |
| 7   | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | 7   |  |
| 8   | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | 8   |  |
| 9   | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | 9   |  |
| 10  | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | 10  |  |
| 11  | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | 11  |  |
| 12  | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | 12  |  |
| 13  | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | 13  |  |
| 14  | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | 14  |  |
| 15  | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | 15  |  |
| 16  | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | 16  |  |
| 17  | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | 17  |  |
| 18  | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | 18  |  |
| 19  | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | 19  |  |
| 20  | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | 20  |  |
| 21  | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | 21  |  |
| 22  | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | 22  |  |
| 23  | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | 23  |  |
| 24  | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | 24  |  |
| 25  | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            | 25  |  |
| 26  | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            | 26  |  |
| 27  | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | 27  |  |
| 28  | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | 28  |  |
| CPU | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | CPU |  |
|     | 1                                   | 2                                   | 3                                   | 4                                   | 5                                   | 6                                   | 7                                   | 8                                   | 9                                   | 10                                  | 11                                  | 12                                  | 13                                  | 14                                  | 15                                  | 16                                  | 17                                  | 18                                  | 19                                  | 20                                  | 21                                  | 22                                  | 23                                  | 24                                  | 25                                  | 26                                  | 27                                  | 28  |  |

**Outgoing**

Apply Cancel

The following table describes the labels in this screen.

Table 46 Advanced Application &gt; VLAN: Port Based VLAN Setup

| LABEL          | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Setting Wizard | <p>Choose <b>All connected</b> or <b>Port isolation</b>.</p> <p><b>All connected</b> means all ports can communicate with each other, that is, there are no virtual LANs. All incoming and outgoing ports are selected. This option is the most flexible but also the least secure.</p> <p><b>Port isolation</b> means that each port can only communicate with the CPU management port and cannot communicate with each other. All incoming ports are selected while only the CPU outgoing port is selected. This option is the most limiting but also the most secure.</p> <p>After you make your selection, click <b>Apply</b> (top right of screen) to display the screens as mentioned above. You can still customize these settings by adding/deleting incoming or outgoing ports, but you must also click <b>Apply</b> at the bottom of the screen.</p> |
| Incoming       | <p>These are the ingress ports; an ingress port is an incoming port, that is, a port through which a data packet enters. If you wish to allow two subscriber ports to talk to each other, you must define the ingress port for both ports. The numbers in the top row denote the incoming port for the corresponding port listed on the left (its outgoing port). <b>CPU</b> refers to the Switch management port. By default it forms a VLAN with all Ethernet ports. If it does not form a VLAN with a particular port then the Switch cannot be managed from that port.</p>                                                                                                                                                                                                                                                                                 |

Table 46 Advanced Application &gt; VLAN: Port Based VLAN Setup (continued)

| LABEL    | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Outgoing | These are the egress ports. An egress port is an outgoing port, that is, a port through which a data packet leaves. If you wish to allow two subscriber ports to talk to each other, you must define the egress port for both ports. <b>CPU</b> refers to the Switch management port. By default it forms a VLAN with all Ethernet ports. If it does not form a VLAN with a particular port then the Switch cannot be managed from that port. |
| Apply    | Click <b>Apply</b> to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the <b>Save</b> link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.                                                                                                                                                            |
| Cancel   | Click <b>Cancel</b> to begin configuring this screen afresh.                                                                                                                                                                                                                                                                                                                                                                                  |

# CHAPTER 10

## Static MAC Forward Setup

Use these screens to configure static MAC address forwarding.

### 10.1 Overview

This chapter discusses how to configure forwarding rules based on MAC addresses of devices on your network.

### 10.2 Configuring Static MAC Forwarding

A static MAC address is an address that has been manually entered in the MAC address table. Static MAC addresses do not age out. When you set up static MAC address rules, you are setting static MAC addresses for a port. This may reduce the need for broadcasting.

Static MAC address forwarding together with port security allows only computers in the MAC address table on a port to access the Switch. See [Chapter 20 on page 197](#) for more information on port security.

Click **Advanced Application > Static MAC Forwarding** in the navigation panel to display the configuration screen as shown.

**Figure 95** Advanced Application > Static MAC Forwarding (Standalone mode)

| Static MAC Forwarding       |                          |      |             |     |      |                          |
|-----------------------------|--------------------------|------|-------------|-----|------|--------------------------|
| Active                      | <input type="checkbox"/> |      |             |     |      |                          |
| Name                        | <input type="text"/>     |      |             |     |      |                          |
| MAC Address                 | <input type="text"/>     |      |             |     |      |                          |
| VID                         | <input type="text"/>     |      |             |     |      |                          |
| Port                        | <input type="text"/>     |      |             |     |      |                          |
| <div>Add Cancel Clear</div> |                          |      |             |     |      |                          |
| Index                       | Active                   | Name | MAC Address | VID | Port | <input type="checkbox"/> |
| <div>Delete Cancel</div>    |                          |      |             |     |      |                          |

The following table describes the labels in this screen.

Table 47 Advanced Application > Static MAC Forwarding

| LABEL       | DESCRIPTION                                                                                                                                                                                                                                                                                                                       |
|-------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Active      | Select this check box to activate your rule. You may temporarily deactivate a rule without deleting it by clearing this check box.                                                                                                                                                                                                |
| Name        | Enter a descriptive name for identification purposes for this static MAC address forwarding rule.                                                                                                                                                                                                                                 |
| MAC Address | Enter the MAC address in valid MAC address format, that is, six hexadecimal character pairs.<br><br>Note: Static MAC addresses do not age out.                                                                                                                                                                                    |
| VID         | Enter the VLAN identification number.                                                                                                                                                                                                                                                                                             |
| Port        | Enter the port where the MAC address entered in the previous field will be automatically forwarded.                                                                                                                                                                                                                               |
| Add         | Click this to create a new entry or to update an existing one.<br><br>This saves your rule to the Switch's run-time memory. The Switch loses this rule if it is turned off or loses power, so use the <b>Save</b> link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel      | Click <b>Cancel</b> to begin configuring this screen afresh.                                                                                                                                                                                                                                                                      |
| Clear       | Click <b>Clear</b> to reset the fields to the factory defaults.                                                                                                                                                                                                                                                                   |
| Index       | Click an index number to modify a static MAC address rule for a port.                                                                                                                                                                                                                                                             |
| Active      | This field displays whether this static MAC address forwarding rule is active ( <b>Yes</b> ) or not ( <b>No</b> ). You may temporarily deactivate a rule without deleting it.                                                                                                                                                     |
| Name        | This field displays the descriptive name for identification purposes for this static MAC address-forwarding rule.                                                                                                                                                                                                                 |
| MAC Address | This field displays the MAC address that will be forwarded and the VLAN identification number to which the MAC address belongs.                                                                                                                                                                                                   |
| VID         | This field displays the ID number of the VLAN group.                                                                                                                                                                                                                                                                              |
| Port        | This field displays the port where the MAC address shown in the next field will be forwarded.                                                                                                                                                                                                                                     |
|             | Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries.                                                                                                                                                                                           |
| Delete      | Click <b>Delete</b> to remove the selected entry from the summary table.                                                                                                                                                                                                                                                          |
| Cancel      | Click <b>Cancel</b> to clear the check boxes.                                                                                                                                                                                                                                                                                     |



# CHAPTER 11

## Static Multicast Forward Setup

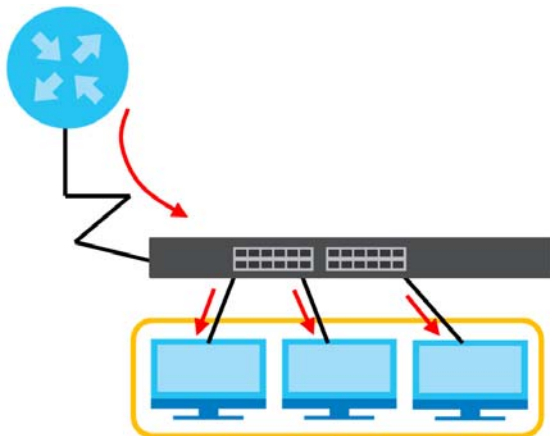
Use these screens to configure static multicast address forwarding.

### 11.1 Static Multicast Forwarding Overview

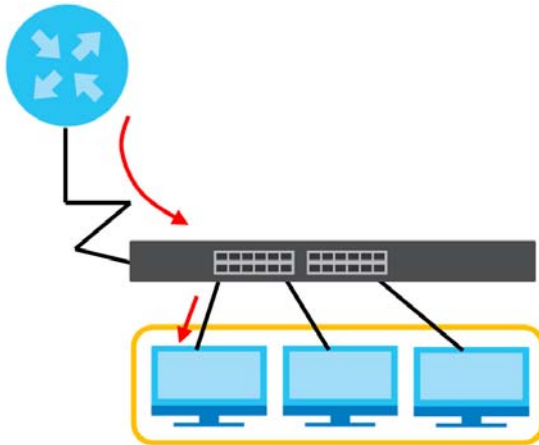
A multicast MAC address is the MAC address of a member of a multicast group. A static multicast address is a multicast MAC address that has been manually entered in the multicast table. Static multicast addresses do not age out. Static multicast forwarding allows you (the administrator) to forward multicast frames to a member without the member having to join the group first.

If a multicast group has no members, then the switch will either flood the multicast frames to all ports or drop them. You can configure this in the **Advanced Application > Multicast > IPv4 Multicast > IGMP Snooping** screen (see [Section 25.3.1 on page 226](#)). [Figure 96](#) shows such unknown multicast frames flooded to all ports. With static multicast forwarding, you can forward these multicasts to port(s) within a VLAN group. [Figure 97](#) shows frames being forwarded to devices connected to port 3. [Figure 98](#) shows frames being forwarded to ports 2 and 3 within VLAN group 4.

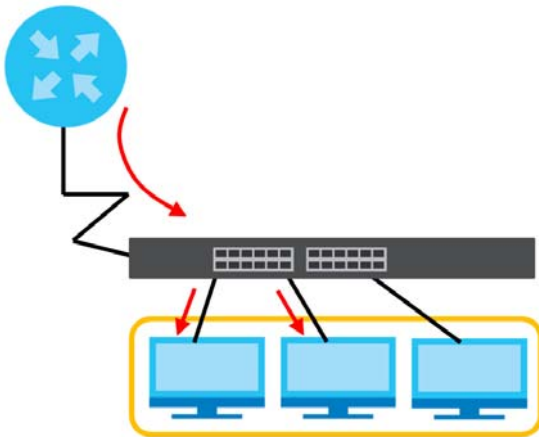
**Figure 96** No Static Multicast Forwarding



**Figure 97** Static Multicast Forwarding to A Single Port



**Figure 98** Static Multicast Forwarding to Multiple Ports



## 11.2 Configuring Static Multicast Forwarding

Use this screen to configure rules to forward specific multicast frames, such as streaming or control frames, to specific port(s).

Click **Advanced Application** > **Static Multicast Forwarding** to display the configuration screen as shown.

**Figure 99** Advanced Application > Static Multicast Forwarding

The following table describes the labels in this screen.

Table 48 Advanced Application &gt; Static Multicast Forwarding

| LABEL       | DESCRIPTION                                                                                                                                                                                                                                                                                                                       |
|-------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Active      | Select this check box to activate your rule. You may temporarily deactivate a rule without deleting it by clearing this check box.                                                                                                                                                                                                |
| Name        | Type a descriptive name (up to 32 printable ASCII characters) for this static multicast MAC address forwarding rule. This is for identification only.                                                                                                                                                                             |
| MAC Address | Enter a multicast MAC address which identifies the multicast group. The last binary bit of the first octet pair in a multicast MAC address must be 1. For example, the first octet pair 00000001 is 01 and 00000011 is 03 in hexadecimal, so 01:00:5e:00:00:0A and 03:00:5e:00:00:27 are valid multicast MAC addresses.           |
| VID         | You can forward frames with matching destination MAC address to port(s) within a VLAN group. Enter the ID that identifies the VLAN group here. If you don't have a specific target VLAN, enter 1.                                                                                                                                 |
| Port        | Enter the port(s) where frames with destination MAC address that matched the entry above are forwarded. You can enter multiple ports separated by (no space) comma (,) or hyphen for a range. For example, enter "3-5" for ports 3, 4, and 5. Enter "3,5,7" for ports 3, 5, and 7.                                                |
| Add         | Click this to create a new entry or to update an existing one.<br><br>This saves your rule to the Switch's run-time memory. The Switch loses this rule if it is turned off or loses power, so use the <b>Save</b> link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel      | Click <b>Cancel</b> to reset the fields to their last saved values.                                                                                                                                                                                                                                                               |
| Clear       | Click <b>Clear</b> to reset the fields to the factory defaults.                                                                                                                                                                                                                                                                   |
| Index       | Click an index number to modify a static multicast MAC address rule for port(s).                                                                                                                                                                                                                                                  |
| Active      | This field displays whether a static multicast MAC address forwarding rule is active ( <b>Yes</b> ) or not ( <b>No</b> ). You may temporarily deactivate a rule without deleting it.                                                                                                                                              |
| Name        | This field displays the descriptive name for identification purposes for a static multicast MAC address-forwarding rule.                                                                                                                                                                                                          |
| MAC Address | This field displays the multicast MAC address that identifies a multicast group.                                                                                                                                                                                                                                                  |
| VID         | This field displays the ID number of a VLAN group to which frames containing the specified multicast MAC address will be forwarded.                                                                                                                                                                                               |
| Port        | This field displays the port(s) within a identified VLAN group to which frames containing the specified multicast MAC address will be forwarded.                                                                                                                                                                                  |

Table 48 Advanced Application &gt; Static Multicast Forwarding (continued)

| LABEL  | DESCRIPTION                                                                                                                             |
|--------|-----------------------------------------------------------------------------------------------------------------------------------------|
|        | Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries. |
| Delete | Click <b>Delete</b> to remove the selected entry from the summary table.                                                                |
| Cancel | Click <b>Cancel</b> to clear the check boxes.                                                                                           |

# CHAPTER 12

## Filtering

This chapter discusses MAC address port filtering.

### 12.1 Configure a Filtering Rule

Configure the Switch to filter traffic based on the traffic's source, destination MAC addresses and/or VLAN group (ID).

Click **Advanced Application > Filtering** in the navigation panel to display the screen as shown next.

**Figure 100** Advanced Application > Filtering

The following table describes the related labels in this screen.

Table 49 Advanced Application > Filtering

| LABEL  | DESCRIPTION                                                                                                                                        |
|--------|----------------------------------------------------------------------------------------------------------------------------------------------------|
| Active | Make sure to select this check box to activate your rule. You may temporarily deactivate a rule without deleting it by deselecting this check box. |
| Name   | Type a descriptive name (up to 32 printable ASCII characters) for this rule. This is for identification only.                                      |

Table 49 Advanced Application &gt; Filtering (continued)

| LABEL       | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|-------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Action      | <p>Select <b>Discard source</b> to drop frames from the source MAC address (specified in the <b>MAC</b> field). The Switch can still send frames to the MAC address.</p> <p>Select <b>Discard destination</b> to drop frames to the destination MAC address (specified in the <b>MAC</b> address). The Switch can still receive frames originating from the MAC address.</p> <p>Select <b>Discard source</b> and <b>Discard destination</b> to block traffic to/from the MAC address specified in the <b>MAC</b> field.</p> |
| MAC         | Type a MAC address in a valid MAC address format, that is, six hexadecimal character pairs.                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| VID         | Type the VLAN group identification number.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Add         | <p>Click this to create a new entry or to update an existing one.</p> <p>This saves your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the <b>Save</b> link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.</p>                                                                                                                                                                             |
| Cancel      | Click <b>Cancel</b> to begin configuring this screen afresh.                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Clear       | Click <b>Clear</b> to reset the fields to the factory defaults.                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Index       | This field displays the index number of the rule. Click an index number to change the settings.                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Active      | This field displays <b>Yes</b> when the rule is activated and <b>No</b> when it is deactivated.                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Name        | This field displays the descriptive name for this rule. This is for identification purposes only.                                                                                                                                                                                                                                                                                                                                                                                                                           |
| MAC Address | This field displays the source/destination MAC address with the VLAN identification number to which the MAC address belongs.                                                                                                                                                                                                                                                                                                                                                                                                |
| VID         | This field displays the VLAN group identification number.                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Action      | This field displays <b>Discard source</b> , <b>Discard destination</b> , or <b>Discard both</b> depending on what you configured above.                                                                                                                                                                                                                                                                                                                                                                                     |
|             | Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries.                                                                                                                                                                                                                                                                                                                                                                                     |
| Delete      | Check the rule(s) that you want to remove and then click the <b>Delete</b> button.                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Cancel      | Click <b>Cancel</b> to clear the selected checkbox(es).                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |

# CHAPTER 13

## Spanning Tree Protocol

### 13.1 Spanning Tree Protocol Overview

The Switch supports Spanning Tree Protocol (STP), Rapid Spanning Tree Protocol (RSTP) and Multiple Spanning Tree Protocol (MSTP) as defined in the following standards.

- IEEE 802.1D Spanning Tree Protocol
- IEEE 802.1w Rapid Spanning Tree Protocol
- IEEE 802.1s Multiple Spanning Tree Protocol

The Switch also allows you to set up multiple STP configurations (or trees). Ports can then be assigned to the trees.

#### 13.1.1 What You Need to Know

Read on for concepts on STP that can help you configure the screens in this chapter.

##### **(Rapid) Spanning Tree Protocol**

(R)STP detects and breaks network loops and provides backup links between switches, bridges or routers. It allows a Switch to interact with other (R)STP-compliant switches in your network to ensure that only one path exists between any two stations on the network.

The Switch uses IEEE 802.1w RSTP (Rapid Spanning Tree Protocol) that allows faster convergence of the spanning tree than STP (while also being backwards compatible with STP-only aware bridges). In RSTP, topology change information is directly propagated throughout the network from the device that generates the topology change. In STP, a longer delay is required as the device that causes a topology change first notifies the root bridge and then the root bridge notifies the network. Both RSTP and STP flush unwanted learned addresses from the filtering database. In RSTP, the port states are Discarding, Learning, and Forwarding.

Note: In this user's guide, "STP" refers to both STP and RSTP.

##### **STP Terminology**

The root bridge is the base of the spanning tree.

Path cost is the cost of transmitting a frame onto a LAN through that port. The recommended cost is assigned according to the speed of the link to which a port is attached. The slower the media, the higher the cost.

Table 50 STP Path Costs

|           | LINK SPEED | RECOMMENDED VALUE | RECOMMENDED RANGE | ALLOWED RANGE |
|-----------|------------|-------------------|-------------------|---------------|
| Path Cost | 4Mbps      | 250               | 100 to 1000       | 1 to 65535    |
| Path Cost | 10Mbps     | 100               | 50 to 600         | 1 to 65535    |
| Path Cost | 16Mbps     | 62                | 40 to 400         | 1 to 65535    |
| Path Cost | 100Mbps    | 19                | 10 to 60          | 1 to 65535    |
| Path Cost | 1Gbps      | 4                 | 3 to 10           | 1 to 65535    |
| Path Cost | 10Gbps     | 2                 | 1 to 5            | 1 to 65535    |

On each bridge, the bridge communicates with the root through the root port. The root port is the port on this Switch with the lowest path cost to the root (the root path cost). If there is no root port, then this Switch has been accepted as the root bridge of the spanning tree network.

For each LAN segment, a designated bridge is selected. This bridge has the lowest cost to the root among the bridges connected to the LAN.

## How STP Works

After a bridge determines the lowest cost-spanning tree with STP, it enables the root port and the ports that are the designated ports for connected LANs, and disables all other ports that participate in STP. Network packets are therefore only forwarded between enabled ports, eliminating any possible network loops.

STP-aware switches exchange Bridge Protocol Data Units (BPDUs) periodically. When the bridged LAN topology changes, a new spanning tree is constructed.

Once a stable network topology has been established, all bridges listen for Hello BPDUs (Bridge Protocol Data Units) transmitted from the root bridge. If a bridge does not get a Hello BPDU after a predefined interval (Max Age), the bridge assumes that the link to the root bridge is down. This bridge then initiates negotiations with other bridges to reconfigure the network to re-establish a valid network topology.

## STP Port States

STP assigns five port states to eliminate packet looping. A bridge port is not allowed to go directly from blocking state to forwarding state so as to eliminate transient loops.

Table 51 STP Port States

| PORT STATE | DESCRIPTION                                                                                                       |
|------------|-------------------------------------------------------------------------------------------------------------------|
| Disabled   | STP is disabled (default).                                                                                        |
| Blocking   | Only configuration and management BPDUs are received and processed.                                               |
| Listening  | All BPDUs are received and processed.<br><br>Note: The listening state does not exist in RSTP.                    |
| Learning   | All BPDUs are received and processed. Information frames are submitted to the learning process but not forwarded. |
| Forwarding | All BPDUs are received and processed. All information frames are received and forwarded.                          |

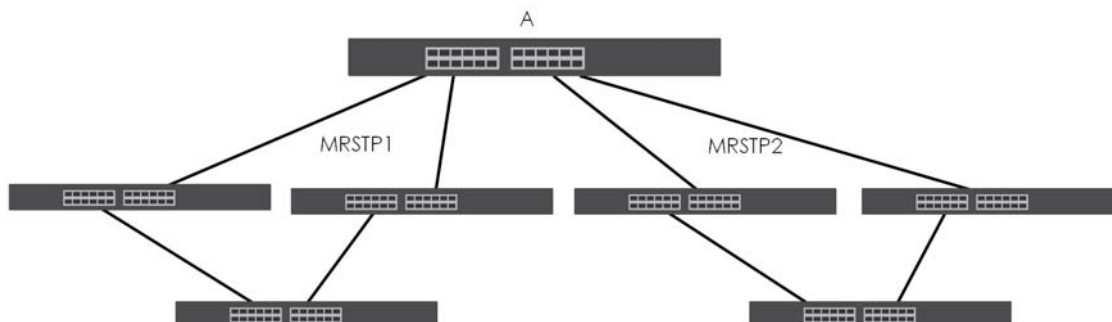


## Multiple RSTP

MRSTP (Multiple RSTP) is Zyxel's proprietary feature that is compatible with RSTP and STP. With MRSTP, you can have more than one spanning tree on your Switch and assign port(s) to each tree. Each spanning tree operates independently with its own bridge information.

In the following example, there are two RSTP instances (**MRSTP1** and **MRSTP2**) on switch **A**.

**Figure 101** MRSTP Network Example



To set up MRSTP, activate MRSTP on the Switch and specify which port(s) belong to which spanning tree.

Note: Each port can belong to one STP tree only.

## Multiple STP

Multiple Spanning Tree Protocol (IEEE 802.1s) is backwards compatible with STP/RSTP and addresses the limitations of existing spanning tree protocols (STP and RSTP) in networks to include the following features:

- One Common and Internal Spanning Tree (CIST) that represents the entire network's connectivity.
- Grouping of multiple bridges (or switching devices) into regions that appear as one single bridge on the network.
- A VLAN can be mapped to a specific Multiple Spanning Tree Instance (MSTI). MSTI allows multiple VLANs to use the same spanning tree.
- Load-balancing is possible as traffic from different VLANs can use distinct paths in a region.

## 13.2 Spanning Tree Protocol Status Screen

Click **Advanced Application > Spanning Tree Protocol** to see the screen as shown.

**Figure 102** Advanced Application > Spanning Tree Protocol (

Spanning Tree Protocol Status

[Configuration](#)
[RSTP](#)
[MRSTP](#)
[MSTP](#)

Spanning Tree Protocol: RSTP

|                           |                   |                   |
|---------------------------|-------------------|-------------------|
| Bridge                    | Root              | Our Bridge        |
| Bridge ID                 | 0000-000000000000 | 0000-000000000000 |
| Hello Time (second)       | 0                 | 0                 |
| Max Age (second)          | 0                 | 0                 |
| Forwarding Delay (second) | 0                 | 0                 |
| Cost to Bridge            | 0                 |                   |
| Port ID                   | 0X0000            |                   |
| Topology Changed Times    | 0                 |                   |
| Time Since Last Change    | 0:00:00           |                   |

| Port | Port State | Port Role | Designated Bridge ID | Designated Port ID | Designated Cost | Root Guard State |
|------|------------|-----------|----------------------|--------------------|-----------------|------------------|
|------|------------|-----------|----------------------|--------------------|-----------------|------------------|

This screen differs depending on which STP mode (RSTP, MRSTP or MSTP) you configure on the Switch. This screen is described in detail in the section that follows the configuration section for each STP mode. Click **Configuration** to activate one of the STP standards on the Switch.

## 13.3 Spanning Tree Configuration

Use the **Spanning Tree Configuration** screen to activate one of the STP modes on the Switch. Click **Configuration** in the **Advanced Application > Spanning Tree Protocol**.

**Figure 103** Advanced Application > Spanning Tree Protocol > Configuration

| Spanning Tree Configuration                                                |                                                                                                                                                            | <a href="#">Status</a> |
|----------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|
| Spanning Tree Mode                                                         | <input checked="" type="radio"/> Rapid Spanning Tree<br><input type="radio"/> Multiple Rapid Spanning Tree<br><input type="radio"/> Multiple Spanning Tree |                        |
| <input type="button" value="Apply"/> <input type="button" value="Cancel"/> |                                                                                                                                                            |                        |

The following table describes the labels in this screen.

Table 52 Advanced Application &gt; Spanning Tree Protocol &gt; Configuration

| LABEL              | DESCRIPTION                                                                                                                                                                                                                                                                        |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Spanning Tree Mode | You can activate one of the STP modes on the Switch.<br><br>Select <b>Rapid Spanning Tree</b> , <b>Multiple Rapid Spanning Tree</b> or <b>Multiple Spanning Tree</b> . See <a href="#">Section 13.10 on page 157</a> for background information on STP.                            |
| Apply              | Click <b>Apply</b> to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the <b>Save</b> link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel             | Click <b>Cancel</b> to begin configuring this screen afresh.                                                                                                                                                                                                                       |

## 13.4 Configure Rapid Spanning Tree Protocol

Use this screen to configure RSTP settings, see [Section 13.10 on page 157](#) for more information on RSTP. Click **RSTP** in the **Advanced Application > Spanning Tree Protocol** screen.

**Figure 104** Advanced Application > Spanning Tree Protocol > RSTP

| Port | Active                   | Edge                     | Root Guard               | Priority | Path Cost |
|------|--------------------------|--------------------------|--------------------------|----------|-----------|
| *    | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |          |           |
| 1    | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | 128      | 4         |
| 2    | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | 128      | 4         |
| 3    | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | 128      | 4         |
| 4    | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | 128      | 4         |
| 5    | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | 128      | 4         |
| 6    | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | 128      | 4         |
| 7    | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | 128      | 4         |
| 8    | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | 128      | 4         |
| 9    | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | 128      | 4         |
| 10   | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | 128      | 4         |
| 11   | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | 128      | 4         |

The following table describes the labels in this screen.

Table 53 Advanced Application > Spanning Tree Protocol > RSTP

| LABEL           | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|-----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Status          | Click <b>Status</b> to display the <b>RSTP Status</b> screen (see <a href="#">Figure 105 on page 145</a> ).                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Active          | <p>Select this check box to activate RSTP. Clear this checkbox to disable RSTP.</p> <p>Note: You must also activate <b>Rapid Spanning Tree</b> in the <b>Advanced Application &gt; Spanning Tree Protocol &gt; Configuration</b> screen to enable RSTP on the Switch.</p>                                                                                                                                                                                                                                                                                         |
| Bridge Priority | <p>Bridge priority is used in determining the root switch, root port and designated port. The switch with the highest priority (lowest numeric value) becomes the STP root switch. If all switches have the same priority, the switch with the lowest MAC address will then become the root switch. Select a value from the drop-down list box.</p> <p>The lower the numeric value you assign, the higher the priority for this bridge.</p> <p>Bridge Priority determines the root bridge, which in turn determines Hello Time, Max Age and Forwarding Delay.</p> |
| Hello Time      | This is the time interval in seconds between BPDU (Bridge Protocol Data Units) configuration message generations by the root switch. The allowed range is 1 to 10 seconds.                                                                                                                                                                                                                                                                                                                                                                                        |

Table 53 Advanced Application &gt; Spanning Tree Protocol &gt; RSTP (continued)

| LABEL            | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Max Age          | This is the maximum time (in seconds) a switch can wait without receiving a BPDU before attempting to reconfigure. All switch ports (except for designated ports) should receive BPDUs at regular intervals. Any port that ages out STP information (provided in the last BPDU) becomes the designated port for the attached LAN. If it is a root port, a new root port is selected from among the switch ports attached to the network. The allowed range is 6 to 40 seconds.                                                                           |
| Forwarding Delay | This is the maximum time (in seconds) a switch will wait before changing states. This delay is required because every switch must receive information about topology changes before it starts to forward frames. In addition, each port needs time to listen for conflicting information that would make it return to a blocking state; otherwise, temporary data loops might result. The allowed range is 4 to 30 seconds.<br><br>As a general rule:<br><br>Note: $2 * (\text{Forward Delay} - 1) \geq \text{Max Age} \geq 2 * (\text{Hello Time} + 1)$ |
| Port             | This field displays the port number.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| *                | Settings in this row apply to all ports.<br><br>Use this row only if you want to make some settings the same for all ports. Use this row first to set the common settings and then make adjustments on a port-by-port basis.<br><br>Note: Changes in this row are copied to all the ports as soon as you make them.                                                                                                                                                                                                                                      |
| Active           | Select this check box to activate RSTP on this port.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Edge             | Select this check box to configure a port as an edge port when it is directly attached to a computer. An edge port changes its initial STP port state from blocking state to forwarding state immediately without going through listening and learning states right after the port is configured as an edge port or when its link status changes.<br><br>Note: An edge port becomes a non-edge port as soon as it receives a Bridge Protocol Data Unit (BPDU).                                                                                           |
| Root Guard       | Select this check box to enable root guard on this port in order to prevent the switch(es) attached to the port from becoming the root bridge.<br><br>With root guard enabled, a port is blocked when the Switch receives a superior BPDU on it. The Switch allows traffic to pass through this port again when the switch connected to the port stops to send superior BPDUs.                                                                                                                                                                           |
| Priority         | Configure the priority for each port here.<br><br>Priority decides which port should be disabled when more than one port forms a loop in a switch. Ports with a higher priority numeric value are disabled first. The allowed range is between 0 and 255 and the default value is 128.                                                                                                                                                                                                                                                                   |
| Path Cost        | Path cost is the cost of transmitting a frame on to a LAN through that port. It is recommended to assign this value according to the speed of the bridge. The slower the media, the higher the cost - see <a href="#">Table 50 on page 140</a> for more information.                                                                                                                                                                                                                                                                                     |
| Apply            | Click <b>Apply</b> to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the <b>Save</b> link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.                                                                                                                                                                                                                                                                       |
| Cancel           | Click <b>Cancel</b> to begin configuring this screen afresh.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |

## 13.5 Rapid Spanning Tree Protocol Status

Click **Advanced Application > Spanning Tree Protocol** in the navigation panel to display the status screen as shown next. See [Section 13.10 on page 157](#) for more information on RSTP.

Note: This screen is only available after you activate RSTP on the Switch.

**Figure 105** Advanced Application > Spanning Tree Protocol > Status: RSTP

| Spanning Tree Protocol Status |                   |                   | <a href="#">Configuration</a> | <a href="#">RSTP</a> | <a href="#">MRSTP</a> | <a href="#">MSTP</a> |
|-------------------------------|-------------------|-------------------|-------------------------------|----------------------|-----------------------|----------------------|
| Spanning Tree Protocol: RSTP  |                   |                   |                               |                      |                       |                      |
| Bridge                        | Root              | Our Bridge        |                               |                      |                       |                      |
| Bridge ID                     | 8000-1c740dfef65e | 8000-1c740dfef65e |                               |                      |                       |                      |
| Hello Time (second)           | 2                 | 2                 |                               |                      |                       |                      |
| Max Age (second)              | 20                | 20                |                               |                      |                       |                      |
| Forwarding Delay (second)     | 15                | 15                |                               |                      |                       |                      |
| Cost to Bridge                | 0                 |                   |                               |                      |                       |                      |
| Port ID                       | 0X0000            |                   |                               |                      |                       |                      |
| Topology Changed Times        | 0                 |                   |                               |                      |                       |                      |
| Time Since Last Change        | 0:00:20           |                   |                               |                      |                       |                      |
|                               |                   |                   |                               |                      |                       |                      |
| Port                          | Port State        | Port Role         | Designated Bridge ID          | Designated Port ID   | Designated Cost       | Root Guard State     |
|                               |                   |                   |                               |                      |                       |                      |

The following table describes the labels in this screen.

Table 54 Advanced Application > Spanning Tree Protocol > Status: RSTP

| LABEL                     | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|---------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Configuration             | Click <b>Configuration</b> to specify which STP mode you want to activate. Click <b>RSTP</b> to edit RSTP settings on the Switch.                                                                                                                                                                                                                                                                                                                                                |
| Bridge                    | <b>Root</b> refers to the base of the spanning tree (the root bridge). <b>Our Bridge</b> is this Switch. This Switch may also be the root bridge.                                                                                                                                                                                                                                                                                                                                |
| Bridge ID                 | This is the unique identifier for this bridge, consisting of the bridge priority plus the MAC address. This ID is the same for <b>Root</b> and <b>Our Bridge</b> if the Switch is the root switch.                                                                                                                                                                                                                                                                               |
| Hello Time (second)       | This is the time interval (in seconds) at which the root switch transmits a configuration message. The root bridge determines Hello Time, Max Age and Forwarding Delay.                                                                                                                                                                                                                                                                                                          |
| Max Age (second)          | This is the maximum time (in seconds) a switch can wait without receiving a configuration message before attempting to reconfigure.                                                                                                                                                                                                                                                                                                                                              |
| Forwarding Delay (second) | This is the time (in seconds) the root switch will wait before changing states (that is, listening to learning to forwarding). See <a href="#">Section on page 140</a> for information on port states.<br><br>Note: The listening state does not exist in RSTP.                                                                                                                                                                                                                  |
| Cost to Bridge            | This is the path cost from the root port on this Switch to the root switch.                                                                                                                                                                                                                                                                                                                                                                                                      |
| Port ID                   | This is the priority and number of the port on the Switch through which this Switch must communicate with the root of the Spanning Tree.                                                                                                                                                                                                                                                                                                                                         |
| Topology Changed Times    | This is the number of times the spanning tree has been reconfigured.                                                                                                                                                                                                                                                                                                                                                                                                             |
| Time Since Last Change    | This is the time since the spanning tree was last reconfigured.                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Port                      | This field displays the number of the port on the Switch.                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Port State                | This field displays the port state in STP. <ul style="list-style-type: none"> <li>• <b>Discarding</b> - The port does not forward/process received frames or learn MAC addresses, but still listens for BPDUs.</li> <li>• <b>Learning</b> - The port learns MAC addresses and processes BPDUs, but does not forward frames yet.</li> <li>• <b>Forwarding</b> - The port is operating normally. It learns MAC addresses, processes BPDUs and forwards received frames.</li> </ul> |

Table 54 Advanced Application &gt; Spanning Tree Protocol &gt; Status: RSTP (continued)

| LABEL                | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|----------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Port Role            | <p>This field displays the role of the port in STP.</p> <ul style="list-style-type: none"> <li>• <b>Root</b> - A forwarding port on a non-root bridge, which has the lowest path cost and is the best port from the non-root bridge to the root bridge. A root bridge does not have a root port.</li> <li>• <b>Designated</b> - A forwarding port on the designated bridge for each connected LAN segment. A designated bridge has the lowest path cost to the root bridge among the bridges connected to the LAN segment. All the ports on a root bridge (root switch) are designated ports.</li> <li>• <b>Alternate</b> - A blocked port, which has a best alternate path to the root bridge. This path is different from using the root port. The port moves to the forwarding state when the designated port for the LAN segment fails.</li> <li>• <b>Backup</b> - A blocked port, which has a backup/redundant path to a LAN segment where a designated port is already connected when a switch has two links to the same LAN segment.</li> <li>• <b>Disabled</b> - Not strictly part of STP. The port can be disabled manually.</li> </ul> |
| Designated Bridge ID | <p>This field displays the identifier of the designated bridge to which this port belongs when the port is a designated port. Otherwise, it displays the identifier of the designated bridge for the LAN segment to which this port is connected.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Designated Port ID   | <p>This field displays the priority and number of the bridge port (on the designated bridge), through which the designated bridge transmits the stored configuration messages.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Designated Cost      | <p>This field displays the path cost to the LAN segment to which the port is connected when the port is a designated port. Otherwise, it displays the path cost to the root bridge from the designated port for the LAN segment to which this port is connected.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Root Guard State     | <p>This field displays the state of the port on which root guard is enabled.</p> <ul style="list-style-type: none"> <li>• <b>Root-inconsistent</b> - the Switch receives superior BPDUs on the port and blocks the port.</li> <li>• <b>Forwarding</b> - the Switch unblocks and allows the port to forward frames again.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |

## 13.6 Configure Multiple Rapid Spanning Tree Protocol

To configure MRSTP, click **MRSTP** in the **Advanced Application > Spanning Tree Protocol** screen. See [Section 13.10 on page 157](#) for more information on MRSTP.

**Figure 106** Advanced Application > Spanning Tree Protocol > MRSTP

| Multiple Rapid Spanning Tree Protocol |                          |                 |            |         |         |         |                  |         |  | <a href="#">Status</a> |
|---------------------------------------|--------------------------|-----------------|------------|---------|---------|---------|------------------|---------|--|------------------------|
| Tree                                  | Active                   | Bridge Priority | Hello Time |         | MAX Age |         | Forwarding Delay |         |  |                        |
| 1                                     | <input type="checkbox"/> | 32768 ▼         | 2          | seconds | 20      | seconds | 15               | seconds |  |                        |
| 2                                     | <input type="checkbox"/> | 32768 ▼         | 2          | seconds | 20      | seconds | 15               | seconds |  |                        |
| 3                                     | <input type="checkbox"/> | 32768 ▼         | 2          | seconds | 20      | seconds | 15               | seconds |  |                        |
| 4                                     | <input type="checkbox"/> | 32768 ▼         | 2          | seconds | 20      | seconds | 15               | seconds |  |                        |

| Port | Active                   | Edge                     | Root Guard               | Priority | Path Cost | Tree |
|------|--------------------------|--------------------------|--------------------------|----------|-----------|------|
| *    | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |          |           | 1 ▼  |
| 1    | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | 128      | 4         | 1 ▼  |
| 2    | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | 128      | 4         | 1 ▼  |
| 3    | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | 128      | 4         | 1 ▼  |
| 4    | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | 128      | 4         | 1 ▼  |
| 5    | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | 128      | 4         | 1 ▼  |
| 6    | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | 128      | 4         | 1 ▼  |
| 7    | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | 128      | 4         | 1 ▼  |
| 8    | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | 128      | 4         | 1 ▼  |
| 9    | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | 128      | 4         | 1 ▼  |
| 10   | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | 128      | 4         | 1 ▼  |
| 32   | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | 128      | 2         | 1 ▼  |

The following table describes the labels in this screen.

Table 55 Advanced Application &gt; Spanning Tree Protocol &gt; MRSTP

| LABEL           | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|-----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Status          | Click <b>Status</b> to display the <b>MRSTP Status</b> screen (see <a href="#">Figure 107</a> on page 149).                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Tree            | This is a read only index number of the STP trees.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Active          | <p>Select this check box to activate an STP tree. Clear this checkbox to disable an STP tree.</p> <p>Note: You must also activate <b>Multiple Rapid Spanning Tree</b> in the <b>Advanced Application &gt; Spanning Tree Protocol &gt; Configuration</b> screen to enable MRSTP on the Switch.</p>                                                                                                                                                                                                                                                                 |
| Bridge Priority | <p>Bridge priority is used in determining the root switch, root port and designated port. The switch with the highest priority (lowest numeric value) becomes the STP root switch. If all switches have the same priority, the switch with the lowest MAC address will then become the root switch. Select a value from the drop-down list box.</p> <p>The lower the numeric value you assign, the higher the priority for this bridge.</p> <p>Bridge Priority determines the root bridge, which in turn determines Hello Time, Max Age and Forwarding Delay.</p> |
| Hello Time      | This is the time interval in seconds between BPDU (Bridge Protocol Data Units) configuration message generations by the root switch. The allowed range is 1 to 10 seconds.                                                                                                                                                                                                                                                                                                                                                                                        |
| Max Age         | This is the maximum time (in seconds) a switch can wait without receiving a BPDU before attempting to reconfigure. All switch ports (except for designated ports) should receive BPDUs at regular intervals. Any port that ages out STP information (provided in the last BPDU) becomes the designated port for the attached LAN. If it is a root port, a new root port is selected from among the Switch ports attached to the network. The allowed range is 6 to 40 seconds.                                                                                    |

Table 55 Advanced Application &gt; Spanning Tree Protocol &gt; MRSTP (continued)

| LABEL            | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Forwarding Delay | <p>This is the maximum time (in seconds) a switch will wait before changing states. This delay is required because every switch must receive information about topology changes before it starts to forward frames. In addition, each port needs time to listen for conflicting information that would make it return to a blocking state; otherwise, temporary data loops might result. The allowed range is 4 to 30 seconds.</p> <p>As a general rule:</p> <p>Note: <math>2 * (\text{Forward Delay} - 1) \geq \text{Max Age} \geq 2 * (\text{Hello Time} + 1)</math></p> |
| Port             | This field displays the port number.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| *                | <p>Settings in this row apply to all ports.</p> <p>Use this row only if you want to make some settings the same for all ports. Use this row first to set the common settings and then make adjustments on a port-by-port basis.</p> <p>Note: Changes in this row are copied to all the ports as soon as you make them.</p>                                                                                                                                                                                                                                                 |
| Active           | Select this check box to activate STP on this port.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Edge             | <p>Select this check box to configure a port as an edge port when it is directly attached to a computer. An edge port changes its initial STP port state from blocking state to forwarding state immediately without going through listening and learning states right after the port is configured as an edge port or when its link status changes.</p> <p>Note: An edge port becomes a non-edge port as soon as it receives a Bridge Protocol Data Unit (BPDU).</p>                                                                                                      |
| Root Guard       | <p>Select this check box to enable root guard on this port in order to prevent the switch(es) attached to the port from becoming the root bridge.</p> <p>With root guard enabled, a port is blocked when the Switch receives a superior BPDU on it. The Switch allows traffic to pass through this port again when the switch connected to the port stops to send superior BPDUs.</p>                                                                                                                                                                                      |
| Priority         | <p>Configure the priority for each port here.</p> <p>Priority decides which port should be disabled when more than one port forms a loop in the Switch. Ports with a higher priority numeric value are disabled first. The allowed range is between 0 and 255 and the default value is 128.</p>                                                                                                                                                                                                                                                                            |
| Path Cost        | Path cost is the cost of transmitting a frame on to a LAN through that port. It is recommended that you assign this value according to the speed of the bridge. The slower the media, the higher the cost - see <a href="#">Table 50 on page 140</a> for more information.                                                                                                                                                                                                                                                                                                 |
| Tree             | Select which STP tree configuration this port should participate in.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Apply            | Click <b>Apply</b> to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the <b>Save</b> link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.                                                                                                                                                                                                                                                                                         |
| Cancel           | Click <b>Cancel</b> to begin configuring this screen afresh.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |

## 13.7 Multiple Rapid Spanning Tree Protocol Status

Click **Advanced Application > Spanning Tree Protocol** in the navigation panel to display the status screen as shown next. See [Section 13.10 on page 157](#) for more information on MRSTP.

Note: This screen is only available after you activate MRSTP on the Switch.



**Figure 107** Advanced Application > Spanning Tree Protocol > Status: MRSTP

Spanning Tree Protocol Status

[Configuration](#)
[RSTP](#)
[MRSTP](#)
[MSTP](#)

Spanning Tree Protocol: MRSTP

Tree 1 ▾

|                           |                  |                  |
|---------------------------|------------------|------------------|
| Bridge                    | Root             | Our Bridge       |
| Bridge ID                 | 8000-1c740def65e | 8000-1c740def65e |
| Hello Time (second)       | 2                | 2                |
| Max Age (second)          | 20               | 20               |
| Forwarding Delay (second) | 15               | 15               |
| Cost to Bridge            | 0                |                  |
| Port ID                   | 0X0000           |                  |
| Topology Changed Times    | 0                |                  |
| Time Since Last Change    | 0:03:25          |                  |

| Port | Port State | Port Role | Designated Bridge ID | Designated Port ID | Designated Cost | Root Guard State |
|------|------------|-----------|----------------------|--------------------|-----------------|------------------|
| 1    | DISCARDING | Disabled  | 0000-000000000000    | 0x0000             | 0               | Forwarding       |
| 2    | DISCARDING | Disabled  | 0000-000000000000    | 0x0000             | 0               | Forwarding       |
| 3    | DISCARDING | Disabled  | 0000-000000000000    | 0x0000             | 0               | Forwarding       |

The following table describes the labels in this screen.

Table 56 Advanced Application &gt; Spanning Tree Protocol &gt; Status: MRSTP

| LABEL                     | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|---------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Configuration             | Click <b>Configuration</b> to specify which STP mode you want to activate. Click <b>MRSTP</b> to edit MRSTP settings on the Switch.                                                                                                                                                                                                                                                                                                                                        |
| Tree                      | Select which STP tree configuration you want to view.                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Bridge                    | <b>Root</b> refers to the base of the spanning tree (the root bridge). <b>Our Bridge</b> is this Switch. This Switch may also be the root bridge.                                                                                                                                                                                                                                                                                                                          |
| Bridge ID                 | This is the unique identifier for this bridge, consisting of bridge priority plus MAC address. This ID is the same for <b>Root</b> and <b>Our Bridge</b> if the Switch is the root switch.                                                                                                                                                                                                                                                                                 |
| Hello Time (second)       | This is the time interval (in seconds) at which the root switch transmits a configuration message. The root bridge determines Hello Time, Max Age and Forwarding Delay.                                                                                                                                                                                                                                                                                                    |
| Max Age (second)          | This is the maximum time (in seconds) a switch can wait without receiving a configuration message before attempting to reconfigure.                                                                                                                                                                                                                                                                                                                                        |
| Forwarding Delay (second) | This is the time (in seconds) the root switch will wait before changing states (that is, listening to learning to forwarding).<br><br>Note: The listening state does not exist in RSTP.                                                                                                                                                                                                                                                                                    |
| Cost to Bridge            | This is the path cost from the root port on this Switch to the root switch.                                                                                                                                                                                                                                                                                                                                                                                                |
| Port ID                   | This is the priority and number of the port on the Switch through which this Switch must communicate with the root of the Spanning Tree.                                                                                                                                                                                                                                                                                                                                   |
| Topology Changed Times    | This is the number of times the spanning tree has been reconfigured.                                                                                                                                                                                                                                                                                                                                                                                                       |
| Time Since Last Change    | This is the time since the spanning tree was last reconfigured.                                                                                                                                                                                                                                                                                                                                                                                                            |
| Port                      | This field displays the number of the port on the Switch.                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Port State                | This field displays the port state in STP. <ul style="list-style-type: none"> <li><b>Discarding</b> - The port does not forward/process received frames or learn MAC addresses, but still listens for BPDUs.</li> <li><b>Learning</b> - The port learns MAC addresses and processes BPDUs, but does not forward frames yet.</li> <li><b>Forwarding</b> - The port is operating normally. It learns MAC addresses, processes BPDUs and forwards received frames.</li> </ul> |

Table 56 Advanced Application &gt; Spanning Tree Protocol &gt; Status: MRSTP (continued)

| LABEL                | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|----------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Port Role            | <p>This field displays the role of the port in STP.</p> <ul style="list-style-type: none"> <li>• <b>Root</b> - A forwarding port on a non-root bridge, which has the lowest path cost and is the best port from the non-root bridge to the root bridge. A root bridge does not have a root port.</li> <li>• <b>Designated</b> - A forwarding port on the designated bridge for each connected LAN segment. A designated bridge has the lowest path cost to the root bridge among the bridges connected to the LAN segment. All the ports on a root bridge (root switch) are designated ports.</li> <li>• <b>Alternate</b> - A blocked port, which has a best alternate path to the root bridge. This path is different from using the root port. The port moves to the forwarding state when the designated port for the LAN segment fails.</li> <li>• <b>Backup</b> - A blocked port, which has a backup/redundant path to a LAN segment where a designated port is already connected when a switch has two links to the same LAN segment.</li> <li>• <b>Disabled</b> - Not strictly part of STP. The port can be disabled manually.</li> </ul> |
| Designated Bridge ID | <p>This field displays the identifier of the designated bridge to which this port belongs when the port is a designated port. Otherwise, it displays the identifier of the designated bridge for the LAN segment to which this port is connected.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Designated Port ID   | <p>This field displays the priority and number of the bridge port (on the designated bridge), through which the designated bridge transmits the stored configuration messages.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Designated Cost      | <p>This field displays the path cost to the LAN segment to which the port is connected when the port is a designated port. Otherwise, it displays the path cost to the root bridge from the designated port for the LAN segment to which this port is connected.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Root Guard State     | <p>This field displays the state of the port on which root guard is enabled.</p> <ul style="list-style-type: none"> <li>• <b>Root</b> - inconsistent - the Switch receives superior BPDUs on the port and blocks the port.</li> <li>• <b>Forwarding</b> - the Switch unblocks and allows the port to forward frames again.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |

## 13.8 Configure Multiple Spanning Tree Protocol

To configure MSTP, click **MSTP** in the **Advanced Application > Spanning Tree Protocol** screen. See [Section on page 141](#) for more information on MSTP.

**Figure 108** Advanced Application > Spanning Tree Protocol > MSTP

Multiple Spanning Tree Protocol

Status Port

Bridge

Active

☐

Hello Time

2

seconds

MAX Age

20

seconds

Forwarding Delay

15

seconds

Maximum hops

20

Configuration Name

1c740dfef65e

Revision Number

0

Apply

Cancel

Instance

Instance

Bridge Priority

32768

▼

VLAN Range

Start

End

Add

Remove

Clear

Enabled VLAN(s)

| Port | Active                   | Priority | Path Cost |
|------|--------------------------|----------|-----------|
| *    | <input type="checkbox"/> |          |           |
| 1    | <input type="checkbox"/> | 128      | 4         |
| 2    | <input type="checkbox"/> | 128      | 4         |
| 3    | <input type="checkbox"/> | 128      | 4         |
| 4    | <input type="checkbox"/> | 128      | 4         |
| 5    | <input type="checkbox"/> | 128      | 4         |
| 6    | <input type="checkbox"/> | 128      | 2         |

Add

Cancel

| Instance | VLAN   | Active Port |
|----------|--------|-------------|
| 0        | 1-4094 | -           |

Delete

Cancel

The following table describes the labels in this screen.

Table 57 Advanced Application &gt; Spanning Tree Protocol &gt; MSTP

| LABEL  | DESCRIPTION                                                                                                                                                                                                                                                                                              |
|--------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Status | Click <b>Status</b> to display the <b>MSTP Status</b> screen (see <a href="#">Figure 110 on page 155</a> ).                                                                                                                                                                                              |
| Active | <p>Select this check box to activate MSTP on the Switch. Clear this checkbox to disable MSTP on the Switch.</p> <p>Note: You must also activate <b>Multiple Spanning Tree</b> in the <b>Advanced Application &gt; Spanning Tree Protocol &gt; Configuration</b> screen to enable MSTP on the Switch.</p> |

Table 57 Advanced Application &gt; Spanning Tree Protocol &gt; MSTP (continued)

| LABEL              | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Hello Time         | This is the time interval in seconds between BPDU (Bridge Protocol Data Units) configuration message generations by the root switch. The allowed range is 1 to 10 seconds.                                                                                                                                                                                                                                                                                                                                                                                                                        |
| MaxAge             | This is the maximum time (in seconds) a switch can wait without receiving a BPDU before attempting to reconfigure. All switch ports (except for designated ports) should receive BPDUs at regular intervals. Any port that ages out STP information (provided in the last BPDU) becomes the designated port for the attached LAN. If it is a root port, a new root port is selected from among the Switch ports attached to the network. The allowed range is 6 to 40 seconds.                                                                                                                    |
| Forwarding Delay   | This is the maximum time (in seconds) a switch will wait before changing states. This delay is required because every switch must receive information about topology changes before it starts to forward frames. In addition, each port needs time to listen for conflicting information that would make it return to a blocking state; otherwise, temporary data loops might result. The allowed range is 4 to 30 seconds. As a general rule:<br><br>Note: $2 * (\text{Forward Delay} - 1) \geq \text{Max Age} \geq 2 * (\text{Hello Time} + 1)$                                                 |
| Maximum hops       | Enter the number of hops (between 1 and 255) in an MSTP region before the BPDU is discarded and the port information is aged.                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Configuration Name | Enter a descriptive name (up to 32 characters) of an MST region.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Revision Number    | Enter a number to identify a region's configuration. Devices must have the same revision number to belong to the same region.                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Apply              | Click <b>Apply</b> to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the <b>Save</b> link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.                                                                                                                                                                                                                                                                                                                |
| Cancel             | Click <b>Cancel</b> to begin configuring this screen afresh.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Instance           | Use this section to configure MSTI (Multiple Spanning Tree Instance) settings.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Instance           | Enter the number you want to use to identify this MST instance on the Switch. The Switch supports instance numbers 0-16.                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Bridge Priority    | Set the priority of the Switch for the specific spanning tree instance. The lower the number, the more likely the Switch will be chosen as the root bridge within the spanning tree instance.<br><br>Enter priority values between 0 and 61440 in increments of 4096 (thus valid values are 4096, 8192, 12288, 16384, 20480, 24576, 28672, 32768, 36864, 40960, 45056, 49152, 53248, 57344 and 61440).                                                                                                                                                                                            |
| VLAN Range         | Enter the start of the VLAN ID range that you want to add or remove from the VLAN range edit area in the <b>Start</b> field. Enter the end of the VLAN ID range that you want to add or remove from the VLAN range edit area in the <b>End</b> field.<br><br>Next click:<br><ul style="list-style-type: none"><li>• <b>Add</b> - to add this range of VLAN(s) to be mapped to the MST instance.</li><li>• <b>Remove</b> - to remove this range of VLAN(s) from being mapped to the MST instance.</li><li>• <b>Clear</b> - to remove all VLAN(s) from being mapped to this MST instance.</li></ul> |
| Enabled VLAN(s)    | This field displays which VLAN(s) are mapped to this MST instance.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Port               | This field displays the port number.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| *                  | Settings in this row apply to all ports.<br><br>Use this row only if you want to make some settings the same for all ports. Use this row first to set the common settings and then make adjustments on a port-by-port basis.<br><br>Note: Changes in this row are copied to all the ports as soon as you make them.                                                                                                                                                                                                                                                                               |
| Active             | Select this check box to add this port to the MST instance.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |

Table 57 Advanced Application &gt; Spanning Tree Protocol &gt; MSTP (continued)

| LABEL       | DESCRIPTION                                                                                                                                                                                                                                                                                                                            |
|-------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Priority    | Configure the priority for each port here.<br><br>Priority decides which port should be disabled when more than one port forms a loop in the Switch. Ports with a higher priority numeric value are disabled first. The allowed range is between 0 and 255 and the default value is 128.                                               |
| Path Cost   | Path cost is the cost of transmitting a frame on to a LAN through that port. It is recommended to assign this value according to the speed of the bridge. The slower the media, the higher the cost - see <a href="#">Table 50 on page 140</a> for more information.                                                                   |
| Add         | Click this to create a new entry or to update an existing one.<br><br>This saves your changes to the Switch's run-time memory. The Switch loses this change if it is turned off or loses power, so use the <b>Save</b> link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel      | Click <b>Cancel</b> to begin configuring this screen afresh.                                                                                                                                                                                                                                                                           |
| Instance    | This field displays the ID of an MST instance.                                                                                                                                                                                                                                                                                         |
| VLAN        | This field displays the VID (or VID ranges) to which the MST instance is mapped.                                                                                                                                                                                                                                                       |
| Active Port | This field display the ports configured to participate in the MST instance.                                                                                                                                                                                                                                                            |
|             | Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries.                                                                                                                                                                                                |
| Delete      | Check the rule(s) that you want to remove and then click the <b>Delete</b> button.                                                                                                                                                                                                                                                     |
| Cancel      | Click <b>Cancel</b> to clear the selected checkbox(es).                                                                                                                                                                                                                                                                                |

### 13.8.1 Multiple Spanning Tree Protocol Port Configuration

To configure MSTP ports, click **Port** in the **Advanced Application > Spanning Tree Protocol > MSTP** screen.

Figure 109 Advanced Application &gt; Spanning Tree Protocol &gt; MSTP &gt; Port

| MSTP Port Configuration |                          |                          |
|-------------------------|--------------------------|--------------------------|
| Port                    | Edge                     | Root Guard               |
| *                       | <input type="checkbox"/> | <input type="checkbox"/> |
| 1                       | <input type="checkbox"/> | <input type="checkbox"/> |
| 2                       | <input type="checkbox"/> | <input type="checkbox"/> |
| 3                       | <input type="checkbox"/> | <input type="checkbox"/> |
| 4                       | <input type="checkbox"/> | <input type="checkbox"/> |
| 5                       | <input type="checkbox"/> | <input type="checkbox"/> |
| 6                       | <input type="checkbox"/> | <input type="checkbox"/> |
| 7                       | <input type="checkbox"/> | <input type="checkbox"/> |
| 8                       | <input type="checkbox"/> | <input type="checkbox"/> |
| 9                       | <input type="checkbox"/> | <input type="checkbox"/> |
| 10                      | <input type="checkbox"/> | <input type="checkbox"/> |
| 11                      | <input type="checkbox"/> | <input type="checkbox"/> |
| 12                      | <input type="checkbox"/> | <input type="checkbox"/> |
| 13                      | <input type="checkbox"/> | <input type="checkbox"/> |
| 14                      | <input type="checkbox"/> | <input type="checkbox"/> |
| 15                      | <input type="checkbox"/> | <input type="checkbox"/> |
| 16                      | <input type="checkbox"/> | <input type="checkbox"/> |

[MSTP](#)

The following table describes the labels in this screen.

Table 58 Advanced Application > Spanning Tree Protocol > MSTP > Port

| LABEL      | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Port       | This field displays the port number.                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| *          | <p>Settings in this row apply to all ports.</p> <p>Use this row only if you want to make some settings the same for all ports. Use this row first to set the common settings and then make adjustments on a port-by-port basis.</p> <p>Note: Changes in this row are copied to all the ports as soon as you make them.</p>                                                                                                                                            |
| Edge       | <p>Select this check box to configure a port as an edge port when it is directly attached to a computer. An edge port changes its initial STP port state from blocking state to forwarding state immediately without going through listening and learning states right after the port is configured as an edge port or when its link status changes.</p> <p>Note: An edge port becomes a non-edge port as soon as it receives a Bridge Protocol Data Unit (BPDU).</p> |
| Root Guard | <p>Select this check box to enable root guard on this port in order to prevent the switch(es) attached to the port from becoming the root bridge.</p> <p>With root guard enabled, a port is blocked when the Switch receives a superior BPDU on it. The Switch allows traffic to pass through this port again when the switch connected to the port stops to send superior BPDUs.</p>                                                                                 |
| Apply      | Click <b>Apply</b> to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the <b>Save</b> link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.                                                                                                                                                                                    |
| Cancel     | Click <b>Cancel</b> to begin configuring this screen afresh.                                                                                                                                                                                                                                                                                                                                                                                                          |

## 13.9 Multiple Spanning Tree Protocol Status

Click **Advanced Application > Spanning Tree Protocol** in the navigation panel to display the status screen as shown next. See [Section on page 141](#) for more information on MSTP.

Note: This screen is only available after you activate MSTP on the Switch.

**Figure 110** Advanced Application > Spanning Tree Protocol > Status: MSTP

Spanning Tree Protocol Status

[Configuration](#)
[RSTP](#)
[MRSTP](#)
[MSTP](#)

Spanning Tree Protocol: MSTP

CST

| Bridge                    | Root                             | Our Bridge        |
|---------------------------|----------------------------------|-------------------|
| Bridge ID                 | 8000-1c740dfef65e                | 8000-1c740dfef65e |
| Hello Time (second)       | 2                                | 2                 |
| Max Age (second)          | 20                               | 20                |
| Forwarding Delay (second) | 15                               | 15                |
| Cost to Bridge            | 0                                | 0                 |
| Port ID                   | 0x0000                           | 0x0000            |
| Configuration Name        | 1c740dfef65e                     |                   |
| Revision Number           | 0                                |                   |
| Configuration Digest      | AC36177F50283CD4B83821D8AB26DE62 |                   |
| Topology Changed Times    | 0                                |                   |
| Time Since Last Change    | 0:02:04                          |                   |

Instance

| Instance | VLAN   |
|----------|--------|
| 0        | 1-4094 |

MSTI 0 ▼

| Bridge        | Regional Root     | Our Bridge        |
|---------------|-------------------|-------------------|
| Bridge ID     | 8000-1c740dfef65e | 8000-1c740dfef65e |
| Internal Cost | 0                 | 0                 |
| Port ID       | 0x0000            | 0x0000            |

| Port | Port State | Port Role | Designated Bridge ID | Designated Port ID | Designated Cost | Root Guard State |
|------|------------|-----------|----------------------|--------------------|-----------------|------------------|
| 1    | DISCARDING | Disabled  | 8000-1c740dfef65e    | 0x8001             | 0               | Forwarding       |
| 2    | DISCARDING | Disabled  | 8000-1c740dfef65e    | 0x8002             | 0               | Forwarding       |

The following table describes the labels in this screen.

Table 59 Advanced Application &gt; Spanning Tree Protocol &gt; Status: MSTP

| LABEL                     | DESCRIPTION                                                                                                                                                                                |
|---------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Configuration             | Click <b>Configuration</b> to specify which STP mode you want to activate. Click <b>MSTP</b> to edit MSTP settings on the Switch.                                                          |
| CST                       | This section describes the Common Spanning Tree settings.                                                                                                                                  |
| Bridge                    | <b>Root</b> refers to the base of the spanning tree (the root bridge). <b>Our Bridge</b> is this Switch. This Switch may also be the root bridge.                                          |
| Bridge ID                 | This is the unique identifier for this bridge, consisting of bridge priority plus MAC address. This ID is the same for <b>Root</b> and <b>Our Bridge</b> if the Switch is the root switch. |
| Hello Time (second)       | This is the time interval (in seconds) at which the root switch transmits a configuration message.                                                                                         |
| Max Age (second)          | This is the maximum time (in seconds) a switch can wait without receiving a configuration message before attempting to reconfigure.                                                        |
| Forwarding Delay (second) | This is the time (in seconds) the root switch will wait before changing states (that is, listening to learning to forwarding).                                                             |
| Cost to Bridge            | This is the path cost from the root port on this Switch to the root switch.                                                                                                                |
| Port ID                   | This is the priority and number of the port on the Switch through which this Switch must communicate with the root of the Spanning Tree.                                                   |

Table 59 Advanced Application &gt; Spanning Tree Protocol &gt; Status: MSTP (continued)

| LABEL                  | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Configuration Name     | This field displays the configuration name for this MST region.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Revision Number        | This field displays the revision number for this MST region.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Configuration Digest   | A configuration digest is generated from the VLAN-MSTI mapping information.<br><br>This field displays the 16-octet signature that is included in an MSTP BPDU. This field displays the digest when MSTP is activated on the system.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Topology Changed Times | This is the number of times the spanning tree has been reconfigured.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Time Since Last Change | This is the time since the spanning tree was last reconfigured.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Instance:              | These fields display the MSTI to VLAN mapping. In other words, which VLANs run on each spanning tree instance.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Instance               | This field displays the MSTI ID.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| VLAN                   | This field displays which VLANs are mapped to an MSTI.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| MSTI                   | Select the MST instance settings you want to view.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Bridge                 | <b>Root</b> refers to the base of the MST instance. <b>Our Bridge</b> is this Switch. This Switch may also be the root bridge.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Bridge ID              | This is the unique identifier for this bridge, consisting of bridge priority plus MAC address. This ID is the same for <b>Root</b> and <b>Our Bridge</b> if the Switch is the root switch.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Internal Cost          | This is the path cost from the root port in this MST instance to the regional root switch.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Port ID                | This is the priority and number of the port on the Switch through which this Switch must communicate with the root of the MST instance.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Port                   | This field displays the number of the port on the Switch.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Port State             | This field displays the port state in STP. <ul style="list-style-type: none"> <li>• <b>Discarding</b> - The port does not forward/process received frames or learn MAC addresses, but still listens for BPDUs.</li> <li>• <b>Learning</b> - The port learns MAC addresses and processes BPDUs, but does not forward frames yet.</li> <li>• <b>Forwarding</b> - The port is operating normally. It learns MAC addresses, processes BPDUs and forwards received frames.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Port Role              | This field displays the role of the port in STP. <ul style="list-style-type: none"> <li>• <b>Root</b> - A forwarding port on a non-root bridge, which has the lowest path cost and is the best port from the non-root bridge to the root bridge. A root bridge does not have a root port.</li> <li>• <b>Designated</b> - A forwarding port on the designated bridge for each connected LAN segment. A designated bridge has the lowest path cost to the root bridge among the bridges connected to the LAN segment. All the ports on a root bridge (root switch) are designated ports.</li> <li>• <b>Alternate</b> - A blocked port, which has a best alternate path to the root bridge. This path is different from using the root port. The port moves to the forwarding state when the designated port for the LAN segment fails.</li> <li>• <b>Backup</b> - A blocked port, which has a backup/redundant path to a LAN segment where a designated port is already connected when a switch has two links to the same LAN segment.</li> <li>• <b>Disabled</b> - Not strictly part of STP. The port can be disabled manually.</li> </ul> |
| Designated Bridge ID   | This field displays the identifier of the designated bridge to which this port belongs when the port is a designated port. Otherwise, it displays the identifier of the designated bridge for the LAN segment to which this port is connected.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Designated Port ID     | This field displays the priority and number of the bridge port (on the designated bridge), through which the designated bridge transmits the stored configuration messages.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |



Table 59 Advanced Application &gt; Spanning Tree Protocol &gt; Status: MSTP (continued)

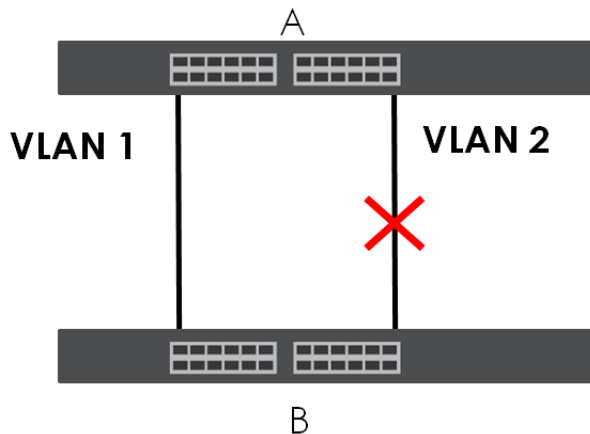
| LABEL            | DESCRIPTION                                                                                                                                                                                                                                                                                                                    |
|------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Designated Cost  | This field displays the path cost to the LAN segment to which the port is connected when the port is a designated port. Otherwise, it displays the path cost to the root bridge from the designated port for the LAN segment to which this port is connected.                                                                  |
| Root Guard State | This field displays the state of the port on which root guard is enabled. <ul style="list-style-type: none"> <li>• <b>Root</b> - inconsistent - the Switch receives superior BPDUs on the port and blocks the port.</li> <li>• <b>Forwarding</b> - the Switch unblocks and allows the port to forward frames again.</li> </ul> |

## 13.10 Technical Reference

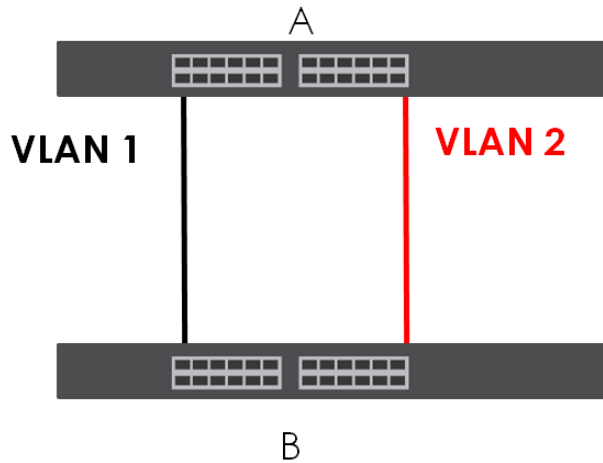
### 13.10.1 MSTP Network Example

The following figure shows a network example where two VLANs are configured on the two switches. If the switches are using STP or RSTP, the link for VLAN 2 will be blocked as STP and RSTP allow only one link in the network and block the redundant link.

Figure 111 STP/RSTP Network Example



With MSTP, VLANs 1 and 2 are mapped to different spanning trees in the network. Thus traffic from the two VLANs travel on different paths. The following figure shows the network example using MSTP.

**Figure 112** MSTP Network Example

### 13.10.2 MST Region

An MST region is a logical grouping of multiple network devices that appears as a single device to the rest of the network. Each MSTP-enabled device can only belong to one MST region. When BPDUs enter an MST region, external path cost (of paths outside this region) is increased by one. Internal path cost (of paths within this region) is increased by one when BPDUs traverse the region.

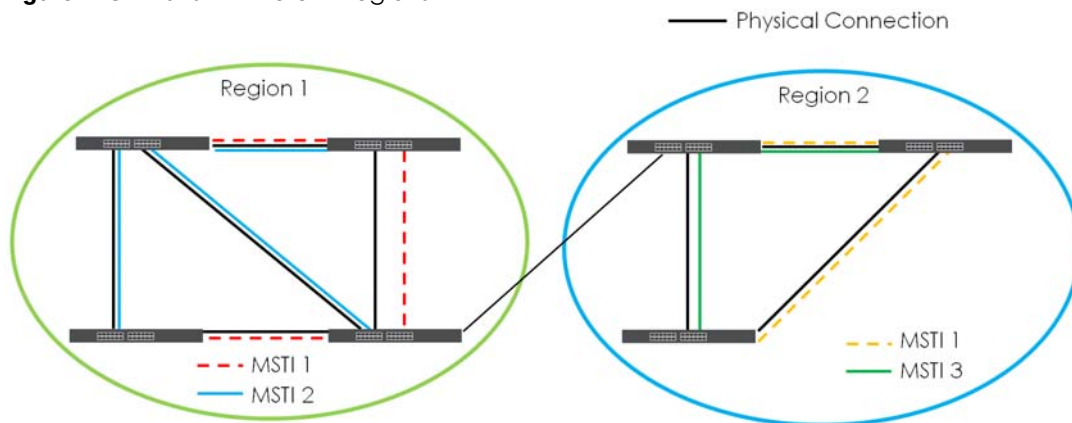
Devices that belong to the same MST region are configured to have the same MSTP configuration identification settings. These include the following parameters:

- Name of the MST region
- Revision level as the unique number for the MST region
- VLAN-to-MST Instance mapping

### 13.10.3 MST Instance

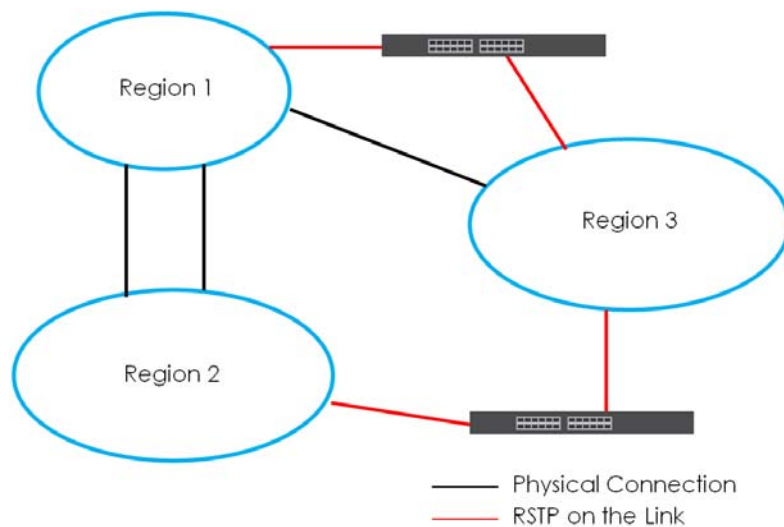
An MST Instance (MSTI) is a spanning tree instance. VLANs can be configured to run on a specific MSTI. Each created MSTI is identified by a unique number (known as an MST ID) known internally to a region. Thus an MSTI does not span across MST regions.

The following figure shows an example where there are two MST regions. Regions 1 and 2 have 2 spanning tree instances.

**Figure 113** MSTIs in Different Regions

### 13.10.4 Common and Internal Spanning Tree (CIST)

A CIST represents the connectivity of the entire network and it is equivalent to a spanning tree in an STP/RSTP. The CIST is the default MST instance (MSTID 0). Any VLANs that are not members of an MST instance are members of the CIST. In an MSTP-enabled network, there is only one CIST that runs between MST regions and single spanning tree devices. A network may contain multiple MST regions and other network segments running RSTP.

**Figure 114** MSTP and Legacy RSTP Network Example

# CHAPTER 14

## Bandwidth Control

This chapter shows you how to cap the maximum bandwidth using the **Bandwidth Control** screen.

### 14.1 Bandwidth Control Overview

Bandwidth control means defining a maximum allowable bandwidth for incoming and/or out-going traffic flows on a port.

#### 14.1.1 CIR and PIR

The Committed Information Rate (CIR) is the guaranteed bandwidth for the incoming traffic flow on a port. The Peak Information Rate (PIR) is the maximum bandwidth allowed for the incoming traffic flow on a port when there is no network congestion.

The CIR and PIR should be set for all ports that use the same uplink bandwidth. If the CIR is reached, packets are sent at the rate up to the PIR. When network congestion occurs, packets through the ingress port exceeding the CIR will be marked for drop.

Note: The CIR should be less than the PIR.

Note: The sum of CIRs cannot be greater than or equal to the uplink bandwidth.

### 14.2 Bandwidth Control Setup

Click **Advanced Application > Bandwidth Control** in the navigation panel to bring up the screen as shown next.

**Figure 115** Advanced Application > Bandwidth Control

| Port | Active                   | Commit Rate               | Ingress Rate Active      | Peak Rate                 | Active                   | Egress Rate               |
|------|--------------------------|---------------------------|--------------------------|---------------------------|--------------------------|---------------------------|
| *    | <input type="checkbox"/> | <input type="text"/> kbps | <input type="checkbox"/> | <input type="text"/> kbps | <input type="checkbox"/> | <input type="text"/> kbps |
| 1    | <input type="checkbox"/> | <input type="text"/> kbps | <input type="checkbox"/> | <input type="text"/> kbps | <input type="checkbox"/> | <input type="text"/> kbps |
| 2    | <input type="checkbox"/> | <input type="text"/> kbps | <input type="checkbox"/> | <input type="text"/> kbps | <input type="checkbox"/> | <input type="text"/> kbps |
| 3    | <input type="checkbox"/> | <input type="text"/> kbps | <input type="checkbox"/> | <input type="text"/> kbps | <input type="checkbox"/> | <input type="text"/> kbps |
| 4    | <input type="checkbox"/> | <input type="text"/> kbps | <input type="checkbox"/> | <input type="text"/> kbps | <input type="checkbox"/> | <input type="text"/> kbps |
| 5    | <input type="checkbox"/> | <input type="text"/> kbps | <input type="checkbox"/> | <input type="text"/> kbps | <input type="checkbox"/> | <input type="text"/> kbps |
| 6    | <input type="checkbox"/> | <input type="text"/> kbps | <input type="checkbox"/> | <input type="text"/> kbps | <input type="checkbox"/> | <input type="text"/> kbps |
| 7    | <input type="checkbox"/> | <input type="text"/> kbps | <input type="checkbox"/> | <input type="text"/> kbps | <input type="checkbox"/> | <input type="text"/> kbps |
| 8    | <input type="checkbox"/> | <input type="text"/> kbps | <input type="checkbox"/> | <input type="text"/> kbps | <input type="checkbox"/> | <input type="text"/> kbps |
| 9    | <input type="checkbox"/> | <input type="text"/> kbps | <input type="checkbox"/> | <input type="text"/> kbps | <input type="checkbox"/> | <input type="text"/> kbps |
| 10   | <input type="checkbox"/> | <input type="text"/> kbps | <input type="checkbox"/> | <input type="text"/> kbps | <input type="checkbox"/> | <input type="text"/> kbps |

The following table describes the related labels in this screen.

Table 60 Advanced Application &gt; Bandwidth Control

| LABEL        | DESCRIPTION                                                                                                                                                                                                                                                                                                                |
|--------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Active       | Select this check box to enable bandwidth control on the Switch.                                                                                                                                                                                                                                                           |
| Port         | This field displays the port number.                                                                                                                                                                                                                                                                                       |
| *            | <p>Settings in this row apply to all ports.</p> <p>Use this row only if you want to make some settings the same for all ports. Use this row first to set the common settings and then make adjustments on a port-by-port basis.</p> <p>Note: Changes in this row are copied to all the ports as soon as you make them.</p> |
| Ingress Rate |                                                                                                                                                                                                                                                                                                                            |
| Active       | Select this check box to activate commit rate limits on this port.                                                                                                                                                                                                                                                         |
| Commit Rate  | Specify the guaranteed bandwidth allowed in kilobits per second (Kbps) for the incoming traffic flow on a port. The commit rate should be less than the peak rate. The sum of commit rates cannot be greater than or equal to the uplink bandwidth.                                                                        |
| Active       | Select this check box to activate peak rate limits on this port.                                                                                                                                                                                                                                                           |
| Peak Rate    | Specify the maximum bandwidth allowed in kilobits per second (Kbps) for the incoming traffic flow on a port.                                                                                                                                                                                                               |
| Active       | Select this check box to activate egress rate limits on this port.                                                                                                                                                                                                                                                         |
| Egress Rate  | Specify the maximum bandwidth allowed in kilobits per second (Kbps) for the out-going traffic flow on a port.                                                                                                                                                                                                              |
| Apply        | Click <b>Apply</b> to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the <b>Save</b> link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.                                         |
| Cancel       | Click <b>Cancel</b> to begin configuring this screen afresh.                                                                                                                                                                                                                                                               |

# CHAPTER 15

## Broadcast Storm Control

This chapter introduces and shows you how to configure the broadcast storm control feature.

### 15.1 Broadcast Storm Control Setup

Broadcast storm control limits the number of broadcast, multicast and destination lookup failure (DLF) packets the Switch receives per second on the ports. When the maximum number of allowable broadcast, multicast and/or DLF packets is reached per second, the subsequent packets are discarded. Enable this feature to reduce broadcast, multicast and/or DLF packets in your network. You can specify limits for each packet type on each port.

Click **Advanced Application > Broadcast Storm Control** in the navigation panel to display the screen as shown next.

**Figure 116** Advanced Application > Broadcast Storm Control

| Port | Broadcast (pkt/s)          | Multicast (pkt/s)          | DLF (pkt/s)                |
|------|----------------------------|----------------------------|----------------------------|
| *    | <input type="checkbox"/>   | <input type="checkbox"/>   | <input type="checkbox"/>   |
| 1    | <input type="checkbox"/> 0 | <input type="checkbox"/> 0 | <input type="checkbox"/> 0 |
| 2    | <input type="checkbox"/> 0 | <input type="checkbox"/> 0 | <input type="checkbox"/> 0 |
| 3    | <input type="checkbox"/> 0 | <input type="checkbox"/> 0 | <input type="checkbox"/> 0 |
| 4    | <input type="checkbox"/> 0 | <input type="checkbox"/> 0 | <input type="checkbox"/> 0 |
| 5    | <input type="checkbox"/> 0 | <input type="checkbox"/> 0 | <input type="checkbox"/> 0 |
| 6    | <input type="checkbox"/> 0 | <input type="checkbox"/> 0 | <input type="checkbox"/> 0 |
| 7    | <input type="checkbox"/> 0 | <input type="checkbox"/> 0 | <input type="checkbox"/> 0 |
| 8    | <input type="checkbox"/> 0 | <input type="checkbox"/> 0 | <input type="checkbox"/> 0 |
| 9    | <input type="checkbox"/> 0 | <input type="checkbox"/> 0 | <input type="checkbox"/> 0 |
| 10   | <input type="checkbox"/> 0 | <input type="checkbox"/> 0 | <input type="checkbox"/> 0 |
| 11   | <input type="checkbox"/> 0 | <input type="checkbox"/> 0 | <input type="checkbox"/> 0 |
| 12   | <input type="checkbox"/> 0 | <input type="checkbox"/> 0 | <input type="checkbox"/> 0 |
| 13   | <input type="checkbox"/> 0 | <input type="checkbox"/> 0 | <input type="checkbox"/> 0 |
| 14   | <input type="checkbox"/> 0 | <input type="checkbox"/> 0 | <input type="checkbox"/> 0 |
| 15   | <input type="checkbox"/> 0 | <input type="checkbox"/> 0 | <input type="checkbox"/> 0 |

Apply Cancel

The following table describes the labels in this screen.

Table 61 Advanced Application > Broadcast Storm Control

| LABEL             | DESCRIPTION                                                                                                                                                                                                                                                                                                                |
|-------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Active            | Select this check box to enable traffic storm control on the Switch. Clear this check box to disable this feature.                                                                                                                                                                                                         |
| Port              | This field displays the port number.                                                                                                                                                                                                                                                                                       |
| *                 | <p>Settings in this row apply to all ports.</p> <p>Use this row only if you want to make some settings the same for all ports. Use this row first to set the common settings and then make adjustments on a port-by-port basis.</p> <p>Note: Changes in this row are copied to all the ports as soon as you make them.</p> |
| Broadcast (pkt/s) | <p>Select this option to enable and specify how many broadcast packets the Switch accepts per second on the port.</p> <p>The Switch will generate a trap and/or log when the actual rate is higher than the specified threshold.</p>                                                                                       |
| Multicast (pkt/s) | <p>Select this option to enable and specify how many multicast packets the Switch accepts per second on the port.</p> <p>The Switch will generate a trap and/or log when the actual rate is higher than the specified threshold.</p>                                                                                       |
| DLF (pkt/s)       | Select this option to enable and specify how many destination lookup failure (DLF) packets the Switch accepts per second on the port.                                                                                                                                                                                      |
| Apply             | Click <b>Apply</b> to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the <b>Save</b> link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.                                         |
| Cancel            | Click <b>Cancel</b> to begin configuring this screen afresh.                                                                                                                                                                                                                                                               |

# CHAPTER 16

## Mirroring

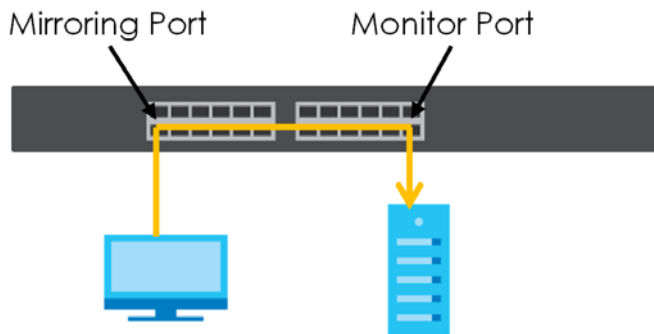
This chapter discusses port mirroring setup screens.

### 16.1 Port Mirroring

Port mirroring allows you to copy a traffic flow to a monitor port (the port you copy the traffic to) in order that you can examine the traffic from the monitor port without interference.

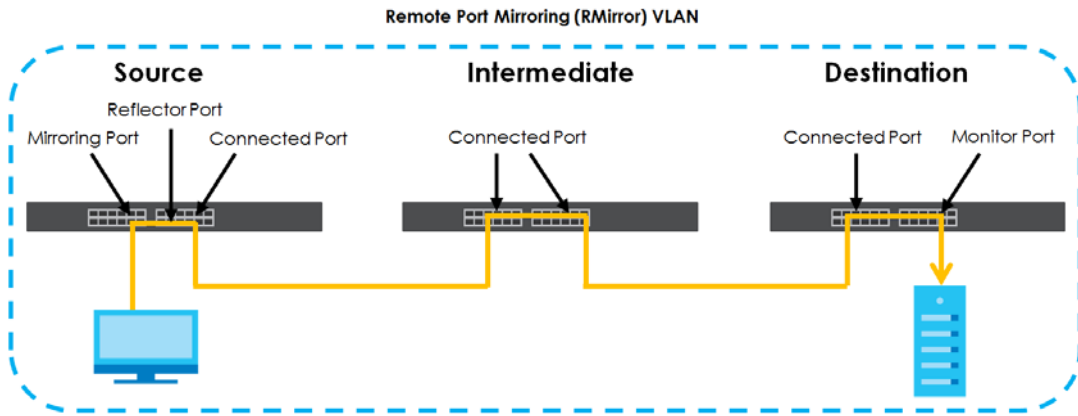
The Switch supports both local port mirroring and remote port mirroring.

In local port mirroring, the mirroring ports (through which traffic you copy passes) and the monitor port are on the same device.



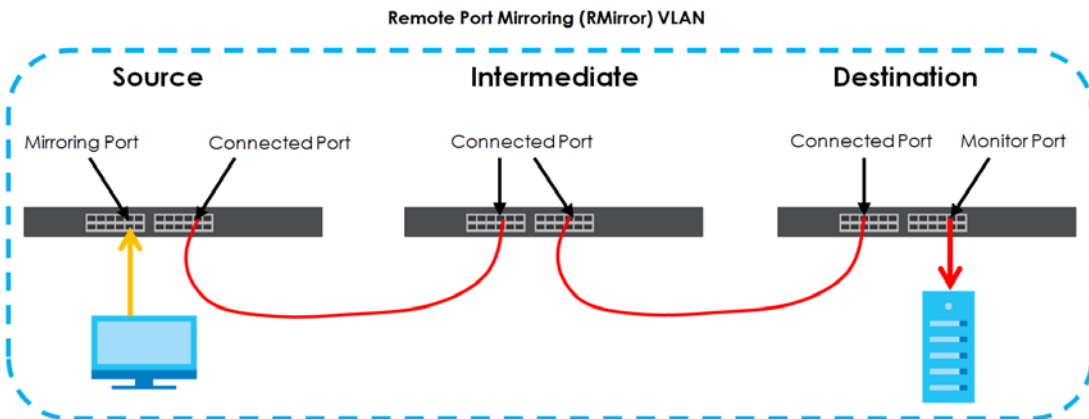
In remote port mirroring (RMirror), the mirroring ports and monitor port can be on different devices in a network. You can use it to monitor multiple switches across your network. The traffic from the source device's mirroring port(s) is sent to a reflector port for VLAN tagging and copied to the connected port(s). Traffic are then carried over the specified remote port mirroring (RMirror) VLAN and sent to the destination device's monitor port through the connected ports that connect to other switches.





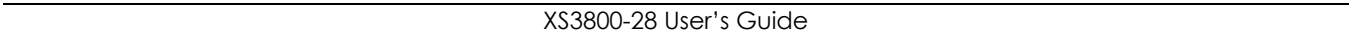
## Single-Destination RMirror

If the mirrored traffic is forwarded to one single destination switch, you can disable the reflector port. The Switch adds RMirror VLAN tag and forwards mirrored traffic from the mirroring port to the connected port directly.



## Multi-Destination RMirror

If you configure more than one connected port on the source switch to forward the mirrored traffic to multiple destination switches, you must enable a reflector port on the source switch.



The following table shows the rule for a port in remote port mirroring. For example, a port on the source device can be a mirroring port in both RMirror VLAN 1 and RMirror VLAN 2. But when the port is the

The following table shows the rule for a port in remote port mirroring. For example, a port on the source device can be a mirroring port in both RMirror VLAN 1 and RMirror VLAN 2. But when the port is the

source device's mirroring port in RMirror VLAN 1, it cannot be the reflector port or monitor port in another RMirror VLAN.

Table 62 Port Rules between Different Remote Port Mirroring VLANs

|                |                                                     | RMIRROR VLAN 1        |                       |                |                                                     |                          |
|----------------|-----------------------------------------------------|-----------------------|-----------------------|----------------|-----------------------------------------------------|--------------------------|
|                |                                                     | SOURCE MIRRORING PORT | SOURCE REFLECTOR PORT | CONNECTED PORT | SOURCE CONNECTED PORT IN SINGLE-DESTINATION RMIRROR | DESTINATION MONITOR PORT |
| RMIRROR VLAN 2 | SOURCE MIRRORING PORT                               | Y                     | N                     | Y              | N                                                   | N                        |
|                | SOURCE REFLECTOR PORT                               | N                     | N                     | N              | N                                                   | N                        |
|                | CONNECTED PORT                                      | Y                     | N                     | Y              | Y                                                   | N                        |
|                | SOURCE CONNECTED PORT IN SINGLE-DESTINATION RMIRROR | N                     | N                     | Y              | N                                                   | N                        |
|                | DESTINATION MONITOR PORT                            | N                     | N                     | N              | N                                                   | N                        |

The following table shows the rule for a port used in both local port mirroring and remote port mirroring. For example, the RMirror mirroring port on the source device can also be used as the mirroring port in local port mirroring. But it cannot be the monitor port in local port mirroring.

Table 63 Port Rules between Remote and Local Port Mirroring

|                      |                | RMIRROR               |                       |                |                                                     |                          |
|----------------------|----------------|-----------------------|-----------------------|----------------|-----------------------------------------------------|--------------------------|
|                      |                | SOURCE MIRRORING PORT | SOURCE REFLECTOR PORT | CONNECTED PORT | SOURCE CONNECTED PORT IN SINGLE-DESTINATION RMIRROR | DESTINATION MONITOR PORT |
| LOCAL PORT MIRRORING | MIRRORING PORT | Y                     | N                     | Y              | N                                                   | N                        |
|                      | MONITOR PORT   | N                     | N                     | N              | N                                                   | N                        |

### 16.1.1 Local Port Mirroring

Click **Advanced Application > Mirroring** in the navigation panel to display the **Mirroring** screen. Use this screen to select a monitor port and specify the traffic flow to be copied to the monitor port.

**Figure 117** Advanced Application > Mirroring

| Port | Mirrored                 | Direction |
|------|--------------------------|-----------|
| *    | <input type="checkbox"/> | Ingress ▼ |
| 1    | <input type="checkbox"/> | Ingress ▼ |
| 2    | <input type="checkbox"/> | Ingress ▼ |
| 3    | <input type="checkbox"/> | Ingress ▼ |
| 4    | <input type="checkbox"/> | Ingress ▼ |
| 5    | <input type="checkbox"/> | Ingress ▼ |
| 6    | <input type="checkbox"/> | Ingress ▼ |
| 7    | <input type="checkbox"/> | Ingress ▼ |
| 8    | <input type="checkbox"/> | Ingress ▼ |
| 9    | <input type="checkbox"/> | Ingress ▼ |
| 10   | <input type="checkbox"/> | Ingress ▼ |
| 11   | <input type="checkbox"/> | Ingress ▼ |
| 12   | <input type="checkbox"/> | Ingress ▼ |

The following table describes the labels in this screen.

Table 64 Advanced Application > Mirroring

| LABEL        | DESCRIPTION                                                                                                                                                                                                                                                                                                         |
|--------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Active       | Select this check box to activate port mirroring on the Switch. Clear this check box to disable the feature.                                                                                                                                                                                                        |
| Monitor Port | The monitor port is the port you copy the traffic to in order to examine it in more detail without interfering with the traffic flow on the original port(s). Type the port number of the monitor port.                                                                                                             |
| Port         | This field displays the port number.                                                                                                                                                                                                                                                                                |
| *            | Settings in this row apply to all ports.<br><br>Use this row only if you want to make some settings the same for all ports. Use this row first to set the common settings and then make adjustments on a port-by-port basis.<br><br>Note: Changes in this row are copied to all the ports as soon as you make them. |
| Mirrored     | Select this option to mirror the traffic on a port.                                                                                                                                                                                                                                                                 |
| Direction    | Specify the direction of the traffic to mirror by selecting from the drop-down list box. Choices are <b>Egress</b> (outgoing), <b>Ingress</b> (incoming) and <b>Both</b> .                                                                                                                                          |
| Apply        | Click <b>Apply</b> to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the <b>Save</b> link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.                                  |
| Cancel       | Click <b>Cancel</b> to begin configuring this screen afresh.                                                                                                                                                                                                                                                        |

## 16.1.2 Remote Port Mirroring

Use this screen to create a remote port mirroring (RMirror) VLAN through which the mirrored traffic is forwarded.

Click the **RMirror** link in the **Advanced Application > Mirroring** screen. The following screen opens.

**Figure 118** Advanced Application > Mirroring > RMirror

The following table describes the labels in this screen.

**Table 65** Advanced Application > Mirroring > RMirror

| LABEL           | DESCRIPTION                                                                                                                                                                                                                                                                       |
|-----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Active          | Select the option to enable the VLAN.                                                                                                                                                                                                                                             |
| RMirror VLAN ID | Specify the ID number of remote port mirroring (RMirror) VLAN.                                                                                                                                                                                                                    |
| Apply           | Click <b>Apply</b> to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the <b>Save</b> link on the top navigation panel to save your changes to the nonvolatile memory when you are done configuring. |
| Cancel          | Click <b>Cancel</b> to begin configuring this screen afresh.                                                                                                                                                                                                                      |
| VLAN            | This field displays the ID number of the RMirror VLAN. Click on the VLAN ID number to change the settings.                                                                                                                                                                        |
| Active          | This field displays whether the VLAN is enabled or not.                                                                                                                                                                                                                           |
|                 | Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries.                                                                                                                                           |
| Delete          | Check the rule(s) that you want to remove and then click the <b>Delete</b> button.                                                                                                                                                                                                |
| Cancel          | Click <b>Cancel</b> to clear the selected checkbox(es).                                                                                                                                                                                                                           |

### 16.1.3 Source

Use this screen to configure the reflector port and specify the traffic flow to be copied to the monitor port when the Switch is the source device in remote port mirroring.

Click the **Source** link in the **RMirror** screen. The following screen opens.

**Figure 119** Advanced Application > Mirroring > RMirror > Source

**Source** [RMirror](#)

RMirror VLAN ID ▼

Priority 0 ▼

Reflector Port Active ☐  
Port

| Port | Mirrored                 | Direction |
|------|--------------------------|-----------|
| *    | <input type="checkbox"/> | Both ▼    |
| 1    | <input type="checkbox"/> | Both ▼    |
| 2    | <input type="checkbox"/> | Both ▼    |
| 3    | <input type="checkbox"/> | Both ▼    |
| 4    | <input type="checkbox"/> | Both ▼    |
| 5    | <input type="checkbox"/> | Both ▼    |
| 6    | <input type="checkbox"/> | Both ▼    |
| 7    | <input type="checkbox"/> | Both ▼    |
| 8    | <input type="checkbox"/> | Both ▼    |
| 9    | <input type="checkbox"/> | Both ▼    |
| 10   | <input type="checkbox"/> | Both ▼    |
| 11   | <input type="checkbox"/> | Both ▼    |

Apply Cancel

VLAN
Priority
Ingress
Mirror Port  
Egress
Both
Reflector Port  
Active
Port

The following table describes the labels in this screen.

Table 66 Advanced Application &gt; Mirroring &gt; RMirror &gt; Source

| LABEL           | DESCRIPTION                                                                                                                                                                                                                                                                                                         |
|-----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| RMirror VLAN ID | Select the RMirror VLAN over which the mirrored traffic is forwarded.                                                                                                                                                                                                                                               |
| Priority        | Enter the priority of the mirrored traffic.                                                                                                                                                                                                                                                                         |
| Reflector Port  | Select the check box to enable the specified reflector port.<br><br>Enter the number of reflector port that adds the RMirror VLAN tag to all mirrored traffic and forwards traffic to the connected port(s) in the same RMirror VLAN.                                                                               |
| Port            | This field displays the port number.                                                                                                                                                                                                                                                                                |
| *               | Settings in this row apply to all ports.<br><br>Use this row only if you want to make some settings the same for all ports. Use this row first to set the common settings and then make adjustments on a port-by-port basis.<br><br>Note: Changes in this row are copied to all the ports as soon as you make them. |
| Mirrored        | Select this option to mirror the traffic on a port.                                                                                                                                                                                                                                                                 |
| Direction       | Specify the direction of the traffic to mirror by selecting from the drop-down list box. Choices are <b>Egress</b> (outgoing), <b>Ingress</b> (incoming) and <b>Both</b> .                                                                                                                                          |
| Apply           | Click <b>Apply</b> to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the <b>Save</b> link on the top navigation panel to save your changes to the nonvolatile memory when you are done configuring.                                   |

Table 66 Advanced Application &gt; Mirroring &gt; RMirror &gt; Source (continued)

| LABEL          | DESCRIPTION                                                                                                      |
|----------------|------------------------------------------------------------------------------------------------------------------|
| Cancel         | Click <b>Cancel</b> to begin configuring this screen afresh.                                                     |
| VLAN           | This field displays the ID number of RMirror VLAN over which the mirrored traffic is forwarded.                  |
| Priority       | This field displays the priority of the mirrored traffic.                                                        |
| Mirror Port    |                                                                                                                  |
| Ingress        | This field displays the number of port(s) on which the incoming traffic is mirrored.                             |
| Egress         | This field displays the number of port(s) on which the outgoing traffic is mirrored.                             |
| Both           | This field displays the number of port(s) on which the incoming and outgoing traffic is mirrored.                |
| Reflector Port | This field displays whether the reflector port is enabled and the number of reflector port in this RMirror VLAN. |

## 16.1.4 Destination

Use this screen to specify the RMirror VLAN and configure the monitor port when the Switch is the destination device in remote port mirroring.

Click the **Destination** link in the **RMirror** screen. The following screen opens.

Figure 120 Advanced Application &gt; Mirroring &gt; RMirror &gt; Destination

The following table describes the labels in this screen.

Table 67 Advanced Application &gt; Mirroring &gt; RMirror &gt; Destination

| LABEL           | DESCRIPTION                                                                                                                                                                                                                                                                       |
|-----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| RMirror VLAN ID | Select the RMirror VLAN over which the mirrored traffic is forwarded.                                                                                                                                                                                                             |
| Monitor Port    | Specify the port to which you copy the traffic in order to examine it in more detail without interfering with the traffic flow on the original port(s).                                                                                                                           |
| Tagging         | Select whether to add the RMirror VLAN tag to mirrored traffic on the monitor port.                                                                                                                                                                                               |
| Apply           | Click <b>Apply</b> to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the <b>Save</b> link on the top navigation panel to save your changes to the nonvolatile memory when you are done configuring. |
| Cancel          | Click <b>Cancel</b> to begin configuring this screen afresh.                                                                                                                                                                                                                      |
| VLAN            | This field displays the ID number of RMirror VLAN over which the mirrored traffic is forwarded.                                                                                                                                                                                   |
| Monitor Port    | This field displays the number of port that receives the mirrored traffic from the source device for analysis.                                                                                                                                                                    |
| Tagging         | This field displays whether the mirrored traffic is tagged with the RMirror VLAN ID.                                                                                                                                                                                              |

Table 67 Advanced Application &gt; Mirroring &gt; RMirror &gt; Destination (continued)

| LABEL  | DESCRIPTION                                                                                                    |
|--------|----------------------------------------------------------------------------------------------------------------|
| Delete | Check the rule(s) that you want to remove in the <b>Delete</b> column and then click the <b>Delete</b> button. |
| Cancel | Click <b>Cancel</b> to begin configuring this screen afresh.                                                   |

## 16.1.5 Connected Port

Use this screen to select the RMirror VLAN and specify the port(s) that helps forward mirrored traffic to other connected switches and/or receive mirrored traffic from other connected port in the same RMirror VLAN.

Click the **Connected Port** link in the **RMirror** screen. The following screen opens.

Figure 121 Advanced Application &gt; Mirroring &gt; RMirror &gt; Connected Port

| Port | Connected Port           |
|------|--------------------------|
| *    | <input type="checkbox"/> |
| 1    | <input type="checkbox"/> |
| 2    | <input type="checkbox"/> |
| 3    | <input type="checkbox"/> |
| 4    | <input type="checkbox"/> |
| 5    | <input type="checkbox"/> |
| 6    | <input type="checkbox"/> |
| 7    | <input type="checkbox"/> |
| 8    | <input type="checkbox"/> |
| 9    | <input type="checkbox"/> |
| 10   | <input type="checkbox"/> |
| 11   | <input type="checkbox"/> |
| 12   | <input type="checkbox"/> |

The following table describes the labels in this screen.

Table 68 Advanced Application &gt; Mirroring &gt; RMirror &gt; Connected Port

| LABEL           | DESCRIPTION                                                                                                                                                                                                                                                                                                                |
|-----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| RMirror VLAN ID | Select the RMirror VLAN over which the mirrored traffic is forwarded.                                                                                                                                                                                                                                                      |
| Port            | This field displays the port number.                                                                                                                                                                                                                                                                                       |
| *               | <p>Settings in this row apply to all ports.</p> <p>Use this row only if you want to make some settings the same for all ports. Use this row first to set the common settings and then make adjustments on a port-by-port basis.</p> <p>Note: Changes in this row are copied to all the ports as soon as you make them.</p> |



Table 68 Advanced Application &gt; Mirroring &gt; RMirror &gt; Connected Port (continued)

| LABEL          | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Connected Port | <p>When the Switch is a source device in remote port mirroring, select this option to have the port help forward mirrored traffic to the connected port of the intermediate or destination device in the same RMirror VLAN.</p> <p>When the Switch is an intermediate device in remote port mirroring, select this option to have the port receive mirrored traffic from the connected source or another intermediate device or forward mirrored traffic to the connected destination or another intermediate device in the same RMirror VLAN.</p> <p>When the Switch is a destination device in remote port mirroring, select this option to have the port receive mirrored traffic from the connected source or intermediate device in the same RMirror VLAN.</p> |
| Apply          | Click <b>Apply</b> to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the <b>Save</b> link on the top navigation panel to save your changes to the nonvolatile memory when you are done configuring.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Cancel         | Click <b>Cancel</b> to begin configuring this screen afresh.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| VLAN           | This field displays the ID number of port mirroring VLAN over which the mirrored traffic is forwarded.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Connected Port | This field displays the number of port(s) that helps forward mirrored traffic to other connected switches.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |

# CHAPTER 17

## Link Aggregation

This chapter shows you how to logically aggregate physical links to form one logical, higher-bandwidth link.

### 17.1 Link Aggregation Overview

Link aggregation (trunking) is the grouping of physical ports into one logical higher-capacity link. You may want to trunk ports if for example, it is cheaper to use multiple lower-speed links than to under-utilize a high-speed, but more costly, single-port link.

However, the more ports you aggregate then the fewer available ports you have. A trunk group is one logical link containing multiple ports.

The beginning port of each trunk group must be physically connected to form a trunk group.

The Switch supports both static and dynamic link aggregation.

**Note:** In a properly planned network, it is recommended to implement static link aggregation only. This ensures increased network stability and control over the trunk groups on your Switch.

See [Section 17.6 on page 180](#) for a static port trunking example.

### 17.2 Dynamic Link Aggregation

The Switch adheres to the IEEE 802.3ad standard for static and dynamic (LACP) port trunking.

The Switch supports the link aggregation IEEE802.3ad standard. This standard describes the Link Aggregation Control Protocol (LACP), which is a protocol that dynamically creates and manages trunk groups.

When you enable LACP link aggregation on a port, the port can automatically negotiate with the ports at the remote end of a link to establish trunk groups. LACP also allows port redundancy, that is, if an operational port fails, then one of the “standby” ports become operational without user intervention. Please note that:

- You must connect all ports point-to-point to the same Ethernet switch and configure the ports for LACP trunking.
- LACP only works on full-duplex links.

- All ports in the same trunk group must have the same media type, speed, duplex mode and flow control settings.

Configure trunk groups or LACP before you connect the Ethernet switch to avoid causing network topology loops.

### 17.2.1 Link Aggregation ID

LACP aggregation ID consists of the following information. Port Priority and Port Number are 0 as it is the aggregator ID for the trunk group, not the individual port.

Table 69 Link Aggregation ID: Local Switch

| SYSTEM PRIORITY | MAC ADDRESS       | KEY  | PORT PRIORITY | PORT NUMBER |
|-----------------|-------------------|------|---------------|-------------|
| 0000            | 00-00-00-00-00-00 | 0000 | 00            | 0000        |

Table 70 Link Aggregation ID: Peer Switch

| SYSTEM PRIORITY | MAC ADDRESS       | KEY  | PORT PRIORITY | PORT NUMBER |
|-----------------|-------------------|------|---------------|-------------|
| 0000            | 00-00-00-00-00-00 | 0000 | 00            | 0000        |

## 17.3 Link Aggregation Status

Click **Advanced Application** > **Link Aggregation** in the navigation panel. The **Link Aggregation Status** screen displays by default. See [Section 17.1 on page 174](#) for more information.

Figure 122 Advanced Application > Link Aggregation Status

| Link Aggregation Status |               |                    |               |             | <a href="#">Link Aggregation Setting</a> |
|-------------------------|---------------|--------------------|---------------|-------------|------------------------------------------|
| Group ID                | Enabled Ports | Synchronized Ports | Aggregator ID | Criteria    | Status                                   |
| T1                      | -             | -                  | -             | src-dst-mac | -                                        |
| T2                      | -             | -                  | -             | src-dst-mac | -                                        |
| T3                      | -             | -                  | -             | src-dst-mac | -                                        |
| T4                      | -             | -                  | -             | src-dst-mac | -                                        |
| T5                      | -             | -                  | -             | src-dst-mac | -                                        |
| T6                      | -             | -                  | -             | src-dst-mac | -                                        |
| T7                      | -             | -                  | -             | src-dst-mac | -                                        |
| T8                      | -             | -                  | -             | src-dst-mac | -                                        |
| T9                      | -             | -                  | -             | src-dst-mac | -                                        |
| T10                     | -             | -                  | -             | src-dst-mac | -                                        |
| T11                     | -             | -                  | -             | src-dst-mac | -                                        |
| T12                     | -             | -                  | -             | src-dst-mac | -                                        |
| T13                     | -             | -                  | -             | src-dst-mac | -                                        |
| T14                     | -             | -                  | -             | src-dst-mac | -                                        |
| T15                     | -             | -                  | -             | src-dst-mac | -                                        |

The following table describes the labels in this screen.

Table 71 Advanced Application > Link Aggregation Status

| LABEL              | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Group ID           | This field displays the group ID to identify a trunk group, that is, one logical link containing multiple ports.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Enabled Port       | <p>These are the ports you have configured in the <b>Link Aggregation</b> screen to be in the trunk group.</p> <p>The port number(s) displays only when this trunk group is activated and there is a port belonging to this group.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Synchronized Ports | These are the ports that are currently transmitting data as one logical link in this trunk group.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Aggregator ID      | <p>Link Aggregator ID consists of the following: system priority, MAC address, key, port priority and port number. Refer to <a href="#">Section 17.2.1 on page 175</a> for more information on this field.</p> <p>The ID displays only when there is a port belonging to this trunk group and LACP is also enabled for this group.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Criteria           | <p>This shows the outgoing traffic distribution algorithm used in this trunk group. Packets from the same source and/or to the same destination are sent over the same link within the trunk.</p> <p><b>src-mac</b> means the Switch distributes traffic based on the packet's source MAC address.</p> <p><b>dst-mac</b> means the Switch distributes traffic based on the packet's destination MAC address.</p> <p><b>src-dst-mac</b> means the Switch distributes traffic based on a combination of the packet's source and destination MAC addresses.</p> <p><b>src-ip</b> means the Switch distributes traffic based on the packet's source IP address.</p> <p><b>dst-ip</b> means the Switch distributes traffic based on the packet's destination IP address.</p> <p><b>src-dst-ip</b> means the Switch distributes traffic based on a combination of the packet's source and destination IP addresses.</p> |
| Status             | <p>This field displays how these ports were added to the trunk group. It displays:</p> <ul style="list-style-type: none"> <li>• <b>Static</b> - if the ports are configured as static members of a trunk group.</li> <li>• <b>LACP</b> - if the ports are configured to join a trunk group via LACP.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |

## 17.4 Link Aggregation Setting

Click **Advanced Application > Link Aggregation > Link Aggregation Setting** to display the screen shown next. See [Section 17.1 on page 174](#) for more information on link aggregation.

**Figure 123** Advanced Application > Link Aggregation > Link Aggregation Setting

Link Aggregation Setting

Status LACP

| Group ID | Active                   | Criteria      |
|----------|--------------------------|---------------|
| T1       | <input type="checkbox"/> | src-dst-mac ▼ |
| T2       | <input type="checkbox"/> | src-dst-mac ▼ |
| T3       | <input type="checkbox"/> | src-dst-mac ▼ |
| T4       | <input type="checkbox"/> | src-dst-mac ▼ |
| T5       | <input type="checkbox"/> | src-dst-mac ▼ |
| T6       | <input type="checkbox"/> | src-dst-mac ▼ |
| T7       | <input type="checkbox"/> | src-dst-mac ▼ |
| T8       | <input type="checkbox"/> | src-dst-mac ▼ |
| T9       | <input type="checkbox"/> | src-dst-mac ▼ |
| T10      | <input type="checkbox"/> | src-dst-mac ▼ |
| T11      | <input type="checkbox"/> | src-dst-mac ▼ |
| T12      | <input type="checkbox"/> | src-dst-mac ▼ |
| T13      | <input type="checkbox"/> | src-dst-mac ▼ |
| T14      | <input type="checkbox"/> | src-dst-mac ▼ |
| T15      | <input type="checkbox"/> | src-dst-mac ▼ |
| T16      | <input type="checkbox"/> | src-dst-mac ▼ |

| Port | Group  |
|------|--------|
| 1    | None ▼ |
| 2    | None ▼ |
| 3    | None ▼ |
| 4    | None ▼ |
| 5    | None ▼ |
| 6    | None ▼ |
| 7    | None ▼ |
| 8    | None ▼ |
| 9    | None ▼ |
| 10   | None ▼ |

Apply

Cancel

The following table describes the labels in this screen.

Table 72 Advanced Application &gt; Link Aggregation &gt; Link Aggregation Setting

| LABEL                    | DESCRIPTION                                                                                           |
|--------------------------|-------------------------------------------------------------------------------------------------------|
| Link Aggregation Setting | This is the only screen you need to configure to enable static link aggregation.                      |
| Group ID                 | The field identifies the link aggregation group, that is, one logical link containing multiple ports. |
| Active                   | Select this option to activate a trunk group.                                                         |

Table 72 Advanced Application &gt; Link Aggregation &gt; Link Aggregation Setting (continued)

| LABEL    | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Criteria | <p>Select the outgoing traffic distribution type. Packets from the same source and/or to the same destination are sent over the same link within the trunk. By default, the Switch uses the <b>src-dst-mac</b> distribution type. If the Switch is behind a router, the packet's destination or source MAC address will be changed. In this case, set the Switch to distribute traffic based on its IP address to make sure port trunking can work properly.</p> <p>Select <b>src-mac</b> to distribute traffic based on the packet's source MAC address.</p> <p>Select <b>dst-mac</b> to distribute traffic based on the packet's destination MAC address.</p> <p>Select <b>src-dst-mac</b> to distribute traffic based on a combination of the packet's source and destination MAC addresses.</p> <p>Select <b>src-ip</b> to distribute traffic based on the packet's source IP address.</p> <p>Select <b>dst-ip</b> to distribute traffic based on the packet's destination IP address.</p> <p>Select <b>src-dst-ip</b> to distribute traffic based on a combination of the packet's source and destination IP addresses.</p> |
| Port     | This field displays the port number.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Group    | <p>Select the trunk group to which a port belongs.</p> <p>Note: When you enable the port security feature on the Switch and configure port security settings for a port, you cannot include the port in an active trunk group.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Apply    | Click <b>Apply</b> to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the <b>Save</b> link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Cancel   | Click <b>Cancel</b> to begin configuring this screen afresh.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |

## 17.5 Link Aggregation Control Protocol

Click in the **Advanced Application > Link Aggregation > Link Aggregation Setting > LACP** to display the screen shown next. See [Section 17.2 on page 174](#) for more information on dynamic link aggregation.

**Figure 124** Advanced Application > Link Aggregation > Link Aggregation Setting > LACP

**Link Aggregation Control Protocol** [Link Aggregation Setting](#)

Active ☐

System Priority

| Group ID | LACP Active              |
|----------|--------------------------|
| T1       | <input type="checkbox"/> |
| T2       | <input type="checkbox"/> |
| T3       | <input type="checkbox"/> |
| T4       | <input type="checkbox"/> |
| T5       | <input type="checkbox"/> |
| T6       | <input type="checkbox"/> |
| T7       | <input type="checkbox"/> |
| T8       | <input type="checkbox"/> |
| T9       | <input type="checkbox"/> |
| T10      | <input type="checkbox"/> |
| T11      | <input type="checkbox"/> |
| T12      | <input type="checkbox"/> |
| T13      | <input type="checkbox"/> |
| T14      | <input type="checkbox"/> |
| T15      | <input type="checkbox"/> |
| T16      | <input type="checkbox"/> |

| Port | LACP Timeout |
|------|--------------|
| *    | 30 ▼ seconds |
| 1    | 30 ▼ seconds |
| 2    | 30 ▼ seconds |
| 3    | 30 ▼ seconds |
| 4    | 30 ▼ seconds |
| 5    | 30 ▼ seconds |

The following table describes the labels in this screen.

Table 73 Advanced Application &gt; Link Aggregation &gt; Link Aggregation Setting &gt; LACP

| LABEL                             | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                              |
|-----------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Link Aggregation Control Protocol | Note: Do not configure this screen unless you want to enable dynamic link aggregation.                                                                                                                                                                                                                                                                                                                   |
| Active                            | Select this checkbox to enable Link Aggregation Control Protocol (LACP).                                                                                                                                                                                                                                                                                                                                 |
| System Priority                   | LACP system priority is a number between 1 and 65,535. The switch with the lowest system priority (and lowest port number if system priority is the same) becomes the LACP "server". The LACP "server" controls the operation of LACP setup. Enter a number to set the priority of an active port using Link Aggregation Control Protocol (LACP). The smaller the number, the higher the priority level. |
| Group ID                          | The field identifies the link aggregation group, that is, one logical link containing multiple ports.                                                                                                                                                                                                                                                                                                    |
| LACP Active                       | Select this option to enable LACP for a trunk.                                                                                                                                                                                                                                                                                                                                                           |
| Port                              | This field displays the port number.                                                                                                                                                                                                                                                                                                                                                                     |

Table 73 Advanced Application &gt; Link Aggregation &gt; Link Aggregation Setting &gt; LACP (continued)

| LABEL        | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|--------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| *            | <p>Settings in this row apply to all ports.</p> <p>Use this row only if you want to make some settings the same for all ports. Use this row first to set the common settings and then make adjustments on a port-by-port basis.</p> <p>Note: Changes in this row are copied to all the ports as soon as you make them.</p>                                                                                                                                          |
| LACP Timeout | <p>Timeout is the time interval between the individual port exchanges of LACP packets in order to check that the peer port in the trunk group is still up. If a port does not respond after three tries, then it is deemed to be "down" and is removed from the trunk. Set a short timeout (one second) for busy trunked links to ensure that disabled ports are removed from the trunk group as soon as possible.</p> <p>Select either 1 second or 30 seconds.</p> |
| Apply        | Click <b>Apply</b> to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the <b>Save</b> link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.                                                                                                                                                                                  |
| Cancel       | Click <b>Cancel</b> to begin configuring this screen afresh.                                                                                                                                                                                                                                                                                                                                                                                                        |

## 17.6 Static Trunking Example

This example shows you how to create a static port trunk group for ports 2-5.

- 1 Make your physical connections** - make sure that the ports that you want to belong to the trunk group are connected to the same destination. The following figure shows ports 2-5 on switch **A** connected to switch **B**.

**Figure 125** Trunking Example - Physical Connections



- 2 Configure static trunking** - Click **Advanced Application > Link Aggregation > Link Aggregation Setting**. In this screen activate trunk group **T1**, select the traffic distribution algorithm used by this group and select the ports that should belong to this group as shown in the figure below. Click **Apply** when you are done.



**Figure 126** Trunking Example - Configuration Screen

Link Aggregation Setting

Status LACP

| Group ID | Active                              | Criteria      |
|----------|-------------------------------------|---------------|
| T1       | <input checked="" type="checkbox"/> | src-dst-mac ▼ |
| T2       | <input type="checkbox"/>            | src-dst-mac ▼ |
| T3       | <input type="checkbox"/>            | src-dst-mac ▼ |
| T4       | <input type="checkbox"/>            | src-dst-mac ▼ |
| T5       | <input type="checkbox"/>            | src-dst-mac ▼ |
| T6       | <input type="checkbox"/>            | src-dst-mac ▼ |
| T7       | <input type="checkbox"/>            | src-dst-mac ▼ |
| T8       | <input type="checkbox"/>            | src-dst-mac ▼ |
| T9       | <input type="checkbox"/>            | src-dst-mac ▼ |
| T10      | <input type="checkbox"/>            | src-dst-mac ▼ |
| T11      | <input type="checkbox"/>            | src-dst-mac ▼ |
| T12      | <input type="checkbox"/>            | src-dst-mac ▼ |
| T13      | <input type="checkbox"/>            | src-dst-mac ▼ |
| T14      | <input type="checkbox"/>            | src-dst-mac ▼ |
| T15      | <input type="checkbox"/>            | src-dst-mac ▼ |

| Port | Group  |
|------|--------|
| 1    | None ▼ |
| 2    | T1 ▼   |
| 3    | T1 ▼   |
| 4    | T1 ▼   |
| 5    | T1 ▼   |
| 6    | None ▼ |
| 7    | None ▼ |
| 8    | None ▼ |
| 9    | None ▼ |

EXAMPLE

Apply Cancel

Your trunk group 1 (**T1**) configuration is now complete.

# CHAPTER 18

## Port Authentication

This chapter describes the IEEE 802.1x and MAC authentication methods.

### 18.1 Port Authentication Overview

Port authentication is a way to validate access to ports on the Switch to clients based on an external server (authentication server). The Switch supports the following methods for port authentication:

- **IEEE 802.1x** - An authentication server validates access to a port based on a username and password provided by the user. At the time of writing, IEEE 802.1x is not supported by all operating systems. See your operating system documentation. If your operating system does not support 802.1x, then you may need to install 802.1x client software.
- **MAC** - An authentication server validates access to a port based on the MAC address and password of the client.

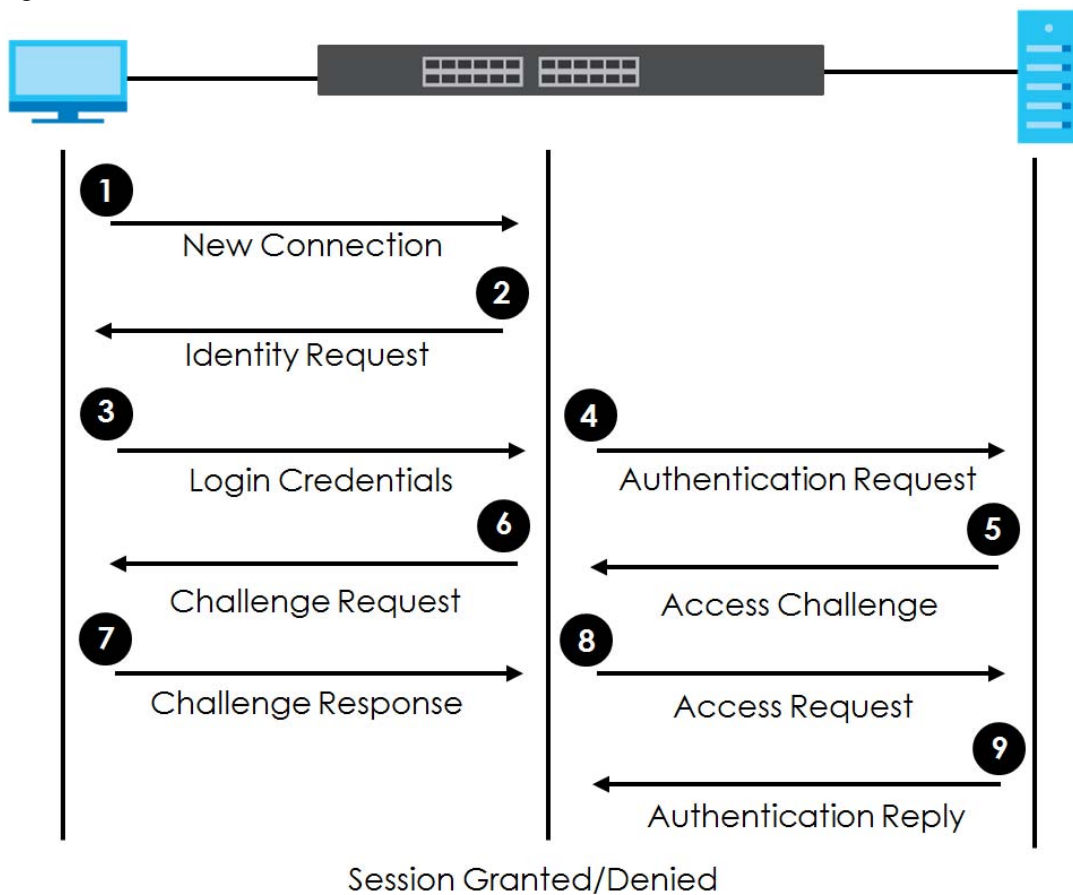
Both types of authentication use the RADIUS (Remote Authentication Dial In User Service, RFC 2138, 2139) protocol to validate users. See [Section 26.1.2 on page 247](#) for more information on configuring your RADIUS server settings.

Note: If you enable IEEE 802.1x authentication and MAC authentication on the same port, the Switch performs IEEE 802.1x authentication first. If a user fails to authenticate via the IEEE 802.1x method, then access to the port is denied.

#### 18.1.1 IEEE 802.1x Authentication

The following figure illustrates how a client connecting to an IEEE 802.1x authentication enabled port goes through a validation process. The Switch prompts the client for login information in the form of a user name and password after the client responds to its identity request. When the client provides the login credentials, the Switch sends an authentication request to a RADIUS server. The RADIUS server validates whether this client is allowed access to the port.

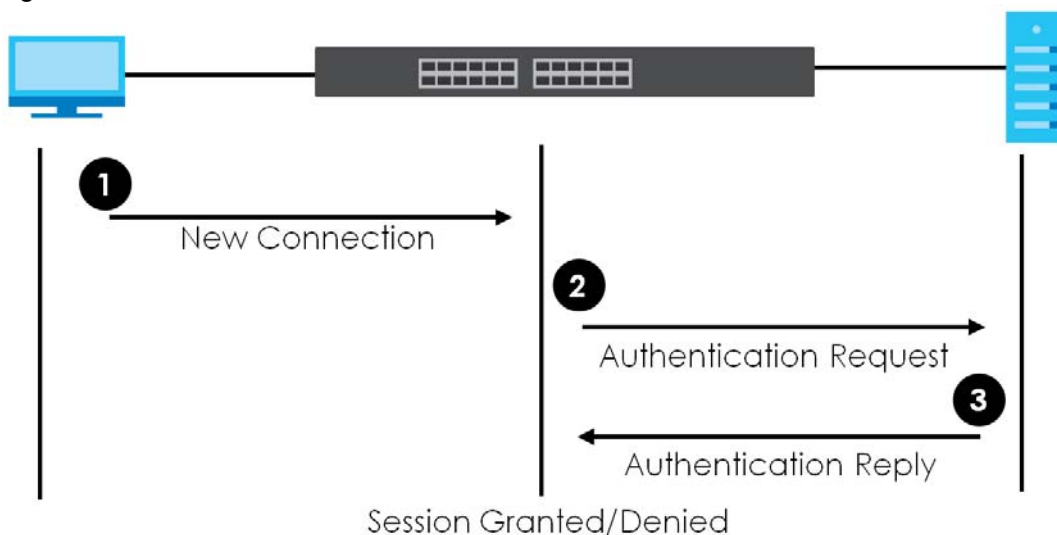
**Figure 127** IEEE 802.1x Authentication Process



### 18.1.2 MAC Authentication

MAC authentication works in a very similar way to IEEE 802.1x authentication. The main difference is that the Switch does not prompt the client for login credentials. The login credentials are based on the source MAC address of the client connecting to a port on the Switch along with a password configured specifically for MAC authentication on the Switch.

**Figure 128** MAC Authentication Process



## 18.2 Port Authentication Configuration

To enable port authentication, first activate the port authentication method(s) you want to use (both on the Switch and the port(s)), then configure the RADIUS server settings in the **AAA > Radius Server Setup** screen.

To activate a port authentication method, click **Advanced Application > Port Authentication** in the navigation panel. Select a port authentication method in the screen that appears.

**Figure 129** Advanced Application > Port Authentication

| Port Authentication |                            |
|---------------------|----------------------------|
| 802.1x              | <a href="#">Click here</a> |
| MAC Authentication  | <a href="#">Click here</a> |

### 18.2.1 Activate IEEE 802.1x Security

Use this screen to activate IEEE 802.1x security. In the **Port Authentication** screen click **802.1x** to display the configuration screen as shown.

**Figure 130** Advanced Application > Port Authentication > 802.1x

| Port | Active                   | Max-Req | Reauth | Reauth-period<br>secs | Quiet-period<br>secs | Tx-period<br>secs | Supp-Timeout<br>secs |
|------|--------------------------|---------|--------|-----------------------|----------------------|-------------------|----------------------|
| *    | <input type="checkbox"/> |         | On ▼   |                       |                      |                   |                      |
| 1    | <input type="checkbox"/> | 2       | On ▼   | 3600                  | 60                   | 30                | 30                   |
| 2    | <input type="checkbox"/> | 2       | On ▼   | 3600                  | 60                   | 30                | 30                   |
| 3    | <input type="checkbox"/> | 2       | On ▼   | 3600                  | 60                   | 30                | 30                   |
| 4    | <input type="checkbox"/> | 2       | On ▼   | 3600                  | 60                   | 30                | 30                   |
| 5    | <input type="checkbox"/> | 2       | On ▼   | 3600                  | 60                   | 30                | 30                   |
| 6    | <input type="checkbox"/> | 2       | On ▼   | 3600                  | 60                   | 30                | 30                   |
| 7    | <input type="checkbox"/> | 2       | On ▼   | 3600                  | 60                   | 30                | 30                   |
| 8    | <input type="checkbox"/> | 2       | On ▼   | 3600                  | 60                   | 30                | 30                   |
| 9    | <input type="checkbox"/> | 2       | On ▼   | 3600                  | 60                   | 30                | 30                   |
| 10   | <input type="checkbox"/> | 2       | On ▼   | 3600                  | 60                   | 30                | 30                   |
| 11   | <input type="checkbox"/> | 2       | On ▼   | 3600                  | 60                   | 30                | 30                   |
| 12   | <input type="checkbox"/> | 2       | On ▼   | 3600                  | 60                   | 30                | 30                   |
| 13   | <input type="checkbox"/> | 2       | On ▼   | 3600                  | 60                   | 30                | 30                   |
| 14   | <input type="checkbox"/> | 2       | On ▼   | 3600                  | 60                   | 30                | 30                   |
| 15   | <input type="checkbox"/> | 2       | On ▼   | 3600                  | 60                   | 30                | 30                   |
| 16   | <input type="checkbox"/> | 2       | On ▼   | 3600                  | 60                   | 30                | 30                   |
| 17   | <input type="checkbox"/> | 2       | On ▼   | 3600                  | 60                   | 30                | 30                   |

Apply Cancel

The following table describes the labels in this screen.

Table 74 Advanced Application > Port Authentication > 802.1x

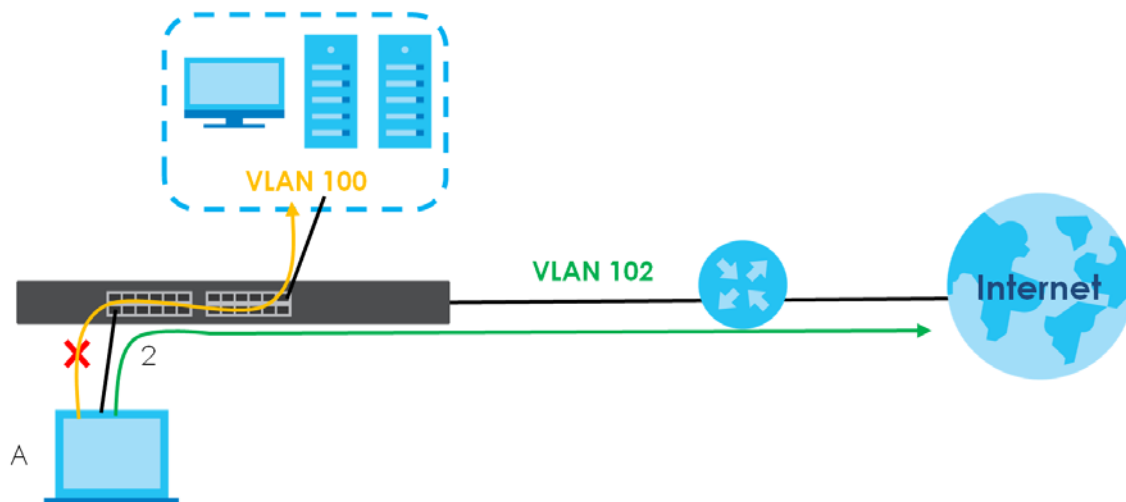
| LABEL              | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Active             | Select this check box to permit 802.1x authentication on the Switch.<br><br>Note: You must first enable 802.1x authentication on the Switch before configuring it on each port.                                                                                                                                                                                                                                                                                                                                     |
| EAPOL flood        | Select this check box to flood EAPoL packets to all ports in the same VLAN.<br><br>EAP over LAN (EAPOL) is a port authentication protocol used in IEEE 802.1x. It is used to encapsulate and transmit EAP packets between the supplicant (a client device that requests access to the network resources or services) and authenticator (the Switch) directly over the LAN.<br><br>Note: <b>EAPOL flood</b> will not take effect when 802.1x authentication is enabled.                                              |
| Port               | This field displays the port number.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| *                  | Settings in this row apply to all ports.<br><br>Use this row only if you want to make some settings the same for all ports. Use this row first to set the common settings and then make adjustments on a port-by-port basis.<br><br>Note: Changes in this row are copied to all the ports as soon as you make them.                                                                                                                                                                                                 |
| Active             | Select this checkbox to permit 802.1x authentication on this port. You must first allow 802.1x authentication on the Switch before configuring it on each port.                                                                                                                                                                                                                                                                                                                                                     |
| Max-Req            | Specify the number of times the Switch tries to authenticate client(s) before sending unresponsive ports to the Guest VLAN.<br><br>This is set to 2 by default. That is, the Switch attempts to authenticate a client twice. If the client does not respond to the first authentication request, the Switch tries again. If the client still does not respond to the second request, the Switch sends the client to the Guest VLAN. The client needs to send a new request to be authenticated by the Switch again. |
| Reauth             | Specify if a subscriber has to periodically re-enter his or her username and password to stay connected to the port.                                                                                                                                                                                                                                                                                                                                                                                                |
| Reauth-period secs | Specify the length of time required to pass before a client has to re-enter his or her username and password to stay connected to the port.                                                                                                                                                                                                                                                                                                                                                                         |
| Quiet-period secs  | Specify the number of seconds the port remains in the HELD state and rejects further authentication requests from the connected client after a failed authentication exchange.                                                                                                                                                                                                                                                                                                                                      |
| Tx-period secs     | Specify the number of seconds the Switch waits for client's response before re-sending an identity request to the client.                                                                                                                                                                                                                                                                                                                                                                                           |
| Supp-Timeout secs  | Specify the number of seconds the Switch waits for client's response to a challenge request before sending another request.                                                                                                                                                                                                                                                                                                                                                                                         |
| Apply              | Click <b>Apply</b> to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the <b>Save</b> link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.                                                                                                                                                                                                                                  |
| Cancel             | Click <b>Cancel</b> to begin configuring this screen afresh.                                                                                                                                                                                                                                                                                                                                                                                                                                                        |

## 18.2.2 Guest VLAN

When 802.1x port authentication is enabled on the Switch and its ports, clients that do not have the correct credentials are blocked from using the port(s). You can configure your Switch to have one VLAN that acts as a guest VLAN. If you enable the guest VLAN (**102** in the example) on a port (**2** in the example), the user (**A** in the example) that is not IEEE 802.1x capable or fails to enter the correct username and password can still access the port, but traffic from the user is forwarded to the guest VLAN. That is, unauthenticated users can have access to limited network resources in the same guest

VLAN, such as the Internet. The rights granted to the Guest VLAN depends on how the network administrator configures switches or routers with the guest network feature.

**Figure 131** Guest VLAN Example



Use this screen to enable and assign a guest VLAN to a port. In the **Port Authentication > 802.1x** screen click **Guest Vlan** to display the configuration screen as shown.

**Figure 132** Advanced Application > Port Authentication > 802.1x > Guest VLAN

| Guest Vlan |                          |            |              | 802.1x       |     |
|------------|--------------------------|------------|--------------|--------------|-----|
| Port       | Active                   | Guest Vlan | Host-mode    | Multi-Secure | Num |
| *          | <input type="checkbox"/> |            | Multi-Host ▼ |              |     |
| 1          | <input type="checkbox"/> | 1          | Multi-Host ▼ | 1            |     |
| 2          | <input type="checkbox"/> | 1          | Multi-Host ▼ | 1            |     |
| 3          | <input type="checkbox"/> | 1          | Multi-Host ▼ | 1            |     |
| 4          | <input type="checkbox"/> | 1          | Multi-Host ▼ | 1            |     |
| 5          | <input type="checkbox"/> | 1          | Multi-Host ▼ | 1            |     |
| 6          | <input type="checkbox"/> | 1          | Multi-Host ▼ | 1            |     |
| 7          | <input type="checkbox"/> | 1          | Multi-Host ▼ | 1            |     |
| 8          | <input type="checkbox"/> | 1          | Multi-Host ▼ | 1            |     |
| 9          | <input type="checkbox"/> | 1          | Multi-Host ▼ | 1            |     |
| 10         | <input type="checkbox"/> | 1          | Multi-Host ▼ | 1            |     |
| 11         | <input type="checkbox"/> | 1          | Multi-Host ▼ | 1            |     |
| 12         | <input type="checkbox"/> | 1          | Multi-Host ▼ | 1            |     |
| 13         | <input type="checkbox"/> |            | Multi-Host ▼ | 1            |     |
| 14         | <input type="checkbox"/> | 1          | Multi-Host ▼ | 1            |     |

The following table describes the labels in this screen.

Table 75 Advanced Application > Port Authentication > 802.1x > Guest VLAN

| LABEL            | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Port             | This field displays the port number.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| *                | <p>Settings in this row apply to all ports.</p> <p>Use this row only if you want to make some settings the same for all ports. Use this row first to set the common settings and then make adjustments on a port-by-port basis.</p> <p>Note: Changes in this row are copied to all the ports as soon as you make them.</p>                                                                                                                                                                                                                                                                                                                                                                    |
| Active           | <p>Select this checkbox to enable the guest VLAN feature on this port.</p> <p>Clients that fail authentication are placed in the guest VLAN and can receive limited services.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Guest Vlan       | <p>A guest VLAN is a pre-configured VLAN on the Switch that allows non-authenticated users to access limited network resources through the Switch. You must also enable IEEE 802.1x authentication on the Switch and the associated ports. Enter the number that identifies the guest VLAN.</p> <p>Make sure this is a VLAN recognized in your network.</p>                                                                                                                                                                                                                                                                                                                                   |
| Host-mode        | <p>Specify how the Switch authenticates users when more than one user connect to the port (using a hub).</p> <p>Select <b>Multi-Host</b> to authenticate only the first user that connects to this port. If the first user enters the correct credential, any other users are allowed to access the port without authentication. If the first user fails to enter the correct credential, they are all put in the guest VLAN. Once the first user who did authentication logs out or disconnects from the port, rest of the users are blocked until a user does the authentication process again.</p> <p>Select <b>Multi-Secure</b> to authenticate each user that connects to this port.</p> |
| Multi-Secure Num | If you set <b>Host-mode</b> to <b>Multi-Secure</b> , specify the maximum number of users (between 1 and 24) that the Switch will authenticate on this port.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Apply            | Click <b>Apply</b> to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the <b>Save</b> link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.                                                                                                                                                                                                                                                                                                                                                                                                            |
| Cancel           | Click <b>Cancel</b> to begin configuring this screen afresh.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |

### 18.2.3 Activate MAC Authentication

Use this screen to activate MAC authentication. In the **Port Authentication** screen click **MAC Authentication** to display the configuration screen as shown.

**Figure 133** Advanced Application > Port Authentication > MAC Authentication

| Port | Active                   | Trusted-VLAN List |
|------|--------------------------|-------------------|
| *    | <input type="checkbox"/> |                   |
| 1    | <input type="checkbox"/> |                   |
| 2    | <input type="checkbox"/> |                   |
| 3    | <input type="checkbox"/> |                   |
| 4    | <input type="checkbox"/> |                   |
| 5    | <input type="checkbox"/> |                   |
| 6    | <input type="checkbox"/> |                   |
| 7    | <input type="checkbox"/> |                   |
| 8    | <input type="checkbox"/> |                   |
| 9    | <input type="checkbox"/> |                   |
| 20   | <input type="checkbox"/> |                   |
| 26   | <input type="checkbox"/> |                   |
| 27   | <input type="checkbox"/> |                   |
| 28   | <input type="checkbox"/> |                   |

The following table describes the labels in this screen.

**Table 76** Advanced Application > Port Authentication > MAC Authentication

| LABEL         | DESCRIPTION                                                                                                                                                                                                                                                             |
|---------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Active        | Select this check box to permit MAC authentication on the Switch.<br><br>Note: You must first enable MAC authentication on the Switch before configuring it on each port.                                                                                               |
| Name Prefix   | Type the prefix that is appended to all MAC addresses sent to the RADIUS server for authentication. You can enter up to 32 printable ASCII characters.<br><br>If you leave this field blank, then only the MAC address of the client is forwarded to the RADIUS server. |
| Delimiter     | Select the delimiter the RADIUS server uses to separate the pairs in MAC addresses used as the account username (and password). You can select <b>Dash</b> (-), <b>Colon</b> (;), or <b>None</b> to use no delimiters at all in the MAC address.                        |
| Case          | Select the case ( <b>Upper</b> or <b>Lower</b> ) the RADIUS server requires for letters in MAC addresses used as the account username (and password).                                                                                                                   |
| Password Type | Select <b>Static</b> to have the Switch send the password you specify below or <b>MAC-Address</b> to use the client MAC address as the password.                                                                                                                        |
| Password      | Type the password the Switch sends along with the MAC address of a client for authentication with the RADIUS server. You can enter up to 32 printable ASCII characters.                                                                                                 |



Table 76 Advanced Application &gt; Port Authentication &gt; MAC Authentication (continued)

| LABEL             | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|-------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Timeout           | <p>Specify the amount of time before the Switch allows a client MAC address that fails authentication to try and authenticate again. Maximum time is 3000 seconds.</p> <p>When a client fails MAC authentication, its MAC address is learned by the MAC address table with a status of denied. The timeout period you specify here is the time the MAC address entry stays in the MAC address table until it is cleared. If you specify 0 for the timeout value, the Switch uses the <b>Aging Time</b> configured in the <b>Switch Setup</b> screen.</p> <p>Note: If the <b>Aging Time</b> in the <b>Switch Setup</b> screen is set to a lower value, then it supersedes this setting. See <a href="#">Section 8.3 on page 83</a>.</p> |
| Port              | This field displays the port number.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| *                 | <p>Use this row to make the setting the same for all ports. Use this row first and then make adjustments on a port-by-port basis.</p> <p>Note: Changes in this row are copied to all the ports as soon as you make them.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Active            | Select this check box to permit MAC authentication on this port. You must first allow MAC authentication on the Switch before configuring it on each port.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Trusted-VLAN List | Enter the ID number(s) of the trusted VLAN(s) (separated by a comma). If a client's VLAN ID is specified here, the client can access the port and the connected networks without MAC authentication.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Apply             | Click <b>Apply</b> to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the <b>Save</b> link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Cancel            | Click <b>Cancel</b> to begin configuring this screen afresh.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |

## 18.3 Technical Reference

This section provides technical background information on the topics discussed in this chapter.

### 18.3.1 IEEE 802.1x

The IEEE 802.1x is a standard for authentication as well as providing additional accounting and control features. It can be implemented both on wired and wireless networks. It is supported by Windows XP and a number of network devices. Some advantages of IEEE 802.1x are:

- User based identification
- Support for RADIUS (Remote Authentication Dial In User Service, RFC 2138, 2139) for centralized user profile and accounting management on a network RADIUS server.
- Support for EAP (Extensible Authentication Protocol, RFC 2486) that allows additional authentication methods to be deployed with no changes to the switch or the wired clients.

### 18.3.2 RADIUS

RADIUS is based on a client-server model that supports authentication, authorization and accounting. The RADIUS server handles the following tasks:

- Authentication

Determines the identity of the users.

- Authorization

Determines the network services available to authenticated users once they are connected to the network.

- Accounting

Keeps track of the actions that are performed on the switch, such as login events.

RADIUS is a simple package exchange in which your switch acts as a message relay between the wired client and the network RADIUS server.

### **18.3.2.1 Types of RADIUS Messages**

The following types of RADIUS messages are exchanged between the switch and the RADIUS server for user authentication:

- Access-Request

Sent by a switch requesting authentication.

- Access-Reject

Sent by a RADIUS server rejecting access.

- Access-Accept

Sent by a RADIUS server allowing access.

- Access-Challenge

Sent by a RADIUS server requesting more information in order to allow access. The switch sends a proper response from the user and then sends another Access-Request message.

The following types of RADIUS messages are exchanged between the switch and the RADIUS server for user accounting:

- Accounting-Request

Sent by the switch requesting accounting.

- Accounting-Response

Sent by the RADIUS server to indicate that it has started or stopped accounting.

The switch and the RADIUS server use a shared secret key, which is a password, they both know to authenticate the communications between them, and ensure network security. A shared key is not sent over the network.

The switch forwards the RADIUS requests of a client to the RADIUS server. The login password information exchanged is sent over the network and encrypted to protect the network from unauthorized access.

### 18.3.3 EAP (Extensible Authentication Protocol) Authentication

This section discusses some popular authentication types: EAP-MD5, EAP-TLS, EAP-TTLS, PEAP and LEAP. Your wired LAN device may not support all authentication types.

EAP (Extensible Authentication Protocol) is an authentication protocol that runs on top of the IEEE 802.1x transport mechanism in order to support multiple types of user authentication. By using EAP to interact with an EAP-compatible RADIUS server, a switch helps a wired station and a RADIUS server perform authentication.

The type of authentication you use depends on the RADIUS server and an intermediary switch(es) that supports IEEE 802.1x.

For EAP-TLS authentication type, you must first have a wired connection to the network and obtain the certificate(s) from a certificate authority (CA). A certificate (also called digital IDs) can be used to authenticate users and a CA issues certificates and guarantees the identity of each certificate owner.

- EAP-MD5 (Message-Digest Algorithm 5)

MD5 authentication is the simplest one-way authentication method. The authentication server sends a challenge to the wired client. The wired client 'proves' that it knows the password by encrypting the password with the challenge and sends back the information. Password is not sent in plain text.

However, MD5 authentication has some weaknesses. Since the authentication server needs to get the plaintext passwords, the passwords must be stored. Thus someone other than the authentication server may access the password file. In addition, it is possible to impersonate an authentication server as MD5 authentication method does not perform mutual authentication. Finally, MD5 authentication method does not support data encryption with dynamic session key. You must configure WEP encryption keys for data encryption.

- EAP-TLS (Transport Layer Security)

With EAP-TLS, digital certifications are needed by both the server and the wired clients for mutual authentication. The server presents a certificate to the client. After validating the identity of the server, the client sends a different certificate to the server. The exchange of certificates is done in the open before a secured tunnel is created. This makes user identity vulnerable to passive attacks. A digital certificate is an electronic ID card that authenticates the sender's identity. However, to implement EAP-TLS, you need a Certificate Authority (CA) to handle certificates, which imposes a management overhead.

- EAP-TTLS (Tunneled Transport Layer Service)

EAP-TTLS is an extension of the EAP-TLS authentication that uses certificates for only the server-side authentications to establish a secure connection. Client authentication is then done by sending username and password through the secure connection, thus client identity is protected. For client authentication, EAP-TTLS supports EAP methods and legacy authentication methods such as PAP, CHAP, MS-CHAP and MS-CHAP v2.

- PEAP (Protected EAP)

Like EAP-TTLS, server-side certificate authentication is used to establish a secure connection, then use simple username and password methods through the secured connection to authenticate the clients, thus hiding client identity. However, PEAP only supports EAP methods, such as EAP-MD5, EAP-MSCHAPv2 and EAP-GTC (EAP-Generic Token Card), for client authentication. EAP-GTC is implemented only by Cisco.

- LEAP

LEAP (Lightweight Extensible Authentication Protocol) is a Cisco implementation of IEEE 802.1x.

### 18.3.4 EAPOL (EAP over LAN)

EAPOL is a port authentication protocol used in IEEE802.1x. It encapsulates and sends EAP packets from the LAN. EAPOL exchanges the following messages between a wired client and switch.

- EAPOL-Start

A wired client will send this message to a switch to let it know the wired client is ready.

- EAPOL-Key

The switch will send an encryption key to the wired client. It'll be allowed access to the network when both of the switch and wired client have the correct encryption keys.

- EAP-Packet

Both of the wired client and the switch will send this message to complete the authentication process.

- EAPOL-Logoff

This message will be sent when the wired client wants to be disconnected from the network.

- EAPOL-Encapsulated-ASF-Alert

This message is sent If the authentication process is not completed yet, and alerts needs to be forwarded.

# CHAPTER 19

## Port Security

This chapter shows you how to set up port security.

### 19.1 About Port Security

Port security allows only packets with dynamically learned MAC addresses and/or configured static MAC addresses to pass through a port on the Switch. The Switch can learn up to 32K MAC addresses in total with no limit on individual ports other than the sum cannot exceed 32K.

For maximum port security, enable this feature, disable MAC address learning and configure static MAC address(es) for a port. It is not recommended you disable port security together with MAC address learning as this will result in many broadcasts. By default, MAC address learning is still enabled even though the port security is not activated.

### 19.2 Port Security Setup

Click **Advanced Application > Port Security** in the navigation panel to display the screen as shown.

**Figure 134** Advanced Application > Port Security

**Port Security** [VLAN MAC Address Limit](#)

**MAC Freeze**

Port List  **MAC freeze**

**Port Security**

Active ☐

| Port | Active                   | Address Learning                    | Limited Number of Learned MAC Address |
|------|--------------------------|-------------------------------------|---------------------------------------|
| *    | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="text"/>                  |
| 1    | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="text" value="0"/>        |
| 2    | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="text" value="0"/>        |
| 3    | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="text" value="0"/>        |
| 4    | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="text" value="0"/>        |
| 5    | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="text" value="0"/>        |
| 6    | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="text" value="0"/>        |
| 7    | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="text" value="0"/>        |
| 8    | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="text" value="0"/>        |
| 9    | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="text" value="0"/>        |

**Apply** **Cancel**

The following table describes the labels in this screen.

Table 77 Advanced Application &gt; Port Security

| LABEL            | DESCRIPTION                                                                                                                                                                                                                                                                                                                                      |
|------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Port List        | Enter the number of the port(s) (separated by a comma) on which you want to enable port security and disable MAC address learning. After you click <b>MAC freeze</b> , all previously learned MAC addresses on the specified port(s) will become static MAC addresses and display in the <b>Static MAC Forwarding</b> screen.                    |
| MAC freeze       | Click <b>MAC freeze</b> to have the Switch automatically select the <b>Active</b> check boxes and clear the <b>Address Learning</b> check boxes only for the ports specified in the <b>Port list</b> .                                                                                                                                           |
| Active           | Select this option to enable port security on the Switch.                                                                                                                                                                                                                                                                                        |
| Port             | This field displays the port number.                                                                                                                                                                                                                                                                                                             |
| *                | <p>Settings in this row apply to all ports.</p> <p>Use this row only if you want to make some of the settings the same for all ports. Use this row first to set the common settings and then make adjustments on a port-by-port basis.</p> <p>Note: Changes in this row are copied to all the ports as soon as you make them.</p>                |
| Active           | <p>Select this check box to enable the port security feature on this port. The Switch forwards packets whose MAC address(es) is in the MAC address table on this port. Packets with no matching MAC address(es) are dropped.</p> <p>Clear this check box to disable the port security feature. The Switch forwards all packets on this port.</p> |
| Address Learning | MAC address learning reduces outgoing broadcast traffic. For MAC address learning to occur on a port, the port itself must be active with address learning enabled.                                                                                                                                                                              |

Table 77 Advanced Application &gt; Port Security (continued)

| LABEL                                 | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|---------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Limited Number of Learned MAC Address | Use this field to limit the number of (dynamic) MAC addresses that may be learned on a port. For example, if you set this field to "5" on port 2, then only the devices with these five learned MAC addresses may access port 2 at any one time. A sixth device must wait until one of the five learned MAC addresses ages out. MAC address aging out time can be set in the <b>Switch Setup</b> screen. The valid range is from "0" to "32K". "0" means this feature is disabled. |
| Apply                                 | Click <b>Apply</b> to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the <b>Save</b> link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.                                                                                                                                                                                                 |
| Cancel                                | Click <b>Cancel</b> to begin configuring this screen afresh.                                                                                                                                                                                                                                                                                                                                                                                                                       |

## 19.3 VLAN MAC Address Limit

Use this screen to set the MAC address learning limit on per-port and per-VLAN basis. Click **VLAN MAC Address Limit** in the **Advanced Application > Port Security** screen to display the screen as shown.

Figure 135 Advanced Application &gt; Port Security &gt; VLAN MAC Address Limit

The screenshot shows the 'VLAN MAC Address Limit' configuration interface. At the top, there's a title bar with the text 'VLAN MAC Address Limit' and a link 'Port Security'. Below this is a form with four fields: 'Active' with a checkbox, 'Port' with a text input, 'VID' with a text input, and 'Limit Number' with a text input. Underneath the form are three buttons: 'Add', 'Cancel', and 'Clear'. At the bottom of the screen, there is a table with the following columns: 'Index', 'Active', 'Port', 'VID', 'Limit Number', and a checkbox. Below the table are two buttons: 'Delete' and 'Cancel'.

The following table describes the labels in this screen.

Table 78 Advanced Application &gt; Port Security &gt; VLAN MAC Address Limit

| LABEL        | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|--------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Active       | Select this option to activate this rule.                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Port         | Enter the number of the port to which this rule is applied.                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| VID          | Enter the VLAN identification number.                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Limit Number | Use this field to limit the number of (dynamic) MAC addresses that may be learned on a port in a specified VLAN. For example, if you set this field to "5" on port 2, then only the devices with these five learned MAC addresses may access port 2 at any one time. A sixth device would have to wait until one of the five learned MAC addresses aged out. MAC address aging out time can be set in the <b>Switch Setup</b> screen. The valid range is from "0" to "32K". "0" means this feature is disabled. |
| Add          | Click this to create a new entry or to update an existing one.<br><br>This saves your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the <b>Save</b> link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.                                                                                                                                                                        |
| Cancel       | Click <b>Cancel</b> to reset the fields to your previous configuration.                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Clear        | Click <b>Clear</b> to reset the fields to the factory defaults.                                                                                                                                                                                                                                                                                                                                                                                                                                                 |

Table 78 Advanced Application &gt; Port Security &gt; VLAN MAC Address Limit (continued)

| LABEL        | DESCRIPTION                                                                                                                             |
|--------------|-----------------------------------------------------------------------------------------------------------------------------------------|
| Index        | This field displays the index number of the rule. Click an index number to change the settings.                                         |
| Active       | This field displays <b>Yes</b> when the rule is activated and <b>No</b> when is it deactivated.                                         |
| Port         | This field displays the number of the port to which this rule is applied.                                                               |
| VID          | This is the VLAN ID number to which the port belongs.                                                                                   |
| Limit Number | This is the maximum number of MAC addresses which a port can learn in a VLAN.                                                           |
|              | Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries. |
| Delete       | Check the rule(s) that you want to remove in the <b>Delete</b> column and then click the <b>Delete</b> button.                          |
| Cancel       | Click <b>Cancel</b> to clear the selected checkbox(es) in the <b>Delete</b> column.                                                     |



# CHAPTER 20

## Time Range

This chapter shows you how to set up a time range for time-oriented features on the Switch.

### 20.1 About Time Range

You can set a time range for time-oriented features such as Classifier ACL (Access Control List) rule which categorizes data packets into different network traffic flow. The advantage of the time range feature is that it allows you to schedule the active time of configurations. For example, see [Section 21.2 on page 199](#) to configure the classifier rule with time range.

The time range can be configured in two ways - Absolute and Periodic. Absolute is a fixed time range with a start and end time. Periodic is recurrence of a time range and doesn't have an end time.

### 20.2 Time Range Setup

Click **Advanced Application > Time Range** in the navigation panel to display the screen as shown.

**Figure 136** Advanced Application > Time Range

| Time Range                  |                                                                                                                                                                                                                                                                               |      |       |    |         |
|-----------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|-------|----|---------|
| Name                        |                                                                                                                                                                                                                                                                               |      |       |    |         |
| Type                        | <input checked="" type="radio"/> Absolute <input type="radio"/> Periodic                                                                                                                                                                                                      |      |       |    |         |
| Absolute                    | Start                                                                                                                                                                                                                                                                         | 1970 | 01    | 01 | 00 : 00 |
|                             | End                                                                                                                                                                                                                                                                           | 1970 | 01    | 01 | 00 : 00 |
| Periodic                    | <input checked="" type="radio"/> Monday 00 : 00 to Monday 00 : 00                                                                                                                                                                                                             |      |       |    |         |
|                             | <input type="checkbox"/> Mon <input type="checkbox"/> Tue <input type="checkbox"/> Wed <input type="checkbox"/> Thu <input type="checkbox"/> Fri <input type="checkbox"/> Sat <input type="checkbox"/> Sun <input type="checkbox"/> Weekdays <input type="checkbox"/> Weekend |      |       |    |         |
|                             | <input type="checkbox"/> Daily 00 : 00 to 00 : 00                                                                                                                                                                                                                             |      |       |    |         |
| <div>Add Cancel Clear</div> |                                                                                                                                                                                                                                                                               |      |       |    |         |
| Index                       | Name                                                                                                                                                                                                                                                                          | Type | Range |    |         |
| <div>Delete Cancel</div>    |                                                                                                                                                                                                                                                                               |      |       |    |         |

The following table describes the labels in this screen.

Table 79 Advanced Application > Time Range

| LABEL    | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Name     | Type a name for this time range rule.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Type     | Select a time range type. <b>Absolute</b> is a fixed time range that has a set start and end date. <b>Periodic</b> is recurrence of a time range.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Absolute | This sets a fixed time range.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Start    | Specify the year, month, day, hour and minute when the schedule begins.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| End      | Specify the year, month, day, hour and minute when the schedule ends.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Periodic | This section is available only when you set <b>Type</b> to <b>Periodic</b> .<br><br>Select the first option if you want to define a recurring schedule for a consecutive time period. You then select the day of the week, hour and minute when the schedule begins and ends respectively.<br><br>Select the second option if you want to define a recurring schedule for multiple non-consecutive time periods. You need to select each day of the week the recurring schedule is effective. You also need to specify the hour and minute when the schedule begins and ends each day. The schedule begins and ends in the same day. |
| Add      | Click <b>Add</b> to save the time range you entered.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Cancel   | Click <b>Cancel</b> to begin configuring this screen afresh.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Clear    | Click <b>Clear</b> to reset the fields to the factory defaults.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Index    | This field displays the index number of the rule. Click an index number to change the settings.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Name     | This field displays the name of the time range rule.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Type     | This field displays the type of the schedule.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Range    | This field displays the time period(s) to which this schedule applies.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|          | Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Delete   | Check the rule(s) that you want to remove and then click the <b>Delete</b> button.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Cancel   | Click <b>Cancel</b> to clear the selected checkbox(es).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |

# CHAPTER 21

## Classifier

This chapter introduces and shows you how to configure the packet classifier on the Switch.

### 21.1 About the Classifier and QoS

Quality of Service (QoS) refers to both a network's ability to deliver data with minimum delay, and the networking methods used to control the use of bandwidth. Without QoS, all traffic data is equally likely to be dropped when the network is congested. This can cause a reduction in network performance and make the network inadequate for time-critical application such as video-on-demand.

A classifier groups traffic into data flows according to specific criteria such as the source address, destination address, source port number, destination port number or incoming port number. For example, you can configure a classifier to select traffic from the same protocol port (such as Telnet) to form a flow.

Configure QoS on the Switch to group and prioritize application traffic and fine-tune network performance. Setting up QoS involves two separate steps:

- 1 Configure classifiers to sort traffic into different flows.
- 2 Configure policy rules to define actions to be performed for a classified traffic flow (refer to [Chapter 22 on page 208](#) to configure policy rules).

You can also configure policy routing to forward a classified traffic flow to a different gateway for cost savings and load sharing. See [Chapter 45 on page 381](#) for how to configure policy routing.

### 21.2 Classifier Status

Use this screen to view the classifiers configured on the Switch and how many times the traffic matches the rules.

Click **Advanced Application > Classifier** in the navigation panel to display the configuration screen as shown.

**Figure 137** Advanced Application > Classifier > Classifier Status

| Classifier Status |        |        |        |             | <a href="#">Classifier Configuration</a> |
|-------------------|--------|--------|--------|-------------|------------------------------------------|
| Index             | Active | Weight | Name   | Match Count | Rule                                     |
| 1                 | No     | 32767  | Class1 | -           | vlan 1;                                  |

☒ Any
 ☐ Classifier

The following table describes the labels in this screen.

Table 80 Advanced Application &gt; Classifier &gt; Classifier Status

| LABEL       | DESCRIPTION                                                                                                                                                                                                                                         |
|-------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Index       | This field displays the index number of the Classifier rule.                                                                                                                                                                                        |
| Active      | This field displays <b>Yes</b> when the rule is activated and <b>No</b> when it is deactivated.                                                                                                                                                     |
| Weight      | This field displays the rule's weight. This is to indicate a rule's priority when the match order is set to <b>manual</b> in the <b>Classifier &gt; Classifier Global Setting</b> screen.<br>The higher the number, the higher the rule's priority. |
| Name        | This field displays the name of the Classifier rule.                                                                                                                                                                                                |
| Match Count | This field displays the number of times a rule is applied. It displays '-' if the rule does not have count enabled.                                                                                                                                 |
| Rule        | This field displays a summary of the classifier rule's settings.                                                                                                                                                                                    |
| Any         | Select <b>Any</b> , then click <b>Clear</b> to clear the matched count for all classifiers.                                                                                                                                                         |
| Classifier  | Select <b>Classifier</b> , enter a classifier rule name and then click <b>Clear</b> to erase the recorded statistical information for that classifier, or select <b>Any</b> to clear statistics for all classifiers.                                |

## 21.3 Classifier Configuration

Use the **Classifier Configuration** screen to define the classifiers. After you define the classifier, you can specify actions (or policy) to act upon the traffic that matches the rules. In the **Classifier Status** screen click **Classifier Configuration** to display the configuration screen as shown.

**Figure 138** Advanced Application > Classifier > Classifier Configuration

| Classifier Configuration |                                    | <a href="#">Classifier Status</a>                                                                                                       | <a href="#">Classifier Global Setting</a>                                                                                                 |
|--------------------------|------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|
| Active                   | <input type="checkbox"/>           |                                                                                                                                         |                                                                                                                                           |
| Name                     | <input type="text"/>               |                                                                                                                                         |                                                                                                                                           |
| Weight                   | <input type="text" value="32767"/> |                                                                                                                                         |                                                                                                                                           |
| Log                      | <input type="checkbox"/>           |                                                                                                                                         |                                                                                                                                           |
| Count                    | <input type="checkbox"/>           |                                                                                                                                         |                                                                                                                                           |
| Time Range               | <input type="text" value="None"/>  |                                                                                                                                         |                                                                                                                                           |
| Ingress Port             | Port                               | <input checked="" type="radio"/> Any<br><input type="radio"/> <input type="text"/>                                                      |                                                                                                                                           |
|                          | Trunk                              | <input checked="" type="radio"/> Any<br><input type="radio"/> <input type="text"/>                                                      |                                                                                                                                           |
| Packet Format            | <input type="text" value="All"/>   |                                                                                                                                         |                                                                                                                                           |
| Layer 2                  | VLAN                               | VLAN                                                                                                                                    | <input checked="" type="radio"/> Any<br><input type="radio"/> <input type="text"/>                                                        |
|                          |                                    | Inner VLAN                                                                                                                              | <input checked="" type="radio"/> Any<br><input type="radio"/> <input type="text"/>                                                        |
|                          | Priority                           | Priority                                                                                                                                | <input checked="" type="radio"/> Any<br><input type="radio"/> 0                                                                           |
|                          |                                    | Inner Priority                                                                                                                          | <input checked="" type="radio"/> Any<br><input type="radio"/> 0                                                                           |
|                          | Ethernet Type                      | <input checked="" type="radio"/> All<br><input type="radio"/> Others <input type="text"/> (Hex)                                         |                                                                                                                                           |
|                          | Source                             | MAC Address                                                                                                                             | <input checked="" type="radio"/> Any<br><input type="radio"/> MAC <input type="text"/><br><input type="text"/> /Mask <input type="text"/> |
|                          | Destination                        | MAC Address                                                                                                                             | <input checked="" type="radio"/> Any<br><input type="radio"/> MAC <input type="text"/><br><input type="text"/> /Mask <input type="text"/> |
| Layer 3                  | IP Packet Length                   | <input checked="" type="radio"/> Any<br><input type="radio"/> <input type="text"/> To <input type="text"/> Bytes                        |                                                                                                                                           |
|                          | DSCP                               | IPv4                                                                                                                                    | <input checked="" type="radio"/> Any<br><input type="radio"/> <input type="text"/>                                                        |
|                          |                                    | IPv6                                                                                                                                    | <input checked="" type="radio"/> Any<br><input type="radio"/> <input type="text"/>                                                        |
|                          | Precedence                         | <input checked="" type="radio"/> Any<br><input type="radio"/> <input type="text"/>                                                      |                                                                                                                                           |
|                          | ToS                                | <input checked="" type="radio"/> Any<br><input type="radio"/> <input type="text"/>                                                      |                                                                                                                                           |
|                          | IP Protocol                        | <input checked="" type="radio"/> All <input type="checkbox"/> Establish Only<br><input type="radio"/> Others <input type="text"/> (Dec) |                                                                                                                                           |
|                          | IPv6 Next Header                   | <input checked="" type="radio"/> All <input type="checkbox"/> Establish Only<br><input type="radio"/> Others <input type="text"/> (Dec) |                                                                                                                                           |
| Layer 4                  | Source                             | IP Address / Address Prefix                                                                                                             | <input type="text"/> / <input type="text"/>                                                                                               |
|                          | Destination                        | IP Address / Address Prefix                                                                                                             | <input type="text"/> / <input type="text"/>                                                                                               |
|                          | Source                             | Socket Number                                                                                                                           | <input checked="" type="radio"/> Any<br><input type="radio"/> <input type="text"/> To <input type="text"/>                                |
|                          | Destination                        | Socket Number                                                                                                                           | <input checked="" type="radio"/> Any<br><input type="radio"/> <input type="text"/> To <input type="text"/>                                |

The following table describes the labels in this screen.

Table 81 Advanced Application &gt; Classifier &gt; Classifier Configuration

| LABEL  | DESCRIPTION                                                                                                                                                                                      |
|--------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Active | Select this option to enable this rule.                                                                                                                                                          |
| Name   | Enter a descriptive name for this rule for identifying purposes.                                                                                                                                 |
| Weight | Enter a number between 0 and 65535 to specify the rule's weight. When the match order is in manual mode in the <b>Classifier Global Setting</b> screen, a higher weight means a higher priority. |

Table 81 Advanced Application &gt; Classifier &gt; Classifier Configuration (continued)

| LABEL                                                       | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|-------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Log                                                         | Select this option to have the Switch create a log message when the rule is applied and record the number of matched packets in a particular time interval.<br><br>Note: Make sure you also enable logging in the <b>Classifier Global Setting</b> screen.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Count                                                       | Select this option to have the Switch count how many times the rule is applied.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Time Range                                                  | Select the name of the pre-configured schedule that you want to apply to the rule. The rule will be active only at the scheduled date and/or time.<br><br>If you select <b>None</b> , the rule will be active all the time.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Ingress Port                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Port                                                        | Type the port number to which the rule should be applied. You may choose one port only or all ports ( <b>Any</b> ).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Trunk                                                       | Select <b>Any</b> to apply the rule to all trunk groups.<br><br>To specify a trunk group, select the second choice and type a trunk group ID.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Packet Format                                               | Specify the format of the packet. Choices are <b>All</b> , <b>802.3 tagged</b> , <b>802.3 untagged</b> , <b>Ethernet II tagged</b> and <b>Ethernet II untagged</b> .<br><br>A value of <b>802.3</b> indicates that the packets are formatted according to the IEEE 802.3 standards.<br><br>A value of <b>Ethernet II</b> indicates that the packets are formatted according to RFC 894, Ethernet II encapsulation.                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Layer 2                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Specify the fields below to configure a layer-2 classifier. |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| VLAN                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| VLAN                                                        | Select <b>Any</b> to classify traffic from any VLAN or select the second option and specify the source VLAN ID in the field provided.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Inner VLAN                                                  | Select <b>Any</b> to classify traffic from any inner VLAN (the customer's VLAN) or select the second option and specify the source VLAN ID in the field provided.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Priority                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Priority                                                    | Select <b>Any</b> to classify traffic from any priority level or select the second option and specify a priority level in the field provided.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Inner Priority                                              | Select <b>Any</b> to classify traffic from any inner priority level or select the second option and specify a priority level in the field provided.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Ethernet Type                                               | Select an Ethernet type or select <b>Others</b> and enter the Ethernet type number in hexadecimal value. Refer to <a href="#">Table 83 on page 204</a> for information.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Source                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| MAC Address                                                 | Select <b>Any</b> to apply the rule to all MAC addresses.<br><br>To specify a source, select <b>MAC/Mask</b> to enter the source MAC address of the packet in valid MAC address format (six hexadecimal character pairs) and type the mask for the specified MAC address to determine which bits a packet's MAC address should match.<br><br>Enter "f" for each bit of the specified MAC address that the traffic's MAC address should match. Enter "0" for the bit(s) of the matched traffic's MAC address, which can be of any hexadecimal character(s). For example, if you set the MAC address to 00:13:49:00:00:00 and the mask to ff:ff:ff:00:00:00, a packet with a MAC address of 00:13:49:12:34:56 matches this criteria. If you leave the <b>Mask</b> field blank, the Switch automatically sets the mask to ff:ff:ff:ff:ff:ff. |
| Destination                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |

Table 81 Advanced Application &gt; Classifier &gt; Classifier Configuration (continued)

| LABEL                                                                  | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| MAC Address                                                            | <p>Select <b>Any</b> to apply the rule to all MAC addresses.</p> <p>To specify a source, select <b>MAC/Mask</b> to enter the source MAC address of the packet in valid MAC address format (six hexadecimal character pairs) and type the mask for the specified MAC address to determine which bits a packet's MAC address should match.</p> <p>Enter "f" for each bit of the specified MAC address that the traffic's MAC address should match. Enter "0" for the bit(s) of the matched traffic's MAC address, which can be of any hexadecimal character(s). For example, if you set the MAC address to 00:13:49:00:00:00 and the mask to ff:ff:ff:00:00:00, a packet with a MAC address of 00:13:49:12:34:56 matches this criteria. If you leave the <b>Mask</b> field blank, the Switch automatically sets the mask to ff:ff:ff:ff:ff:ff.</p> |
| Layer 3<br>Specify the fields below to configure a layer-3 classifier. |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| IP Packet Length                                                       | Click <b>Any</b> to classify any size of packet length or manually enter a range of number (from/to) of packet size in the field provided.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| DSCP IPv4/IPv6                                                         | Select <b>Any</b> to classify traffic from any DSCP or select the second option and specify a DSCP (DiffServ Code Point) number between 0 and 63 in the field provided.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Precedence                                                             | Select <b>Any</b> to classify traffic from any precedence or select the second option and specify an IP Precedence (the first 3 bits of the 8-bit ToS field) value between 0 and 7 in the field provided.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| ToS                                                                    | Select <b>Any</b> to classify traffic from any ToS or select the second option and specify Type of Service (the last 5 bits of the 8-bit ToS field) value between 0 and 255 in the field provided.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| IP Protocol                                                            | <p>Select an IPv4 protocol type or select <b>Other</b> and enter the protocol number in decimal value. Refer to <a href="#">Table 84 on page 205</a> for more information.</p> <p>You may select <b>Establish Only</b> for <b>TCP</b> protocol type. This means that the Switch will identify packets that initiate or acknowledge (establish) TCP connections.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| IPv6 Next Header                                                       | <p>Select an IPv6 protocol type or select <b>Other</b> and enter an 8-bit next header in the IPv6 packet. The Next Header field is similar to the IPv4 Protocol field. The IPv6 protocol number ranges from 1 to 255.</p> <p>You may select <b>Establish Only</b> for <b>TCP</b> protocol type. This means that the Switch will identify packets that initiate or acknowledge (establish) TCP connections.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Source                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| IP Address/Address Prefix                                              | <p>Enter a source IP address in dotted decimal notation.</p> <p>Specify the address prefix by entering the number of ones in the subnet mask.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Destination                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| IP Address/Address Prefix                                              | <p>Enter a destination IP address in dotted decimal notation.</p> <p>Specify the address prefix by entering the number of ones in the subnet mask.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Layer 4<br>Specify the fields below to configure a layer-4 classifier. |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Source/Destination Socket Number                                       | <p>Note: You must select either <b>UDP</b> or <b>TCP</b> in the <b>IP Protocol</b> field before you configure the socket numbers.</p> <p>Select Any to apply the rule to all TCP/UDP protocol port numbers or select the second option and enter a TCP/UDP protocol port number.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Add                                                                    | <p>Click this to create a new entry or to update an existing one.</p> <p>This saves your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the <b>Save</b> link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Cancel                                                                 | Click <b>Cancel</b> to begin configuring this screen afresh.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Clear                                                                  | Click <b>Clear</b> to set the above fields back to the factory defaults.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |

### 21.3.1 Viewing and Editing Classifier Configuration

To view a summary of the classifier configuration, scroll down to the summary table at the bottom of the **Classifier** screen. To change the settings of a rule, click a number in the **Index** field.

Note: When two rules conflict with each other, a higher layer rule has priority over a lower layer rule.

**Figure 139** Advanced Application > Classifier > Classifier Configuration: Summary Table

| Index                                                                                    | Active | Weight | Name   | Rule    |                          |
|------------------------------------------------------------------------------------------|--------|--------|--------|---------|--------------------------|
| 1                                                                                        | No     | 32767  | Class1 | vlan 1; | <input type="checkbox"/> |
| <div> <input type="button" value="Delete"/> <input type="button" value="Cancel"/> </div> |        |        |        |         |                          |

The following table describes the labels in this screen.

Table 82 Advanced Application > Classifier > Classifier Configuration: Summary Table

| LABEL  | DESCRIPTION                                                                                                                             |
|--------|-----------------------------------------------------------------------------------------------------------------------------------------|
| Index  | This field displays the index number of the rule. Click an index number to edit the rule.                                               |
| Active | This field displays <b>Yes</b> when the rule is activated and <b>No</b> when it is deactivated.                                         |
| Weight | The field displays the priority of the rule when the match order is in <b>manual</b> mode. A higher weight means a higher priority.     |
| Name   | This field displays the descriptive name for this rule. This is for identification purposes only.                                       |
| Rule   | This field displays a summary of the classifier rule's settings.                                                                        |
|        | Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries. |
| Delete | Click <b>Delete</b> to remove the selected entry from the summary table.                                                                |
| Cancel | Click <b>Cancel</b> to clear the check boxes.                                                                                           |

The following table shows some other common Ethernet types and the corresponding protocol number.

Table 83 Common Ethernet Types and Protocol Number

| ETHERNET TYPE  | PROTOCOL NUMBER |
|----------------|-----------------|
| IP ETHII       | 0800            |
| X.75 Internet  | 0801            |
| NBS Internet   | 0802            |
| ECMA Internet  | 0803            |
| Chaosnet       | 0804            |
| X.25 Level 3   | 0805            |
| XNS Compat     | 0807            |
| Banyan Systems | 0BAD            |
| BBN Simnet     | 5208            |
| IBM SNA        | 80D5            |
| AppleTalk AARP | 80F3            |



Some of the most common IP ports are:

Table 84 Common IP Ports

| PORT NUMBER | PORT NAME |
|-------------|-----------|
| 21          | FTP       |
| 23          | Telnet    |
| 25          | SMTP      |
| 53          | DNS       |
| 80          | HTTP      |
| 110         | POP3      |

## 21.4 Classifier Global Setting Configuration

Use this screen to configure the match order and enable logging on the Switch. In the **Classifier Configuration** screen click **Classifier Global Setting** to display the configuration screen as shown.

**Figure 140** Advanced Application > Classifier > Classifier Configuration > Classifier Global Setting

The following table describes the labels in this screen.

Table 85 Advanced Application > Classifier > Classifier Configuration > Classifier Global Setting

| LABEL       | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|-------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Match Order | Select <b>manual</b> to have classifier rules applied according to the weight of each rule you configured in <b>Advanced Application &gt; Classifier &gt; Classifier Configuration</b> .<br><br>Alternatively, select <b>auto</b> to have classifier rules applied according to the layer of the item configured in the rule. Layer-4 items have the highest priority, and layer-2 items has the lowest priority. For example, you configure a layer-2 item (VLAN ID) in classifier A and configure a layer-3 item (source IP address) in classifier B. When an incoming packet matches both classifier rules, classifier B has priority over classifier A. |
| Logging     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Active      | Select this to allow the Switch to create a log when packets match a classifier rule during a defined time interval.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Interval    | Select the length of the time period (in seconds) to count matched packets for a classifier rule. Enter an integer from 0-65535. 0 means that no logging is done.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Apply       | Click <b>Apply</b> to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the <b>Save</b> link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.                                                                                                                                                                                                                                                                                                                                                                          |
| Cancel      | Click <b>Cancel</b> to begin configuring this screen afresh.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |

## 21.5 Classifier Example

The following screen shows an example of configuring a classifier that identifies all traffic from MAC address 00:50:ba:ad:4f:81 on port 2.

**Figure 141** Classifier: Example

The screenshot displays the 'Classifier Configuration' interface. The configuration is as follows:

- Active:** ☒ (highlighted with a red circle)
- Name:** Example (highlighted with a red circle)
- Weight:** 32767
- Log:** ☐
- Count:** ☐
- Time Range:** None
- Ingress Port:**
  - Port:** 2 (highlighted with a red circle)
  - Trunk:** Any
- Packet Format:** All
- Layer 2:**
  - VLAN:** Any
  - Inner VLAN:** Any
  - Priority:** Any
  - Inner Priority:** 0
  - Ethernet Type:** All
  - Source:** MAC Address 00:50:ba:ad:4f:81 (highlighted with a red circle)
  - Destination:** MAC Address
- Layer 3:**
  - IP Packet Length:** Any
  - DSCP:** Any
  - Precedence:** Any
  - ToS:** Any
  - IP Protocol:** All
  - IPv6 Next Header:** All
  - Source:** IP Address / Address Prefix
  - Destination:** IP Address / Address Prefix (highlighted with a red circle and the word 'EXAMPLE' in red text)
- Layer 4:**
  - Source:** Socket Number
  - Destination:** Socket Number

At the bottom of the interface are buttons for **Add**, **Cancel**, and **Clear**.

After you have configured a classifier, you can configure a policy to define action(s) on the classified traffic flow. See [Chapter 22 on page 208](#) for information on configuring a policy rule.

# CHAPTER 22

## Policy Rule

This chapter shows you how to configure policy rules.

### 22.1 Policy Rules Overview

A classifier distinguishes traffic into flows based on the configured criteria (refer to [Chapter 21 on page 199](#) for more information). A policy rule ensures that a traffic flow gets the requested treatment in the network.

#### 22.1.1 DiffServ

DiffServ (Differentiated Services) is a class of service (CoS) model that marks packets so that they receive specific per-hop treatment at DiffServ-compliant network devices along the route based on the application types and traffic flow. Packets are marked with DiffServ Code Points (DSCPs) indicating the level of service desired. This allows the intermediary DiffServ-compliant network devices to handle the packets differently depending on the code points without the need to negotiate paths or remember state information for every flow. In addition, applications do not have to request a particular service or give advanced notice of where the traffic is going.

#### 22.1.2 DSCP and Per-Hop Behavior

DiffServ defines a new DS (Differentiated Services) field to replace the Type of Service (TOS) field in the IP header. The DS field contains a 2-bit unused field and a 6-bit DSCP field which can define up to 64 service levels. The following figure illustrates the DS field.

DSCP is backward compatible with the three precedence bits in the ToS octet so that non-DiffServ compliant, ToS-enabled network device will not conflict with the DSCP mapping.



The DSCP value determines the forwarding behavior, the PHB (Per-Hop Behavior), that each packet gets across the DiffServ network. Based on the marking rule, different kinds of traffic can be marked for different kinds of forwarding. Resources can then be allocated according to the DSCP values and the configured policies.

### 22.2 Configuring Policy Rules

You must first configure a classifier in the **Classifier** screen. Refer to [Section 21.2 on page 199](#) for more information.

Click **Advanced Application > Policy Rule** in the navigation panel to display the screen as shown.

**Figure 142** Advanced Application > Policy Rule

The screenshot shows the 'Advanced Application > Policy Rule' configuration interface. It includes sections for setting the policy's active status, name, classifier, and various parameters like egress port, priority, DSCP, and TOS. The 'Action' section allows for configuring forwarding, priority, Diffserv, outgoing actions, and metering. At the bottom, there are buttons for adding, canceling, or clearing the rule, and a table to manage multiple rules.

The following table describes the labels in this screen.

**Table 86** Advanced Application > Policy Rule

| LABEL         | DESCRIPTION                                                                                                                                                                                                                                           |
|---------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Active        | Select this option to enable the policy.                                                                                                                                                                                                              |
| Name          | Enter a descriptive name for identification purposes.                                                                                                                                                                                                 |
| Classifier(s) | This field displays the active classifier(s) you configure in the <b>Classifier</b> screen.<br>Select the classifier(s) to which this policy rule applies. To select more than one classifier, press [SHIFT] and select the choices at the same time. |

Table 86 Advanced Application &gt; Policy Rule (continued)

| LABEL                                                                                                                                                                | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Parameters<br><br>Set the fields below for this policy. You only have to set the field(s) that is related to the action(s) you configure in the <b>Action</b> field. |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| General                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Egress Port                                                                                                                                                          | Type the number of an outgoing port.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Priority                                                                                                                                                             | Specify a priority level.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| DSCP                                                                                                                                                                 | Specify a DSCP (DiffServ Code Point) number between 0 and 63.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| TOS                                                                                                                                                                  | Specify the type of service (TOS) priority level.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Metering                                                                                                                                                             | You can configure the desired bandwidth available to a traffic flow. Traffic that exceeds the maximum bandwidth allocated (in cases where the network is congested) is called out-of-profile traffic.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Bandwidth                                                                                                                                                            | Specify the bandwidth in kilobit per second (Kbps). Enter a number between 1 and 1000000.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Out-of-Profile DSCP                                                                                                                                                  | Specify a new DSCP number (between 0 and 63) if you want to replace or remark the DSCP number for out-of-profile traffic.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Action<br><br>Specify the action(s) the Switch takes on the associated classified traffic flow.                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Forwarding                                                                                                                                                           | Select <b>No change</b> to forward the packets.<br><br>Select <b>Discard the packet</b> to drop the packets.<br><br>Select <b>Do not drop the matching frame previously marked for dropping</b> to retain the frames that were marked to be dropped before.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Priority                                                                                                                                                             | Select <b>No change</b> to keep the priority setting of the frames.<br><br>Select <b>Set the packet's 802.1p priority and send the packet to priority queue</b> to replace the packet's 802.1p priority field with the value you set in the Priority field and put the packets in the designated queue.<br><br>Select <b>Replace the 802.1p priority field with the IP TOS value and send the packet to priority queue</b> to replace the packet's 802.1p priority field with the value you set in the TOS field and put the packets in the designated queue.<br><br>Select <b>Replace the 802.1p priority field with the inner 802.1p priority value and send the packet to priority queue</b> to replace the packet's 802.1p priority field with the existing customer priority level carried in the frames and put the packets in the designated queue. |
| Diffserv                                                                                                                                                             | Select <b>No change</b> to keep the TOS and/or DSCP fields in the packets.<br><br>Select <b>Set the packet's TOS field</b> to set the TOS field with the value you configure in the TOS field.<br><br>Select <b>Replace the IP TOS with the 802.1p priority value</b> to replace the TOS field with the value you configure in the Priority field.<br><br>Select <b>Set the Diffserv Codepoint field in the frame</b> to set the DSCP field with the value you configure in the DSCP field.                                                                                                                                                                                                                                                                                                                                                                |
| Outgoing                                                                                                                                                             | Select <b>Send the packet to the mirror port</b> to send the packet to the mirror port.<br><br>Select <b>Send the packet to the egress port</b> to send the packet to the egress port.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Metering                                                                                                                                                             | Select <b>Enable</b> to activate bandwidth limitation on the traffic flow(s) then set the actions to be taken on out-of-profile packets.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |

Table 86 Advanced Application &gt; Policy Rule (continued)

| LABEL                 | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|-----------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Out-of-profile action | <p>Select the action(s) to be performed for out-of-profile traffic.</p> <p>Select <b>Drop the packet</b> to discard the out-of-profile traffic.</p> <p>Select <b>Change the DSCP value</b> to replace the DSCP field with the value specified in the <b>Out of profile DSCP</b> field.</p> <p>Select <b>Set Out-Drop Precedence</b> to mark out-of-profile traffic and drop it when network is congested.</p> <p>Select <b>Do not drop the matching frame previously marked for dropping</b> to queue the frames that are marked to be dropped.</p> |
| Add                   | <p>Click this to create a new entry or to update an existing one.</p> <p>This saves your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the <b>Save</b> link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.</p>                                                                                                                                                                                                     |
| Cancel                | Click <b>Cancel</b> to begin configuring this screen afresh.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Clear                 | Click <b>Clear</b> to set the above fields back to the factory defaults.                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Index                 | This field displays the policy index number. Click an index number to edit the policy.                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Active                | This field displays <b>Yes</b> when policy is activated and <b>No</b> when is it deactivated.                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Name                  | This field displays the name you have assigned to this policy.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Classifier(s)         | This field displays the name(s) of the classifier to which this policy applies.                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|                       | Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries.                                                                                                                                                                                                                                                                                                                                                                                                             |
| Delete                | Click <b>Delete</b> to remove the selected entry from the summary table.                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Cancel                | Click <b>Cancel</b> to clear the check boxes.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |

## 22.3 Policy Example

The figure below shows an example **Policy** screen where you configure a policy to limit bandwidth and discard out-of-profile traffic on a traffic flow classified using the **Example** classifier (refer to [Section 21.5 on page 206](#)).

**Figure 143** Policy Example

| Policy                |                                                                                                                                                                                                                                                                                                                                                                                                         |
|-----------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Active                | <input checked="" type="checkbox"/>                                                                                                                                                                                                                                                                                                                                                                     |
| Name                  | Test                                                                                                                                                                                                                                                                                                                                                                                                    |
| Classifier(s)         | Example                                                                                                                                                                                                                                                                                                                                                                                                 |
| Parameters            | <div>General</div> <div> Egress Port: <input type="text" value="1"/><br/> Priority: <input type="text" value="0"/><br/> DSCP: <input type="text"/><br/> TOS: <input type="text" value="0"/> </div>                                                                                                                                                                                                      |
|                       | <div>Metering</div> <div> Bandwidth: <input type="text" value="10000"/> kbps<br/> Out-of-Profile DSCP: <input type="text"/> </div>                                                                                                                                                                                                                                                                      |
|                       | Forwarding                                                                                                                                                                                                                                                                                                                                                                                              |
|                       | Priority                                                                                                                                                                                                                                                                                                                                                                                                |
|                       | Diffserv                                                                                                                                                                                                                                                                                                                                                                                                |
| Action                | <input checked="" type="radio"/> No change<br><input type="radio"/> Discard the packet<br><input type="radio"/> Do not drop the matching frame previously marked for dropping                                                                                                                                                                                                                           |
|                       | <input checked="" type="radio"/> No change<br><input type="radio"/> Set the packet's 802.1p priority and send the packet to priority queue<br><input type="radio"/> Replace the 802.1p priority field with the IP TOS value and send the packet to priority queue<br><input type="radio"/> Replace the 802.1p priority field with the inner 802.1p priority value and send the packet to priority queue |
|                       | <input checked="" type="radio"/> No change<br><input type="radio"/> Set the packet's TOS field<br><input type="radio"/> Replace the IP TOS field with the 802.1p priority value<br><input type="radio"/> Set the Diffserv Codepoint field in the frame                                                                                                                                                  |
|                       | Outgoing                                                                                                                                                                                                                                                                                                                                                                                                |
|                       | <input type="checkbox"/> Send the packet to the mirror port<br><input type="checkbox"/> Send the packet to the egress port                                                                                                                                                                                                                                                                              |
| Metering              | <input type="checkbox"/> Enable                                                                                                                                                                                                                                                                                                                                                                         |
| Out-of-profile action | <input checked="" type="checkbox"/> Drop the packet<br><input type="checkbox"/> Change the DSCP value<br><input type="checkbox"/> Set Out-Drop Precedence<br><input type="checkbox"/> Do not drop the matching frame previously marked for dropping                                                                                                                                                     |



# CHAPTER 23

## Queuing Method

This chapter introduces the queuing methods supported.

### 23.1 Queuing Method Overview

Queuing is used to help solve performance degradation when there is network congestion. Use the **Queuing Method** screen to configure queuing algorithms for outgoing traffic. See also **Priority Queue Assignment** in **Switch Setup** and **802.1p Priority** in **Port Setup** for related information.

Queuing algorithms allow switches to maintain separate queues for packets from each individual source or flow and prevent a source from monopolizing the bandwidth.

#### 23.1.1 Strictly Priority

Strictly Priority (SP) services queues based on priority only. As traffic comes into the Switch, traffic on the highest priority queue, Q7 is transmitted first. When that queue empties, traffic on the next highest-priority queue, Q6 is transmitted until Q6 empties, and then traffic is transmitted on Q5 and so on. If higher priority queues never empty, then traffic on lower priority queues never gets sent. SP does not automatically adapt to changing network requirements.

#### 23.1.2 Weighted Fair Queuing

Weighted Fair Queuing is used to guarantee each queue's minimum bandwidth based on its bandwidth weight (the number you configure in the **Weight** field) when there is traffic congestion. WFQ is activated only when a port has more traffic than it can handle. Queues with larger weights get more guaranteed bandwidth than queues with smaller weights. By default, the weight for Q0 is 1, for Q1 is 2, for Q2 is 3, and so on. The weights range from 1 to 15.

#### 23.1.3 Weighted Round Robin Scheduling (WRR)

Round Robin Scheduling services queues on a rotating basis and is activated only when a port has more traffic than it can handle. A queue is given an amount of bandwidth irrespective of the incoming traffic on that port. This queue then moves to the back of the list. The next queue is given an equal amount of bandwidth, and then moves to the end of the list; and so on, depending on the number of queues being used. This works in a looping fashion until a queue is empty.

Weighted Round Robin Scheduling (WRR) uses the same algorithm as round robin scheduling, but services queues based on their priority and queue weight (the number you configure in the queue **Weight** field) rather than a fixed amount of bandwidth. WRR is activated only when a port has more

traffic than it can handle. Queues with larger weights get more service than queues with smaller weights. This queuing mechanism is highly efficient in that it divides any available bandwidth across the different traffic queues and returns to queues that have not yet emptied.

## 23.2 Configuring Queuing

Click **Advanced Application > Queuing Method** in the navigation panel.

**Figure 144** Advanced Application > Queuing Method

| Port | Method                                                                                         | Q0 | Q1 | Q2 | Q3 | Q4 | Q5 | Q6 | Q7 | Hybrid-SPQ Lowest-Queue |
|------|------------------------------------------------------------------------------------------------|----|----|----|----|----|----|----|----|-------------------------|
| *    | SPQ ▼                                                                                          |    |    |    |    |    |    |    |    | None ▼                  |
| 1    | <input checked="" type="radio"/> SPQ<br><input type="radio"/> WFQ<br><input type="radio"/> WRR | 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8  | None ▼                  |
| 2    | <input checked="" type="radio"/> SPQ<br><input type="radio"/> WFQ<br><input type="radio"/> WRR | 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8  | None ▼                  |
| 3    | <input checked="" type="radio"/> SPQ<br><input type="radio"/> WFQ<br><input type="radio"/> WRR | 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8  | None ▼                  |
| 4    | <input checked="" type="radio"/> SPQ<br><input type="radio"/> WFQ<br><input type="radio"/> WRR | 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8  | None ▼                  |
| 5    | <input checked="" type="radio"/> SPQ<br><input type="radio"/> WFQ<br><input type="radio"/> WRR | 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8  | None ▼                  |
| 6    | <input checked="" type="radio"/> SPQ<br><input type="radio"/> WFQ<br><input type="radio"/> WRR | 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8  | None ▼                  |
| 7    | <input checked="" type="radio"/> SPQ<br><input type="radio"/> WFQ<br><input type="radio"/> WRR | 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8  | None ▼                  |

The following table describes the labels in this screen.

**Table 87** Advanced Application > Queuing Method

| LABEL | DESCRIPTION                                                                                                                                                                                                                                                                                                                |
|-------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Port  | This field displays the port number.                                                                                                                                                                                                                                                                                       |
| *     | <p>Settings in this row apply to all ports.</p> <p>Use this row only if you want to make some settings the same for all ports. Use this row first to set the common settings and then make adjustments on a port-by-port basis.</p> <p>Note: Changes in this row are copied to all the ports as soon as you make them.</p> |

Table 87 Advanced Application &gt; Queuing Method (continued)

| LABEL                          | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|--------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Method                         | <p>Select <b>SPQ</b> (Strictly Priority Queuing), <b>WFQ</b> (Weighted Fair Queuing) or <b>WRR</b> (Weighted Round Robin).</p> <p>Strictly Priority services queues based on priority only. When the highest priority queue empties, traffic on the next highest-priority queue begins. Q7 has the highest priority and Q0 the lowest.</p> <p>Weighted Fair Queuing is used to guarantee each queue's minimum bandwidth based on their bandwidth weight (the number you configure in the <b>Weight</b> field). Queues with larger weights get more guaranteed bandwidth than queues with smaller weights.</p> <p>Weighted Round Robin Scheduling services queues on a rotating basis based on their queue weight (the number you configure in the queue <b>Weight</b> field). Queues with larger weights get more service than queues with smaller weights.</p> |
| Weight<br>Q0-Q7                | When you select <b>WFQ</b> or <b>WRR</b> enter the queue weight here. Bandwidth is divided across the different traffic queues according to their weights.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Hybrid-SPQ<br><br>Lowest-Queue | <p>This field is applicable only when you select <b>WFQ</b> or <b>WRR</b>.</p> <p>Select a queue (<b>Q0</b> to <b>Q7</b>) to have the Switch use <b>SPQ</b> to service the subsequent queue(s) after and including the specified queue for the 1000Base-T, 1000Base-X and 10 Gigabit Ethernet ports. For example, if you select <b>Q5</b>, the Switch services traffic on <b>Q5</b>, <b>Q6</b> and <b>Q7</b> using <b>SPQ</b>.</p> <p>Select <b>None</b> to always use <b>WFQ</b> or <b>WRR</b>.</p>                                                                                                                                                                                                                                                                                                                                                            |
| Apply                          | Click <b>Apply</b> to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the <b>Save</b> link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Cancel                         | Click <b>Cancel</b> to begin configuring this screen afresh.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |

# CHAPTER 24

## VLAN Stacking

This chapter shows you how to configure VLAN stacking on your Switch. See the chapter on VLANs for more background information on Virtual LAN

### 24.1 VLAN Stacking Overview

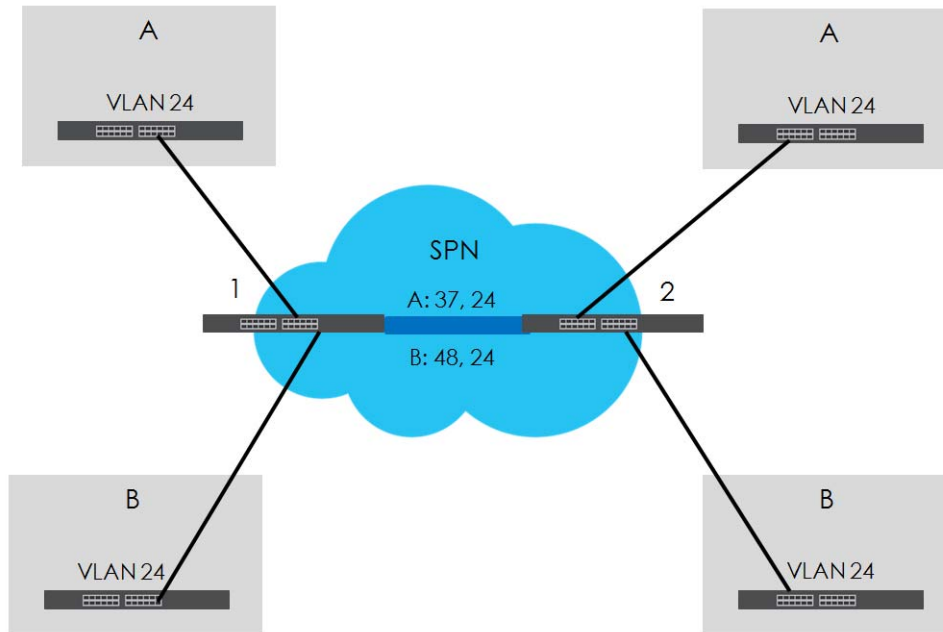
A service provider can use VLAN stacking to allow it to distinguish multiple customers VLANs, even those with the same (customer-assigned) VLAN ID, within its network.

Use VLAN stacking to add an outer VLAN tag to the inner IEEE 802.1Q tagged frames that enter the network. By tagging the tagged frames ("double-tagged" frames), the service provider can manage up to 4,094 VLAN groups with each group containing up to 4,094 customer VLANs. This allows a service provider to provide different service, based on specific VLANs, for many different customers.

A service provider's customers may require a range of VLANs to handle multiple applications. A service provider's customers can assign their own inner VLAN tags on ports for these applications. The service provider can assign an outer VLAN tag for each customer. Therefore, there is no VLAN tag overlap among customers, so traffic from different customers is kept separate.

#### 24.1.1 VLAN Stacking Example

In the following example figure, both **A** and **B** are Service Provider's Network (SPN) customers with VPN tunnels between their head offices and branch offices respectively. Both have an identical VLAN tag for their VLAN group. The service provider can separate these two VLANs within its network by adding tag 37 to distinguish customer **A** and tag 48 to distinguish customer **B** at edge device **1** and then stripping those tags at edge device **2** as the data frames leave the network.

**Figure 145** VLAN Stacking Example

## 24.2 VLAN Stacking Port Roles

Each port can have three VLAN stacking “roles”, **Normal**, **Access Port** and **Tunnel Port** (the latter is for Gigabit ports only).

- Select **Normal** for “regular” (non-VLAN stacking) IEEE 802.1Q frame switching.
- Select **Access Port** for ingress ports on the service provider's edge devices (**1** and **2** in the VLAN stacking example figure). The incoming frame is treated as “untagged”, so a second VLAN tag (outer VLAN tag) can be added.

Note: Static VLAN **Tx Tagging** MUST be disabled on a port where you choose **Normal** or **Access Port**.

- Select **Tunnel Port** (available for Gigabit ports only) for egress ports at the edge of the service provider's network. All VLANs belonging to a customer can be aggregated into a single service provider's VLAN (using the outer VLAN tag defined by the Service Provider's (SP) VLAN ID (VID)).

Note: Static VLAN **Tx Tagging** MUST be enabled on a port where you choose **Tunnel Port**.

## 24.3 VLAN Tag Format

A VLAN tag (service provider VLAN stacking or customer IEEE 802.1Q) consists of the following three fields.

Table 88 VLAN Tag Format

|      |          |     |
|------|----------|-----|
| Type | Priority | VID |
|------|----------|-----|

**Type** is a standard Ethernet type code identifying the frame and indicates that whether the frame carries IEEE 802.1Q tag information. **SP TPID** (Service Provider Tag Protocol Identifier) is the service provider VLAN stacking tag type. Many vendors use 0x8100 or 0x9100.

**TPID** (Tag Protocol Identifier) is the customer IEEE 802.1Q tag.

- If the VLAN stacking port role is **Access Port**, then the Switch adds the **SP TPID** tag to all incoming frames on the service provider's edge devices (1 and 2 in the VLAN stacking example figure).
- If the VLAN stacking port role is **Tunnel Port**, then the Switch only adds the **SP TPID** tag to all incoming frames on the service provider's edge devices (1 and 2 in the VLAN stacking example figure) that have an **SP TPID** different to the one configured on the Switch. (If an incoming frame's **SP TPID** is the same as the one configured on the Switch, then the Switch will not add the tag.)

**Priority** refers to the IEEE 802.1p standard that allows the service provider to prioritize traffic based on the class of service (CoS) the customer has paid for.

- On the Switch, configure priority level of the inner IEEE 802.1Q tag in the **Port Setup** screen.
- "0" is the lowest priority level and "7" is the highest.

**VID** is the VLAN ID. **SP VID** is the VID for the second (service provider's) VLAN tag.

### 24.3.1 Frame Format

The frame format for an untagged Ethernet frame, a single-tagged 802.1Q frame (customer) and a "double-tagged" 802.1Q frame (service provider) is shown next.

Configure the fields as highlighted in the Switch **VLAN Stacking** screen.

Table 89 Single and Double Tagged 802.1Q Frame Format

|    |    |        |          |     |      |          |     |           |      |     |                                   |
|----|----|--------|----------|-----|------|----------|-----|-----------|------|-----|-----------------------------------|
|    |    |        |          |     |      | DA       | SA  | Len/Etype | Data | FCS | Untagged Ethernet frame           |
|    |    |        | DA       | SA  | TPID | Priority | VID | Len/Etype | Data | FCS | IEEE 802.1Q customer tagged frame |
| DA | SA | SPTPID | Priority | VID | TPID | Priority | VID | Len/Etype | Data | FCS | Double-tagged frame               |

Table 90 802.1Q Frame

|          |                                            |           |                                   |
|----------|--------------------------------------------|-----------|-----------------------------------|
| DA       | Destination Address                        | Priority  | 802.1p Priority                   |
| SA       | Source Address                             | Len/Etype | Length and type of Ethernet frame |
| (SP)TPID | (Service Provider) Tag Protocol Identifier | Data      | Frame data                        |
| VID      | VLAN ID                                    | FCS       | Frame Check Sequence              |

## 24.4 Configuring VLAN Stacking

Click **Advanced Application > VLAN Stacking** to display the screen as shown.

**Figure 146** Advanced Application > VLAN Stacking

**VLAN Stacking** [Port-based QinQ](#) [Selective QinQ](#)

Active ☐

| Port | Role     | Tunnel TPID |
|------|----------|-------------|
| *    | Normal ▼ |             |
| 1    | Normal ▼ | 8100        |
| 2    | Normal ▼ | 8100        |
| 3    | Normal ▼ | 8100        |
| 4    | Normal ▼ | 8100        |
| 5    | Normal ▼ | 8100        |
| 6    | Normal ▼ | 8100        |
| 7    | Normal ▼ | 8100        |
| 8    | Normal ▼ | 8100        |
| 9    | Normal ▼ | 8100        |
| 10   | Normal ▼ | 8100        |
| 11   | Normal ▼ | 8100        |

Apply Cancel

The following table describes the labels in this screen.

Table 91 Advanced Application &gt; VLAN Stacking

| LABEL       | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|-------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Active      | Select this checkbox to enable VLAN stacking on the Switch.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Port        | This field displays the port number.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| *           | <p>Settings in this row apply to all ports.</p> <p>Use this row only if you want to make some settings the same for all ports. Use this row first to set the common settings and then make adjustments on a port-by-port basis.</p> <p>Note: Changes in this row are copied to all the ports as soon as you make them.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Role        | <p>Select <b>Normal</b> to have the Switch ignore frames received (or transmitted) on this port with VLAN stacking tags. Anything you configure in <b>SPVID</b> and <b>Priority</b> of the <b>Port-based QinQ</b> or the <b>Selective QinQ</b> screen are ignored.</p> <p>Select <b>Access Port</b> to have the Switch add the SP TPID tag to all incoming frames received on this port. Select <b>Access Port</b> for ingress ports at the edge of the service provider's network.</p> <p>Select <b>Tunnel Port</b> (available for Gigabit ports only) for egress ports at the edge of the service provider's network. Select <b>Tunnel Port</b> to have the Switch add the <b>Tunnel TPID</b> tag to all outgoing frames sent on this port.</p> <p>In order to support VLAN stacking on a port, the port must be able to allow frames of 1526 Bytes (1522 Bytes + 4 Bytes for the second tag) to pass through it.</p> |
| Tunnel TPID | <p>TPID is a standard Ethernet type code identifying the frame and indicates whether the frame carries IEEE 802.1Q tag information. Enter a four-digit hexadecimal number from 0000 to FFFF that the Switch adds in the outer VLAN tag of the frames sent on the tunnel port(s). The Switch also uses this to check if the received frames are double-tagged.</p> <p>The value of this field is 0x8100 as defined in IEEE 802.1Q. It's used to identify the customer tag of an incoming frame. If the Switch needs to communicate with other vendors' devices, they should use the same TPID.</p> <p>Note: You can define up to four different tunnel TPIDs (including <b>8100</b>) in this screen at a time.</p>                                                                                                                                                                                                       |

Table 91 Advanced Application &gt; VLAN Stacking (continued)

| LABEL  | DESCRIPTION                                                                                                                                                                                                                                                                        |
|--------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Apply  | Click <b>Apply</b> to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the <b>Save</b> link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click <b>Cancel</b> to begin configuring this screen afresh.                                                                                                                                                                                                                       |

### 24.4.1 Port-based Q-in-Q

Port-based Q-in-Q lets the Switch treat all frames received on the same port as the same VLAN flows and add the same outer VLAN tag to them, even they have different customer VLAN IDs.

Click **Port-based QinQ** in the **Advanced Application > VLAN Stacking** screen to display the screen as shown.

Figure 147 Advanced Application &gt; VLAN Stacking &gt; Port-based QinQ

| Port | SPVID | Priority |
|------|-------|----------|
| *    |       | 0 ▼      |
| 1    | 1     | 0 ▼      |
| 2    | 1     | 0 ▼      |
| 3    | 1     | 0 ▼      |
| 4    | 1     | 0 ▼      |
| 5    | 1     | 0 ▼      |
| 6    | 1     | 0 ▼      |
| 7    | 1     | 0 ▼      |
| 8    | 1     | 0 ▼      |
| 9    | 1     | 0 ▼      |
| 10   | 1     | 0 ▼      |
| 11   | 1     | 0 ▼      |
| 12   | 1     | 0 ▼      |
| 13   | 1     | 0 ▼      |
| 14   | 1     | 0 ▼      |

Apply Cancel

The following table describes the labels in this screen.

Table 92 Advanced Application &gt; VLAN Stacking &gt; Port-based QinQ

| LABEL    | DESCRIPTION                                                                                                                                                                                                                                 |
|----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Port     | This field displays the port number. * means all ports (on the same Switch).                                                                                                                                                                |
| SPVID    | <b>SPVID</b> is the service provider's VLAN ID (the outer VLAN tag). Enter the service provider ID (from 1 to 4094) for frames received on this port. See <a href="#">Chapter 9 on page 109</a> for more background information on VLAN ID. |
| Priority | Select a priority level (from 0 to 7). This is the service provider's priority level that adds to the frames received on this port.<br><br>"0" is the lowest priority level and "7" is the highest.                                         |



Table 92 Advanced Application &gt; VLAN Stacking &gt; Port-based QinQ (continued)

| LABEL  | DESCRIPTION                                                                                                                                                                                                                                                                        |
|--------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Apply  | Click <b>Apply</b> to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the <b>Save</b> link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click <b>Cancel</b> to begin configuring this screen afresh.                                                                                                                                                                                                                       |

## 24.4.2 Selective Q-in-Q

Selective Q-in-Q is VLAN-based. It allows the Switch to add different outer VLAN tags to the incoming frames received on one port according to their inner VLAN tags.

Note: Selective Q-in-Q rules are only applied to single-tagged frames received on the access ports. If the incoming frames are untagged or single-tagged but received on a tunnel port or cannot match any selective Q-in-Q rules, the Switch applies the port-based Q-in-Q rules to them.

Click **Selective QinQ** in the **Advanced Application > VLAN Stacking** screen to display the screen as shown.

Figure 148 Advanced Application &gt; VLAN Stacking &gt; Selective QinQ

The following table describes the labels in this screen.

Table 93 Advanced Application &gt; VLAN Stacking &gt; Selective QinQ

| LABEL  | DESCRIPTION                                                                                                                                                                                                                                 |
|--------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Active | Check this box to activate this rule.                                                                                                                                                                                                       |
| Name   | Enter a descriptive name (up to 32 printable ASCII characters) for identification purposes.                                                                                                                                                 |
| Port   | The port number identifies the port you are configuring.                                                                                                                                                                                    |
| CVID   | Enter a customer VLAN ID (the inner VLAN tag) from 1 to 4094. This is the VLAN tag carried in the packets from the subscribers.                                                                                                             |
| SPVID  | <b>SPVID</b> is the service provider's VLAN ID (the outer VLAN tag). Enter the service provider ID (from 1 to 4094) for frames received on this port. See <a href="#">Chapter 9 on page 109</a> for more background information on VLAN ID. |

Table 93 Advanced Application &gt; VLAN Stacking &gt; Selective QinQ (continued)

| LABEL    | DESCRIPTION                                                                                                                                                                                                                                                                                                                              |
|----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Priority | Select a priority level (from 0 to 7). This is the service provider's priority level that adds to the frames received on this port.<br><br>"0" is the lowest priority level and "7" is the highest.                                                                                                                                      |
| Add      | Click this to create a new entry or to update an existing one.<br><br>This saves your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the <b>Save</b> link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel   | Click <b>Cancel</b> to begin configuring this screen afresh.                                                                                                                                                                                                                                                                             |
| Index    | This is the number of the selective VLAN stacking rule. Click on an index number to change the settings.                                                                                                                                                                                                                                 |
| Active   | This shows whether this rule is activated or not.                                                                                                                                                                                                                                                                                        |
| Name     | This is the descriptive name for this rule.                                                                                                                                                                                                                                                                                              |
| Port     | This is the port number to which this rule is applied.                                                                                                                                                                                                                                                                                   |
| CVID     | This is the customer VLAN ID in the incoming packets.                                                                                                                                                                                                                                                                                    |
| SPVID    | This is the service provider's VLAN ID that adds to the packets from the subscribers.                                                                                                                                                                                                                                                    |
| Priority | This is the service provider's priority level in the packets.                                                                                                                                                                                                                                                                            |
|          | Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries.                                                                                                                                                                                                  |
| Delete   | Check the rule(s) that you want to remove in the <b>Delete</b> column and then click the <b>Delete</b> button.                                                                                                                                                                                                                           |
| Cancel   | Click <b>Cancel</b> to clear the <b>Delete</b> check boxes.                                                                                                                                                                                                                                                                              |

# CHAPTER 25

## Multicast

This chapter shows you how to configure various multicast features.

### 25.1 Multicast Overview

Traditionally, IP packets are transmitted in one of either two ways - Unicast (1 sender to 1 recipient) or Broadcast (1 sender to everybody on the network). Multicast delivers IP packets to just a group of hosts on the network.

IGMP (Internet Group Management Protocol) is a network-layer protocol used to establish membership in an IPv4 multicast group - it is not used to carry user data. Refer to RFC 1112, RFC 2236 and RFC 3376 for information on IGMP versions 1, 2 and 3 respectively.

The Multicast Listener Discovery (MLD) protocol (defined in RFC 2710) is derived from IPv4's Internet Group Management Protocol version 2 (IGMPv2). MLD uses ICMPv6 message types, rather than IGMP message types. MLDv1 is similar to IGMPv2 and MLDv2 is similar to IGMPv3. MLD allows an IPv6 switch or router to discover the presence of MLD listeners who wish to receive multicast packets and the IP addresses of multicast groups the hosts want to join on its network.

MLD snooping and MLD proxy are analogous to IGMP snooping and IGMP proxy in IPv4. MLD filtering controls which multicast groups a port can join.

#### 25.1.1 IP Multicast Addresses

In IPv4, a multicast address allows a device to send packets to a specific group of hosts (multicast group) in a different subnetwork. A multicast IP address represents a traffic receiving group, not individual receiving devices. IP addresses in the Class D range (224.0.0.0 to 239.255.255.255) are used for IP multicasting. Certain IP multicast numbers are reserved by IANA for special purposes (see the IANA website for more information).

In IPv6, multicast addresses provide the same functionality as IPv4 broadcast addresses. Broadcasting is not supported in IPv6. A multicast address allows a host to send packets to all hosts in a multicast group. Multicast scope allows you to determine the size of the multicast group. A multicast address has a predefined prefix of ff00::/8.

#### 25.1.2 IGMP Filtering

With the IGMP filtering feature, you can control which IGMP groups a subscriber on a port can join. This allows you to control the distribution of multicast services (such as content information distribution) based on service plans and types of subscription.

You can set the Switch to filter the multicast group join reports on a per-port basis by configuring an IGMP filtering profile and associating the profile to a port.

### 25.1.3 IGMP Snooping

The Switch can passively snoop on IGMP packets transferred between IP multicast routers/switches and IP multicast hosts to learn the IP multicast group membership. It checks IGMP packets passing through it, picks out the group registration information, and configures multicasting accordingly. IGMP snooping allows the Switch to learn multicast groups without you having to manually configure them.

The Switch forwards multicast traffic destined for multicast groups (that it has learned from IGMP snooping or that you have manually configured) to ports that are members of that group. IGMP snooping generates no additional network traffic, allowing you to significantly reduce multicast traffic passing through your Switch.

### 25.1.4 IGMP Snooping and VLANs

The Switch can perform IGMP snooping on up to 16 VLANs. You can configure the Switch to automatically learn multicast group membership of any VLANs. The Switch then performs IGMP snooping on the first 16 VLANs that send IGMP packets. This is referred to as auto mode. Alternatively, you can specify the VLANs that IGMP snooping should be performed on. This is referred to as fixed mode. In fixed mode the Switch does not learn multicast group membership of any VLANs other than those explicitly added as an IGMP snooping VLAN.

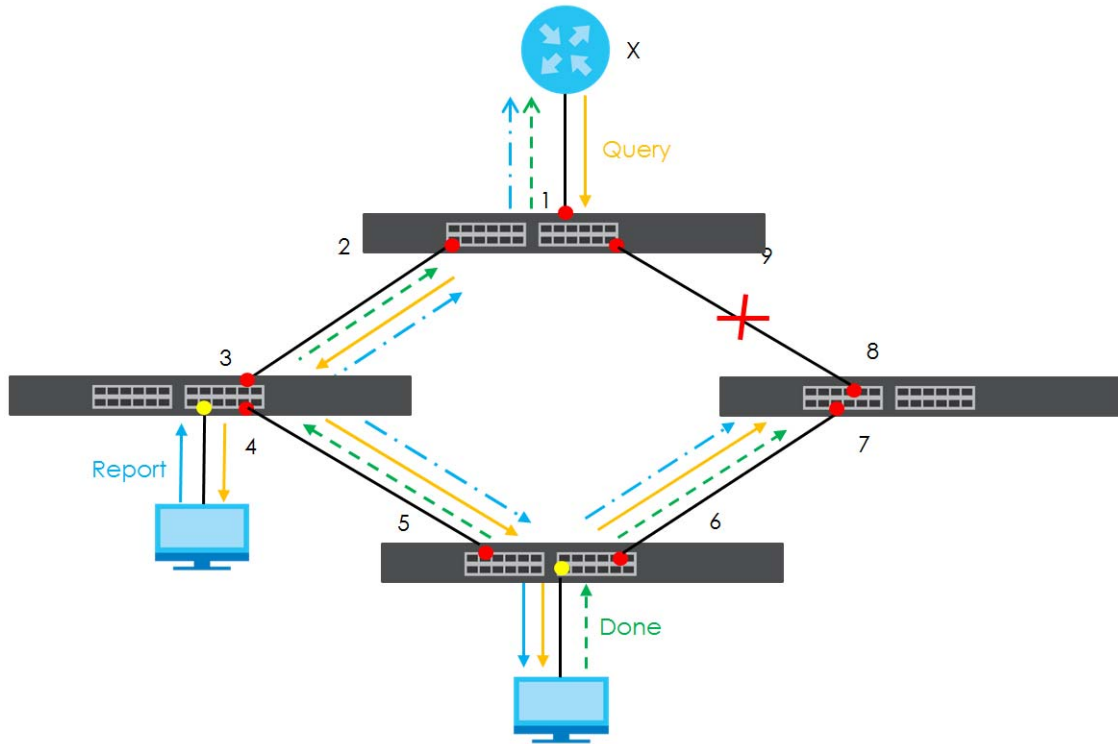
### 25.1.5 MLD Snooping-Proxy

MLD snooping-proxy is a Zyxel-proprietary feature. IPv6 MLD proxy allows only one upstream interface on a switch, while MLD snooping-proxy supports more than one upstream port on a switch. The upstream port in MLD snooping-proxy can report group changes to a connected multicast router and forward MLD messages to other upstream ports. This helps especially when you want to have a network that uses STP to provide backup links between switches and also performs MLD snooping and proxy functions. MLD snooping-proxy, like MLD proxy, can minimize MLD control messages and allow better network performance.

In MLD snooping-proxy, if one upstream port is learned via snooping, all other upstream ports on the same device will be added to the same group. If one upstream port requests to leave a group, all other upstream ports on the same device will also be removed from the group.

In the following MLD snooping-proxy example, all connected upstream ports (1 ~7) are treated as one interface. The connection between ports 8 and 9 is blocked by STP to break the loop. If there is one

query from a router (X) or MLD Done or Report message from any upstream port, it will be broadcast to all connected upstream ports.



### 25.1.6 MLD Messages

A multicast router or switch periodically sends general queries to MLD hosts to update the multicast forwarding table. When an MLD host wants to join a multicast group, it sends an MLD Report message for that address.

An MLD Done message is similar to an IGMP Leave message. When an MLD host wants to leave a multicast group, it can send a Done message to the router or switch. If the leave mode is not set to **Immediate**, the router or switch sends a group-specific query to the port on which the Done message is received to determine if other devices connected to this port should remain in the group.

## 25.2 Multicast Setup

Use this screen to configure IGMP for IPv4 or MLD for IPv6 and set up multicast VLANs. Click **Advanced Application > Multicast** in the navigation panel.

**Figure 149** Advanced Application > Multicast Setup

| Multicast Setup |                            |
|-----------------|----------------------------|
| IPv4 Multicast  | <a href="#">Click Here</a> |
| IPv6 Multicast  | <a href="#">Click Here</a> |
| MVR             | <a href="#">Click Here</a> |

The following table describes the labels in this screen.

Table 94 Advanced Application > Multicast Setup

| LABEL          | DESCRIPTION                                                                                       |
|----------------|---------------------------------------------------------------------------------------------------|
| IPv4 Multicast | Click the link to open screens where you can configure IGMP snooping and IGMP filtering for IPv4. |
| IPv6 Multicast | Click the link to open screens where you can configure MLD snooping and MLD filtering for IPv6.   |
| MVR            | Click the link to open screens where you can create multicast VLANs.                              |

## 25.3 IPv4 Multicast Status

Click **Advanced Application > Multicast > IPv4 Multicast** to display the screen as shown. This screen shows the IPv4 multicast group information. See [Section 25.1 on page 223](#) for more information on multicasting.

Figure 150 Advanced Application > Multicast > IPv4 Multicast



| IPv4 Multicast Status |     |      |                                                               |
|-----------------------|-----|------|---------------------------------------------------------------|
|                       |     |      | <a href="#">Multicast Setup</a> <a href="#">IGMP Snooping</a> |
| Index                 | VID | Port | Multicast Group                                               |

The following table describes the labels in this screen.

Table 95 Advanced Application > Multicast > IPv4 Multicast

| LABEL           | DESCRIPTION                                                              |
|-----------------|--------------------------------------------------------------------------|
| Index           | This is the index number of the entry.                                   |
| VID             | This field displays the multicast VLAN ID.                               |
| Port            | This field displays the port number that belongs to the multicast group. |
| Multicast Group | This field displays IP multicast group addresses.                        |

### 25.3.1 IGMP Snooping

Click the **IGMP Snooping** link in the **Advanced Application > Multicast > IPv4 Multicast** screen to display the screen as shown. See [Section 25.1 on page 223](#) for more information on multicasting.

**Figure 151** Advanced Application > Multicast > IPv4 Multicast > IGMP Snooping

| IGMP Snooping            |  | IPv4 Multicast Status                     | IGMP Snooping VLAN         | IGMP Filtering Profile |
|--------------------------|--|-------------------------------------------|----------------------------|------------------------|
| IGMP Snooping            |  | Active <input type="checkbox"/>           |                            |                        |
|                          |  | Querier <input type="checkbox"/>          |                            |                        |
|                          |  | Host Timeout                              | 260                        |                        |
|                          |  | 802.1p Priority                           | No-Change ▼                |                        |
| IGMP Filtering           |  | Active <input type="checkbox"/>           |                            |                        |
| Unknown Multicast Frame  |  | <input checked="" type="radio"/> Flooding | <input type="radio"/> Drop |                        |
| Reserved Multicast Group |  | <input checked="" type="radio"/> Flooding | <input type="radio"/> Drop |                        |

| Port | Immed. Leave          | Normal Leave                          | Fast Leave                | Group Limited            | Max Group Num. | Throttling | IGMP Filtering Profile | IGMP Querier Mode |
|------|-----------------------|---------------------------------------|---------------------------|--------------------------|----------------|------------|------------------------|-------------------|
| *    | <input type="radio"/> | <input checked="" type="radio"/>      | <input type="radio"/>     | <input type="checkbox"/> |                | Deny ▼     | Default ▼              | Auto ▼            |
| 1    | <input type="radio"/> | <input checked="" type="radio"/> 4000 | <input type="radio"/> 200 | <input type="checkbox"/> | 0              | Deny ▼     | Default ▼              | Auto ▼            |
| 2    | <input type="radio"/> | <input checked="" type="radio"/> 4000 | <input type="radio"/> 200 | <input type="checkbox"/> | 0              | Deny ▼     | Default ▼              | Auto ▼            |
| 3    | <input type="radio"/> | <input checked="" type="radio"/> 4000 | <input type="radio"/> 200 | <input type="checkbox"/> | 0              | Deny ▼     | Default ▼              | Auto ▼            |
| 4    | <input type="radio"/> | <input checked="" type="radio"/> 4000 | <input type="radio"/> 200 | <input type="checkbox"/> | 0              | Deny ▼     | Default ▼              | Auto ▼            |
| 5    | <input type="radio"/> | <input checked="" type="radio"/> 4000 | <input type="radio"/> 200 | <input type="checkbox"/> | 0              | Deny ▼     | Default ▼              | Auto ▼            |
| 6    | <input type="radio"/> | <input checked="" type="radio"/> 4000 | <input type="radio"/> 200 | <input type="checkbox"/> | 0              | Deny ▼     | Default ▼              | Auto ▼            |
| 7    | <input type="radio"/> | <input checked="" type="radio"/> 4000 | <input type="radio"/> 200 | <input type="checkbox"/> | 0              | Deny ▼     | Default ▼              | Auto ▼            |
| 8    | <input type="radio"/> | <input checked="" type="radio"/> 4000 | <input type="radio"/> 200 | <input type="checkbox"/> | 0              | Deny ▼     | Default ▼              | Auto ▼            |
| 9    | <input type="radio"/> | <input checked="" type="radio"/> 4000 | <input type="radio"/> 200 | <input type="checkbox"/> | 0              | Deny ▼     | Default ▼              | Auto ▼            |
| 32   | <input type="radio"/> | <input checked="" type="radio"/> 4000 | <input type="radio"/> 200 | <input type="checkbox"/> | 0              | Deny ▼     | Default ▼              | Auto ▼            |

Apply Cancel

The following table describes the labels in this screen.

**Table 96** Advanced Application > Multicast > IPv4 Multicast > IGMP Snooping

| LABEL                   | DESCRIPTION                                                                                                                                                                                                                                                              |
|-------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| IGMP Snooping           | Use these settings to configure IGMP snooping.                                                                                                                                                                                                                           |
| Active                  | Select <b>Active</b> to enable IGMP Snooping to forward group multicast traffic only to ports that are members of that group.                                                                                                                                            |
| Querier                 | Select this option to allow the Switch to send IGMP General Query messages to the VLANs with the multicast hosts attached.                                                                                                                                               |
| Host Timeout            | Specify the time (from 1 to 16 711 450) in seconds that elapses before the Switch removes an IGMP group membership entry if it does not receive report messages from the port.                                                                                           |
| 802.1p Priority         | Select a priority level (0-7) to which the Switch changes the priority in outgoing IGMP control packets. Otherwise, select <b>No-Change</b> to not replace the priority.                                                                                                 |
| IGMP Filtering          | Select <b>Active</b> to enable IGMP filtering to control which IGMP groups a subscriber on a port can join.<br><br>Note: If you enable IGMP filtering, you must create and assign IGMP filtering profiles for the ports that you want to allow to join multicast groups. |
| Unknown Multicast Frame | Specify the action to perform when the Switch receives an unknown multicast frame. Select <b>Drop</b> to discard the frame(s). Select <b>Flooding</b> to send the frame(s) to all ports.                                                                                 |

Table 96 Advanced Application &gt; Multicast &gt; IPv4 Multicast &gt; IGMP Snooping (continued)

| LABEL                    | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|--------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Reserved Multicast Group | <p>The IP address range of 224.0.0.0 to 224.0.0.255 are reserved for multicasting on the local network only. For example, 224.0.0.1 is for all hosts on a local network segment and 224.0.0.9 is used to send RIP routing information to all RIP v2 routers on the same network segment. A multicast router will not forward a packet with the destination IP address within this range to other networks. See the IANA web site for more information.</p> <p>The layer-2 multicast MAC addresses used by Cisco layer-2 protocols, 01:00:0C:CC:CC:CC and 01:00:0C:CC:CC:CD, are also included in this group.</p> <p>Specify the action to perform when the Switch receives a frame with a reserved multicast address. Select <b>Drop</b> to discard the frame(s). Select <b>Flooding</b> to send the frame(s) to all ports.</p>                                                  |
| Port                     | This field displays the port number.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| *                        | <p>Settings in this row apply to all ports.</p> <p>Use this row only if you want to make some settings the same for all ports. Use this row first to set the common settings and then make adjustments on a port-by-port basis.</p> <p>Note: Changes in this row are copied to all the ports as soon as you make them.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Immed. Leave             | <p>Select this option to set the Switch to remove this port from the multicast tree when an IGMP version 2 leave message is received on this port.</p> <p>Select this option if there is only one host connected to this port.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Normal Leave             | <p>Enter an IGMP normal leave timeout value (from 200 to 6,348,800) in milliseconds. Select this option to have the Switch use this timeout to update the forwarding table for the port.</p> <p>In normal leave mode, when the Switch receives an IGMP leave message from a host on a port, it forwards the message to the multicast router. The multicast router then sends out an IGMP Group-Specific Query (GSQ) message to determine whether other hosts connected to the port should remain in the specific multicast group. The Switch forwards the query message to all hosts connected to the port and waits for IGMP reports from hosts to update the forwarding table.</p> <p>This defines how many seconds the Switch waits for an IGMP report before removing an IGMP snooping membership entry when an IGMP leave message is received on this port from a host.</p> |
| Fast Leave               | <p>Enter an IGMP fast leave timeout value (from 200 to 6,348,800) in milliseconds. Select this option to have the Switch use this timeout to update the forwarding table for the port.</p> <p>In fast leave mode, right after receiving an IGMP leave message from a host on a port, the Switch itself sends out an IGMP Group-Specific Query (GSQ) message to determine whether other hosts connected to the port should remain in the specific multicast group. This helps speed up the leave process.</p> <p>This defines how many seconds the Switch waits for an IGMP report before removing an IGMP snooping membership entry when an IGMP leave message is received on this port from a host.</p>                                                                                                                                                                         |
| Group Limited            | Select this option to limit the number of multicast groups this port is allowed to join.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Max Group Num.           | Enter the number of multicast groups this port is allowed to join. Once a port is registered in the specified number of multicast groups, any new IGMP join report frame(s) is dropped on this port.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Throttling               | <p>IGMP throttling controls how the Switch deals with the IGMP reports when the maximum number of the IGMP groups a port can join is reached.</p> <p>Select <b>Deny</b> to drop any new IGMP join report received on this port until an existing multicast forwarding table entry is aged out.</p> <p>Select <b>Replace</b> to replace an existing entry in the multicast forwarding table with the new IGMP report(s) received on this port.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                |



Table 96 Advanced Application &gt; Multicast &gt; IPv4 Multicast &gt; IGMP Snooping (continued)

| LABEL                  | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| IGMP Filtering Profile | <p>Select the name of the IGMP filtering profile to use for this port. Otherwise, select <b>Default</b> to prohibit the port from joining any multicast group.</p> <p>You can create IGMP filtering profiles in the <b>Multicast &gt; IPv4 Multicast &gt; IGMP Snooping &gt; IGMP Filtering Profile</b> screen.</p>                                                                                                                                                                                                                                                                                                                                                                                                 |
| IGMP Querier Mode      | <p>The Switch treats an IGMP query port as being connected to an IGMP multicast router (or server). The Switch forwards IGMP join or leave packets to an IGMP query port.</p> <p>Select <b>Auto</b> to have the Switch use the port as an IGMP query port if the port receives IGMP query packets.</p> <p>Select <b>Fixed</b> to have the Switch always use the port as an IGMP query port. Select this when you connect an IGMP multicast server to the port.</p> <p>Select <b>Edge</b> to stop the Switch from using the port as an IGMP query port. The Switch will not keep any record of an IGMP router being connected to this port. The Switch does not forward IGMP join or leave packets to this port.</p> |
| Apply                  | Click <b>Apply</b> to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the <b>Save</b> link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Cancel                 | Click <b>Cancel</b> to begin configuring this screen afresh.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |

## 25.3.2 IGMP Snooping VLAN

Click **Advanced Application > Multicast > IPv4 Multicast** in the navigation panel. Click the **IGMP Snooping** link and then the **IGMP Snooping VLAN** link to display the screen as shown. See [Section 25.1.4 on page 224](#) for more information on IGMP Snooping VLAN.

**Figure 152** Advanced Application > Multicast > IPv4 Multicast > IGMP Snooping > IGMP Snooping VLAN

**IGMP Snooping VLAN** [IGMP Snooping](#)

Mode ☒ auto ☐ fixed

[Apply](#) [Cancel](#)

**VLAN**

Name

VID

[Add](#) [Cancel](#) [Clear](#)

| Index | Name | VID | <input type="checkbox"/> |
|-------|------|-----|--------------------------|
|       |      |     |                          |

[Delete](#) [Cancel](#)

The following table describes the labels in this screen.

Table 97 Advanced Application > Multicast > IPv4 Multicast > IGMP Snooping > IGMP Snooping VLAN

| LABEL  | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|--------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Mode   | <p>Select <b>auto</b> to have the Switch learn multicast group membership information of any VLANs automatically.</p> <p>Select <b>fixed</b> to have the Switch only learn multicast group membership information of the VLAN(s) that you specify below.</p> <p>In either <b>auto</b> or <b>fixed</b> mode, the Switch can learn up to 16 VLANs (including up to five VLANs you configured in the <b>MVR</b> screen). For example, if you have configured one multicast VLAN in the <b>MVR</b> screen, you can only specify up to 15 VLANs in this screen.</p> <p>The Switch drops any IGMP control messages which do not belong to these 16 VLANs.</p> <p>Note: You must also enable IGMP snooping in the <b>Multicast &gt; IPv4 Multicast &gt; IGMP Snooping</b> screen first.</p> |
| Apply  | Click <b>Apply</b> to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the <b>Save</b> link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Cancel | Click <b>Cancel</b> to begin configuring this screen afresh.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| VLAN   | Use this section of the screen to add VLANs upon which the Switch is to perform IGMP snooping.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Name   | Enter the descriptive name of the VLAN for identification purposes.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| VID    | <p>Enter the ID of a static VLAN; the valid range is between 1 and 4094.</p> <p>Note: You cannot configure the same VLAN ID as in the <b>MVR</b> screen.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Add    | <p>Click this to create a new entry or to update an existing one.</p> <p>This saves your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the <b>Save</b> link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Cancel | Click <b>Cancel</b> to reset the fields to your previous configuration.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Clear  | Click <b>Clear</b> to reset the fields to the factory defaults.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Index  | This is the index number of the IGMP snooping VLAN entry in the table.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Name   | This field displays the descriptive name for this VLAN group.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| VID    | This field displays the ID number of the VLAN group.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|        | Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Delete | Check the entry(ies) that you want to remove, then click the <b>Delete</b> button.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Cancel | Click <b>Cancel</b> to clear the check boxes.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |

### 25.3.3 IGMP Filtering Profile

An IGMP filtering profile specifies a range of multicast groups that clients connected to the Switch are able to join. A profile contains a range of multicast IP addresses which you want clients to be able to join. Profiles are assigned to ports (in the **IGMP Snooping** screen). Clients connected to those ports are then able to join the multicast groups specified in the profile. Each port can be assigned a single profile. A profile can be assigned to multiple ports.

Click **Advanced Application > Multicast > IPv4 Multicast** in the navigation panel. Click the **IGMP Snooping** link and then the **IGMP Filtering Profile** link to display the screen as shown.

**Figure 153** Advanced Application > Multicast > IPv4 Multicast > IGMP Snooping > IGMP Filtering Profile

**IGMP Filtering Profile** [IGMP Snooping](#)

**Profile Setup**

| Profile Name | Start Address | End Address |
|--------------|---------------|-------------|
|              | 224.0.0.0     | 224.0.0.0   |

[Add](#) [Clear](#)

| Profile Name | Start Address | End Address | Delete Profile <input type="checkbox"/> | Delete Rule <input type="checkbox"/> |
|--------------|---------------|-------------|-----------------------------------------|--------------------------------------|
| Default      | 0.0.0.0       | 0.0.0.0     | <input type="checkbox"/>                | <input type="checkbox"/>             |

[Delete](#) [Cancel](#)

The following table describes the labels in this screen.

**Table 98** Advanced Application > Multicast > IPv4 Multicast > IGMP Snooping > IGMP Filtering Profile

| LABEL          | DESCRIPTION                                                                                                                                                                                                                                                                                                                                   |
|----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Profile Name   | Enter a descriptive name for the profile for identification purposes.<br><br>To configure additional rule(s) for a profile that you have already added, enter the profile name and specify a different IP multicast address range.                                                                                                            |
| Start Address  | Type the starting multicast IP address for a range of multicast IP addresses that you want to belong to the IGMP filter profile.                                                                                                                                                                                                              |
| End Address    | Type the ending multicast IP address for a range of IP addresses that you want to belong to the IGMP filter profile.<br><br>If you want to add a single multicast IP address, enter it in both the <b>Start Address</b> and <b>End Address</b> fields.                                                                                        |
| Add            | Click this to create a new entry.<br><br>This saves your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the <b>Save</b> link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.                                   |
| Clear          | Click <b>Clear</b> to reset the fields to the factory defaults.                                                                                                                                                                                                                                                                               |
| Profile Name   | This field displays the descriptive name of the profile.                                                                                                                                                                                                                                                                                      |
| Start Address  | This field displays the start of the multicast address range.                                                                                                                                                                                                                                                                                 |
| End Address    | This field displays the end of the multicast address range.                                                                                                                                                                                                                                                                                   |
| Delete Profile | Select a profile's check box to select a specific profile. Otherwise, select the check box in the table heading row to select all profiles.                                                                                                                                                                                                   |
| Delete Rule    | Select the check box(es) of the rule(s) that you want to remove from a profile.                                                                                                                                                                                                                                                               |
| Delete         | To delete the profile(s) and all the accompanying rules, select the profile(s) that you want to remove in the <b>Delete Profile</b> column, then click the <b>Delete</b> button.<br><br>To delete a rule(s) from a profile, select the rule(s) that you want to remove in the <b>Delete Rule</b> column, then click the <b>Delete</b> button. |
| Cancel         | Click <b>Cancel</b> to clear the <b>Delete Profile/Delete Rule</b> check boxes.                                                                                                                                                                                                                                                               |

## 25.4 IPv6 Multicast Status

Click **Advanced Application > Multicast > IPv6 Multicast** to display the screen as shown. This screen shows the IPv6 multicast group information. See [Section 25.1 on page 223](#) for more information on multicasting.

**Figure 154** Advanced Application > Multicast > IPv6 Multicast

| IPv6 Multicast Status |     |      | <a href="#">Multicast Setup</a> | <a href="#">MLD Snooping-proxy</a> |
|-----------------------|-----|------|---------------------------------|------------------------------------|
| Index                 | VID | Port | Multicast Group                 | Group Timeout                      |

The following table describes the labels in this screen.

Table 99 Advanced Application > Multicast > IPv6 Multicast

| LABEL           | DESCRIPTION                                                                                                                                                          |
|-----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Index           | This is the index number of the entry.                                                                                                                               |
| VID             | This field displays the multicast VLAN ID.                                                                                                                           |
| Port            | This field displays the port number that belongs to the multicast group.                                                                                             |
| Multicast Group | This field displays IP multicast group addresses.                                                                                                                    |
| Group Timeout   | This field displays the time (in seconds) that elapses before the Switch removes an MLD group membership entry if it does not receive report messages from the port. |

### 25.4.1 MLD Snooping-proxy

Click the **MLD Snooping-proxy** link in the **Advanced Application > Multicast > IPv6 Multicast** screen to display the screen as shown. See [Section 25.1 on page 223](#) for more information on multicasting.

**Figure 155** Advanced Application > Multicast > IPv6 Multicast > MLD Snooping-proxy

| MLD Snooping-proxy |                 | <a href="#">IPv6 Multicast Status</a> | <a href="#">VLAN</a>   | <a href="#">Filtering</a> |
|--------------------|-----------------|---------------------------------------|------------------------|---------------------------|
| MLD Snooping-proxy | Active          | <input type="checkbox"/>              |                        |                           |
|                    | 802.1p Priority | 0                                     | ▼                      |                           |
|                    |                 | <a href="#">Apply</a>                 | <a href="#">Cancel</a> |                           |

The following table describes the labels in this screen.

Table 100 Advanced Application > Multicast > IPv6 Multicast > MLD Snooping-proxy

| LABEL              | DESCRIPTION                                                                                                                                                                                                                                                                        |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| MLD Snooping-proxy | Use these settings to configure MLD snooping-proxy.                                                                                                                                                                                                                                |
| Active             | Select <b>Active</b> to enable MLD snooping-proxy on the Switch to minimize MLD control messages and allow better network performance.                                                                                                                                             |
| 802.1p Priority    | Select a priority level (0-7) to which the Switch changes the priority in outgoing MLD messages.                                                                                                                                                                                   |
| Apply              | Click <b>Apply</b> to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the <b>Save</b> link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel             | Click <b>Cancel</b> to begin configuring this screen afresh.                                                                                                                                                                                                                       |

## 25.4.2 MLD Snooping-proxy VLAN

Click the **MLD Snooping-proxy** link and then the **VLAN** link in the **Advanced Application > Multicast > IPv6 Multicast** screen to display the screen as shown. See [Section 25.1 on page 223](#) for more information on multicasting.

**Figure 156** Advanced Application > Multicast > IPv6 Multicast > MLD Snooping-proxy > VLAN

| VLAN                                                                                                                                                         |                            | <a href="#">MLD Snooping-proxy</a> <a href="#">Port Role Setting</a> |              |       |     |  |  |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|----------------------------------------------------------------------|--------------|-------|-----|--|--|
| VID                                                                                                                                                          | <input type="text"/>       |                                                                      |              |       |     |  |  |
| Upstream                                                                                                                                                     | Query Interval             | 125000                                                               | milliseconds |       |     |  |  |
|                                                                                                                                                              | Maximum Response Delay     | 10000                                                                | milliseconds |       |     |  |  |
|                                                                                                                                                              | Robustness Variable        | 2                                                                    |              |       |     |  |  |
|                                                                                                                                                              | Last Member Query Interval | 1000                                                                 | milliseconds |       |     |  |  |
| Downstream                                                                                                                                                   | Query Interval             | 125000                                                               | milliseconds |       |     |  |  |
|                                                                                                                                                              | Maximum Response Delay     | 10000                                                                | milliseconds |       |     |  |  |
| <div>Add Cancel Clear</div>                                                                                                                                  |                            |                                                                      |              |       |     |  |  |
| <table border="1"> <thead> <tr> <th>Index</th> <th>VID</th> </tr> </thead> <tbody> <tr> <td></td> <td></td> </tr> </tbody> </table> <div>Delete Cancel</div> |                            |                                                                      |              | Index | VID |  |  |
| Index                                                                                                                                                        | VID                        |                                                                      |              |       |     |  |  |
|                                                                                                                                                              |                            |                                                                      |              |       |     |  |  |

The following table describes the labels in this screen.

Table 101 Advanced Application > Multicast > IPv6 Multicast > MLD Snooping-proxy > VLAN

| LABEL                  | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| VID                    | Enter the ID number of the VLAN on which you want to enable MLD snooping-proxy and configure related settings.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Upstream               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Query Interval         | <p>Enter the amount of time (in milliseconds) between general query messages sent by the router connected to the upstream port. This value should be exactly the same as what's configured in the connected multicast router.</p> <p>This value is used to calculate the amount of time an MLD snooping membership entry (learned only on the upstream port) can remain in the forwarding table.</p> <p>When an MLD Report message is received, the Switch sets the timeout period of the entry to be <math>T = (QI \times RV) + MRD</math>, where <math>T</math> = Timeout, <math>QI</math> = Query Interval, <math>RV</math> = Robustness Variable, and <math>MRD</math> = Maximum Response Delay.</p>                                                                                                                                                                                       |
| Maximum Response Delay | <p>Enter the amount of time (in milliseconds) the router connected to the upstream port waits for a response to an MLD general query message. This value should be exactly the same as what's configured in the connected multicast router.</p> <p>This value is used to calculate the amount of time an MLD snooping membership entry (learned only on the upstream port) can remain in the forwarding table.</p> <p>When an MLD Report message is received, the Switch sets the timeout period of the entry to be <math>T = (QI \times RV) + MRD</math>, where <math>T</math> = Timeout, <math>QI</math> = Query Interval, <math>RV</math> = Robustness Variable, and <math>MRD</math> = Maximum Response Delay.</p> <p>When an MLD Done message is received, the Switch sets the entry's lifetime to be the product of <b>Last Member Query Interval</b> and <b>Robustness Variable</b></p> |

Table 101 Advanced Application &gt; Multicast &gt; IPv6 Multicast &gt; MLD Snooping-proxy &gt; VLAN

| LABEL                      | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|----------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Robustness Variable        | <p>Enter the number of queries. A multicast address entry (learned only on an upstream port by snooping) is removed from the forwarding table when there is no response to the configured number of queries sent by the router connected to the upstream port. This value should be exactly the same as what's configured in the connected multicast router.</p> <p>This value is used to calculate the amount of time an MLD snooping membership entry (learned only on the upstream port) can remain in the forwarding table.</p>                                                                                                |
| Last Member Query Interval | <p>Enter the amount of time (in milliseconds) between the MLD group-specific queries sent by an upstream port when an MLD Done message is received. This value should be exactly the same as what's configured in the connected multicast router.</p> <p>This value is used to calculate the amount of time an MLD snooping membership entry (learned only on the upstream port) can remain in the forwarding table after a Done message is received.</p> <p>When an MLD Done message is received, the Switch sets the entry's lifetime to be the product of <b>Last Member Query Interval</b> and <b>Robustness Variable</b>.</p> |
| Downstream                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Query Interval             | Enter the amount of time (in milliseconds) between general query messages sent by the downstream port.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Maximum Response Delay     | Enter the maximum time (in milliseconds) that the Switch waits for a response to a general query message sent by the downstream port.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Add                        | <p>Click this to create a new entry or to update an existing one.</p> <p>This saves your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the <b>Save</b> link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.</p>                                                                                                                                                                                                                                                                                    |
| Cancel                     | Click <b>Cancel</b> to reset the fields to your previous configuration.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Clear                      | Click <b>Clear</b> to reset the fields to the factory defaults.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Index                      | This is the index number of the MLD snooping-proxy VLAN entry in the table. Click on an index number to view more details or change the settings.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| VID                        | This field displays the ID number of the VLAN group.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|                            | Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Delete                     | Click <b>Delete</b> to remove the selected entry(ies) permanently.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Cancel                     | Click <b>Cancel</b> to clear the check boxes.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |

### 25.4.3 MLD Snooping-proxy VLAN Port Role Setting

Click the **Port Role Setting** link in the **Advanced Application > Multicast > IPv6 Multicast > MLD Snooping-proxy > VLAN** screen to display the screen as shown. See [Section 25.1 on page 223](#) for more information on multicasting.

**Figure 157** Advanced Application > Multicast > IPv6 Multicast > MLD Snooping-proxy > VLAN > Port Role Setting

| Port | Port Role | Leave Mode | Leave Timeout | Fast Leave Timeout |
|------|-----------|------------|---------------|--------------------|
| *    | None      | Normal     |               |                    |
| 1    | None      | Normal     | 4000          | 4000               |
| 2    | None      | Normal     | 4000          | 4000               |
| 3    | None      | Normal     | 4000          | 4000               |
| 4    | None      | Normal     | 4000          | 4000               |
| 5    | None      | Normal     | 4000          | 4000               |
| 6    | None      | Normal     | 4000          | 4000               |
| 7    | None      | Normal     | 4000          | 4000               |
| 8    | None      | Normal     | 4000          | 4000               |
| 9    | None      | Normal     | 4000          | 4000               |
| 10   | None      | Normal     | 4000          | 4000               |
| 11   | None      | Normal     | 4000          | 4000               |

The following table describes the labels in this screen.

**Table 102** Advanced Application > Multicast > IPv6 Multicast > MLD Snooping-proxy > VLAN > Port Role Setting

| LABEL                      | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| MLD Snooping-proxy VLAN ID | Select the VLAN ID for which you want to configure a port's MLD snooping-proxy settings.                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Port                       | This field displays the port number.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| *                          | <p>Settings in this row apply to all ports.</p> <p>Use this row only if you want to make some settings the same for all ports. Use this row first to set the common settings and then make adjustments on a port-by-port basis.</p> <p>Note: Changes in this row are copied to all the ports as soon as you make them.</p>                                                                                                                                                                                                  |
| Port Role                  | <p>A port on the Switch can be either a <b>Downstream</b> port or <b>Upstream</b> port in MLD. A downstream port connects to MLD hosts and acts as a multicast router to send MLD queries and listen to the MLD host's Report and Done messages. An upstream port connects to a multicast router and works as a host to send Report or Done messages when receiving queries from a multicast router.</p> <p>Otherwise, select <b>None</b> if the port is not joining a multicast group or does not belong to this VLAN.</p> |
| Leave Mode                 | <p>Select the leave mode for the specified downstream port(s) in this VLAN.</p> <p>This specifies whether the Switch removes an MLD snooping membership entry (learned on a downstream port) immediately (<b>Immediate</b>) or wait for an MLD report before the leave timeout (<b>Normal</b>) or fast leave timeout (<b>Fast</b>) when an MLD leave message is received on this port from a host.</p>                                                                                                                      |

Table 102 Advanced Application > Multicast > IPv6 Multicast > MLD Snooping-proxy > VLAN > Port Role Setting (continued)

| LABEL              | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                               |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Leave Timeout      | Enter the MLD snooping normal leave timeout (in milliseconds) the Switch uses to update the forwarding table for the specified downstream port(s).<br><br>This defines how many seconds the Switch waits for an MLD report before removing an MLD snooping membership entry (learned on a downstream port) when an MLD Done message is received on this port from a host. |
| Fast Leave Timeout | Enter the fast leave timeout (in milliseconds) for the specified downstream port(s).<br><br>This defines how many seconds the Switch waits for an MLD report before removing an MLD snooping membership entry (learned on a downstream port) when an MLD Done message is received on this port from a host.                                                               |
| Apply              | Click <b>Apply</b> to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the <b>Save</b> link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.                                                                                        |
| Cancel             | Click <b>Cancel</b> to reset the fields to your previous configuration.                                                                                                                                                                                                                                                                                                   |

## 25.4.4 MLD Snooping-proxy Filtering

Use this screen to configure the Switch's MLD filtering settings. Click the **MLD Snooping-proxy** link and then the **Filtering** link in the **Advanced Application > Multicast > IPv6 Multicast** screen to display the screen as shown. See [Section 25.1 on page 223](#) for more information on multicasting.

Figure 158 Advanced Application > Multicast > IPv6 Multicast > MLD Snooping-proxy > Filtering

The screenshot shows the 'Filtering' configuration page. At the top, there's a navigation bar with 'Filtering' and links to 'MLD Snooping-proxy' and 'Filtering Profile'. Below this is a section for 'Active' with a checkbox. The main part of the page is a table with four columns: 'Port', 'Group Limit', 'Max Group Num.', and 'Filtering Profile'. The table lists ports from 1 to 11, each with a 'Group Limit' checkbox, a 'Max Group Num.' input field (all set to 0), and a 'Filtering Profile' dropdown menu (all set to 'Default'). At the bottom of the table are 'Apply' and 'Cancel' buttons.

The following table describes the labels in this screen.

Table 103 Advanced Application > Multicast > IPv6 Multicast > MLD Snooping-proxy > Filtering

| LABEL  | DESCRIPTION                                               |
|--------|-----------------------------------------------------------|
| Active | Select this option to enable MLD filtering on the Switch. |
| Port   | This field displays the port number.                      |



Table 103 Advanced Application &gt; Multicast &gt; IPv6 Multicast &gt; MLD Snooping-proxy &gt; Filtering

| LABEL             | DESCRIPTION                                                                                                                                                                                                                                                                                                               |
|-------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| *                 | Settings in this row apply to all ports.<br><br>Use this row only if you want to make some settings the same for all ports. Use this row first to set the common settings and then make adjustments on a port-by-port basis.<br><br>Note: Changes in this row are copied to all the ports as soon as you make them.       |
| Group Limit       | Select this option to limit the number of multicast groups this port is allowed to join.                                                                                                                                                                                                                                  |
| Max Group Num.    | Enter the number of multicast groups this port is allowed to join. Once a port is registered in the specified number of multicast groups, any new MLD Report message is dropped on this port.                                                                                                                             |
| Filtering Profile | Select the name of the MLD filtering profile to use for this port. Otherwise, select <b>Default</b> to prohibit the port from joining any multicast group.<br><br>You can create MLD filtering profiles in the <b>Multicast &gt; IPv6 Multicast &gt; MLD Snooping-proxy &gt; Filtering &gt; Filtering Profile</b> screen. |
| Apply             | Click <b>Apply</b> to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the <b>Save</b> link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.                                        |
| Cancel            | Click <b>Cancel</b> to reset the fields to your previous configuration.                                                                                                                                                                                                                                                   |

## 25.4.5 MLD Snooping-proxy Filtering Profile

Use this screen to create an MLD filtering profile and set the range of the multicast address(es). Click the **Filtering Profile** link in the **Advanced Application > Multicast > IPv6 Multicast > MLD Snooping-proxy > Filtering** screen to display the screen as shown.

**Figure 159** Advanced Application > Multicast > IPv6 Multicast > MLD Snooping-proxy > Filtering > Filtering Profile

**Filtering Profile** [Filtering](#)

**Profile Setup**

|               |  |  |
|---------------|--|--|
| Profile Name  |  |  |
| Start Address |  |  |
| End Address   |  |  |

[Add](#) [Clear](#)

| Profile Name | Start Address | End Address   |                                     |
|--------------|---------------|---------------|-------------------------------------|
| Default      | 0:0:0:0:0:0:0 | 0:0:0:0:0:0:0 | <input checked="" type="checkbox"/> |

[Delete](#) [Cancel](#)

The following table describes the labels in this screen.

Table 104 Advanced Application > Multicast > IPv6 Multicast > MLD Snooping-proxy > Filtering > Filtering Profile

| LABEL         | DESCRIPTION                                                                                                                                                                                                                                                                                                                                            |
|---------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Profile Name  | Enter a descriptive name for the profile for identification purposes.<br><br>To configure additional rule(s) for a profile that you have already added, enter the profile name and specify a different IP multicast address range.                                                                                                                     |
| Start Address | Type the starting multicast IPv6 address for a range of multicast IPv6 addresses that you want to belong to the MLD filtering profile.                                                                                                                                                                                                                 |
| End Address   | Type the ending multicast IPv6 address for a range of IPv6 addresses that you want to belong to the MLD filtering profile.<br><br>If you want to add a single multicast IPv6 address, enter it in both the <b>Start Address</b> and <b>End Address</b> fields.                                                                                         |
| Add           | Click this to create a new entry.<br><br>This saves your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the <b>Save</b> link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.                                            |
| Clear         | Click <b>Clear</b> to reset the fields to the factory defaults.                                                                                                                                                                                                                                                                                        |
| Profile Name  | This field displays the descriptive name of the profile.                                                                                                                                                                                                                                                                                               |
| Start Address | This field displays the start of the multicast IPv6 address range.                                                                                                                                                                                                                                                                                     |
| End Address   | This field displays the end of the multicast IPv6 address range.                                                                                                                                                                                                                                                                                       |
|               | To delete the profile(s) and all the accompanying rules, select the profile(s) that you want to remove, then click the <b>Delete</b> button. You can select the check box in the table heading row to select all profiles.<br><br>To delete a rule(s) from a profile, select the rule(s) that you want to remove, then click the <b>Delete</b> button. |
| Delete        | Click <b>Delete</b> button to permanently delete the entries you selected.                                                                                                                                                                                                                                                                             |
| Cancel        | Click <b>Cancel</b> to clear the check boxes.                                                                                                                                                                                                                                                                                                          |

## 25.5 MVR Overview

Multicast VLAN Registration (MVR) is designed for applications (such as Media-on-Demand (MoD)) that use multicast traffic across an Ethernet ring-based service provider network.

MVR allows one single multicast VLAN to be shared among different subscriber VLANs on the network. While isolated in different subscriber VLANs, connected devices can subscribe to and unsubscribe from the multicast stream in the multicast VLAN. This improves bandwidth utilization with reduced multicast traffic in the subscriber VLANs and simplifies multicast group management.

MVR only responds to IGMP join and leave control messages from multicast groups that are configured under MVR. Join and leave reports from other multicast groups are managed by IGMP snooping.

The following figure shows a network example. The subscriber VLAN (**1**, **2** and **3**) information is hidden from the streaming media server, **S**. In addition, the multicast VLAN information is only visible to the Switch and **S**.

**Figure 160** MVR Network Example

### 25.5.1 Types of MVR Ports

In MVR, a source port is a port on the Switch that can send and receive multicast traffic in a multicast VLAN while a receiver port can only receive multicast traffic. Once configured, the Switch maintains a forwarding table that matches the multicast stream to the associated multicast group.

### 25.5.2 MVR Modes

You can set your Switch to operate in either dynamic or compatible mode.

In dynamic mode, the Switch sends IGMP leave and join reports to the other multicast devices (such as multicast routers or servers) in the multicast VLAN. This allows the multicast devices to update the multicast forwarding table to forward or not forward multicast traffic to the receiver ports.

In compatible mode, the Switch does not send any IGMP reports. In this case, you must manually configure the forwarding settings on the multicast devices in the multicast VLAN.

### 25.5.3 How MVR Works

The following figure shows a multicast television example where a subscriber device (such as a computer) in VLAN 1 receives multicast traffic from the streaming media server, **S**, via the Switch. Multiple subscriber devices can connect through a port configured as the receiver on the Switch.

When the subscriber selects a television channel, computer **A** sends an IGMP report to the Switch to join the appropriate multicast group. If the IGMP report matches one of the configured MVR multicast group addresses on the Switch, an entry is created in the forwarding table on the Switch. This maps the subscriber VLAN to the list of forwarding destinations for the specified multicast traffic.

When the subscriber changes the channel or turns off the computer, an IGMP leave message is sent to the Switch to leave the multicast group. The Switch sends a query to VLAN 1 on the receiver port (in this case, an uplink port on the Switch). If there is another subscriber device connected to this port in the same subscriber VLAN, the receiving port will still be on the list of forwarding destination for the multicast traffic. Otherwise, the Switch removes the receiver port from the forwarding table.

**Figure 161** MVR Multicast Television Example

## 25.6 General MVR Configuration

Use the **MVR** screen to create multicast VLANs and select the receiver port(s) and a source port for each multicast VLAN. Click **Advanced Application > Multicast > MVR** to display the screen as shown next.

Note: You can create up to five multicast VLANs and up to 256 multicast rules on the Switch.

Note: Your Switch automatically creates a static VLAN (with the same VID) when you create a multicast VLAN in this screen.

**Figure 162** Advanced Application > Multicast > MVR

The following table describes the related labels in this screen.

Table 105 Advanced Application &gt; Multicast &gt; MVR

| LABEL             | DESCRIPTION                                                                                                                                                                                                                                                                                                     |
|-------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Active            | Select this check box to enable MVR to allow one single multicast VLAN to be shared among different subscriber VLANs on the network.                                                                                                                                                                            |
| Group Name        | Enter a descriptive name (up to 32 printable ASCII characters) for identification purposes.                                                                                                                                                                                                                     |
| Multicast VLAN ID | Enter the VLAN ID (1 to 4094) of the multicast VLAN.                                                                                                                                                                                                                                                            |
| 802.1p Priority   | Select a priority level (0-7) with which the Switch replaces the priority in outgoing IGMP or MLD control packets (belonging to this multicast VLAN).                                                                                                                                                           |
| Mode              | Specify the MVR mode on the Switch. Choices are <b>Dynamic</b> and <b>Compatible</b> .<br>Select <b>Dynamic</b> to send IGMP reports or MLD messages to all MVR source ports in the multicast VLAN.<br>Select <b>Compatible</b> to set the Switch not to send IGMP reports or MLD messages.                     |
| Port              | This field displays the port number.                                                                                                                                                                                                                                                                            |
| *                 | Settings in this row apply to all ports.<br>Use this row only if you want to make some settings the same for all ports. Use this row first to set the common settings and then make adjustments on a port-by-port basis.<br><br>Note: Changes in this row are copied to all the ports as soon as you make them. |

Table 105 Advanced Application &gt; Multicast &gt; MVR (continued)

| LABEL         | DESCRIPTION                                                                                                                                                                                                                                                                                                                              |
|---------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Source Port   | Select this option to set this port as the MVR source port that sends and receives multicast traffic. All source ports must belong to a single multicast VLAN.                                                                                                                                                                           |
| Receiver Port | Select this option to set this port as a receiver port that only receives multicast traffic.                                                                                                                                                                                                                                             |
| None          | Select this option to set the port not to participate in MVR. No MVR multicast traffic is sent or received on this port.                                                                                                                                                                                                                 |
| Tagging       | Select this checkbox if you want the port to tag the VLAN ID in all outgoing frames transmitted.                                                                                                                                                                                                                                         |
| Add           | Click this to create a new entry or to update an existing one.<br><br>This saves your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the <b>Save</b> link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel        | Click <b>Cancel</b> to begin configuring this screen afresh.                                                                                                                                                                                                                                                                             |
| VLAN          | This field displays the multicast VLAN ID. Click on an index number to change the settings.                                                                                                                                                                                                                                              |
| Active        | This field displays whether the multicast group is enabled or not.                                                                                                                                                                                                                                                                       |
| Name          | This field displays the descriptive name for this setting.                                                                                                                                                                                                                                                                               |
| Mode          | This field displays the MVR mode.                                                                                                                                                                                                                                                                                                        |
| Source Port   | This field displays the source port number(s).                                                                                                                                                                                                                                                                                           |
| Receiver Port | This field displays the receiver port number(s).                                                                                                                                                                                                                                                                                         |
| 802.1p        | This field displays the priority level.                                                                                                                                                                                                                                                                                                  |
|               | Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries.                                                                                                                                                                                                  |
| Delete        | To delete a multicast VLAN(s), select the rule(s) that you want to remove, then click the <b>Delete</b> button.                                                                                                                                                                                                                          |
| Cancel        | Click <b>Cancel</b> to clear the check boxes.                                                                                                                                                                                                                                                                                            |

## 25.6.1 MVR Group Configuration

All source ports and receiver ports belonging to a multicast group can receive multicast data sent to this multicast group.

Use this screen to configure MVR IP multicast group address(es). Click the **Group Configuration** link in the **MVR** screen.

Note: A port can belong to more than one multicast VLAN. However, IP multicast group addresses in different multicast VLANs cannot overlap.

**Figure 163** Advanced Application > Multicast > MVR > Group Configuration

The following table describes the labels in this screen.

Table 106 Advanced Application &gt; Multicast &gt; MVR &gt; Group Configuration

| LABEL             | DESCRIPTION                                                                                                                                                                                                                                                                                                                                            |
|-------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Multicast VLAN ID | Select a multicast VLAN ID (that you configured in the <b>MVR</b> screen) from the drop-down list box.                                                                                                                                                                                                                                                 |
| Group Name        | Enter a descriptive name for identification purposes.                                                                                                                                                                                                                                                                                                  |
| Start Address     | Enter the starting IP multicast address of the multicast group in dotted decimal notation.<br>Refer to <a href="#">Section 25.1.1 on page 223</a> for more information on IP multicast addresses.                                                                                                                                                      |
| End Address       | Enter the ending IP multicast address of the multicast group in dotted decimal notation.<br>Enter the same IP address as the <b>Start Address</b> field if you want to configure only one IP address for a multicast group.<br>Refer to <a href="#">Section 25.1.1 on page 223</a> for more information on IP multicast addresses.                     |
| Add               | Click this to create a new entry.<br><br>This saves your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the <b>Save</b> link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.                                            |
| Cancel            | Click <b>Cancel</b> to begin configuring this screen afresh.                                                                                                                                                                                                                                                                                           |
| MVLAN             | This field displays the multicast VLAN ID.                                                                                                                                                                                                                                                                                                             |
| Group Name        | This field displays the descriptive name for this setting.                                                                                                                                                                                                                                                                                             |
| Start Address     | This field displays the starting IP address of the multicast group.                                                                                                                                                                                                                                                                                    |
| End Address       | This field displays the ending IP address of the multicast group.                                                                                                                                                                                                                                                                                      |
| Delete            | To delete the profile(s) and all the accompanying rules, select the profile(s) that you want to remove, then click the <b>Delete</b> button. You can select the check box in the table heading row to select all profiles.<br><br>To delete a rule(s) from a profile, select the rule(s) that you want to remove, then click the <b>Delete</b> button. |

Table 106 Advanced Application &gt; Multicast &gt; MVR &gt; Group Configuration (continued)

| LABEL  | DESCRIPTION                                                                                                                                                                                                                         |
|--------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Delete | Select the entry(ies) that you want to remove, then click the <b>Delete</b> button to remove the selected entry(ies) from the table.<br><br>If you delete a multicast VLAN, all multicast groups in this VLAN will also be removed. |
| Cancel | Select <b>Cancel</b> to clear the checkbox(es) in the table.                                                                                                                                                                        |

## 25.6.2 MVR Configuration Example

The following figure shows a network example where ports 1, 2 and 3 on the Switch belong to VLAN 1. In addition, port 7 belongs to the multicast group with VID 200 to receive multicast traffic (the **News** and **Movie** channels) from the remote streaming media server, **S**. Computers A, B and C in VLAN 1 are able to receive the traffic.

Figure 164 MVR Configuration Example



To configure the MVR settings on the Switch, create a multicast VLAN in the **MVR** screen and set the receiver and source ports.

Figure 165 MVR Configuration Example

| Port | Source Port | Receiver Port | None | Tagging                             |
|------|-------------|---------------|------|-------------------------------------|
| 1    |             |               |      |                                     |
| 2    |             |               |      |                                     |
| 3    |             |               |      |                                     |
| 4    |             |               |      |                                     |
| 5    |             |               |      |                                     |
| 6    |             |               |      |                                     |
| 7    |             |               |      | <input checked="" type="checkbox"/> |
| 8    |             |               |      |                                     |
| 9    |             |               |      |                                     |
| 10   |             |               |      |                                     |



To set the Switch to forward the multicast group traffic to the subscribers, configure multicast group settings in the **Group Configuration** screen. The following figure shows an example where two IPv4 multicast groups (**News** and **Movie**) are configured for the multicast VLAN 200.

**Figure 166** MVR Group Configuration Example

**Group Configuration** MVR

Multicast VLAN ID: 200

|               |            |
|---------------|------------|
| Group Name    | Movie      |
| Start Address | 230.1.2.50 |
| End Address   | 230.1.2.60 |

[Add](#) [Cancel](#)

**EXAMPLE**

| MVLAN | Group Name | Start Address | End Address |                          |
|-------|------------|---------------|-------------|--------------------------|
| 200   |            |               |             | <input type="checkbox"/> |
|       | News       | 224.1.4.10    | 224.1.4.50  | <input type="checkbox"/> |

[Delete](#) [Cancel](#)

**Figure 167** MVR Group Configuration Example

**Group Configuration** MVR

Multicast VLAN ID: 200

|               |  |
|---------------|--|
| Group Name    |  |
| Start Address |  |
| End Address   |  |

[Add](#) [Cancel](#)

**EXAMPLE**

| MVLAN | Group Name | Start Address | End Address |                          |
|-------|------------|---------------|-------------|--------------------------|
| 200   |            |               |             | <input type="checkbox"/> |
|       | Movie      | 230.1.2.50    | 230.1.2.60  | <input type="checkbox"/> |
|       | News       | 224.1.4.10    | 224.1.4.50  | <input type="checkbox"/> |

[Delete](#) [Cancel](#)

# CHAPTER 26

## AAA

This chapter describes how to configure authentication, authorization and accounting settings on the Switch.

### 26.1 Authentication, Authorization and Accounting (AAA)

Authentication is the process of determining who a user is and validating access to the Switch. The Switch can authenticate users who try to log in based on user accounts configured on the Switch itself. The Switch can also use an external authentication server to authenticate a large number of users.

Authorization is the process of determining what a user is allowed to do. Different user accounts may have higher or lower privilege levels associated with them. For example, user A may have the right to create new login accounts on the Switch but user B cannot. The Switch can authorize users based on user accounts configured on the Switch itself or it can use an external server to authorize a large number of users.

Accounting is the process of recording what a user is doing. The Switch can use an external server to track when users log in, log out, execute commands and so on. Accounting can also record system related actions such as boot up and shut down times of the Switch.

The external servers that perform authentication, authorization and accounting functions are known as AAA servers. The Switch supports RADIUS (Remote Authentication Dial-In User Service, see [Section 26.1.2 on page 247](#)) and TACACS+ (Terminal Access Controller Access-Control System Plus, see [Section 26.1.2 on page 247](#)) as external authentication, authorization and accounting servers.

**Figure 168** AAA Server



#### 26.1.1 Local User Accounts

By storing user profiles locally on the Switch, your Switch is able to authenticate and authorize users without interacting with a network AAA server. However, there is a limit on the number of users you may authenticate in this way (See [Chapter 52 on page 437](#)).

## 26.1.2 RADIUS and TACACS+

RADIUS and TACACS+ are security protocols used to authenticate users by means of an external server instead of (or in addition to) an internal device user database that is limited to the memory capacity of the device. In essence, RADIUS and TACACS+ authentication both allow you to validate an unlimited number of users from a central location.

The following table describes some key differences between RADIUS and TACACS+.

Table 107 RADIUS vs TACACS+

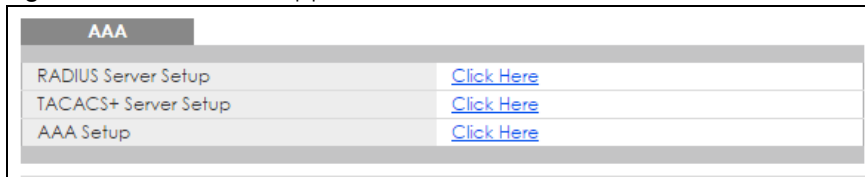
|                    | <b>RADIUS</b>                                  | <b>TACACS+</b>                                                                        |
|--------------------|------------------------------------------------|---------------------------------------------------------------------------------------|
| Transport Protocol | UDP (User Datagram Protocol)                   | TCP (Transmission Control Protocol)                                                   |
| Encryption         | Encrypts the password sent for authentication. | All communication between the client (the Switch) and the TACACS server is encrypted. |

## 26.2 AAA Screens

The **AAA** screens allow you to enable authentication, authorization, accounting or all of them on the Switch. First, configure your authentication and accounting server settings (RADIUS, TACACS+ or both) and then set up the authentication priority, activate authorization and configure accounting settings.

Click **Advanced Application > AAA** in the navigation panel to display the screen as shown.

**Figure 169** Advanced Application > AAA



### 26.2.1 RADIUS Server Setup

Use this screen to configure your RADIUS server settings. See [Section 26.1.2 on page 247](#) for more information on RADIUS servers and [Section 26.3 on page 254](#) for RADIUS attributes utilized by the authentication and accounting features on the Switch. Click on the **RADIUS Server Setup** link in the **AAA** screen to view the screen as shown.

**Figure 170** Advanced Application > AAA > RADIUS Server Setup

**RADIUS Server Setup** [AAA](#)

**Authentication Server**

Mode: index-priority ▼

Timeout: 30 seconds

| Index | IP Address | UDP Port | Shared Secret | Delete                   |
|-------|------------|----------|---------------|--------------------------|
| 1     | 0.0.0.0    | 1812     |               | <input type="checkbox"/> |
| 2     | 0.0.0.0    | 1812     |               | <input type="checkbox"/> |

**Accounting Server**

Timeout: 30 seconds

| Index | IP Address | UDP Port | Shared Secret | Delete                   |
|-------|------------|----------|---------------|--------------------------|
| 1     | 0.0.0.0    | 1813     |               | <input type="checkbox"/> |
| 2     | 0.0.0.0    | 1813     |               | <input type="checkbox"/> |

[Apply](#) [Cancel](#)

The following table describes the labels in this screen.

**Table 108** Advanced Application > AAA > RADIUS Server Setup

| LABEL                 | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|-----------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Authentication Server | Use this section to configure your RADIUS authentication settings.                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Mode                  | <p>This field only applies if you configure multiple RADIUS servers.</p> <p>Select <b>index-priority</b> and the Switch tries to authenticate with the first configured RADIUS server, if the RADIUS server does not respond then the Switch tries to authenticate with the second RADIUS server.</p> <p>Select <b>round-robin</b> to alternate between the RADIUS servers that it sends authentication requests to.</p>                                                                          |
| Timeout               | <p>Specify the amount of time in seconds that the Switch waits for an authentication request response from the RADIUS server.</p> <p>If you are using <b>index-priority</b> for your authentication and you are using two RADIUS servers then the timeout value is divided between the two RADIUS servers. For example, if you set the timeout value to 30 seconds, then the Switch waits for a response from the first RADIUS server for 15 seconds and then tries the second RADIUS server.</p> |
| Index                 | This is a read-only number representing a RADIUS server entry.                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| IP Address            | Enter the IP address of an external RADIUS server in dotted decimal notation.                                                                                                                                                                                                                                                                                                                                                                                                                     |
| UDP Port              | The default port of a RADIUS server for authentication is <b>1812</b> . You need not change this value unless your network administrator instructs you to do so.                                                                                                                                                                                                                                                                                                                                  |
| Shared Secret         | Specify a password (up to 32 alphanumeric characters) as the key to be shared between the external RADIUS server and the Switch. This key is not sent over the network. This key must be the same on the external RADIUS server and the Switch.                                                                                                                                                                                                                                                   |
| Delete                | Check this box if you want to remove an existing RADIUS server entry from the Switch. This entry is deleted when you click <b>Apply</b> .                                                                                                                                                                                                                                                                                                                                                         |

Table 108 Advanced Application &gt; AAA &gt; RADIUS Server Setup (continued)

| LABEL             | DESCRIPTION                                                                                                                                                                                                                                                                        |
|-------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Accounting Server | Use this section to configure your RADIUS accounting server settings.                                                                                                                                                                                                              |
| Timeout           | Specify the amount of time in seconds that the Switch waits for an accounting request response from the RADIUS accounting server.                                                                                                                                                  |
| Index             | This is a read-only number representing a RADIUS accounting server entry.                                                                                                                                                                                                          |
| IP Address        | Enter the IP address of an external RADIUS accounting server in dotted decimal notation.                                                                                                                                                                                           |
| UDP Port          | The default port of a RADIUS accounting server for accounting is <b>1813</b> . You need not change this value unless your network administrator instructs you to do so.                                                                                                            |
| Shared Secret     | Specify a password (up to 32 alphanumeric characters) as the key to be shared between the external RADIUS accounting server and the Switch. This key is not sent over the network. This key must be the same on the external RADIUS accounting server and the Switch.              |
| Delete            | Check this box if you want to remove an existing RADIUS accounting server entry from the Switch. This entry is deleted when you click <b>Apply</b> .                                                                                                                               |
| Apply             | Click <b>Apply</b> to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the <b>Save</b> link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel            | Click <b>Cancel</b> to begin configuring this screen afresh.                                                                                                                                                                                                                       |

## 26.2.2 TACACS+ Server Setup

Use this screen to configure your TACACS+ server settings. See [Section 26.1.2 on page 247](#) for more information on TACACS+ servers. Click on the **TACACS+ Server Setup** link in the **Authentication and Accounting** screen to view the screen as shown.

Figure 171 Advanced Application &gt; AAA &gt; TACACS+ Server Setup

**TACACS+ Server Setup** [AAA](#)

**Authentication Server**

Mode: index-priority ▼

Timeout: 30 seconds

| Index | IP Address | TCP Port | Shared Secret | Delete                   |
|-------|------------|----------|---------------|--------------------------|
| 1     | 0.0.0.0    | 49       |               | <input type="checkbox"/> |
| 2     | 0.0.0.0    | 49       |               | <input type="checkbox"/> |

**Accounting Server**

Timeout: 30 seconds

| Index | IP Address | TCP Port | Shared Secret | Delete                   |
|-------|------------|----------|---------------|--------------------------|
| 1     | 0.0.0.0    | 49       |               | <input type="checkbox"/> |
| 2     | 0.0.0.0    | 49       |               | <input type="checkbox"/> |

[Apply](#) [Cancel](#)

The following table describes the labels in this screen.

Table 109 Advanced Application > AAA > TACACS+ Server Setup

| LABEL                 | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|-----------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Authentication Server | Use this section to configure your TACACS+ authentication settings.                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Mode                  | <p>This field is only valid if you configure multiple TACACS+ servers.</p> <p>Select <b>index-priority</b> and the Switch tries to authenticate with the first configured TACACS+ server, if the TACACS+ server does not respond then the Switch tries to authenticate with the second TACACS+ server.</p> <p>Select <b>round-robin</b> to alternate between the TACACS+ servers that it sends authentication requests to.</p>                                                                         |
| Timeout               | <p>Specify the amount of time in seconds that the Switch waits for an authentication request response from the TACACS+ server.</p> <p>If you are using <b>index-priority</b> for your authentication and you are using two TACACS+ servers then the timeout value is divided between the two TACACS+ servers. For example, if you set the timeout value to 30 seconds, then the Switch waits for a response from the first TACACS+ server for 15 seconds and then tries the second TACACS+ server.</p> |
| Index                 | This is a read-only number representing a TACACS+ server entry.                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| IP Address            | Enter the IP address of an external TACACS+ server in dotted decimal notation.                                                                                                                                                                                                                                                                                                                                                                                                                         |
| TCP Port              | The default port of a TACACS+ server for authentication is <b>49</b> . You need not change this value unless your network administrator instructs you to do so.                                                                                                                                                                                                                                                                                                                                        |
| Shared Secret         | Specify a password (up to 32 alphanumeric characters) as the key to be shared between the external TACACS+ server and the Switch. This key is not sent over the network. This key must be the same on the external TACACS+ server and the Switch.                                                                                                                                                                                                                                                      |
| Delete                | Check this box if you want to remove an existing TACACS+ server entry from the Switch. This entry is deleted when you click <b>Apply</b> .                                                                                                                                                                                                                                                                                                                                                             |
| Accounting Server     | Use this section to configure your TACACS+ accounting settings.                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Timeout               | Specify the amount of time in seconds that the Switch waits for an accounting request response from the TACACS+ server.                                                                                                                                                                                                                                                                                                                                                                                |
| Index                 | This is a read-only number representing a TACACS+ accounting server entry.                                                                                                                                                                                                                                                                                                                                                                                                                             |
| IP Address            | Enter the IP address of an external TACACS+ accounting server in dotted decimal notation.                                                                                                                                                                                                                                                                                                                                                                                                              |
| TCP Port              | The default port of a TACACS+ accounting server is <b>49</b> . You need not change this value unless your network administrator instructs you to do so.                                                                                                                                                                                                                                                                                                                                                |
| Shared Secret         | Specify a password (up to 32 alphanumeric characters) as the key to be shared between the external TACACS+ accounting server and the Switch. This key is not sent over the network. This key must be the same on the external TACACS+ accounting server and the Switch.                                                                                                                                                                                                                                |
| Delete                | Check this box if you want to remove an existing TACACS+ accounting server entry from the Switch. This entry is deleted when you click <b>Apply</b> .                                                                                                                                                                                                                                                                                                                                                  |
| Apply                 | Click <b>Apply</b> to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the <b>Save</b> link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.                                                                                                                                                                                                                     |
| Cancel                | Click <b>Cancel</b> to begin configuring this screen afresh.                                                                                                                                                                                                                                                                                                                                                                                                                                           |

## 26.2.3 AAA Setup

Use this screen to configure authentication, authorization and accounting settings on the Switch. Click on the **AAA Setup** link in the **AAA** screen to view the screen as shown.

**Figure 172** Advanced Application > AAA > AAA Setup

**AAA Setup** [AAA](#)

**Authentication**

| Type             | Method 1 | Method 2 | Method 3 |
|------------------|----------|----------|----------|
| Privilege Enable | local ▼  | - ▼      | - ▼      |
| Login            | local ▼  | - ▼      | - ▼      |

**Authorization**

| Type  | Active                   | Console                  | Method   |
|-------|--------------------------|--------------------------|----------|
| Exec  | <input type="checkbox"/> | <input type="checkbox"/> | radius ▼ |
| Dot1x | <input type="checkbox"/> | -                        | radius   |

**Accounting**

Update Period: 0 minutes

| Type     | Active                   | Broadcast                | Mode         | Method   | Privilege |
|----------|--------------------------|--------------------------|--------------|----------|-----------|
| System   | <input type="checkbox"/> | <input type="checkbox"/> | -            | radius ▼ | -         |
| Exec     | <input type="checkbox"/> | <input type="checkbox"/> | start-stop ▼ | radius ▼ | -         |
| Dot1x    | <input type="checkbox"/> | <input type="checkbox"/> | start-stop ▼ | radius ▼ | -         |
| Commands | <input type="checkbox"/> | <input type="checkbox"/> | stop-only    | tacacs+  | 0 ▼       |

[Apply](#) [Cancel](#)

The following table describes the labels in this screen.

Table 110 Advanced Application &gt; AAA &gt; AAA Setup

| LABEL            | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Authentication   | Use this section to specify the methods used to authenticate users accessing the Switch.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Privilege Enable | <p>These fields specify which database the Switch should use (first, second and third) to authenticate access privilege level for administrator accounts (users for Switch management).</p> <p>Configure the access privilege of accounts via commands (see the Ethernet Switch CLI Reference Guide) for <b>local</b> authentication. The <b>TACACS+</b> and <b>RADIUS</b> are external servers. Before you specify the priority, make sure you have set up the corresponding database correctly first.</p> <p>You can specify up to three methods for the Switch to authenticate the access privilege level of administrators. The Switch checks the methods in the order you configure them (first <b>Method 1</b>, then <b>Method 2</b> and finally <b>Method 3</b>). You must configure the settings in the <b>Method 1</b> field. If you want the Switch to check other sources for access privilege level specify them in <b>Method 2</b> and <b>Method 3</b> fields.</p> <p>Select <b>local</b> to have the Switch check the access privilege configured for local authentication.</p> <p>Select <b>radius</b> or <b>tacacs+</b> to have the Switch check the access privilege via the external servers.</p> |

Table 110 Advanced Application &gt; AAA &gt; AAA Setup (continued)

| LABEL         | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|---------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Login         | <p>These fields specify which database the Switch should use (first, second and third) to authenticate administrator accounts (users for Switch management).</p> <p>Configure the local user accounts in the <b>Access Control &gt; Logins</b> screen. The TACACS+ and RADIUS are external servers. Before you specify the priority, make sure you have set up the corresponding database correctly first.</p> <p>You can specify up to three methods for the Switch to authenticate administrator accounts. The Switch checks the methods in the order you configure them (first <b>Method 1</b>, then <b>Method 2</b> and finally <b>Method 3</b>). You must configure the settings in the <b>Method 1</b> field. If you want the Switch to check other sources for administrator accounts, specify them in <b>Method 2</b> and <b>Method 3</b> fields.</p> <p>Select <b>local</b> to have the Switch check the administrator accounts configured in the <b>Access Control &gt; Logins</b> screen.</p> <p>Select <b>radius</b> to have the Switch check the administrator accounts configured via the RADIUS Server.</p> <p>Select <b>tacacs+</b> to have the Switch check the administrator accounts configured via the TACACS+ Server.</p> |
| Authorization | Use this section to configure authorization settings on the Switch.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Type          | <p>Set whether the Switch provides the following services to a user.</p> <ul style="list-style-type: none"> <li>• <b>Exec</b>: Allow an administrator which logs in the Switch through Telnet or SSH to have different access privilege level assigned via the external server.</li> <li>• <b>Dot1x</b>: Allow an IEEE 802.1x client to have different bandwidth limit or VLAN ID assigned via the external server.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Active        | Select this to activate authorization for a specified event types.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Console       | Select this to allow an administrator which logs in the Switch through the console port to have different access privilege level assigned via the external server.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Method        | <p>Select whether you want to use RADIUS or TACACS+ for authorization of specific types of events.</p> <p>RADIUS is the only method for IEEE 802.1x authorization.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Accounting    | Use this section to configure accounting settings on the Switch.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Update Period | This is the amount of time in minutes before the Switch sends an update to the accounting server. This is only valid if you select the <b>start-stop</b> option for the <b>Exec</b> or <b>Dot1x</b> entries.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Type          | <p>The Switch supports the following types of events to be sent to the accounting server(s):</p> <ul style="list-style-type: none"> <li>• <b>System</b> - Configure the Switch to send information when the following system events occur: system boots up, system shuts down, system accounting is enabled, system accounting is disabled</li> <li>• <b>Exec</b> - Configure the Switch to send information when an administrator logs in and logs out via the console port, telnet or SSH.</li> <li>• <b>Dot1x</b> - Configure the Switch to send information when an IEEE 802.1x client begins a session (authenticates via the Switch), ends a session as well as interim updates of a session.</li> <li>• <b>Commands</b> - Configure the Switch to send information when commands of specified privilege level and higher are executed on the Switch.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                         |
| Active        | Select this to activate accounting for a specified event types.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Broadcast     | <p>Select this to have the Switch send accounting information to all configured accounting servers at the same time.</p> <p>If you don't select this and you have two accounting servers set up, then the Switch sends information to the first accounting server and if it doesn't get a response from the accounting server then it tries the second accounting server.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |



Table 110 Advanced Application &gt; AAA &gt; AAA Setup (continued)

| LABEL     | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|-----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Mode      | <p>The Switch supports two modes of recording login events. Select:</p> <ul style="list-style-type: none"> <li>• <b>start-stop</b> - to have the Switch send information to the accounting server when a user begins a session, during a user's session (if it lasts past the <b>Update Period</b>), and when a user ends a session.</li> <li>• <b>stop-only</b> - to have the Switch send information to the accounting server only when a user ends a session.</li> </ul> |
| Method    | <p>Select whether you want to use RADIUS or TACACS+ for accounting of specific types of events.</p> <p>TACACS+ is the only method for recording <b>Commands</b> type of event.</p>                                                                                                                                                                                                                                                                                          |
| Privilege | <p>This field is only configurable for <b>Commands</b> type of event. Select the threshold command privilege level for which the Switch should send accounting information. The Switch will send accounting information when commands at the level you specify and higher are executed on the Switch.</p>                                                                                                                                                                   |
| Apply     | <p>Click <b>Apply</b> to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the <b>Save</b> link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.</p>                                                                                                                                                                                   |
| Cancel    | <p>Click <b>Cancel</b> to begin configuring this screen afresh.</p>                                                                                                                                                                                                                                                                                                                                                                                                         |

## 26.2.4 Vendor Specific Attribute

RFC 2865 standard specifies a method for sending vendor-specific information between a RADIUS server and a network access device (for example, the Switch). A company can create Vendor Specific Attributes (VSAs) to expand the functionality of a RADIUS server.

The Switch supports VSAs that allow you to perform the following actions based on user authentication:

- Limit bandwidth on incoming or outgoing traffic for the port the user connects to.
- Assign account privilege levels (see the CLI Reference Guide for more information on account privilege levels) for the authenticated user.

The VSAs are composed of the following:

- **Vendor-ID:** An identification number assigned to the company by the IANA (Internet Assigned Numbers Authority). Zyxel's vendor ID is 890.
- **Vendor-Type:** A vendor specified attribute, identifying the setting you want to modify.
- **Vendor-data:** A value you want to assign to the setting.

Note: Refer to the documentation that comes with your RADIUS server on how to configure VSAs for users authenticating via the RADIUS server.

The following table describes the VSAs supported on the Switch. Note that these attributes only work when you enable authorization (see [Section 26.2.3 on page 250](#)).

Table 111 Supported VSAs

| FUNCTION                     | ATTRIBUTE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Ingress Bandwidth Assignment | Vendor-Id = <b>890</b><br>Vendor-Type = <b>1</b><br>Vendor-data = ingress rate (Kbps in decimal format)                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Egress Bandwidth Assignment  | Vendor-Id = <b>890</b><br>Vendor-Type = <b>2</b><br>Vendor-data = egress rate (Kbps in decimal format)                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Privilege Assignment         | Vendor-ID = <b>890</b><br>Vendor-Type = <b>3</b><br>Vendor-Data = " <b>shell:priv-lvl=N</b> "<br><br>or<br><br>Vendor-ID = <b>9</b> (CISCO)<br>Vendor-Type = <b>1</b> (CISCO-AVPAIR)<br>Vendor-Data = " <b>shell:priv-lvl=N</b> "<br><br>where N is a privilege level (from 0 to 14).<br><br>Note: If you set the privilege level of a login account differently on the RADIUS server(s) and the Switch, the user is assigned a privilege level from the database (RADIUS or local) the Switch uses first for user authentication. |

## 26.2.5 Tunnel Protocol Attribute

You can configure tunnel protocol attributes on the RADIUS server (refer to your RADIUS server documentation) to assign a port on the Switch to a VLAN based on IEEE 802.1x authentication. The port VLAN settings are fixed and untagged. This will also set the port's VID. The following table describes the values you need to configure. Note that these attributes only work when you enable authorization (see [Section 26.2.3 on page 250](#)).

Table 112 Supported Tunnel Protocol Attribute

| FUNCTION        | ATTRIBUTE                                                                                                                                                                                                                                                                     |
|-----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| VLAN Assignment | Tunnel-Type = <b>VLAN(13)</b><br>Tunnel-Medium-Type = <b>802(6)</b><br>Tunnel-Private-Group-ID = VLAN ID<br><br>Note: You must also create a VLAN with the specified VID on the Switch.<br><br>Note: The bolded values in this table are fixed values as defined in RFC 3580. |

## 26.3 Supported RADIUS Attributes

Remote Authentication Dial-In User Service (RADIUS) attributes are data used to define specific authentication, and accounting elements in a user profile, which is stored on the RADIUS server. This section lists the RADIUS attributes supported by the Switch.

Refer to RFC 2865 for more information about RADIUS attributes used for authentication. Refer to RFC 2866 and RFC 2869 for RADIUS attributes used for accounting.

This section lists the attributes used by authentication and accounting functions on the Switch. In cases where the attribute has a specific format associated with it, the format is specified.

## 26.3.1 Attributes Used for Authentication

The following sections list the attributes sent from the Switch to the RADIUS server when performing authentication.

### 26.3.1.1 Attributes Used for Authenticating Privilege Access

User-Name

- the format of the User-Name attribute is **\$enab#\$**, where # is the privilege level (1-14)

User-Password

NAS-Identifier

NAS-IP-Address

### 26.3.1.2 Attributes Used to Login Users

User-Name

User-Password

NAS-Identifier

NAS-IP-Address

### 26.3.1.3 Attributes Used by the IEEE 802.1x Authentication

User-Name

NAS-Identifier

NAS-IP-Address

NAS-Port

NAS-Port-Type

- This value is set to **Ethernet(15)** on the Switch.

Calling-Station-Id

Frame-MTU

EAP-Message

State

Message-Authenticator

## 26.3.2 Attributes Used for Accounting

The following sections list the attributes sent from the Switch to the RADIUS server when performing authentication.

### 26.3.2.1 Attributes Used for Accounting System Events

NAS-IP-Address

NAS-Identifier

Acct-Status-Type

Acct-Session-ID

- The format of Acct-Session-Id is **date+time+8-digit sequential number**, for example, 2007041917210300000001. (date: 2007/04/19, time: 17:21:03, serial number: 00000001)

Acct-Delay-Time

### 26.3.2.2 Attributes Used for Accounting Exec Events

The attributes are listed in the following table along with the time that they are sent (the difference between Console and Telnet/SSH Exec events is that the Telnet/SSH events utilize the Calling-Station-Id attribute):

Table 113 RADIUS Attributes - Exec Events via Console

| ATTRIBUTE            | START | INTERIM-UPDATE | STOP |
|----------------------|-------|----------------|------|
| User-Name            | ✓     | ✓              | ✓    |
| NAS-Identifier       | ✓     | ✓              | ✓    |
| NAS-IP-Address       | ✓     | ✓              | ✓    |
| Service-Type         | ✓     | ✓              | ✓    |
| Acct-Status-Type     | ✓     | ✓              | ✓    |
| Acct-Delay-Time      | ✓     | ✓              | ✓    |
| Acct-Session-Id      | ✓     | ✓              | ✓    |
| Acct-Authentic       | ✓     | ✓              | ✓    |
| Acct-Session-Time    |       | ✓              | ✓    |
| Acct-Terminate-Cause |       |                | ✓    |

Table 114 RADIUS Attributes - Exec Events via Telnet/SSH

| ATTRIBUTE            | START | INTERIM-UPDATE | STOP |
|----------------------|-------|----------------|------|
| User-Name            | ✓     | ✓              | ✓    |
| NAS-Identifier       | ✓     | ✓              | ✓    |
| NAS-IP-Address       | ✓     | ✓              | ✓    |
| Service-Type         | ✓     | ✓              | ✓    |
| Calling-Station-Id   | ✓     | ✓              | ✓    |
| Acct-Status-Type     | ✓     | ✓              | ✓    |
| Acct-Delay-Time      | ✓     | ✓              | ✓    |
| Acct-Session-Id      | ✓     | ✓              | ✓    |
| Acct-Authentic       | ✓     | ✓              | ✓    |
| Acct-Session-Time    |       | ✓              | ✓    |
| Acct-Terminate-Cause |       |                | ✓    |

### 26.3.2.3 Attributes Used for Accounting IEEE 802.1x Events

The attributes are listed in the following table along with the time of the session they are sent:

Table 115 RADIUS Attributes - Exec Events via Console

| ATTRIBUTE             | START | INTERIM-UPDATE | STOP |
|-----------------------|-------|----------------|------|
| User-Name             | ✓     | ✓              | ✓    |
| NAS-IP-Address        | ✓     | ✓              | ✓    |
| NAS-Port              | ✓     | ✓              | ✓    |
| Class                 | ✓     | ✓              | ✓    |
| Called-Station-Id     | ✓     | ✓              | ✓    |
| Calling-Station-Id    | ✓     | ✓              | ✓    |
| NAS-Identifier        | ✓     | ✓              | ✓    |
| NAS-Port-Type         | ✓     | ✓              | ✓    |
| Acct-Status-Type      | ✓     | ✓              | ✓    |
| Acct-Delay-Time       | ✓     | ✓              | ✓    |
| Acct-Session-Id       | ✓     | ✓              | ✓    |
| Acct-Authentic        | ✓     | ✓              | ✓    |
| Acct-Input-Octets     |       | ✓              | ✓    |
| Acct-Output-Octets    |       | ✓              | ✓    |
| Acct-Session-Time     |       | ✓              | ✓    |
| Acct-Input-Packets    |       | ✓              | ✓    |
| Acct-Output-Packets   |       | ✓              | ✓    |
| Acct-Terminate-Cause  |       |                | ✓    |
| Acct-Input-Gigawords  |       | ✓              | ✓    |
| Acct-Output-Gigawords |       | ✓              | ✓    |

# CHAPTER 27

## IP Source Guard

### 27.1 IP Source Guard Overview

IP source guard uses a binding table to distinguish between authorized and unauthorized DHCP and ARP packets in your network. A binding contains these key attributes:

- MAC address
- VLAN ID
- IP address
- Port number

When the Switch receives a DHCP or ARP packet, it looks up the appropriate MAC address, VLAN ID, IP address, and port number in the binding table. If there is a binding, the Switch forwards the packet. If there is not a binding, the Switch discards the packet.

The Switch builds the binding table by snooping DHCP packets (dynamic bindings) and from information provided manually by administrators (static bindings).

IP source guard consists of the following features:

- Static bindings. Use this to create static bindings in the binding table.
- DHCP snooping. Use this to filter unauthorized DHCP packets on the network and to build the binding table dynamically.
- ARP inspection. Use this to filter unauthorized ARP packets on the network.

If you want to use dynamic bindings to filter unauthorized ARP packets (typical implementation), you have to enable DHCP snooping before you enable ARP inspection.

#### 27.1.1 What You Can Do

- Use the **IP Source Guard** screen ([Section 27.2 on page 260](#)) to look at the current bindings for DHCP snooping and ARP inspection.
- Use the **IP Source Guard Static Binding** screen ([Section 27.4 on page 261](#)) to manage static bindings for DHCP snooping and ARP inspection.
- Use the **DHCP Snooping** screen ([Section 27.5 on page 263](#)) to look at various statistics about the DHCP snooping database.
- Use this **DHCP Snooping Configure** screen ([Section 27.6 on page 266](#)) to enable DHCP snooping on the Switch (not on specific VLAN), specify the VLAN where the default DHCP server is located, and configure the DHCP snooping database.
- Use the **DHCP Snooping Port Configure** screen ([Section 27.6.1 on page 267](#)) to specify whether ports are trusted or untrusted ports for DHCP snooping.

- Use the **DHCP Snooping VLAN Configure** screen ([Section 27.6.2 on page 268](#)) to enable DHCP snooping on each VLAN and to specify whether or not the Switch adds DHCP relay agent option 82 information to DHCP requests that the Switch relays to a DHCP server for each VLAN.
- Use the **DHCP Snooping VLAN Port Configure** screen ([Section 27.6.3 on page 269](#)) to apply a different DHCP option 82 profile to certain ports in a VLAN.
- Use the **ARP Inspection Status** screen ([Section 27.7 on page 270](#)) to look at the current list of MAC address filters that were created because the Switch identified an unauthorized ARP packet.
- Use the **ARP Inspection VLAN Status** screen ([Section 27.7.1 on page 271](#)) to look at various statistics about ARP packets in each VLAN.
- Use the **ARP Inspection Log Status** screen ([Section 27.7.2 on page 272](#)) to look at log messages that were generated by ARP packets and that have not been sent to the syslog server yet.
- Use the **ARP Inspection Configure** screen ([Section 27.8 on page 273](#)) to enable ARP inspection on the Switch. You can also configure the length of time the Switch stores records of discarded ARP packets and global settings for the ARP inspection log.
- Use the **ARP Inspection Port Configure** screen ([Section 27.8.1 on page 275](#)) to specify whether ports are trusted or untrusted ports for ARP inspection.
- Use the **ARP Inspection VLAN Configure** screen ([Section 27.8.2 on page 276](#)) to enable ARP inspection on each VLAN and to specify when the Switch generates log messages for receiving ARP packets from each VLAN.
- Use the **Advanced Application > IP Source Guard > IPv6 Source Binding Status** screen ([Section 27.10 on page 277](#)) to look at the current IPv6 dynamic and static bindings and to remove dynamic bindings based on IPv6 address and/or IPv6 prefix.
- Use the **Advanced Application > IP Source Guard > IPv6 Static Binding Setup** screen ([Section 27.11 on page 278](#)) to manually create an IPv6 source guard binding table and manage IPv6 static bindings.
- Use the **Advanced Application > IP Source Guard > IPv6 Source Guard Policy Setup** screen ([Section 27.12 on page 280](#)) to have IPv6 source guard forward valid IPv6 addresses and/or IPv6 prefixes that are stored in the binding table and allow or block data traffic from all link-local addresses.
- Use the **Advanced Application > IP Source Guard > IPv6 Source Guard Port Setup** screen ([Section 27.13 on page 281](#)) to apply configured IPv6 source guard policies to the ports you specify.
- Use the **Advanced Application > IP Source Guard > IPv6 Snooping Policy Setup** screen ([Section 27.14 on page 282](#)) to dynamically create an IPv6 source guard binding table using a DHCPv6 snooping policy. A DHCPv6 snooping policy lets the Switch sniff DHCPv6 packets sent from a DHCPv6 server to a DHCPv6 client when it is assigning an IPv6 address.
- Use the **Advanced Application > IP Source Guard > IPv6 Snooping VLAN Setup** screen ([Section 27.15 on page 283](#)) to enable a DHCPv6 snooping policy on a specific VLAN interface.
- Use the **Advanced Application > IP Source Guard > IPv6 DHCP Trust Setup** screen ([Section 27.16 on page 283](#)) to specify which ports are trusted and untrusted for DHCP snooping.

## 27.1.2 What You Need to Know

The Switch builds the binding table by snooping DHCP packets (dynamic bindings) and from information provided manually by administrators (static bindings).

IP source guard consists of the following features:

- Static bindings. Use this to create static bindings in the binding table.
- DHCP snooping. Use this to filter unauthorized DHCP packets on the network and to build the binding table dynamically.
- ARP inspection. Use this to filter unauthorized ARP packets on the network.

If you want to use dynamic bindings to filter unauthorized ARP packets (typical implementation), you have to enable DHCP snooping before you enable ARP inspection.

## 27.2 IP Source Guard

Use this screen to look at the current bindings for DHCP snooping and ARP inspection. Bindings are used by DHCP snooping and ARP inspection to distinguish between authorized and unauthorized packets in the network. The Switch learns the bindings by snooping DHCP packets (dynamic bindings) and from information provided manually by administrators (static bindings). To open this screen, click **Advanced Application > IP Source Guard**.

**Figure 173** IP Source Guard

| IP Source Guard |                       |                                         |
|-----------------|-----------------------|-----------------------------------------|
| IPv4            | Source Guard Setup    | <a href="#">Click Here</a>              |
|                 | Source Binding Status | <a href="#">Click Here</a>              |
| IPv6            | Static Binding Setup  | <a href="#">Click Here</a>              |
|                 | Source Guard          | Policy Setup <a href="#">Click Here</a> |
|                 |                       | Port Setup <a href="#">Click Here</a>   |
|                 | Snooping              | Policy Setup <a href="#">Click Here</a> |
|                 |                       | VLAN Setup <a href="#">Click Here</a>   |
|                 | DHCP Trust Setup      | <a href="#">Click Here</a>              |

The following table describes the labels in this screen.

Table 116 IP Source Guard

| LABEL                          | DESCRIPTION                                                                                                                                                                                    |
|--------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| IPv4 Source Guard Setup        | Click the link to open screens where you can view and manage static bindings, configure DHCP snooping or ARP inspection and look at various statistics.                                        |
| IPv6 Source Binding Status     | Click the link to open a screen where you can view the current IPv6 dynamic and static bindings or remove dynamic bindings based on IPv6 address and/or IPv6 prefix.                           |
| IPv6 Static Binding Setup      | Click the link to open a screen where you can manually create IPv6 source guard static binding entries.                                                                                        |
| IPv6 Source Guard Policy Setup | Click the link to open a screen where you can define policies to have IPv6 source guard forward valid addresses and/or prefixes and allow or block data traffic from all link-local addresses. |
| IPv6 Source Guard Port Setup   | Click the link to open a screen where you can apply the configured IPv6 source guard policy to a port.                                                                                         |
| IPv6 Snooping Policy Setup     | Click the link to open a screen where you can set up DHCPv6 snooping policies for the binding table.                                                                                           |
| IPv6 Snooping VLAN Setup       | Click the link to open a screen where you can enable a DHCPv6 snooping policy on a specific VLAN interface.                                                                                    |
| IPv6 DHCP Trust Setup          | Click the link to open a screen where you can specify which ports are trusted for DHCPv6 snooping.                                                                                             |



## 27.3 IPv4 Source Guard Setup

Use this screen to look at the current bindings for DHCP snooping and ARP inspection. Bindings are used by DHCP snooping and ARP inspection to distinguish between authorized and unauthorized packets in the network. The Switch learns the bindings by snooping DHCP packets (dynamic bindings) and from information provided manually by administrators (static bindings). To open this screen, click **Advanced Application > IP Source Guard > IPv4 Source Guard Setup**.

**Figure 174** Advanced Application > IP Source Guard > IPv4 Source Guard Setup

| IP Source Guard |            | <a href="#">IPSG</a> <a href="#">Static Binding</a> <a href="#">DHCP Snooping</a> <a href="#">ARP Inspection</a> |             |      |       |      |
|-----------------|------------|------------------------------------------------------------------------------------------------------------------|-------------|------|-------|------|
| Index           | IP Address | VLAN                                                                                                             | MAC Address | Port | Lease | Type |

The following table describes the labels in this screen.

Table 117 Advanced Application > IP Source Guard > IPv4 Source Guard Setup

| LABEL       | DESCRIPTION                                                                                                                                                                                                                                                                                           |
|-------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Index       | This field displays a sequential number for each binding.                                                                                                                                                                                                                                             |
| IP Address  | This field displays the IP address assigned to the MAC address in the binding.                                                                                                                                                                                                                        |
| VLAN        | This field displays the source VLAN ID in the binding.                                                                                                                                                                                                                                                |
| MAC Address | This field displays the source MAC address in the binding.                                                                                                                                                                                                                                            |
| Port        | This field displays the port number in the binding. If this field is blank, the binding applies to all ports.                                                                                                                                                                                         |
| Lease       | This field displays how many days, hours, minutes, and seconds the binding is valid; for example, <b>2d3h4m5s</b> means the binding is still valid for 2 days, 3 hours, 4 minutes, and 5 seconds. This field displays <b>infinity</b> if the binding is always valid (for example, a static binding). |
| Type        | This field displays how the Switch learned the binding.<br><br><b>static:</b> This binding was learned from information provided manually by an administrator.<br><br><b>dhcp-snooping:</b> This binding was learned by snooping DHCP packets.                                                        |

## 27.4 IPv4 Source Guard Static Binding

Use this screen to manage static bindings for DHCP snooping and ARP inspection. Static bindings are uniquely identified by the MAC address and VLAN ID. Each MAC address and VLAN ID can only be in one static binding. If you try to create a static binding with the same MAC address and VLAN ID as an existing static binding, the new static binding replaces the original one. To open this screen, click **Advanced Application > IP Source Guard > IPv4 Source Guard Setup > Static Binding**.

**Figure 175** IP Source Guard > IPv4 Source Guard Setup > Static Binding

**IP Source Guard Static Binding** [IPv4 SG](#)

**ARP Freeze**

Condition

☐ All  
☐ Port List   
☐ VLAN List

**ARP Freeze**

**Static Binding**

IP Address

VLAN

MAC Address ☐

Port ☐

☐ Any  
☒ Any

**Add** **Cancel** **Clear**

| Index | IP Address | VLAN | MAC Address | Port | Lease | Type |  |
|-------|------------|------|-------------|------|-------|------|--|
|       |            |      |             |      |       |      |  |

**Delete** **Cancel**

The following table describes the labels in this screen.

Table 118 IP Source Guard &gt; IPv4 Source Guard Setup &gt; Static Binding

| LABEL          | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| ARP Freeze     | <p>ARP Freeze allows you to automatically create static bindings from the current ARP entries (either dynamically learned or static ARP entries) until the Switch's binding table is full.</p> <p>Note: The ARP learning mode should be set to <b>ARP-Request</b> in the <b>IP Application &gt; ARP Setup &gt; ARP Learning</b> screen before you use the ARP Freeze feature.</p>                                                                                                                                                                                                                        |
| Condition      | <p><b>All</b> - Select this and click <b>ARP Freeze</b> to have the Switch automatically add all the current ARP entries to the static bindings table.</p> <p><b>Port List</b> - Select this and enter the number of the port(s) (separated by a comma). ARP entries learned on the specified port(s) are added to the static bindings table after you click <b>ARP Freeze</b>.</p> <p><b>VLAN List</b> - Select this and enter the ID number of the VLAN(s) (separated by a comma). ARP entries for the specified VLAN(s) are added to the static bindings table after you click <b>ARP Freeze</b>.</p> |
| Static Binding |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| IP Address     | Enter the IP address assigned to the MAC address in the binding.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| VLAN           | Enter the source VLAN ID in the binding.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| MAC Address    | Enter the source MAC address in the binding. If this binding applies to all MAC addresses, select <b>Any</b> .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |

Table 118 IP Source Guard &gt; IPv4 Source Guard Setup &gt; Static Binding (continued)

| LABEL       | DESCRIPTION                                                                                                                                                                                                                                                                                                                              |
|-------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Port        | Specify the port(s) in the binding. If this binding has one port, select the first radio button and enter the port number in the field to the right. If this binding applies to all ports, select <b>Any</b> .                                                                                                                           |
| Add         | Click this to create a new entry or to update an existing one.<br><br>This saves your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the <b>Save</b> link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel      | Click this to reset the values above based on the last selected static binding or, if not applicable, to clear the fields above.                                                                                                                                                                                                         |
| Clear       | Click <b>Clear</b> to reset the fields to the factory defaults.                                                                                                                                                                                                                                                                          |
| Index       | This field displays a sequential number for each binding. Click on an index number to view more details or change the settings.                                                                                                                                                                                                          |
| IP Address  | This field displays the IP address assigned to the MAC address in the binding.                                                                                                                                                                                                                                                           |
| VLAN        | This field displays the source VLAN ID in the binding.                                                                                                                                                                                                                                                                                   |
| MAC Address | This field displays the source MAC address in the binding.                                                                                                                                                                                                                                                                               |
| Port        | This field displays the port number.                                                                                                                                                                                                                                                                                                     |
| Lease       | This field displays how long the binding is valid.                                                                                                                                                                                                                                                                                       |
| Type        | This field displays how the Switch learned the binding.<br><br><b>static:</b> This binding was learned from information provided manually by an administrator.                                                                                                                                                                           |
|             | Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries.                                                                                                                                                                                                  |
| Delete      | Select the entry(ies) that you want to remove, then click the <b>Delete</b> button to remove the selected entry(ies) from the table.                                                                                                                                                                                                     |
| Cancel      | Click this to clear the check boxes above.                                                                                                                                                                                                                                                                                               |

## 27.5 DHCP Snooping

Use this screen to look at various statistics about the DHCP snooping database. To open this screen, click **Advanced Application > IP Source Guard > IPv4 Source Guard Setup > DHCP Snooping**.

**Figure 176** IP Source Guard > IPv4 Source Guard Setup > DHCP Snooping

DHCP Snooping

IPv4 SG [Configure](#)

Database Status

| Description          |     | Status              |
|----------------------|-----|---------------------|
| Agent URL            |     |                     |
| Write delay timer    | 300 | seconds             |
| Abort timer          | 300 | seconds             |
| Agent running        |     |                     |
| Delay timer expiry   |     | Not Running         |
| Abort timer expiry   |     | Not Running         |
| Last succeeded time  |     |                     |
| Last failed time     |     | None                |
| Last failed reason   |     | No failure recorded |
| Times                |     |                     |
| Total attempts       | 0   |                     |
| Startup failures     | 0   |                     |
| Successful transfers | 0   |                     |
| Failed transfers     | 0   |                     |
| Successful reads     | 0   |                     |
| Failed reads         | 0   |                     |
| Successful writes    | 0   |                     |
| Failed writes        | 0   |                     |

Database detail

| Description                     | Status |
|---------------------------------|--------|
| First successful access         | None   |
| Last ignored bindings counters  |        |
| Binding collisions              | 0      |
| Invalid interfaces              | 0      |
| Parse failures                  | 0      |
| Expired leases                  | 0      |
| Unsupported vlans               | 0      |
| Last ignored time               | None   |
| Total ignored bindings counters |        |
| Binding collisions              | 0      |
| Invalid interfaces              | 0      |
| Parse failures                  | 0      |
| Expired leases                  | 0      |
| Unsupported vlans               | 0      |

The following table describes the labels in this screen.

Table 119 IP Source Guard &gt; IPv4 Source Guard Setup &gt; DHCP Snooping

| LABEL             | DESCRIPTION                                                                                                                                                                                    |
|-------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Database Status   |                                                                                                                                                                                                |
|                   | This section displays the current settings for the DHCP snooping database. You can configure them in the <b>DHCP Snooping Configure</b> screen. See <a href="#">Section 27.6 on page 266</a> . |
| Agent URL         | This field displays the location of the DHCP snooping database.                                                                                                                                |
| Write delay timer | This field displays how long (in seconds) the Switch tries to complete a specific update in the DHCP snooping database before it gives up.                                                     |
| Abort timer       | This field displays how long (in seconds) the Switch waits to update the DHCP snooping database after the current bindings change.                                                             |
|                   | This section displays information about the current update and the next update of the DHCP snooping database.                                                                                  |

Table 119 IP Source Guard &gt; IPv4 Source Guard Setup &gt; DHCP Snooping (continued)

| LABEL                          | DESCRIPTION                                                                                                                                                                                                                                                                                                                                          |
|--------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Agent running                  | <p>This field displays the status of the current update or access of the DHCP snooping database.</p> <p><b>none:</b> The Switch is not accessing the DHCP snooping database.</p> <p><b>read:</b> The Switch is loading dynamic bindings from the DHCP snooping database.</p> <p><b>write:</b> The Switch is updating the DHCP snooping database.</p> |
| Delay timer expiry             | This field displays how much longer (in seconds) the Switch tries to complete the current update before it gives up. It displays <b>Not Running</b> if the Switch is not updating the DHCP snooping database right now.                                                                                                                              |
| Abort timer expiry             | This field displays when (in seconds) the Switch is going to update the DHCP snooping database again. It displays <b>Not Running</b> if the current bindings have not changed since the last update.                                                                                                                                                 |
|                                | This section displays information about the last time the Switch updated the DHCP snooping database.                                                                                                                                                                                                                                                 |
| Last succeeded time            | This field displays the last time the Switch updated the DHCP snooping database successfully.                                                                                                                                                                                                                                                        |
| Last failed time               | This field displays the last time the Switch updated the DHCP snooping database unsuccessfully.                                                                                                                                                                                                                                                      |
| Last failed reason             | This field displays the reason the Switch updated the DHCP snooping database unsuccessfully.                                                                                                                                                                                                                                                         |
|                                | This section displays historical information about the number of times the Switch successfully or unsuccessfully read or updated the DHCP snooping database.                                                                                                                                                                                         |
| Total attempts                 | This field displays the number of times the Switch has tried to access the DHCP snooping database for any reason.                                                                                                                                                                                                                                    |
| Startup failures               | This field displays the number of times the Switch could not create or read the DHCP snooping database when the Switch started up or a new URL is configured for the DHCP snooping database.                                                                                                                                                         |
| Successful transfers           | This field displays the number of times the Switch read bindings from or updated the bindings in the DHCP snooping database successfully.                                                                                                                                                                                                            |
| Failed transfers               | This field displays the number of times the Switch was unable to read bindings from or update the bindings in the DHCP snooping database.                                                                                                                                                                                                            |
| Successful reads               | This field displays the number of times the Switch read bindings from the DHCP snooping database successfully.                                                                                                                                                                                                                                       |
| Failed reads                   | This field displays the number of times the Switch was unable to read bindings from the DHCP snooping database.                                                                                                                                                                                                                                      |
| Successful writes              | This field displays the number of times the Switch updated the bindings in the DHCP snooping database successfully.                                                                                                                                                                                                                                  |
| Failed writes                  | This field displays the number of times the Switch was unable to update the bindings in the DHCP snooping database.                                                                                                                                                                                                                                  |
| Database detail                |                                                                                                                                                                                                                                                                                                                                                      |
| First successful access        | This field displays the first time the Switch accessed the DHCP snooping database for any reason.                                                                                                                                                                                                                                                    |
| Last ignored bindings counters | This section displays the number of times and the reasons the Switch ignored bindings the last time it read bindings from the DHCP binding database. You can clear these counters by restarting the Switch or using CLI commands. See the Ethernet Switch CLI Reference Guide.                                                                       |
| Binding collisions             | This field displays the number of bindings the Switch ignored because the Switch already had a binding with the same MAC address and VLAN ID.                                                                                                                                                                                                        |
| Invalid interfaces             | This field displays the number of bindings the Switch ignored because the port number was a trusted interface or does not exist anymore.                                                                                                                                                                                                             |

Table 119 IP Source Guard &gt; IPv4 Source Guard Setup &gt; DHCP Snooping (continued)

| LABEL                           | DESCRIPTION                                                                                                                                                                                                                                           |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Parse failures                  | This field displays the number of bindings the Switch ignored because the Switch was unable to understand the binding in the DHCP binding database.                                                                                                   |
| Expired leases                  | This field displays the number of bindings the Switch ignored because the lease time had already expired.                                                                                                                                             |
| Unsupported vlans               | This field displays the number of bindings the Switch ignored because the VLAN ID does not exist anymore.                                                                                                                                             |
| Last ignored time               | This field displays the last time the Switch ignored any bindings for any reason from the DHCP binding database.                                                                                                                                      |
| Total ignored bindings counters | This section displays the reasons the Switch has ignored bindings any time it read bindings from the DHCP binding database. You can clear these counters by restarting the Switch or using CLI commands. See the Ethernet Switch CLI Reference Guide. |
| Binding collisions              | This field displays the number of bindings the Switch has ignored because the Switch already had a binding with the same MAC address and VLAN ID.                                                                                                     |
| Invalid interfaces              | This field displays the number of bindings the Switch has ignored because the port number was a trusted interface or does not exist anymore.                                                                                                          |
| Parse failures                  | This field displays the number of bindings the Switch has ignored because the Switch was unable to understand the binding in the DHCP binding database.                                                                                               |
| Expired leases                  | This field displays the number of bindings the Switch has ignored because the lease time had already expired.                                                                                                                                         |
| Unsupported vlans               | This field displays the number of bindings the Switch has ignored because the VLAN ID does not exist anymore.                                                                                                                                         |

## 27.6 DHCP Snooping Configure

Use this screen to enable DHCP snooping on the Switch (not on specific VLAN), specify the VLAN where the default DHCP server is located, and configure the DHCP snooping database. The DHCP snooping database stores the current bindings on a secure, external TFTP server so that they are still available after a restart. To open this screen, click **Advanced Application > IP Source Guard > IPv4 Source Guard Setup > DHCP Snooping > Configure**.

**Figure 177** IP Source Guard > IPv4 Source Guard Setup > DHCP Snooping > Configure

**DHCP Snooping Configure** [DHCP Snooping](#) [Port](#) [VLAN](#)

Active ☐

DHCP Vlan ☒ Disable ☐

**Database**

Agent URL

Timeout interval  seconds

Write delay interval  seconds

Renew DHCP Snooping URL

The following table describes the labels in this screen.

Table 120 IP Source Guard > IPv4 Source Guard Setup > DHCP Snooping > Configure

| LABEL                   | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|-------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Active                  | Select this to enable DHCP snooping on the Switch. You still have to enable DHCP snooping on specific VLAN and specify trusted ports.<br><br>Note: The Switch will drop all DHCP requests if you enable DHCP snooping and there are no trusted ports.                                                                                                                                                                                                                                                                                                                                            |
| DHCP Vlan               | Select a VLAN ID if you want the Switch to forward DHCP packets to DHCP servers on a specific VLAN.<br><br>Note: You have to enable DHCP snooping on the DHCP VLAN too.<br><br>You can select an option 82 profile in the <b>DHCP Snooping VLAN Configure</b> screen ( <a href="#">Section 27.6.2 on page 268</a> ) to help the DHCP servers distinguish between DHCP requests from different VLAN.<br><br>Select <b>Disable</b> if you do not want the Switch to forward DHCP packets to a specific VLAN.                                                                                       |
| Database                | If <b>Timeout interval</b> is greater than <b>Write delay interval</b> , it is possible that the next update is scheduled to occur before the current update has finished successfully or timed out. In this case, the Switch waits to start the next update until it completes the current one.                                                                                                                                                                                                                                                                                                 |
| Agent URL               | Enter the location of the DHCP snooping database. The location should be expressed like this: <b>tftp://[domain name or IP address]/directory, if applicable/file name</b> ; for example, <b>tftp://192.168.10.1/database.txt</b> .                                                                                                                                                                                                                                                                                                                                                              |
| Timeout interval        | Enter how long (10-65535 seconds) the Switch tries to complete a specific update in the DHCP snooping database before it gives up.                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Write delay interval    | Enter how long (10-65535 seconds) the Switch waits to update the DHCP snooping database the first time the current bindings change after an update. Once the next update is scheduled, additional changes in current bindings are automatically included in the next update.                                                                                                                                                                                                                                                                                                                     |
| Renew DHCP Snooping URL | Enter the location of a DHCP snooping database, and click <b>Renew</b> if you want the Switch to load it. You can use this to load dynamic bindings from a different DHCP snooping database than the one specified in <b>Agent URL</b> .<br><br>When the Switch loads dynamic bindings from a DHCP snooping database, it does not discard the current dynamic bindings first. If there is a conflict, the Switch keeps the dynamic binding in volatile memory and updates the <b>Binding collisions</b> counter in the <b>DHCP Snooping</b> screen ( <a href="#">Section 27.5 on page 263</a> ). |
| Apply                   | Click <b>Apply</b> to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the <b>Save</b> link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.                                                                                                                                                                                                                                                                                                               |
| Cancel                  | Click this to reset the values in this screen to their last-saved values.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |

## 27.6.1 DHCP Snooping Port Configure

Use this screen to specify whether ports are trusted or untrusted ports for DHCP snooping.

Note: The Switch will drop all DHCP requests if you enable DHCP snooping and there are no trusted ports.

You can also specify the maximum number for DHCP packets that each port (trusted or untrusted) can receive each second. To open this screen, click **Advanced Application > IP Source Guard > IPv4 Source Guard Setup > DHCP Snooping > Configure > Port**.

**Figure 178** IP Source Guard > IPv4 Source Guard Setup > DHCP Snooping > Configure > Port

| Port | Server Trusted state | Rate (pps) |
|------|----------------------|------------|
| *    | Untrusted ▼          |            |
| 1    | Untrusted ▼          | 0          |
| 2    | Untrusted ▼          | 0          |
| 3    | Untrusted ▼          | 0          |
| 4    | Untrusted ▼          | 0          |
| 5    | Untrusted ▼          | 0          |
| 6    | Untrusted ▼          | 0          |
| 7    | Untrusted ▼          | 0          |
| 8    | Untrusted ▼          | 0          |
| 9    | Untrusted ▼          | 0          |
| 10   | Untrusted ▼          | 0          |
| 11   | Untrusted ▼          | 0          |

Apply Cancel

The following table describes the labels in this screen.

Table 121 IP Source Guard &gt; IPv4 Source Guard Setup &gt; DHCP Snooping &gt; Configure &gt; Port

| LABEL                | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Port                 | This field displays the port number. * means all ports (on the same Switch).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Server Trusted state | <p>Select whether this port is a trusted port (<b>Trusted</b>) or an untrusted port (<b>Untrusted</b>).</p> <p>Trusted ports are connected to DHCP servers or other switches, and the Switch discards DHCP packets from trusted ports only if the rate at which DHCP packets arrive is too high.</p> <p>Untrusted ports are connected to subscribers, and the Switch discards DHCP packets from untrusted ports in the following situations:</p> <ul style="list-style-type: none"> <li>The packet is a DHCP server packet (for example, OFFER, ACK, or NACK).</li> <li>The source MAC address and source IP address in the packet do not match any of the current bindings.</li> <li>The packet is a RELEASE or DECLINE packet, and the source MAC address and source port do not match any of the current bindings.</li> <li>The rate at which DHCP packets arrive is too high.</li> </ul> |
| Rate (pps)           | Specify the maximum number for DHCP packets (1-2048) that the Switch receives from each port each second. The Switch discards any additional DHCP packets. Enter 0 to disable this limit, which is recommended for trusted ports.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Apply                | Click <b>Apply</b> to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the <b>Save</b> link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Cancel               | Click this to reset the values in this screen to their last-saved values.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |

## 27.6.2 DHCP Snooping VLAN Configure

Use this screen to enable DHCP snooping on each VLAN and to specify whether or not the Switch adds DHCP relay agent option 82 information ([Chapter 47 on page 389](#)) to DHCP requests that the Switch relays to a DHCP server for each VLAN. To open this screen, click **Advanced Application > IP Source Guard > IPv4 Source Guard Setup > DHCP Snooping > Configure > VLAN**.



**Figure 179** IP Source Guard > IPv4 Source Guard Setup > DHCP Snooping > Configure > VLAN

| VID | Enabled | Option 82 Profile |
|-----|---------|-------------------|
| *   | No ▾    | ▾                 |
| 100 | Yes ▾   | ▾                 |

The following table describes the labels in this screen.

Table 122 IP Source Guard &gt; IPv4 Source Guard Setup &gt; DHCP Snooping &gt; Configure &gt; VLAN

| LABEL              | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| VLAN Search by VID | Use a comma (,) to separate individual VLANs or a dash (-) to indicates a range of VLANs. For example, "3,4" or "3-9".                                                                                                                                                                                                                                                                                                                      |
| Search             | Click this to display the specified range of VLANs in the section below.                                                                                                                                                                                                                                                                                                                                                                    |
| VID                | This field displays the VLAN ID of each VLAN in the range specified above. If you configure the * VLAN, the settings are applied to all VLANs.                                                                                                                                                                                                                                                                                              |
| Enabled            | Select <b>Yes</b> to enable DHCP snooping on the VLAN. You still have to enable DHCP snooping on the Switch and specify trusted ports.<br><br>Note: The Switch will drop all DHCP requests if you enable DHCP snooping and there are no trusted ports.                                                                                                                                                                                      |
| Option 82 Profile  | Select a pre-defined DHCP option 82 profile that the Switch applies to all ports in the specified VLAN(s). The Switch adds the information (such as slot number, port number, VLAN ID and/or system name) specified in the profile to DHCP requests that it broadcasts to the DHCP VLAN, if specified, or VLAN. You can specify the DHCP VLAN in the <b>DHCP Snooping Configure</b> screen (see <a href="#">Section 27.6 on page 266</a> ). |
| Apply              | Click <b>Apply</b> to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the <b>Save</b> link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.                                                                                                                                                          |
| Cancel             | Click this to reset the values in this screen to their last-saved values.                                                                                                                                                                                                                                                                                                                                                                   |
| Change Pages       | Click <b>Previous</b> or <b>Next</b> to show the previous/next screen if all status information cannot be seen in one screen.                                                                                                                                                                                                                                                                                                               |

### 27.6.3 DHCP Snooping VLAN Port Configure

Use this screen to apply a different DHCP option 82 profile to certain ports in a VLAN. To open this screen, click **Advanced Application > IP Source Guard > IPv4 Source Guard Setup > DHCP Snooping > Configure > VLAN > Port**.

**Figure 180** IP Source Guard > IPv4 Source Guard Setup > DHCP Snooping > Configure > VLAN > Port

The following table describes the labels in this screen.

Table 123 IP Source Guard &gt; IPv4 Source Guard Setup &gt; DHCP Snooping &gt; Configure &gt; VLAN &gt; Port

| LABEL             | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|-------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| VID               | Enter the ID number of the VLAN you want to configure here.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Port              | Enter the number of port(s) to which you want to apply the specified DHCP option 82 profile.<br>You can enter multiple ports separated by (no space) comma (,) or hyphen (-) for a range. For example, enter "3-5" for ports 3, 4, and 5. Enter "3,5,7" for ports 3, 5, and 7.                                                                                                                                                                                                                                                                                                         |
| Option 82 Profile | Select a pre-defined DHCP option 82 profile that the Switch applies to the specified port(s) in this VLAN. The Switch adds the information (such as slot number, port number, VLAN ID and/or system name) specified in the profile to DHCP requests that it broadcasts to the DHCP VLAN, if specified, or VLAN. You can specify the DHCP VLAN in the <b>DHCP Snooping Configure</b> screen (see <a href="#">Section 27.6 on page 266</a> ).<br><br>Note: The profile you select here has priority over the one you select in the <b>DHCP Snooping &gt; Configure &gt; VLAN</b> screen. |
| Add               | Click this to create a new entry or to update an existing one.<br><br>This saves your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the <b>Save</b> link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.                                                                                                                                                                                                                                               |
| Cancel            | Click this to reset the values above based on the last selected entry or, if not applicable, to clear the fields above.                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Clear             | Click <b>Clear</b> to reset the fields to the factory defaults.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Index             | This field displays a sequential number for each entry. Click an index number to change the settings.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| VID               | This field displays the VLAN to which the port(s) belongs.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Port              | This field displays the port(s) to which the Switch applies the settings.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Profile Name      | This field displays the DHCP option 82 profile that the Switch applies to the port(s).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Delete            | Select the entry(ies) that you want to remove in the <b>Delete</b> column, then click the <b>Delete</b> button to remove the selected entry(ies) from the table.                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Cancel            | Click this to clear the <b>Delete</b> check boxes above.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |

## 27.7 ARP Inspection Status

Use this screen to look at the current list of MAC address filters that were created because the Switch identified an unauthorized ARP packet. When the Switch identifies an unauthorized ARP packet, it

automatically creates a MAC address filter to block traffic from the source MAC address and source VLAN ID of the unauthorized ARP packet. To open this screen, click **Advanced Application > IP Source Guard > IPv4 Source Guard Setup > ARP Inspection**.

**Figure 181** IP Source Guard > IPv4 Source Guard Setup > ARP Inspection Status

ARP Inspection Status [IPv4 SG](#) [VLAN Status](#) [Log Status](#) [Configure](#)

Total number of filters = 0

| Index                                         | MAC Address | VID | Port | Expiry (sec) |  |
|-----------------------------------------------|-------------|-----|------|--------------|--|
| <a href="#">Delete</a> <a href="#">Cancel</a> |             |     |      |              |  |

Change Pages [Previous Page](#) [Next Page](#)

The following table describes the labels in this screen.

Table 124 IP Source Guard > IPv4 Source Guard Setup > ARP Inspection Status

| LABEL                   | DESCRIPTION                                                                                                                                        |
|-------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------|
| Total number of filters | This field displays the current number of MAC address filters that were created because the Switch identified unauthorized ARP packets.            |
| Index                   | This field displays a sequential number for each MAC address filter.                                                                               |
| MAC Address             | This field displays the source MAC address in the MAC address filter.                                                                              |
| VID                     | This field displays the source VLAN ID in the MAC address filter.                                                                                  |
| Port                    | This field displays the source port of the discarded ARP packet.                                                                                   |
| Expiry (sec)            | This field displays how long (in seconds) the MAC address filter remains in the Switch. You can also delete the record manually ( <b>Delete</b> ). |
|                         | Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries.            |
| Delete                  | Click this to remove the selected entries.                                                                                                         |
| Cancel                  | Click this to clear the <b>Delete</b> check boxes above.                                                                                           |
| Change Pages            | Click <b>Previous Page</b> or <b>Next Page</b> to show the previous/next screen if all status information cannot be seen in one screen.            |

## 27.7.1 ARP Inspection VLAN Status

Use this screen to look at various statistics about ARP packets in each VLAN. To open this screen, click **Advanced Application > IP Source Guard > IPv4 Source Guard Setup > ARP Inspection > VLAN Status**.

**Figure 182** IP Source Guard > IPv4 Source Guard Setup > ARP Inspection > VLAN Status

The following table describes the labels in this screen.

Table 125 IP Source Guard &gt; IPv4 Source Guard Setup &gt; ARP Inspection &gt; VLAN Status

| LABEL              | DESCRIPTION                                                                                                                             |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------|
| VLAN Search by VID | Use a comma (,) to separate individual VLANs or a dash (-) to indicates a range of VLANs. For example, "3,4" or "3-9".                  |
| Search             | Click this to display the specified range of VLANs in the section below.                                                                |
| VID                | This field displays the VLAN ID of each VLAN in the range specified above.                                                              |
| Received           | This field displays the total number of ARP packets received from the VLAN since the Switch last restarted.                             |
| Request            | This field displays the total number of ARP Request packets received from the VLAN since the Switch last restarted.                     |
| Reply              | This field displays the total number of ARP Reply packets received from the VLAN since the Switch last restarted.                       |
| Forwarded          | This field displays the total number of ARP packets the Switch forwarded for the VLAN since the Switch last restarted.                  |
| Dropped            | This field displays the total number of ARP packets the Switch discarded for the VLAN since the Switch last restarted.                  |
| Change Pages       | Click <b>Previous Page</b> or <b>Next Page</b> to show the previous/next screen if all status information cannot be seen in one screen. |

## 27.7.2 ARP Inspection Log Status

Use this screen to look at log messages that were generated by ARP packets and that have not been sent to the syslog server yet. To open this screen, click **Advanced Application > IP Source Guard > IPv4 Source Guard Setup > ARP Inspection > Log Status**.

**Figure 183** IP Source Guard > IPv4 Source Guard Setup > ARP Inspection > Log Status

The following table describes the labels in this screen.

Table 126 IP Source Guard > IPv4 Source Guard Setup > ARP Inspection > Log Status

| LABEL                     | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|---------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Clearing log status table | Click <b>Apply</b> to remove all the log messages that were generated by ARP packets and that have not been sent to the syslog server yet.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Total number of logs      | This field displays the number of log messages that were generated by ARP packets and that have not been sent to the syslog server yet. If one or more log messages are dropped due to unavailable buffer, there is an entry called <b>overflow</b> with the current number of dropped log messages.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Index                     | This field displays a sequential number for each log message.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Port                      | This field displays the source port of the ARP packet.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| VID                       | This field displays the source VLAN ID of the ARP packet.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Sender Mac                | This field displays the source MAC address of the ARP packet.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Sender IP                 | This field displays the source IP address of the ARP packet.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Num Pkts                  | This field displays the number of ARP packets that were consolidated into this log message. The Switch consolidates identical log messages generated by ARP packets in the log consolidation interval into one log message. You can configure this interval in the <b>ARP Inspection Configure</b> screen. See <a href="#">Section 27.8 on page 273</a> .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Reason                    | <p>This field displays the reason the log message was generated.</p> <p><b>dhcp deny:</b> An ARP packet was discarded because it violated a dynamic binding with the same MAC address and VLAN ID.</p> <p><b>static deny:</b> An ARP packet was discarded because it violated a static binding with the same MAC address and VLAN ID.</p> <p><b>deny:</b> An ARP packet was discarded because there were no bindings with the same MAC address and VLAN ID.</p> <p><b>dhcp permit:</b> An ARP packet was forwarded because it matched a dynamic binding.</p> <p><b>static permit:</b> An ARP packet was forwarded because it matched a static binding.</p> <p>In the <b>ARP Inspection VLAN Configure</b> screen, you can configure the Switch to generate log messages when ARP packets are discarded or forwarded based on the VLAN ID of the ARP packet. See <a href="#">Section 27.8.2 on page 276</a>.</p> |
| Time                      | This field displays when the log message was generated.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |

## 27.8 ARP Inspection Configure

Use this screen to enable ARP inspection on the Switch. You can also configure the length of time the Switch stores records of discarded ARP packets and global settings for the ARP inspection log. To open this screen, click **Advanced Application > IP Source Guard > IPv4 Source Guard Setup > ARP Inspection > Configure**.

**Figure 184** IP Source Guard > IPv4 Source Guard Setup > ARP Inspection > Configure

**ARP Inspection Configure** [ARP Inspection](#) [Port](#) [VLAN](#)

Active ☐

**Filter Aging Time**

Filter aging time  seconds

**Log Profile**

|                 |                                 |         |
|-----------------|---------------------------------|---------|
| Log buffer size | <input type="text" value="32"/> | entries |
| Syslog rate     | <input type="text" value="5"/>  | entries |
| Log interval    | <input type="text" value="1"/>  | seconds |

[Apply](#) [Cancel](#)

The following table describes the labels in this screen.

Table 127 IP Source Guard &gt; IPv4 Source Guard Setup &gt; ARP Inspection &gt; Configure

| LABEL             | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|-------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Active            | Select this to enable ARP inspection on the Switch. You still have to enable ARP inspection on specific VLAN and specify trusted ports.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Filter Aging Time |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Filter aging time | <p>This setting has no effect on existing MAC address filters.</p> <p>Enter how long (1-2147483647 seconds) the MAC address filter remains in the Switch after the Switch identifies an unauthorized ARP packet. The Switch automatically deletes the MAC address filter afterwards. Type 0 if you want the MAC address filter to be permanent.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Log Profile       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Log buffer size   | <p>Enter the maximum number (1-1024) of log messages that were generated by ARP packets and have not been sent to the syslog server yet. Make sure this number is appropriate for the specified <b>Syslog rate</b> and <b>Log interval</b>.</p> <p>If the number of log messages in the Switch exceeds this number, the Switch stops recording log messages and simply starts counting the number of entries that were dropped due to unavailable buffer. Click <b>Clearing log status table</b> in the <b>ARP Inspection Log Status</b> screen to clear the log and reset this counter. See <a href="#">Section 27.7.2 on page 272</a>.</p>                                                                                                                                                                                                                                          |
| Syslog rate       | <p>Type the maximum number of syslog messages the Switch can send to the syslog server in one batch. This number is expressed as a rate because the batch frequency is determined by the <b>Log Interval</b>. You must configure the syslog server (<a href="#">Chapter 55 on page 464</a>) to use this. Enter 0 if you do not want the Switch to send log messages generated by ARP packets to the syslog server.</p> <p>The relationship between <b>Syslog rate</b> and <b>Log interval</b> is illustrated in the following examples:</p> <ul style="list-style-type: none"> <li>4 invalid ARP packets per second, <b>Syslog rate</b> is 5, <b>Log interval</b> is 1: the Switch sends 4 syslog messages every second.</li> <li>6 invalid ARP packets per second, <b>Syslog rate</b> is 5, <b>Log interval</b> is 2: the Switch sends 5 syslog messages every 2 seconds.</li> </ul> |
| Log interval      | Type how often (1-86400 seconds) the Switch sends a batch of syslog messages to the syslog server. Enter 0 if you want the Switch to send syslog messages immediately. See <b>Syslog rate</b> for an example of the relationship between <b>Syslog rate</b> and <b>Log interval</b> .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |

Table 127 IP Source Guard &gt; IPv4 Source Guard Setup &gt; ARP Inspection &gt; Configure (continued)

| LABEL  | DESCRIPTION                                                                                                                                                                                                                                                                        |
|--------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Apply  | Click <b>Apply</b> to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the <b>Save</b> link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click this to reset the values in this screen to their last-saved values.                                                                                                                                                                                                          |

## 27.8.1 ARP Inspection Port Configure

Use this screen to specify whether ports are trusted or untrusted ports for ARP inspection. You can also specify the maximum rate at which the Switch receives ARP packets on each untrusted port. To open this screen, click **Advanced Application > IP Source Guard > IPv4 Source Guard Setup > ARP Inspection > Configure > Port**.

Figure 185 IP Source Guard &gt; IPv4 Source Guard Setup &gt; ARP Inspection &gt; Configure &gt; Port

| Port | Trusted State | Rate (pps) | Limit Burst interval (seconds) |
|------|---------------|------------|--------------------------------|
| *    | Untrusted ▼   |            |                                |
| 1    | Untrusted ▼   | 15         | 1                              |
| 2    | Untrusted ▼   | 15         | 1                              |
| 3    | Untrusted ▼   | 15         | 1                              |
| 4    | Untrusted ▼   | 15         | 1                              |
| 5    | Untrusted ▼   | 15         | 1                              |
| 6    | Untrusted ▼   | 15         | 1                              |
| 7    | Untrusted ▼   | 15         | 1                              |
| 8    | Untrusted ▼   | 15         | 1                              |
| 9    | Untrusted ▼   | 15         | 1                              |
| 10   | Untrusted ▼   | 15         | 1                              |
| 11   | Untrusted ▼   | 15         | 1                              |

Apply Cancel

The following table describes the labels in this screen.

Table 128 IP Source Guard &gt; IPv4 Source Guard Setup &gt; ARP Inspection &gt; Configure &gt; Port

| LABEL         | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|---------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Port          | This field displays the port number. * means all ports (on the same Switch).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Trusted State | <p>Select whether this port is a trusted port (<b>Trusted</b>) or an untrusted port (<b>Untrusted</b>).</p> <p>The Switch does not discard ARP packets on trusted ports for any reason.</p> <p>The Switch discards ARP packets on untrusted ports in the following situations:</p> <ul style="list-style-type: none"> <li>The sender's information in the ARP packet does not match any of the current bindings.</li> <li>The rate at which ARP packets arrive is too high. You can specify the maximum rate at which ARP packets can arrive on untrusted ports.</li> </ul> |
| Limit         | Rate and Burst Interval settings have no effect on trusted ports.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Rate (pps)    | Specify the maximum rate (1-2048 packets per second) at which the Switch receives ARP packets from each port. The Switch discards any additional ARP packets. Enter 0 to disable this limit.                                                                                                                                                                                                                                                                                                                                                                                |

Table 128 IP Source Guard &gt; IPv4 Source Guard Setup &gt; ARP Inspection &gt; Configure &gt; Port (continued)

| LABEL                    | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|--------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Burst interval (seconds) | The burst interval is the length of time over which the rate of ARP packets is monitored for each port. For example, if the Rate is 15 pps and the burst interval is 1 second, then the Switch accepts a maximum of 15 ARP packets in every one-second interval. If the burst interval is 5 seconds, then the Switch accepts a maximum of 75 ARP packets in every five-second interval.<br><br>Enter the length (1-15 seconds) of the burst interval. |
| Apply                    | Click <b>Apply</b> to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the <b>Save</b> link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.                                                                                                                                                                    |
| Cancel                   | Click this to reset the values in this screen to their last-saved values.                                                                                                                                                                                                                                                                                                                                                                             |

## 27.8.2 ARP Inspection VLAN Configure

Use this screen to enable ARP inspection on each VLAN and to specify when the Switch generates log messages for receiving ARP packets from each VLAN. To open this screen, click **Advanced Application > IP Source Guard > IPv4 Source Guard Setup > ARP Inspection > Configure > VLAN**.

Figure 186 IP Source Guard &gt; IPv4 Source Guard Setup &gt; ARP Inspection &gt; Configure &gt; VLAN

The following table describes the labels in this screen.

Table 129 IP Source Guard &gt; IPv4 Source Guard Setup &gt; ARP Inspection &gt; Configure &gt; VLAN

| LABEL              | DESCRIPTION                                                                                                                                    |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------|
| VLAN Search by VID | Use a comma (,) to separate individual VLANs or a dash (-) to indicates a range of VLANs. For example, "3,4" or "3-9".                         |
| Search             | Click this to display the specified range of VLANs in the section below.                                                                       |
| VID                | This field displays the VLAN ID of each VLAN in the range specified above. If you configure the * VLAN, the settings are applied to all VLANs. |
| Enabled            | Select <b>Yes</b> to enable ARP inspection on the VLAN. Select <b>No</b> to disable ARP inspection on the VLAN.                                |



Table 129 IP Source Guard &gt; IPv4 Source Guard Setup &gt; ARP Inspection &gt; Configure &gt; VLAN

| LABEL        | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|--------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Log          | <p>Specify when the Switch generates log messages for receiving ARP packets from the VLAN.</p> <p><b>None:</b> The Switch does not generate any log messages when it receives an ARP packet from the VLAN.</p> <p><b>Deny:</b> The Switch generates log messages when it discards an ARP packet from the VLAN.</p> <p><b>Permit:</b> The Switch generates log messages when it forwards an ARP packet from the VLAN.</p> <p><b>All:</b> The Switch generates log messages every time it receives an ARP packet from the VLAN.</p> |
| Apply        | Click <b>Apply</b> to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the <b>Save</b> link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.                                                                                                                                                                                                                                                |
| Cancel       | Click this to reset the values in this screen to their last-saved values.                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Change Pages | Click <b>Previous Page</b> or <b>Next Page</b> to show the previous/next screen if all status information cannot be seen in one screen.                                                                                                                                                                                                                                                                                                                                                                                           |

## 27.9 IPv6 Source Guard Overview

The purpose of IPv6 source guard is to distinguish between authorized and unauthorized users by using a binding table that validates the source of IPv6 traffic. The binding table can be manually created or be learned through Dynamic Host Configuration Protocol version 6 snooping (DHCPv6 snooping). IPv6 source guard can deny IPv6 traffic from an unknown source. The IPv6 source guard binding table includes:

- IPv6 address
- IPv6 prefix
- VLAN ID
- Port number
- MAC address

Enable IPv6 source guard on a port for the Switch to check incoming IPv6 packets on that port. A packet is allowed when it matches any entry in the IPSG binding table. If a user tries to send IPv6 packets to the Switch that do not match an entry in the IPSG binding table, the Switch will drop these packets. The Switch forwards matching traffic normally. The IPv6 source guard related screens are available in standalone mode.

## 27.10 IPv6 Source Binding Status

Use this screen to look at the current IPv6 dynamic and static bindings and to remove dynamic bindings based on IPv6 address and/or IPv6 prefix. Bindings are used to distinguish between authorized and unauthorized packets in the network. The Switch learns the bindings by snooping DHCP packets (dynamic bindings) and from information provided manually by administrators (static bindings). To open this screen, click **Advanced Application > IP Source Guard > IPv6 Source Binding Status**.

**Figure 187** Advanced Application > IP Source Guard > IPv6 Source Binding Status

The following table describes the labels in this screen.

Table 130 Advanced Application &gt; IP Source Guard &gt; IPv6 Source Binding Status

| LABEL                        | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Clear Dynamic Source Binding | Specify how you want the Switch to remove dynamic IPv6 source binding entries when you click <b>Flush</b> . <ul style="list-style-type: none"> <li>Select <b>All</b> to remove all of the dynamic entries from the IPv6 source binding table.</li> <li>Select <b>IPv6 Address</b> and enter an IPv6 address to remove the dynamic entries snooped with the specified IPv6 address.</li> <li>Select <b>IPv6 Prefix</b> and enter a Prefix address to remove the dynamic entries snooped with the specified Prefix address.</li> </ul> |
| Flush                        | Click this to remove dynamic IPv6 source binding entries according to your selections.                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Cancel                       | Click this to reset the values above based or if not applicable, to clear the fields above.                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Index                        | This field displays a sequential number for each binding.                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Source Address               | This field displays the source IP address in the binding. If the entry is blank, this field will not be checked in the binding.                                                                                                                                                                                                                                                                                                                                                                                                      |
| MAC Address                  | This field displays the source MAC address in the binding. If the entry is blank, this field will not be checked in the binding.                                                                                                                                                                                                                                                                                                                                                                                                     |
| VLAN                         | This field displays the source VLAN ID in the binding. If the entry is blank, this field will not be checked in the binding.                                                                                                                                                                                                                                                                                                                                                                                                         |
| Port                         | This field displays the port number in the binding. If this field is blank, the binding applies to all ports.                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Lease                        | This field displays how many days, hours, minutes, and seconds the binding is valid; for example, <b>2d3h4m5s</b> means the binding is still valid for 2 days, 3 hours, 4 minutes, and 5 seconds. This field displays <b>infinity</b> if the binding is always valid (for example, a static binding).                                                                                                                                                                                                                                |
| Type                         | This field displays how the Switch learned the binding. <p><b>S:</b> This static binding was learned from information provided manually by an administrator.</p> <p><b>DH:</b> This dhcp-snooping binding was learned by snooping DHCP packets.</p>                                                                                                                                                                                                                                                                                  |

## 27.11 IPv6 Static Binding Setup

Use this screen to manually create an IPv6 source guard binding table entry and manage IPv6 static bindings. Static bindings are uniquely identified by the source IPv6 address / prefix. Each source IPv6 address / prefix can only be in one static binding. If you try to create a static binding with the same source IPv6 address / prefix as an existing static binding, the new static binding replaces the original one. To open this screen, click **Advanced Application > IP Source Guard > IPv6 Static Binding Setup**.

**Figure 188** Advanced Application > IP Source Guard > IPv6 Static Binding Setup

The following table describes the labels in this screen.

Table 131 Advanced Application &gt; IP Source Guard &gt; IPv6 Static Binding Setup

| LABEL               | DESCRIPTION                                                                                                                                                                                                                                             |
|---------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| IPv6 Static Binding |                                                                                                                                                                                                                                                         |
| Source Address      | Enter the IPv6 address or IPv6 prefix and prefix length in the binding.                                                                                                                                                                                 |
| MAC Address         | Enter the source MAC address in the binding. If this binding doesn't check this field, select <b>Any</b> .<br><br>Note: You cannot choose <b>Any</b> for all three of <b>MAC Address</b> , <b>VLAN</b> and <b>Port</b> . You must fill in at least one. |
| VLAN                | Enter the source VLAN ID in the binding. If this binding doesn't check this field, select <b>Any</b> .                                                                                                                                                  |
| Port                | Specify the port(s) in the binding. If this binding has one port, select the first radio button and enter the port number in the field to the right. If this binding applies to all ports, select <b>Any</b> .                                          |
| Add                 | Click this to create the specified static binding or to update an existing one.                                                                                                                                                                         |
| Cancel              | Click this to reset the values above based or if not applicable, to clear the fields above.                                                                                                                                                             |
| Clear               | Click this to clear the fields above.                                                                                                                                                                                                                   |
| Index               | This field displays a sequential number for each binding.                                                                                                                                                                                               |
| Source Address      | This field displays the IPv6 address or IPv6 prefix and prefix length in the binding.                                                                                                                                                                   |
| MAC Address         | This field displays the source MAC address in the binding. If the entry is blank, this field will not be checked in the binding.                                                                                                                        |
| VLAN                | This field displays the source VLAN ID in the binding. If the entry is blank, this field will not be checked in the binding.                                                                                                                            |
| Port                | This field displays the port number in the binding. If this field is blank, the binding applies to all ports.                                                                                                                                           |
|                     | Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries.                                                                                                                 |
| Delete              | Select an entry checkbox and click <b>Delete</b> to remove the specified entry.                                                                                                                                                                         |
| Cancel              | Click this to clear the <b>Delete</b> check boxes above.                                                                                                                                                                                                |

## 27.12 IPv6 Source Guard Policy Setup

Use this screen to have IPv6 source guard forward valid IPv6 addresses and/or IPv6 prefixes that are stored in the binding table and allow or block data traffic from all link-local addresses. To open this screen, click **Advanced Application > IP Source Guard > IPv6 Source Guard Policy Setup**.

- If you select **Validate Address** and not **Validate Prefix**, traffic for a binding entry that matches a IPv6 address and VLAN ID, port number, and MAC address will be forwarded. If this binding entry is a IPv6 prefix, the traffic will be denied.
- If you select **Validate Prefix** and not **Validate Address**, traffic for a binding entry that matches a IPv6 prefix and VLAN ID, port number, and MAC address will be forwarded. If this binding entry is a IPv6 address, the traffic will be denied.
- If you select both **Validate Prefix** and **Validate Address** then traffic matching either IPv6 address or prefix will be forwarded.

**Figure 189** Advanced Application > IP Source Guard > IPv6 Source Guard Policy Setup

The following table describes the labels in this screen.

Table 132 Advanced Application > IP Source Guard > IPv6 Source Guard Policy Setup

| LABEL            | DESCRIPTION                                                                                                                                                                                                                                                                                                                    |
|------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Name             | Enter a descriptive name for identification purposes for this IPv6 source guard policy.                                                                                                                                                                                                                                        |
| Validate Address | Select <b>Validate Address</b> to have IPv6 source guard forward valid addresses that are stored in the binding table.                                                                                                                                                                                                         |
| Validate Prefix  | Select <b>Validate Prefix</b> to have IPv6 source guard forward valid prefixes that are stored in the binding table.                                                                                                                                                                                                           |
| Link Local       | Select <b>Permit</b> to allow data traffic from all link-local addresses; otherwise leave the setting at <b>Deny</b> . A link-local address is an IPv6 unicast address that can be automatically configured on any interface using the link-local prefix FE80::/10 and the interface identifier in the modified EUI-64 format. |
| Add              | Click this to create the IPv6 source guard policy or to update an existing one.                                                                                                                                                                                                                                                |
| Cancel           | Click this to reset the values above or if not applicable, to clear the fields above.                                                                                                                                                                                                                                          |
| Clear            | Click this to clear the fields above.                                                                                                                                                                                                                                                                                          |
| Index            | This field displays a sequential number for each policy.                                                                                                                                                                                                                                                                       |
| Name             | This field displays the descriptive name for identification purposes for this IPv6 source guard policy.                                                                                                                                                                                                                        |
| Validate Address | This field displays the <b>Validate Address</b> status for this IPv6 source guard policy.                                                                                                                                                                                                                                      |
| Validate Prefix  | This field displays the <b>Validate Prefix</b> status for this IPv6 source guard policy.                                                                                                                                                                                                                                       |
| Link Local       | This field displays the <b>Link Local</b> traffic status for this IPv6 source guard policy.                                                                                                                                                                                                                                    |

Table 132 Advanced Application &gt; IP Source Guard &gt; IPv6 Source Guard Policy Setup

| LABEL  | DESCRIPTION                                                                                                                             |
|--------|-----------------------------------------------------------------------------------------------------------------------------------------|
|        | Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries. |
| Delete | Select an entry checkbox and click <b>Delete</b> to remove the specified entry.                                                         |
| Cancel | Click this to clear the <b>Delete</b> check boxes above.                                                                                |

## 27.13 IPv6 Source Guard Port Setup

Use this screen to apply configured IPv6 source guard policies to ports you specify. Use port \* to apply a policy to all ports. To open this screen, click **Advanced Application > IP Source Guard > IPv6 Source Guard Port Setup**.

Figure 190 Advanced Application &gt; IP Source Guard &gt; IPv6 Source Guard Port Setup

| Port | Policy Name |
|------|-------------|
| *    | ▼           |
| 1    | ▼           |
| 2    | ▼           |
| 3    | ▼           |
| 4    | ▼           |
| 5    | ▼           |
| 6    | ▼           |
| 7    | ▼           |
| 8    | ▼           |
| 9    | ▼           |
| 10   | ▼           |
| 11   | ▼           |
| 12   | ▼           |

Apply Cancel

The following table describes the labels in this screen.

Table 133 Advanced Application &gt; IP Source Guard &gt; IPv6 Source Guard Port Setup

| LABEL       | DESCRIPTION                                                                                                                                                                                                                                                                        |
|-------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Port        | This field displays the port number. If you configure the * port, the settings are applied to all of the ports.                                                                                                                                                                    |
| Policy Name | Select an IPv6 source guard policy that the Switch will apply to this port.                                                                                                                                                                                                        |
| Apply       | Click <b>Apply</b> to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the <b>Save</b> link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel      | Click this to reset the values in this screen to their last-saved values.                                                                                                                                                                                                          |

## 27.14 IPv6 Snooping Policy Setup

Use this screen to dynamically create an IPv6 source guard binding table using a DHCPv6 snooping policy. A DHCPv6 snooping policy lets the Switch sniff DHCPv6 packets sent from a DHCPv6 server to a DHCPv6 client when it is assigning an IPv6 address. When a DHCPv6 client successfully gets a valid IPv6 address, DHCPv6 snooping builds the binding table dynamically. To open this screen, click **Advanced Application > IP Source Guard > IPv6 Snooping Policy Setup**.

Note: If you do not select **Protocol** and **Prefix Glean**, then the Switch cannot perform DHCPv6 snooping.

**Figure 191** Advanced Application > IP Source Guard > IPv6 Snooping Policy Setup

The following table describes the labels in this screen.

Table 134 Advanced Application > IP Source Guard > IPv6 Snooping Policy Setup

| LABEL               | DESCRIPTION                                                                                                                                                                                                                                                                                                                |
|---------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Name                | Enter a descriptive name for identification purposes for this IPv6 snooping policy.                                                                                                                                                                                                                                        |
| Protocol            | Select <b>DHCP</b> to let the Switch sniff DHCPv6 packets sent from a DHCPv6 server to a DHCPv6 client.                                                                                                                                                                                                                    |
| Prefix Glean        | Select this to learn the IPv6 prefix and length from DHCPv6 sniffed packets.                                                                                                                                                                                                                                               |
| Limit Address Count | This is the number of IPv6 addresses and prefixes learned using the IPv6 snooping policy.<br><br>Note: The maximum limit address count is the maximum size of the IPv6 source guard binding table. At the time of writing, it is 50 for the GS2210 Switch series. See the product datasheet for the latest specifications. |
| Add                 | Click this to create the IPv6 source guard policy or to update an existing one.                                                                                                                                                                                                                                            |
| Cancel              | Click this to reset the values above or if not applicable, to clear the fields above.                                                                                                                                                                                                                                      |
| Clear               | Click this to clear the fields above.                                                                                                                                                                                                                                                                                      |
| Index               | This field displays a sequential number for each IPv6 snooping policy.                                                                                                                                                                                                                                                     |
| Name                | This field displays the descriptive name for identification purposes for this IPv6 source guard policy.                                                                                                                                                                                                                    |
| Protocol            | This field displays the protocols learned from DHCPv6 sniffed packets.                                                                                                                                                                                                                                                     |
| Prefix Glean        | This field displays the IPv6 prefixes learned from DHCPv6 sniffed packets.                                                                                                                                                                                                                                                 |
| Limit Address Count | This field displays the number of IPv6 addresses and prefixes learned using the IPv6 snooping policy.                                                                                                                                                                                                                      |
| Delete              | Select an entry checkbox and click <b>Delete</b> to remove the specified entry.                                                                                                                                                                                                                                            |
| Cancel              | Click this to clear the <b>Delete</b> check boxes above.                                                                                                                                                                                                                                                                   |

## 27.15 IPv6 Snooping VLAN Setup

Use this screen to enable a DHCPv6 snooping policy on a specific VLAN interface. To open this screen, click **Advanced Application > IP Source Guard > IPv6 Snooping VLAN Setup**.

**Figure 192** Advanced Application > IP Source Guard > IPv6 Snooping VLAN Setup

The following table describes the labels in this screen.

Table 135 Advanced Application > IP Source Guard > IPv6 Snooping VLAN Setup

| LABEL     | DESCRIPTION                                                                                                                             |
|-----------|-----------------------------------------------------------------------------------------------------------------------------------------|
| Interface | Select the VLAN interface to apply the selected DHCPv6 snooping policy.                                                                 |
| Policy    | Select the IPv6 snooping policy to apply to this VLAN interface.                                                                        |
| Add       | Click this to create the IPv6 source guard policy or to update an existing one.                                                         |
| Cancel    | Click this to reset the values above or if not applicable, to clear the fields above.                                                   |
| Clear     | Click this to clear the fields above.                                                                                                   |
| Index     | This field displays a sequential number for each binding.                                                                               |
| Interface | This field displays the VLAN interface.                                                                                                 |
| Policy    | This field displays the DHCPv6 snooping policy.                                                                                         |
|           | Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries. |
| Delete    | Select an entry checkbox and click <b>Delete</b> to remove the specified entry.                                                         |
| Cancel    | Click this to clear the <b>Delete</b> check boxes above.                                                                                |

## 27.16 IPv6 DHCP Trust Setup

Use this screen to specify which ports are trusted for DHCPv6 snooping. To open this screen, click **Advanced Application > IP Source Guard > IPv6 DHCP Trust Setup**.

Note: DHCPv6 solicit packets are sent from a DHCPv6 client to a DHCPv6 server. Reply packets from a DHCPv6 server connected to an untrusted port are discarded.

Use port \* to have all ports be **Untrusted** or **Trusted**.

**Figure 193** Advanced Application > IP Source Guard > IPv6 DHCP Trust Setup

**DHCP Trust** [IPSG](#)

**Trust Setting**

Active ☐

**Port Setting**

| Port | Trusted State |
|------|---------------|
| *    | Untrusted ▼   |
| 1    | Untrusted ▼   |
| 2    | Untrusted ▼   |
| 3    | Untrusted ▼   |
| 4    | Untrusted ▼   |
| 5    | Untrusted ▼   |
| 6    | Untrusted ▼   |
| 7    | Untrusted ▼   |
| 8    | Untrusted ▼   |
| 9    | Untrusted ▼   |
| 10   | Untrusted ▼   |

[Apply](#) [Cancel](#)

The following table describes the labels in this screen.

Table 136 Advanced Application &gt; IP Source Guard &gt; IPv6 DHCP Trust Setup

| LABEL         | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|---------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Trust Setting |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Active        | Select this to specify whether ports are trusted or untrusted ports for DHCP snooping. If you do not select this then <b>IPv6 DHCP Trust</b> is not used and all ports are automatically trusted.                                                                                                                                                                                                                                                                                                                                                                                       |
| Port Setting  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Port          | This field displays the port number. If you configure the * port, the settings are applied to all of the ports.                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Trusted state | <p>Select whether this port is a trusted port (<b>Trusted</b>) or an untrusted port (<b>Untrusted</b>).</p> <p>Trusted ports are connected to DHCPv6 servers or other switches.</p> <p>Untrusted ports are connected to subscribers, and the Switch discards DHCPv6 packets from untrusted ports in the following situations:</p> <ul style="list-style-type: none"> <li>The packet is a DHCPv6 server packet (for example, ADVERTISE, REPLY, or RELAY-REPLY).</li> <li>The source MAC address and source IP address in the packet do not match any of the current bindings.</li> </ul> |
| Apply         | Click <b>Apply</b> to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the <b>Save</b> link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.                                                                                                                                                                                                                                                                                                      |
| Cancel        | Click this to reset the values in this screen to their last-saved values.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |

## 27.17 Technical Reference

This section provides technical background information on the topics discussed in this chapter.



## 27.17.1 DHCP Snooping Overview

Use DHCP snooping to filter unauthorized DHCP packets on the network and to build the binding table dynamically. This can prevent clients from getting IP addresses from unauthorized DHCP servers.

### 27.17.1.1 Trusted vs. Untrusted Ports

Every port is either a trusted port or an untrusted port for DHCP snooping. This setting is independent of the trusted/untrusted setting for ARP inspection. You can also specify the maximum number for DHCP packets that each port (trusted or untrusted) can receive each second.

Trusted ports are connected to DHCP servers or other switches. The Switch discards DHCP packets from trusted ports only if the rate at which DHCP packets arrive is too high. The Switch learns dynamic bindings from trusted ports.

Note: The Switch will drop all DHCP requests if you enable DHCP snooping and there are no trusted ports.

Untrusted ports are connected to subscribers. The Switch discards DHCP packets from untrusted ports in the following situations:

- The packet is a DHCP server packet (for example, OFFER, ACK, or NACK).
- The source MAC address and source IP address in the packet do not match any of the current bindings.
- The packet is a RELEASE or DECLINE packet, and the source MAC address and source port do not match any of the current bindings.
- The rate at which DHCP packets arrive is too high.

### 27.17.1.2 DHCP Snooping Database

The Switch stores the binding table in volatile memory. If the Switch restarts, it loads static bindings from permanent memory but loses the dynamic bindings, in which case the devices in the network have to send DHCP requests again. As a result, it is recommended you configure the DHCP snooping database.

The DHCP snooping database maintains the dynamic bindings for DHCP snooping and ARP inspection in a file on an external TFTP server. If you set up the DHCP snooping database, the Switch can reload the dynamic bindings from the DHCP snooping database after the Switch restarts.

You can configure the name and location of the file on the external TFTP server. The file has the following format:

**Figure 194** DHCP Snooping Database File Format

```
<initial-checksum>
TYPE DHCP-SNOOPING
VERSION 1
BEGIN
<binding-1> <checksum-1>
<binding-2> <checksum-1-2>
...
...
<binding-n> <checksum-1-2-...-n>
END
```

The <initial-checksum> helps distinguish between the bindings in the latest update and the bindings from previous updates. Each binding consists of 72 bytes, a space, and another checksum that is used to validate the binding when it is read. If the calculated checksum is not equal to the checksum in the file, that binding and all others after it are ignored.

### 27.17.1.3 DHCP Relay Option 82 Information

The Switch can add information to DHCP requests that it does not discard. This provides the DHCP server more information about the source of the requests. The Switch can add the following information:

- Slot ID (1 byte), port ID (1 byte), and source VLAN ID (2 bytes)
- System name (up to 32 bytes)

This information is stored in an Agent Information field in the option 82 field of the DHCP headers of client DHCP request frames. See [Chapter 47 on page 389](#) for more information about DHCP relay option 82.

When the DHCP server responds, the Switch removes the information in the Agent Information field before forwarding the response to the original source.

You can configure this setting for each source VLAN. This setting is independent of the DHCP relay settings ([Chapter 47 on page 389](#)).

### 27.17.1.4 Configuring DHCP Snooping

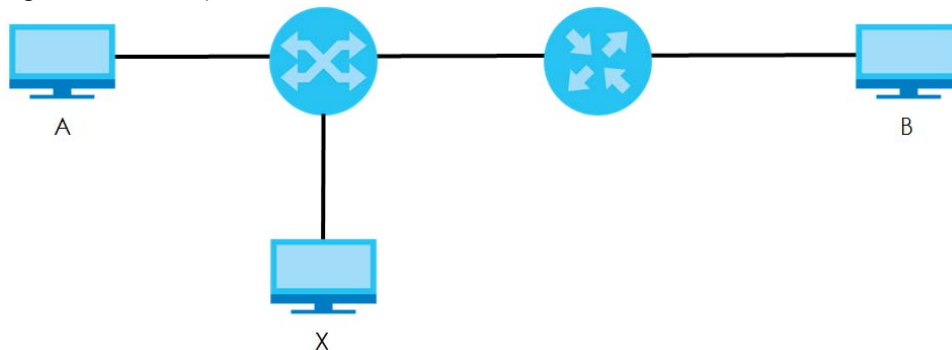
Follow these steps to configure DHCP snooping on the Switch.

- 1 Enable DHCP snooping on the Switch.
- 2 Enable DHCP snooping on each VLAN, and configure DHCP relay option 82.
- 3 Configure trusted and untrusted ports, and specify the maximum number of DHCP packets that each port can receive per second.
- 4 Configure static bindings.

## 27.17.2 ARP Inspection Overview

Use ARP inspection to filter unauthorized ARP packets on the network. This can prevent many kinds of man-in-the-middle attacks, such as the one in the following example.

**Figure 195** Example: Man-in-the-middle Attack



In this example, computer **B** tries to establish a connection with computer **A**. Computer **X** is in the same broadcast domain as computer **A** and intercepts the ARP request for computer **A**. Then, computer **X** does the following things:

- It pretends to be computer **A** and responds to computer **B**.
- It pretends to be computer **B** and sends a message to computer **A**.

As a result, all the communication between computer **A** and computer **B** passes through computer **X**. Computer **X** can read and alter the information passed between them.

### 27.17.2.1 ARP Inspection and MAC Address Filters

When the Switch identifies an unauthorized ARP packet, it automatically creates a MAC address filter to block traffic from the source MAC address and source VLAN ID of the unauthorized ARP packet. You can configure how long the MAC address filter remains in the Switch.

These MAC address filters are different than regular MAC address filters ([Chapter 12 on page 137](#)).

- They are stored only in volatile memory.
- They do not use the same space in memory that regular MAC address filters use.
- They appear only in the **ARP Inspection** screens and commands, not in the **MAC Address Filter** screens and commands.

### 27.17.2.2 Trusted vs. Untrusted Ports

Every port is either a trusted port or an untrusted port for ARP inspection. This setting is independent of the trusted/untrusted setting for DHCP snooping. You can also specify the maximum rate at which the Switch receives ARP packets on untrusted ports.

The Switch does not discard ARP packets on trusted ports for any reason.

The Switch discards ARP packets on untrusted ports in the following situations:

- The sender's information in the ARP packet does not match any of the current bindings.
- The rate at which ARP packets arrive is too high.

### 27.17.2.3 Syslog

The Switch can send syslog messages to the specified syslog server ([Chapter 55 on page 464](#)) when it forwards or discards ARP packets. The Switch can consolidate log messages and send log messages in batches to make this mechanism more efficient.

### 27.17.2.4 Configuring ARP Inspection

Follow these steps to configure ARP inspection on the Switch.

- 1 Configure DHCP snooping. See [Section 27.17.1.4 on page 286](#).

Note: It is recommended you enable DHCP snooping at least one day before you enable ARP inspection so that the Switch has enough time to build the binding table.

- 2 Enable ARP inspection on each VLAN.

- 3** Configure trusted and untrusted ports, and specify the maximum number of ARP packets that each port can receive per second.

# CHAPTER 28

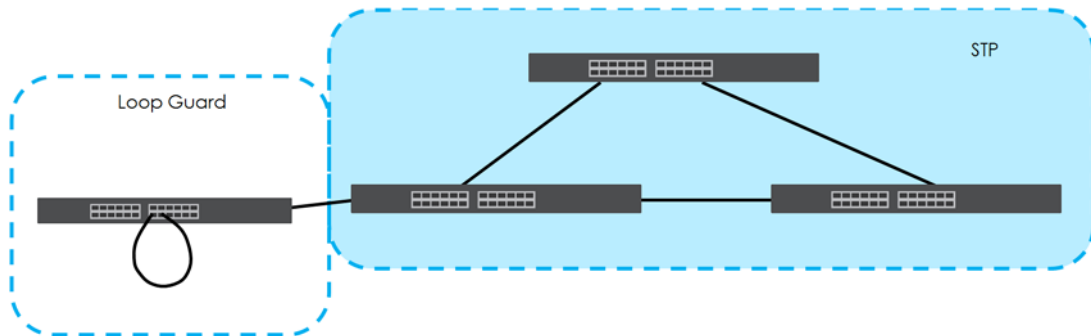
## Loop Guard

This chapter shows you how to configure the Switch to guard against loops on the edge of your network.

### 28.1 Loop Guard Overview

Loop guard allows you to configure the Switch to shut down a port if it detects that packets sent out on that port loop back to the Switch. While you can use Spanning Tree Protocol (STP) to prevent loops in the core of your network, STP cannot prevent loops that occur on the edge of your network.

**Figure 196** Loop Guard vs STP

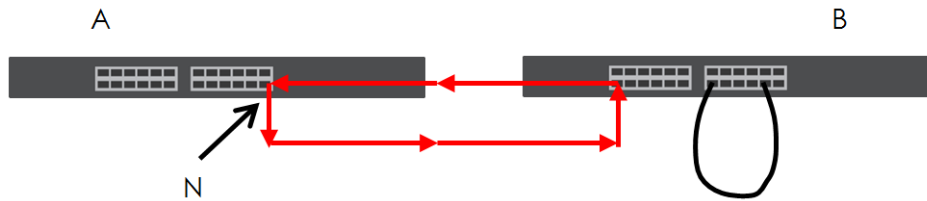


Loop guard is designed to handle loop problems on the edge of your network. This can occur when a port is connected to a Switch that is in a loop state. Loop state occurs as a result of human error. It happens when two ports on a switch are connected with the same cable. When a switch in loop state sends out broadcast messages the messages loop back to the switch and are re-broadcast again and again causing a broadcast storm.

If a switch (not in loop state) connects to a switch in loop state, then it will be affected by the switch in loop state in the following way:

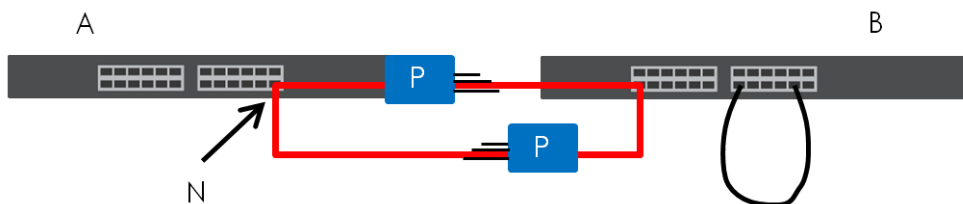
- It will receive broadcast messages sent out from the switch in loop state.
- It will receive its own broadcast messages that it sends out as they loop back. It will then re-broadcast those messages again.

The following figure shows port **N** on switch **A** connected to switch **B**. Switch **B** is in loop state. When broadcast or multicast packets leave port **N** and reach switch **B**, they are sent back to port **N** on **A** as they are rebroadcast from **B**.

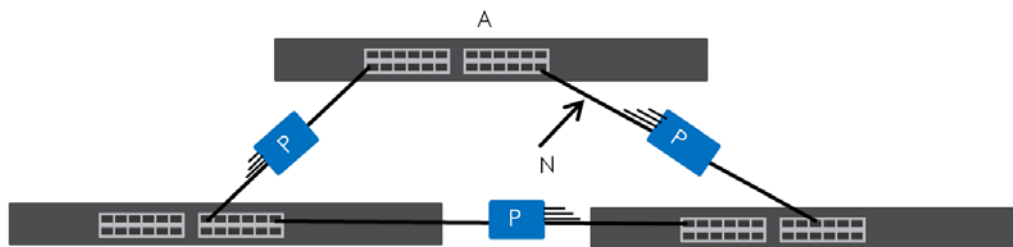
**Figure 197** Switch in Loop State

The loop guard feature checks to see if a loop guard enabled port is connected to a switch in loop state. This is accomplished by periodically sending a probe packet and seeing if the packet returns on the same port. If this is the case, the Switch will shut down the port connected to the switch in loop state.

The following figure shows a loop guard enabled port **N** on switch **A** sending a probe packet **P** to switch **B**. Since switch **B** is in loop state, the probe packet **P** returns to port **N** on **A**. The Switch then shuts down port **N** to ensure that the rest of the network is not affected by the switch in loop state.

**Figure 198** Loop Guard - Probe Packet

The Switch also shuts down port **N** if the probe packet returns to switch **A** on any other port. In other words loop guard also protects against standard network loops. The following figure illustrates three switches forming a loop. A sample path of the loop guard probe packet is also shown. In this example, the probe packet is sent from port **N** and returns on another port. As long as loop guard is enabled on port **N**. The Switch will shut down port **N** if it detects that the probe packet has returned to the Switch.

**Figure 199** Loop Guard - Network Loop

Note: After resolving the loop problem on your network you can re-activate the disabled port via the web configurator (see [Section 8.5 on page 90](#)) or via commands (see the Ethernet Switch CLI Reference Guide).

## 28.2 Loop Guard Setup

Click **Advanced Application** > **Loop Guard** in the navigation panel to display the screen as shown.

Note: The loop guard feature can not be enabled on the ports that have Spanning Tree Protocol (RSTP, MRSTP or MSTP) enabled.

**Figure 200** Advanced Application > Loop Guard

| Port | Active                   |
|------|--------------------------|
| *    | <input type="checkbox"/> |
| 1    | <input type="checkbox"/> |
| 2    | <input type="checkbox"/> |
| 3    | <input type="checkbox"/> |
| 4    | <input type="checkbox"/> |
| 5    | <input type="checkbox"/> |
| 6    | <input type="checkbox"/> |
| 7    | <input type="checkbox"/> |
| 8    | <input type="checkbox"/> |
| 9    | <input type="checkbox"/> |
| 10   | <input type="checkbox"/> |
| 11   | <input type="checkbox"/> |
| 12   | <input type="checkbox"/> |
| 13   | <input type="checkbox"/> |

Apply Cancel

The following table describes the labels in this screen.

**Table 137** Advanced Application > Loop Guard

| LABEL  | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                               |
|--------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Active | Select this option to enable loop guard on the Switch.<br><br>The Switch generates syslog, internal log messages as well as SNMP traps when it shuts down a port via the loop guard feature.                                                                                                                                                                              |
| Port   | This field displays the port number.                                                                                                                                                                                                                                                                                                                                      |
| *      | Use this row to make the setting the same for all ports. Use this row first and then make adjustments on a port-by-port basis.<br><br>Note: Changes in this row are copied to all the ports as soon as you make them.                                                                                                                                                     |
| Active | Select this check box to enable the loop guard feature on this port. The Switch sends broadcast and multicast probe packets from this port to check if the switch the port is connected to is in loop state. If the switch this port is connected to is in loop state the Switch will shut down this port.<br><br>Clear this check box to disable the loop guard feature. |
| Apply  | Click <b>Apply</b> to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the <b>Save</b> link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.                                                                                        |
| Cancel | Click <b>Cancel</b> to begin configuring this screen afresh.                                                                                                                                                                                                                                                                                                              |

# CHAPTER 29

## VLAN Mapping

This chapter shows you how to configure VLAN mapping on the Switch.

### 29.1 VLAN Mapping Overview

With VLAN mapping enabled, the Switch can map the VLAN ID and priority level of packets received from a private network to those used in the service provider's network.

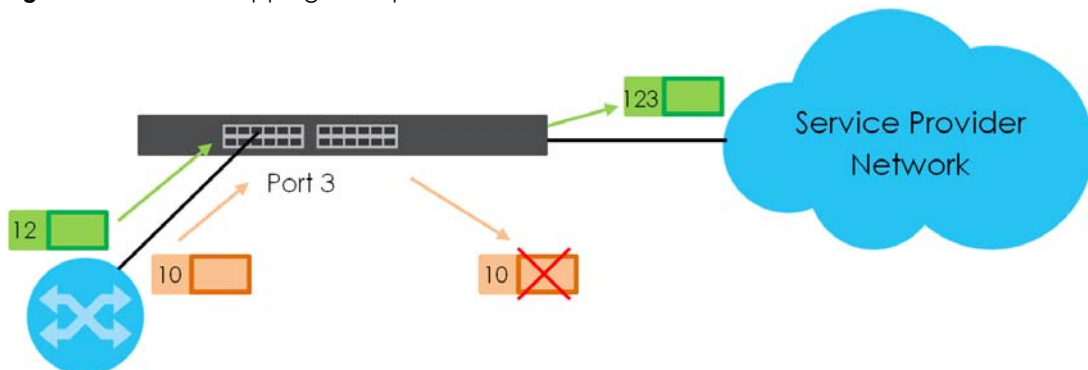
The Switch checks incoming traffic from the switch ports (non-management ports) against the VLAN mapping table first, the MAC learning table and then the VLAN table before forwarding them through the Gigabit uplink port. When VLAN mapping is enabled, the Switch discards the tagged packets that do not match an entry in the VLAN mapping table. If the incoming packets are untagged, the Switch adds a PVID based on the VLAN setting.

Note: You can not enable VLAN mapping and VLAN stacking at the same time.

#### 29.1.1 VLAN Mapping Example

In the following example figure, packets that carry VLAN ID 12 and are received on port 3 match a pre-configured VLAN mapping rule. The Switch translates the VLAN ID from 12 into 123 before forwarding the packets. Any packets carrying a VLAN tag other than 12 (such as 10) and received on port 3 will be dropped.

**Figure 201** VLAN mapping example





## 29.2 Enabling VLAN Mapping

Click **Advanced Application** and then **VLAN Mapping** in the navigation panel to display the screen as shown.

**Figure 202** VLAN Mapping

| Port | Active                   |
|------|--------------------------|
| *    | <input type="checkbox"/> |
| 1    | <input type="checkbox"/> |
| 2    | <input type="checkbox"/> |
| 3    | <input type="checkbox"/> |
| 4    | <input type="checkbox"/> |
| 5    | <input type="checkbox"/> |
| 6    | <input type="checkbox"/> |
| 7    | <input type="checkbox"/> |
| 8    | <input type="checkbox"/> |
| 9    | <input type="checkbox"/> |
| 10   | <input type="checkbox"/> |
| 11   | <input type="checkbox"/> |
| 12   | <input type="checkbox"/> |
| 13   | <input type="checkbox"/> |

Apply Cancel

The following table describes the labels in this screen.

Table 138 VLAN Mapping

| LABEL  | DESCRIPTION                                                                                                                                                                                                                                                                        |
|--------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Active | Select this option to enable VLAN mapping on the Switch.                                                                                                                                                                                                                           |
| Port   | This field displays the port number.                                                                                                                                                                                                                                               |
| *      | Use this row to make the setting the same for all ports. Use this row first and then make adjustments on a port-by-port basis.<br><br>Changes in this row are copied to all the ports as soon as you make them.                                                                    |
| Active | Select this check box to enable the VLAN mapping feature on this port. Clear this check box to disable the VLAN mapping feature.                                                                                                                                                   |
| Apply  | Click <b>Apply</b> to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the <b>Save</b> link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click <b>Cancel</b> to begin configuring this screen afresh.                                                                                                                                                                                                                       |

## 29.3 Configuring VLAN Mapping

Click the **VLAN Mapping Configure** link in the **VLAN Mapping** screen to display the screen as shown. Use this screen to enable and edit the VLAN mapping rule(s).

**Figure 203** VLAN Mapping Configuration

The following table describes the labels in this screen.

Table 139 VLAN Mapping Configuration

| LABEL          | DESCRIPTION                                                                                                                                                                                                                                                                                                                              |
|----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Active         | Check this box to activate this rule.                                                                                                                                                                                                                                                                                                    |
| Name           | Enter a descriptive name (up to 32 printable ASCII characters) for identification purposes.                                                                                                                                                                                                                                              |
| Port           | Type a port to be included in this rule.                                                                                                                                                                                                                                                                                                 |
| VID            | Enter a VLAN ID from 1 to 4094. This is the VLAN tag carried in the packets and will be translated into the VID you specified in the <b>Translated VID</b> field.                                                                                                                                                                        |
| Translated VID | Enter a VLAN ID (from 1 to 4094) into which the customer VID carried in the packets will be translated.                                                                                                                                                                                                                                  |
| Priority       | Select a priority level (from 0 to 7). This is the priority level that replaces the customer priority level in the tagged packets or adds to the untagged packets.                                                                                                                                                                       |
| Add            | Click this to create a new entry or to update an existing one.<br><br>This saves your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the <b>Save</b> link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel         | Click <b>Cancel</b> to reset the fields to your previous configuration.                                                                                                                                                                                                                                                                  |
| Index          | This is the number of the VLAN mapping entry in the table. Click on an index number to change the settings.                                                                                                                                                                                                                              |
| Active         | This shows whether this entry is activated or not.                                                                                                                                                                                                                                                                                       |
| Name           | This is the descriptive name for this rule.                                                                                                                                                                                                                                                                                              |
| Port           | This is the port number to which this rule is applied. I                                                                                                                                                                                                                                                                                 |
| VID            | This is the customer VLAN ID in the incoming packets.                                                                                                                                                                                                                                                                                    |
| Translated VID | This is the VLAN ID that replaces the customer VLAN ID in the tagged packets.                                                                                                                                                                                                                                                            |
| Priority       | This is the priority level that replaces the customer priority level in the tagged packets.                                                                                                                                                                                                                                              |
|                | Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries.                                                                                                                                                                                                  |

Table 139 VLAN Mapping Configuration (continued)

| LABEL  | DESCRIPTION                                                                                                    |
|--------|----------------------------------------------------------------------------------------------------------------|
| Delete | Check the rule(s) that you want to remove in the <b>Delete</b> column and then click the <b>Delete</b> button. |
| Cancel | Click <b>Cancel</b> to clear the <b>Delete</b> check boxes.                                                    |

# CHAPTER 30

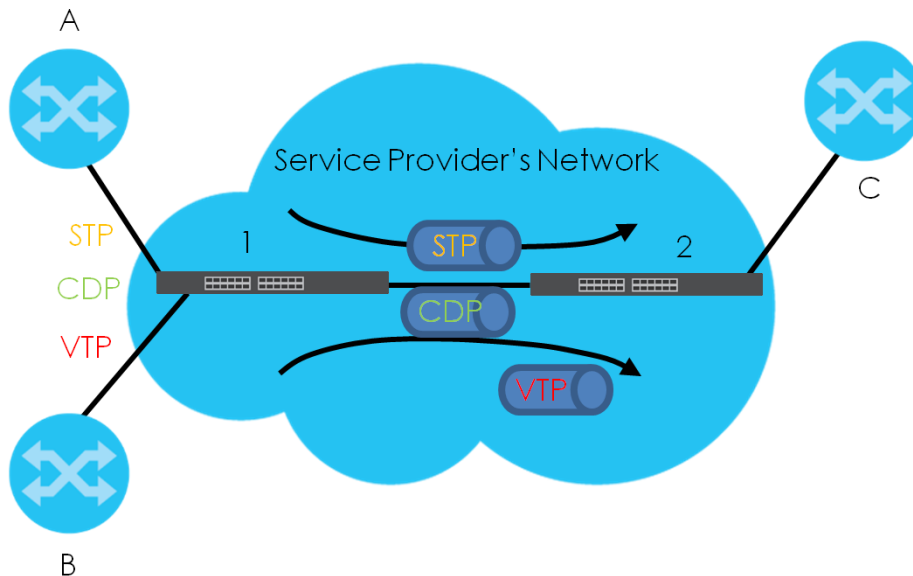
## Layer 2 Protocol Tunneling

This chapter shows you how to configure layer-2 protocol tunneling on the Switch.

### 30.1 Layer 2 Protocol Tunneling Overview

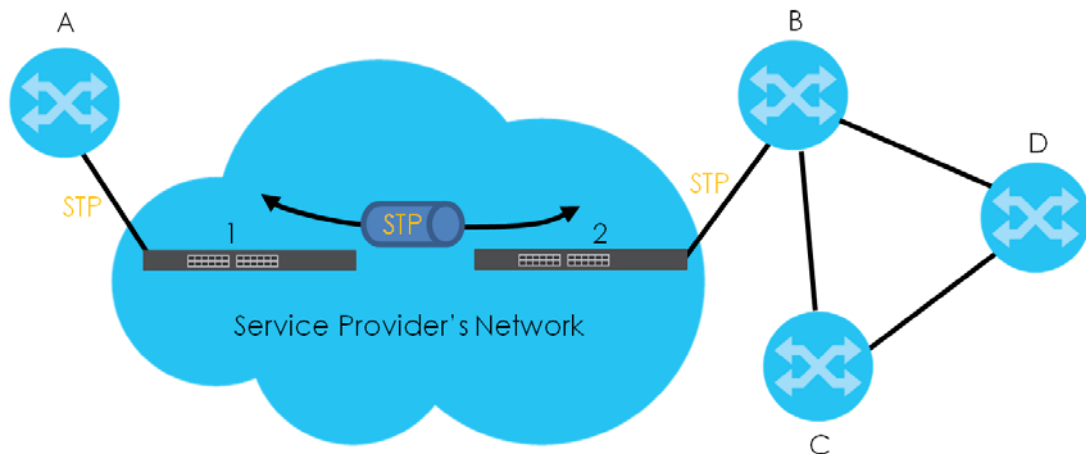
Layer-2 protocol tunneling (L2PT) is used on the service provider's edge devices. L2PT allows edge switches (**1** and **2** in the following figure) to tunnel layer-2 STP (Spanning Tree Protocol), CDP (Cisco Discovery Protocol) and VTP (VLAN Trunking Protocol) packets between customer switches (**A**, **B** and **C** in the following figure) connected through the service provider's network. The edge switch encapsulates layer-2 protocol packets with a specific MAC address before sending them across the service provider's network to other edge switches.

**Figure 204** Layer-2 Protocol Tunneling Network Scenario



In the following example, if you enable L2PT for STP, you can have switches **A**, **B**, **C** and **D** in the same spanning tree, even though switch **A** is not directly connected to switches **B**, **C** and **D**. Topology change information can be propagated throughout the service provider's network.

To emulate a point-to-point topology between two customer switches at different sites, such as **A** and **B**, you can enable protocol tunneling on edge switches **1** and **2** for PAgP (Port Aggregation Protocol), LACP or UDLD (UniDirectional Link Detection).

**Figure 205** L2PT Network Example

### 30.1.1 Layer-2 Protocol Tunneling Mode

Each port can have two layer-2 protocol tunneling modes, **Access** and **Tunnel**.

- The **Access** port is an ingress port on the service provider's edge device (**1** or **2** in [Figure 205 on page 297](#)) and connected to a customer switch (**A** or **B**). Incoming layer-2 protocol packets received on an access port are encapsulated and forwarded to the tunnel ports.
- The **Tunnel** port is an egress port at the edge of the service provider's network and connected to another service provider's switch. Incoming encapsulated layer-2 protocol packets received on a tunnel port are decapsulated and sent to an access port.

## 30.2 Configuring Layer 2 Protocol Tunneling

Click **Advanced Application** > **Layer 2 Protocol Tunneling** in the navigation panel to display the screen as shown.

**Figure 206** Advanced Application > Layer 2 Protocol Tunneling

| Port | CDP                      | STP                      | VTP                      | Point to Point           |                          |                          | Mode     |
|------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|----------|
|      |                          |                          |                          | PAGP                     | LACP                     | UDLD                     |          |
| *    | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Access ▼ |
| 1    | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Access ▼ |
| 2    | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Access ▼ |
| 3    | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Access ▼ |
| 4    | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Access ▼ |
| 5    | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Access ▼ |
| 6    | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Access ▼ |
| 7    | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Access ▼ |
| 8    | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Access ▼ |
| 9    | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Access ▼ |
| 10   | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Access ▼ |
| 11   | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Access ▼ |

The following table describes the labels in this screen.

Table 140 Advanced Application &gt; Layer 2 Protocol Tunneling

| LABEL                   | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|-------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Active                  | Select this to enable layer-2 protocol tunneling on the Switch.                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Destination MAC Address | Specify an MAC address with which the Switch uses to encapsulate the layer-2 protocol packets by replacing the destination MAC address in the packets.<br><br>Note: The MAC address can be either a unicast MAC address or multicast MAC address. If you use a unicast MAC address, make sure the MAC address does not exist in the address table of a switch on the service provider's network.<br><br>Note: All the edge switches in the service provider's network should be set to use the same MAC address for encapsulation. |
| Port                    | This field displays the port number.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| *                       | Use this row to make the setting the same for all ports. Use this row first and then make adjustments on a port-by-port basis.<br><br>Note: Changes in this row are copied to all the ports as soon as you make them.                                                                                                                                                                                                                                                                                                              |
| CDP                     | Select this option to have the Switch tunnel CDP (Cisco Discovery Protocol) packets so that other Cisco devices can be discovered through the service provider's network.                                                                                                                                                                                                                                                                                                                                                          |
| STP                     | Select this option to have the Switch tunnel STP (Spanning Tree Protocol) packets so that STP can run properly across the service provider's network and spanning trees can be set up based on bridge information from all (local and remote) networks.                                                                                                                                                                                                                                                                            |
| VTP                     | Select this option to have the Switch tunnel VTP (VLAN Trunking Protocol) packets so that all customer switches can use consistent VLAN configuration through the service provider's network.                                                                                                                                                                                                                                                                                                                                      |

Table 140 Advanced Application &gt; Layer 2 Protocol Tunneling (continued)

| LABEL          | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Point to Point | <p>The Switch supports PAGP (Port Aggregation Protocol), LACP (Link Aggregation Control Protocol) and UDLD (UniDirectional Link Detection) tunneling for a point-to-point topology.</p> <p>Both PAGP and UDLD are Cisco's proprietary data link layer protocols. PAGP is similar to LACP and used to set up a logical aggregation of Ethernet ports automatically. UDLD is to determine the link's physical status and detect a unidirectional link.</p>                                                                                                                                                                                                                                                                         |
| PAGP           | Select this option to have the Switch send PAGP packets to a peer to automatically negotiate and build a logical port aggregation.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| LACP           | Select this option to have the Switch send LACP packets to a peer to dynamically creates and manages trunk groups.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| UDLD           | Select this option to have the Switch send UDLD packets to a peer's port it connected to monitor the physical status of a link.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Mode           | <p>Select <b>Access</b> to have the Switch encapsulate the incoming layer-2 protocol packets and forward them to the tunnel port(s). Select <b>Access</b> for ingress ports at the edge of the service provider's network.</p> <p>Note: You can enable L2PT services for STP, LACP, VTP, CDP, UDLD, and PAGP on the access port(s) only.</p> <p>Select <b>Tunnel</b> for egress ports at the edge of the service provider's network. The Switch decapsulates the encapsulated layer-2 protocol packets received on a tunnel port by changing the destination MAC address to the original one, and then forward them to an access port. If the service(s) is not enabled on an access port, the protocol packets are dropped.</p> |
| Apply          | Click <b>Apply</b> to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the <b>Save</b> link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Cancel         | Click <b>Cancel</b> to begin configuring this screen afresh.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |

# CHAPTER 31

## sFlow

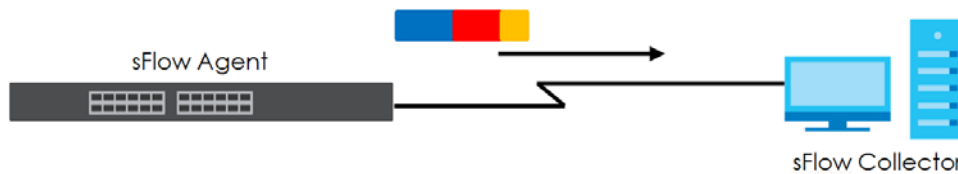
This chapter shows you how to configure sFlow to have the Switch monitor traffic in a network and send information to an sFlow collector for analysis.

### 31.1 sFlow Overview

sFlow (RFC 3176) is a standard technology for monitoring switched networks. An sFlow agent embedded on a switch or router gets sample data and packet statistics from traffic forwarded through its ports. The sFlow agent then creates sFlow data and sends it to an sFlow collector. The sFlow collector is a server that collects and analyzes sFlow datagram. An sFlow datagram includes packet header, input and output interface, sampling process parameters and forwarding information.

sFlow minimizes impact on CPU load of the Switch as it analyzes sample data only. sFlow can continuously monitor network traffic and create reports for network performance analysis and troubleshooting. For example, you can use it to know which IP address or which type of traffic caused network congestion.

**Figure 207** sFlow Application



### 31.2 sFlow Port Configuration

Click **Advanced Application** > **sFlow** in the navigation panel to display the screen as shown.



**Figure 208** Advanced Application > sFlow

| Port | Active                   | Sample-rate | poll-interval | Collector Address |
|------|--------------------------|-------------|---------------|-------------------|
| *    | <input type="checkbox"/> |             |               |                   |
| 1    | <input type="checkbox"/> | 32768       | 120           |                   |
| 2    | <input type="checkbox"/> | 32768       | 120           |                   |
| 3    | <input type="checkbox"/> | 32768       | 120           |                   |
| 4    | <input type="checkbox"/> | 32768       | 120           |                   |
| 5    | <input type="checkbox"/> | 32768       | 120           |                   |
| 6    | <input type="checkbox"/> | 32768       | 120           |                   |
| 7    | <input type="checkbox"/> | 32768       | 120           |                   |
| 8    | <input type="checkbox"/> | 32768       | 120           |                   |
| 9    | <input type="checkbox"/> | 32768       | 120           |                   |
| 10   | <input type="checkbox"/> | 32768       | 120           |                   |
| 11   | <input type="checkbox"/> | 32768       | 120           |                   |
| 12   | <input type="checkbox"/> | 32768       | 120           |                   |

The following table describes the labels in this screen.

Table 141 Advanced Application &gt; sFlow

| LABEL         | DESCRIPTION                                                                                                                                                                                                                                                                        |
|---------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Active        | Select this to enable the sFlow agent on the Switch.                                                                                                                                                                                                                               |
| Apply         | Click <b>Apply</b> to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the <b>Save</b> link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel        | Click <b>Cancel</b> to begin configuring this screen afresh.                                                                                                                                                                                                                       |
| Port          | This field displays the port number.                                                                                                                                                                                                                                               |
| *             | Use this row to make the setting the same for all ports. Use this row first and then make adjustments on a port-by-port basis.<br><br>Note: Changes in this row are copied to all the ports as soon as you make them.                                                              |
| Active        | Select this to allow the Switch to monitor traffic on this port and generate and send sFlow datagram to the specified collector.                                                                                                                                                   |
| Sample-rate   | Enter a number (N) from 256 to 65535. The Switch captures every one out of N packets for this port and creates sFlow datagram.                                                                                                                                                     |
| poll-interval | Specify a time interval (from 20 to 120 in seconds) the Switch waits before sending the sFlow datagram and packet counters for this port to the collector.                                                                                                                         |

Table 141 Advanced Application &gt; sFlow (continued)

| LABEL             | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|-------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Collector Address | Enter the IP address of the sFlow collector.<br><br>Note: You must have the sFlow collector already configured in the <b>sFlow &gt; Collector</b> screen. The sFlow collector does not need to be in the same subnet as the Switch, but it must be accessible from the Switch.<br><br>Note: Configure UDP port 6343 (the default) on a NAT router to allow port forwarding if the collector is behind a NAT router. Configure a firewall rule for UDP port 6343 (the default) to allow incoming traffic if the collector is behind a firewall. |
| Apply             | Click <b>Apply</b> to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the <b>Save</b> link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.                                                                                                                                                                                                                                                             |
| Cancel            | Click <b>Cancel</b> to begin configuring this screen afresh.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |

### 31.2.1 sFlow Collector Configuration

Click the **Collector** link in the **sFlow** screen to display the screen as shown. You can configure up to four sFlow collectors in this screen. You may want to configure more than one collector if the traffic load to be monitored is more than one collector can manage.

Figure 209 Advanced Application &gt; sFlow &gt; Collector

The screenshot shows the 'sFlow Collector' configuration interface. At the top, there's a 'sFlow' header with a 'Port' link. Below it, the 'Collector' section contains two input fields: 'Collector Address' with the value '0.0.0.0' and 'UDP Port' with the value '6343'. Under these fields are three buttons: 'Add', 'Cancel', and 'Clear'. Below the buttons is a table with three columns: 'Index', 'Collector Address', and 'UDP Port'. At the bottom of the table are 'Delete' and 'Cancel' buttons.

The following table describes the labels in this screen.

Table 142 Advanced Application &gt; sFlow &gt; Collector

| LABEL             | DESCRIPTION                                                                                                                                                                                                                                                                                                                              |
|-------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Collector Address | Enter the IP address of the sFlow collector.                                                                                                                                                                                                                                                                                             |
| UDP Port          | Enter a UDP port number the Switch uses to send sFlow datagram to the collector. If you change the port here, make sure you change it on the collector, too. The default port is 6343.                                                                                                                                                   |
| Add               | Click this to create a new entry or to update an existing one.<br><br>This saves your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the <b>Save</b> link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel            | Click <b>Cancel</b> to reset the fields to your previous configuration.                                                                                                                                                                                                                                                                  |
| Clear             | Click <b>Clear</b> to reset the fields to the factory defaults.                                                                                                                                                                                                                                                                          |

Table 142 Advanced Application &gt; sFlow &gt; Collector (continued)

| LABEL             | DESCRIPTION                                                                                                    |
|-------------------|----------------------------------------------------------------------------------------------------------------|
| Index             | This field displays the index number of this entry. Click on an index number to change the settings.           |
| Collector Address | This field displays IP address of the sFlow collector.                                                         |
| UDP Port          | This field displays port number the Switch uses to send sFlow datagram to the collector.                       |
| Delete            | Check the rule(s) that you want to remove in the <b>Delete</b> column and then click the <b>Delete</b> button. |
| Cancel            | Click <b>Cancel</b> to begin configuring this screen afresh.                                                   |

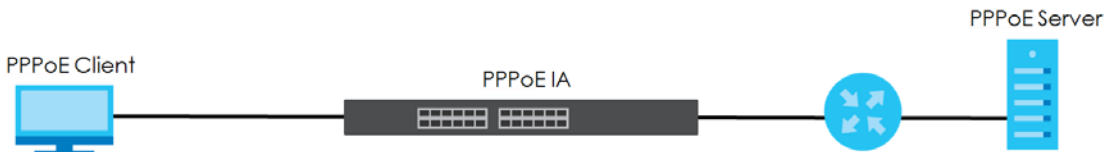
# CHAPTER 32

## PPPoE

This chapter describes how the Switch gives a PPPoE termination server additional information that the server can use to identify and authenticate a PPPoE client.

### 32.1 PPPoE Intermediate Agent Overview

A PPPoE Intermediate Agent (PPPoE IA) is deployed between a PPPoE server and PPPoE clients. It helps the PPPoE server identify and authenticate clients by adding subscriber line specific information to PPPoE discovery packets from clients on a per-port or per-port-per-VLAN basis before forwarding them to the PPPoE server.



#### 32.1.1 PPPoE Intermediate Agent Tag Format

If the PPPoE Intermediate Agent is enabled, the Switch adds a vendor-specific tag to PADI (PPPoE Active Discovery Initialization) and PADR (PPPoE Active Discovery Request) packets from PPPoE clients. This tag is defined in RFC 2516 and has the following format for this feature.

Table 143 PPPoE Intermediate Agent Vendor-specific Tag Format

| Tag_Type | Tag_Len | Value | i1 | i2 |
|----------|---------|-------|----|----|
| (0x0105) |         |       |    |    |

The Tag\_Type is 0x0105 for vendor-specific tags, as defined in RFC 2516. The Tag\_Len indicates the length of Value, i1 and i2. The Value is the 32-bit number 0x00000DE9, which stands for the "ADSL Forum" IANA entry. i1 and i2 are PPPoE intermediate agent sub-options, which contain additional information about the PPPoE client.

### 32.1.2 Sub-Option Format

There are two types of sub-option: "Agent Circuit ID Sub-option" and "Agent Remote ID Sub-option". They have the following formats.

Table 144 PPPoE IA Circuit ID Sub-option Format: User-defined String

| SubOpt           | Length        | Value                |
|------------------|---------------|----------------------|
| 0x01<br>(1 byte) | N<br>(1 byte) | String<br>(63 bytes) |

Table 145 PPPoE IA Remote ID Sub-option Format

| SubOpt           | Length        | Value                               |
|------------------|---------------|-------------------------------------|
| 0x02<br>(1 byte) | N<br>(1 byte) | MAC Address or String<br>(63 bytes) |

The 1 in the first field identifies this as an Agent Circuit ID sub-option and 2 identifies this as an Agent Remote ID sub-option. The next field specifies the length of the field. The Switch takes the Circuit ID string you manually configure for a VLAN on a port as the highest priority and the Circuit ID string for a port as the second priority. In addition, the Switch puts the PPPoE client's MAC address into the Agent Remote ID Sub-option if you do not specify any user-defined string.

#### 32.1.2.1 Flexible Circuit ID Syntax with Identifier String and Variables

If you do not configure a Circuit ID string for a VLAN on a specific port or for a specific port, the Switch adds the user-defined identifier string and variables into the Agent Circuit ID Sub-option. The variables can be the slot ID of the PPPoE client, the port number of the PPPoE client and/or the VLAN ID on the PPPoE packet.

The identifier-string, slot ID, port number and VLAN ID are separated from each other by a pound key (#), semi-colon (;), period (.), comma (,), forward slash (/) or space. An Agent Circuit ID Sub-option example is "Switch/07/0123" and indicates the PPPoE packets come from a PPPoE client which is connected to the Switch's port 7 and belong to VLAN 123.

Table 146 PPPoE IA Circuit ID Sub-option Format: Using Identifier String and Variables

| SubOpt           | Length        | Value                          |                       |                     |                       |                     |                       |                      |
|------------------|---------------|--------------------------------|-----------------------|---------------------|-----------------------|---------------------|-----------------------|----------------------|
| 0x01<br>(1 byte) | N<br>(1 byte) | Identifier String<br>(53 byte) | delimiter<br>(1 byte) | Slot ID<br>(1 byte) | delimiter<br>(1 byte) | Port No<br>(2 byte) | delimiter<br>(1 byte) | VLAN ID<br>(4 bytes) |

#### 32.1.2.2 WT-101 Default Circuit ID Syntax

If you do not configure a Circuit ID string for a specific VLAN on a port or for a specific port, and disable the flexible Circuit ID syntax in the **PPPoE > Intermediate Agent** screen, the Switch automatically generates a Circuit ID string according to the default Circuit ID syntax which is defined in the DSL Forum

Working Text (WT)-101. The default access node identifier is the host name of the PPPoE intermediate agent and the eth indicates "Ethernet".

Table 147 PPPoE IA Circuit ID Sub-option Format: Defined in WT-101

| SubOpt           | Length        | Value                                     |                      |                    |                      |                        |                  |                     |                  |                      |
|------------------|---------------|-------------------------------------------|----------------------|--------------------|----------------------|------------------------|------------------|---------------------|------------------|----------------------|
| 0x01<br>(1 byte) | N<br>(1 byte) | Access<br>Node<br>Identifier<br>(20 byte) | Space<br>(1<br>byte) | eth<br>(3<br>byte) | Space<br>(1<br>byte) | Slot ID<br>(1<br>byte) | /<br>(1<br>byte) | Port No<br>(2 byte) | :<br>(1<br>byte) | VLAN ID<br>(4 bytes) |

### 32.1.3 Port State

Every port is either a trusted port or an untrusted port for the PPPoE intermediate agent. This setting is independent of the trusted/untrusted setting for DHCP snooping or ARP inspection. You can also specify the agent sub-options (circuit ID and remote ID) that the Switch adds to PADI and PADR packets from PPPoE clients.

Trusted ports are connected to PPPoE servers.

- If a PADO (PPPoE Active Discovery Offer), PADS (PPPoE Active Discovery Session-confirmation), or PADT (PPPoE Active Discovery Terminate) packet is sent from a PPPoE server and received on a trusted port, the Switch forwards it to all other ports.
- If a PADI or PADR packet is sent from a PPPoE client but received on a trusted port, the Switch forwards it to other trusted port(s).

Note: The Switch will drop all PPPoE discovery packets if you enable the PPPoE intermediate agent and there are no trusted ports.

Untrusted ports are connected to subscribers.

- If a PADI, PADR, or PADT packet is sent from a PPPoE client and received on an untrusted port, the Switch adds a vendor-specific tag to the packet and then forwards it to the trusted port(s).
- The Switch discards PADO and PADS packets which are sent from a PPPoE server but received on an untrusted port.

## 32.2 The PPPoE Screen

Use this screen to configure the PPPoE Intermediate Agent on the Switch.

Click **Advanced Application > PPPoE** in the navigation panel to display the screen as shown. Click **Click Here** to go to the **Intermediate Agent** screen.

**Figure 210** Advanced Application > PPPoE Intermediate Agent



## 32.3 PPPoE Intermediate Agent

Use this screen to configure the Switch to give a PPPoE termination server additional subscriber information that the server can use to identify and authenticate a PPPoE client.

Click **Advanced Application > PPPoE > Intermediate Agent** in the navigation panel to display the screen as shown.

**Figure 211** Advanced Application > PPPoE > Intermediate Agent

The screenshot shows the 'Intermediate Agent' configuration page. At the top, there's a header with the title 'Intermediate Agent' and three links: 'PPPoE', 'Port', and 'VLAN'. Below the header, there are two main configuration sections. The first section has an 'Active' checkbox (currently unchecked) and an 'access-node-identifier' text field containing the value 'XGS4600'. The second section, titled 'circuit-id', also has an 'Active' checkbox (unchecked), an 'identifier-string' text field, an 'option' dropdown menu set to 'spv', and a 'delimiter' dropdown menu set to '/'. At the bottom of the page, there are 'Apply' and 'Cancel' buttons.

The following table describes the labels in this screen.

Table 148 Advanced Application > PPPoE > Intermediate Agent

| LABEL                  | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Active                 | Select this option to enable the PPPoE intermediate agent globally on the Switch.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| access-node-identifier | Enter up to 20 ASCII characters to identify the PPPoE intermediate agent. Hyphens (-) and spaces are also allowed. The default is the Switch's host name.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| circuit-id             | <p>Use this section to configure the Circuit ID field in the PADI and PADR packets.</p> <p>The Circuit ID you configure for a specific port or for a specific VLAN on a port has priority over this.</p> <p>The Circuit ID you configure for a specific port (in the <b>Advanced Application &gt; PPPoE &gt; Intermediate Agent &gt; Port</b> screen) or for a specific VLAN on a port (in the <b>Advanced Application &gt; PPPoE &gt; Intermediate Agent &gt; Port &gt; VLAN</b> screen) has priority over this. That means, if you also want to configure PPPoE IA Per-Port or Per-Port Per-VLAN setting, leave the fields here empty and configure circuit-id and remote-id in the Per-Port or Per-Port Per-VLAN screen.</p> |
| Active                 | <p>Select this option to have the Switch add the user-defined identifier string and variables (specified in the <b>option</b> field) to PADI or PADR packets from PPPoE clients.</p> <p>If you leave this option unselected and do not configure any Circuit ID string (using CLI commands) on the Switch, the Switch will use the string specified in the <b>access-node-identifier</b> field.</p>                                                                                                                                                                                                                                                                                                                             |
| identifier-string      | Specify a string that the Switch adds in the Agent Circuit ID sub-option. You can enter up to 53 ASCII characters. Spaces are allowed.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| option                 | Select the variables that you want the Switch to generate and add in the Agent Circuit ID sub-option. The variable options include <b>sp</b> , <b>sv</b> , <b>pv</b> and <b>spv</b> which indicate combinations of slot-port, slot-VLAN, port-VLAN and slot-port-VLAN respectively. The Switch enters a zero into the PADI and PADR packets for the slot value.                                                                                                                                                                                                                                                                                                                                                                 |
| delimiter              | Select a delimiter to separate the identifier-string, slot ID, port number and/or VLAN ID from each other. You can use a pound key ( <b>#</b> ), semi-colon ( <b>;</b> ), period ( <b>.</b> ), comma ( <b>,</b> ), forward slash ( <b>/</b> ) or space.                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |

Table 148 Advanced Application &gt; PPPoE &gt; Intermediate Agent (continued)

| LABEL  | DESCRIPTION                                                                                                                                                                                                                                                                        |
|--------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Apply  | Click <b>Apply</b> to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the <b>Save</b> link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click <b>Cancel</b> to begin configuring this screen afresh.                                                                                                                                                                                                                       |

### 32.3.1 PPPoE IA Per-Port

Use this screen to specify whether individual ports are trusted or untrusted ports and have the Switch add extra information to PPPoE discovery packets from PPPoE clients on a per-port basis.

Note: The Switch will drop all PPPoE packets if you enable the PPPoE Intermediate Agent on the Switch and there are no trusted ports.

Click the **Port** link in the **Intermediate Agent** screen to display the screen as shown.

Figure 212 Advanced Application &gt; PPPoE &gt; Intermediate Agent &gt; Port

| Port | Server Trusted State | Circuit-id | Remote-id |
|------|----------------------|------------|-----------|
| *    | Untrusted ▼          |            |           |
| 1    | Untrusted ▼          |            |           |
| 2    | Untrusted ▼          |            |           |
| 3    | Untrusted ▼          |            |           |
| 4    | Untrusted ▼          |            |           |
| 5    | Untrusted ▼          |            |           |
| 6    | Untrusted ▼          |            |           |
| 7    | Untrusted ▼          |            |           |
| 8    | Untrusted ▼          |            |           |
| 9    | Untrusted ▼          |            |           |
| 10   | Untrusted ▼          |            |           |
| 11   | Untrusted ▼          |            |           |
| 12   | Untrusted ▼          |            |           |
| 13   | Untrusted ▼          |            |           |
| 14   | Untrusted ▼          |            |           |

Apply Cancel

The following table describes the labels in this screen.

Table 149 Advanced Application &gt; PPPoE &gt; Intermediate Agent &gt; Port

| LABEL | DESCRIPTION                                                                                                                                                                                                           |
|-------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Port  | This field displays the port number.                                                                                                                                                                                  |
| *     | Use this row to make the setting the same for all ports. Use this row first and then make adjustments on a port-by-port basis.<br><br>Note: Changes in this row are copied to all the ports as soon as you make them. |



Table 149 Advanced Application &gt; PPPoE &gt; Intermediate Agent &gt; Port (continued)

| LABEL                | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|----------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Server Trusted State | <p>Select whether this port is a trusted port (<b>Trusted</b>) or an untrusted port (<b>Untrusted</b>).</p> <p>Trusted ports are uplink ports connected to PPPoE servers.</p> <ul style="list-style-type: none"> <li>If a PADO (PPPoE Active Discovery Offer), PADS (PPPoE Active Discovery Session-confirmation), or PADT (PPPoE Active Discovery Terminate) packet is sent from a PPPoE server and received on a trusted port, the Switch forwards it to all other ports.</li> <li>If a PADI or PADR packet is sent from a PPPoE client but received on a trusted port, the Switch forwards it to other trusted port(s).</li> </ul> <p>Untrusted ports are downlink ports connected to subscribers.</p> <ul style="list-style-type: none"> <li>If a PADI, PADR, or PADT packet is sent from a PPPoE client and received on an untrusted port, the Switch adds a vendor-specific tag to the packet and then forwards it to the trusted port(s).</li> <li>The Switch discards PADO and PADS packets which are sent from a PPPoE server but received on an untrusted port.</li> </ul> |
| Circuit-id           | <p>Enter a string of up to 63 ASCII characters that the Switch adds into the Agent Circuit ID sub-option for PPPoE discovery packets received on this port. Spaces are allowed.</p> <p>The Circuit ID you configure for a specific VLAN on a port (in the <b>Advanced Application &gt; PPPoE &gt; Intermediate Agent &gt; Port &gt; VLAN</b> screen) has the highest priority.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Remote-id            | <p>Enter a string of up to 63 ASCII characters that the Switch adds into the Agent Remote ID sub-option for PPPoE discovery packets received on this port. Spaces are allowed.</p> <p>If you do not specify a string here or in the <b>Remote-id</b> field for a VLAN on a port, the Switch automatically uses the PPPoE client's MAC address.</p> <p>The Remote ID you configure for a specific VLAN on a port (in the <b>Advanced Application &gt; PPPoE &gt; Intermediate Agent &gt; Port &gt; VLAN</b> screen) has the highest priority.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Apply                | Click <b>Apply</b> to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the <b>Save</b> link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Cancel               | Click <b>Cancel</b> to begin configuring this screen afresh.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |

### 32.3.2 PPPoE IA Per-Port Per-VLAN

Use this screen to configure PPPoE IA settings that apply to a specific VLAN on a port.

Click the **VLAN** link in the **Intermediate Agent > Port** screen to display the screen as shown.

Figure 213 Advanced Application &gt; PPPoE &gt; Intermediate Agent &gt; Port &gt; VLAN

The screenshot displays the configuration interface for PPPoE IA settings per port and per VLAN. At the top, there's a 'VLAN' section with a 'Port' link. Below this, there are input fields for 'Show Port', 'Port', 'Show VLAN', 'Start VID', and 'End VID'. An 'Apply' button is located below these fields. Further down, a table is shown with columns 'VID', 'Circuit-id', and 'Remote-id'. The 'VID' column has a value of '0'. Below the table, there are 'Apply' and 'Cancel' buttons.

The following table describes the labels in this screen.

Table 150 Advanced Application > PPPoE > Intermediate Agent > Port > VLAN

| LABEL      | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                    |
|------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Show Port  | Enter a port number to show the PPPoE Intermediate Agent settings for the specified VLAN(s) on the port.                                                                                                                                                                                                                                                                                       |
| Show VLAN  | Use this section to specify the VLANs you want to configure in the section below.                                                                                                                                                                                                                                                                                                              |
| Start VID  | Enter the lowest VLAN ID you want to configure in the section below.                                                                                                                                                                                                                                                                                                                           |
| End VID    | Enter the highest VLAN ID you want to configure in the section below.                                                                                                                                                                                                                                                                                                                          |
| Apply      | Click <b>Apply</b> to display the specified range of VLANs in the section below.                                                                                                                                                                                                                                                                                                               |
| Port       | This field displays the port number specified above.                                                                                                                                                                                                                                                                                                                                           |
| VID        | This field displays the VLAN ID of each VLAN in the range specified above. If you configure the * VLAN, the settings are applied to all VLANs.                                                                                                                                                                                                                                                 |
| *          | Use this row to make the setting the same for all VLANs. Use this row first and then make adjustments on a VLAN-by-VLAN basis.<br><br>Note: Changes in this row are copied to all the VLANs as soon as you make them.                                                                                                                                                                          |
| Circuit-id | Enter a string of up to 63 ASCII characters that the Switch adds into the Agent Circuit ID sub-option for this VLAN on the specified port. Spaces are allowed.<br><br>The Circuit ID you configure here has the highest priority.                                                                                                                                                              |
| Remote-id  | Enter a string of up to 63 ASCII characters that the Switch adds into the Agent Remote ID sub-option for this VLAN on the specified port. Spaces are allowed.<br><br>If you do not specify a string here or in the <b>Remote-id</b> field for a specific port, the Switch automatically uses the PPPoE client's MAC address.<br><br>The Remote ID you configure here has the highest priority. |
| Apply      | Click <b>Apply</b> to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the <b>Save</b> link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.                                                                                                             |
| Cancel     | Click <b>Cancel</b> to begin configuring this screen afresh.                                                                                                                                                                                                                                                                                                                                   |

### 32.3.3 PPPoE IA for VLAN

Use this screen to set whether the PPPoE Intermediate Agent is enabled on a VLAN and whether the Switch appends the Circuit ID and/or Remote ID to PPPoE discovery packets from a specific VLAN.

Click the **VLAN** link in the **Intermediate Agent** screen to display the screen as shown.

Figure 214 Advanced Application > PPPoE > Intermediate Agent > VLAN

The screenshot displays the 'VLAN' configuration interface. At the top, there's a 'VLAN' header with a 'Show VLAN' button and input fields for 'Start VID' and 'End VID'. Below these is an 'Apply' button. The main section is a table with columns: VID, Enabled, Circuit-id, and Remote-id. The first row shows '\*' for VID, 'No' for Enabled, and empty fields for Circuit-id and Remote-id. At the bottom are 'Apply' and 'Cancel' buttons.

The following table describes the labels in this screen.

Table 151 Advanced Application > PPPoE > Intermediate Agent > VLAN

| LABEL      | DESCRIPTION                                                                                                                                                                                                                                                                        |
|------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Show VLAN  | Use this section to specify the VLANs you want to configure in the section below.                                                                                                                                                                                                  |
| Start VID  | Enter the lowest VLAN ID you want to configure in the section below.                                                                                                                                                                                                               |
| End VID    | Enter the highest VLAN ID you want to configure in the section below.                                                                                                                                                                                                              |
| Apply      | Click <b>Apply</b> to display the specified range of VLANs in the section below.                                                                                                                                                                                                   |
| VID        | This field displays the VLAN ID of each VLAN in the range specified above. If you configure the * VLAN, the settings are applied to all VLANs.                                                                                                                                     |
| *          | Use this row to make the setting the same for all VLANs. Use this row first and then make adjustments on a VLAN-by-VLAN basis.<br><br>Note: Changes in this row are copied to all the VLANs as soon as you make them.                                                              |
| Enabled    | Select this option to turn on the PPPoE Intermediate Agent on a VLAN.                                                                                                                                                                                                              |
| Circuit-id | Select this option to make the Circuit ID settings for a specific VLAN take effect.                                                                                                                                                                                                |
| Remote-id  | Select this option to make the Remote ID settings for a specific VLAN take effect.                                                                                                                                                                                                 |
| Apply      | Click <b>Apply</b> to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the <b>Save</b> link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel     | Click <b>Cancel</b> to begin configuring this screen afresh.                                                                                                                                                                                                                       |

# CHAPTER 33

## Error Disable

### 33.1 Error Disable Overview

This chapter shows you how to configure the rate limit for control packets on a port, and set the Switch to take an action (such as to shut down a port or stop sending packets) on a port when the Switch detects a pre-configured error. It also shows you how to configure the Switch to automatically undo the action after the error is gone.

#### 33.1.1 CPU Protection Overview

Switches exchange protocol control packets in a network to get the latest networking information. If a switch receives large numbers of control packets, such as ARP, BPDU or IGMP packets, which are to be processed by the CPU, the CPU may become overloaded and be unable to handle regular tasks properly.

The CPU protection feature allows you to limit the rate of ARP, BPDU and IGMP packets to be delivered to the CPU on a port. This enhances the CPU efficiency and protects against potential DoS attacks or errors from other network(s). You then can choose to drop control packets that exceed the specified rate limit or disable a port on which the packets are received.

#### 33.1.2 Error-Disable Recovery Overview

Some features, such as loop guard or CPU protection, allow the Switch to shut down a port or discard specific packets on a port when an error is detected on the port. For example, if the Switch detects that packets sent out the port(s) loop back to the Switch, the Switch can shut down the port(s) automatically. After that, you need to enable the port(s) or allow the packets on a port manually via the web configurator or the commands. With error-disable recovery, you can set the disabled port(s) to become active or start receiving the packets again after the time interval you specify.

#### 33.1.3 What You Can Do

- Use the **Errdisable Status** screen ([Section 33.3 on page 313](#)) to view whether the Switch detected that control packets exceeded the rate limit configured for a port or a port is disabled according to the feature requirements and what action you configure, and related information.
- Use the **CPU Protection** screen ([Section 33.4 on page 315](#)) to limit the maximum number of control packets (ARP, BPDU and/or IGMP) that the Switch can receive or transmit on a port.
- Use the **Errdisable Detect** screen ([Section 33.5 on page 316](#)) to have the Switch detect whether the control packets exceed the rate limit configured for a port and configure the action to take once the limit is exceeded.
- Use the **Errdisable Recovery** screen ([Section 33.6 on page 317](#)) to set the Switch to automatically undo an action after the error is gone.

## 33.2 The Error Disable Screen

Use this screen to configure error disable related settings. Click **Advanced Application > Errdisable** in the navigation panel to open the following screen.

**Figure 215** Advanced Application > Errdisable

| Errdisable          |                            |
|---------------------|----------------------------|
| Errdisable Status   | <a href="#">Click here</a> |
| CPU protection      | <a href="#">Click here</a> |
| Errdisable Detect   | <a href="#">Click here</a> |
| Errdisable Recovery | <a href="#">Click here</a> |

The following table describes the labels in this screen.

Table 152 Advanced Application > Errdisable

| LABEL               | DESCRIPTION                                                                                                                                                                                                                                |
|---------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Errdisable Status   | Click this link to view whether the Switch detected that control packets exceeded the rate limit configured for a port or a port is disabled according to the feature requirements and what action you configure, and related information. |
| CPU protection      | Click this link to limit the maximum number of control packets (ARP, BPDU and/or IGMP) that the Switch can receive or transmit on a port.                                                                                                  |
| Errdisable Detect   | Click this link to have the Switch detect whether the control packets exceed the rate limit configured for a port and configure the action to take once the limit is exceeded.                                                             |
| Errdisable Recovery | Click this link to set the Switch to automatically undo an action after the error is gone.                                                                                                                                                 |

## 33.3 Error-Disable Status

Use this screen to view whether the Switch detected that control packets exceeded the rate limit configured for a port or a port is disabled according to the feature requirements and what action you configure, and related information. Click the **Click here** link next to **Errdisable Status** in the **Advanced Application > Errdisable** screen to display the screen as shown.

**Figure 216** Advanced Application > Errdisable > Errdisable Status

**Errdisable Status** [Errdisable](#)

**Inactive-reason mode reset**

Port List  Cause

**Errdisable Status**

| Port | Cause         | Active | Mode          | Rate | Status     | Recovery Time Left (secs) | Total Dropped |
|------|---------------|--------|---------------|------|------------|---------------------------|---------------|
| 1    | Loop Guard    | NO     | inactive-port | -    | Forwarding | -                         | -             |
|      | ARP           | NO     | inactive-port | 0    | Forwarding | -                         | -             |
|      | BPDU          | NO     | inactive-port | 0    | Forwarding | -                         | -             |
|      | IGMP          | NO     | inactive-port | 0    | Forwarding | -                         | -             |
|      | Anti-arp scan | NO     | inactive-port | -    | Forwarding | -                         | -             |
|      | BPDU Guard    | NO     | inactive-port | -    | Forwarding | -                         | -             |
|      | ZULD          | NO     | inactive-port | -    | Forwarding | -                         | -             |
| 2    | Loop Guard    | NO     | inactive-port | -    | Forwarding | -                         | -             |
|      | ARP           | NO     | inactive-port | 0    | Forwarding | -                         | -             |
|      | BPDU          | NO     | inactive-port | 0    | Forwarding | -                         | -             |
|      | IGMP          | NO     | inactive-port | 0    | Forwarding | -                         | -             |
|      | Anti-arp scan | NO     | inactive-port | -    | Forwarding | -                         | -             |
|      | BPDU Guard    | NO     | inactive-port | -    | Forwarding | -                         | -             |
|      | ZULD          | NO     | inactive-port | -    | Forwarding | -                         | -             |
|      | Loop Guard    | NO     | inactive-port | -    | Forwarding | -                         | -             |
|      | ARP           | NO     | inactive-port | 0    | Forwarding | -                         | -             |
|      | BPDU          | NO     | inactive-port | 0    | Forwarding | -                         | -             |
|      | IGMP          | NO     | inactive-port | 0    | Forwarding | -                         | -             |
|      | Anti-arp scan | NO     | inactive-port | -    | Forwarding | -                         | -             |
|      | BPDU Guard    | NO     | inactive-port | -    | Forwarding | -                         | -             |
|      | ZULD          | NO     | inactive-port | -    | Forwarding | -                         | -             |

The following table describes the labels in this screen.

**Table 153** Advanced Application > Errdisable > Errdisable Status

| LABEL                      | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                               |
|----------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Inactive-reason mode reset |                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Port List                  | Enter the number of the port(s) (separated by a comma) on which you want to reset inactive-reason status.                                                                                                                                                                                                                                                                                                                 |
| Cause                      | Select the cause of inactive-reason mode you want to reset here.                                                                                                                                                                                                                                                                                                                                                          |
| Reset                      | Press to reset the specified port(s) to handle ARP, BPDU or IGMP packets instead of ignoring them, if the port(s) is in inactive-reason mode.                                                                                                                                                                                                                                                                             |
| Errdisable Status          |                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Port                       | This field displays the port number.                                                                                                                                                                                                                                                                                                                                                                                      |
| Cause                      | This displays the type of the control packet received on the port or the feature enabled on the port and cause the Switch to take the specified action.                                                                                                                                                                                                                                                                   |
| Active                     | This field displays whether the control packets (ARP, BPDU, and/or IGMP), on the port is being detected or not. It also shows whether loop guard, anti-arp scanning, BPDU guard or ZULD is enabled on the port.                                                                                                                                                                                                           |
| Mode                       | This field shows the action that the Switch takes for the cause. <ul style="list-style-type: none"> <li><b>inactive-port</b> - The Switch disables the port.</li> <li><b>inactive-reason</b> - The Switch drops all the specified control packets (such as BPDU) on the port.</li> <li><b>rate-limitation</b> - The Switch drops the additional control packets the port(s) has to handle in every one second.</li> </ul> |
| Rate                       | This field displays how many control packets this port can receive or transmit per second. It can be adjusted in CPU Protection. <b>0</b> means no rate limit.                                                                                                                                                                                                                                                            |

Table 153 Advanced Application &gt; Errdisable &gt; Errdisable Status (continued)

| LABEL                     | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                              |
|---------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Status                    | <p>This field displays the errdisable status</p> <ul style="list-style-type: none"> <li><b>Forwarding:</b> The Switch is forwarding packets. Rate-limitation mode is always in <b>Forwarding</b> status.</li> <li><b>Err-disable:</b> The Switch disables the port on which the control packets are received (inactive-port) or drops specified control packets on the port (inactive-reason)</li> </ul> |
| Recovery Time Left (secs) | This field displays the time (seconds) left before the port(s) becomes active of Errdisable Recovery.                                                                                                                                                                                                                                                                                                    |
| Total Dropped             | This field displays the total packet number dropped by this port where the packet rate exceeds the rate of mode rate-limitation.                                                                                                                                                                                                                                                                         |

## 33.4 CPU Protection Configuration

Use this screen to limit the maximum number of control packets (ARP, BPDU and/or IGMP) that the Switch can receive or transmit on a port. Click the **Click Here** link next to **CPU protection** in the **Advanced Application > Errdisable** screen to display the screen as shown.

Note: After you configure this screen, make sure you also enable error detection for the specific control packets in the **Advanced Application > Errdisable > Errdisable Detect** screen.

Figure 217 Advanced Application &gt; Errdisable &gt; CPU protection

**CPU protection** [Errdisable](#)

Reason: ARP ▼

| Port | Rate Limit (pkt/s) |
|------|--------------------|
| *    |                    |
| 1    | 0                  |
| 2    | 0                  |
| 3    | 0                  |
| 4    | 0                  |
| 5    | 0                  |
| 6    | 0                  |
| 7    | 0                  |
| 8    | 0                  |
| 9    | 0                  |
| 10   | 0                  |
| 11   | 0                  |
| 12   | 0                  |
| 13   | 0                  |
| 14   | 0                  |

[Apply](#) [Cancel](#)

The following table describes the labels in this screen.

Table 154 Advanced Application > Errdisable > CPU protection

| LABEL              | DESCRIPTION                                                                                                                                                                                                                                                                                                      |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Reason             | Select the type of control packet you want to configure here.                                                                                                                                                                                                                                                    |
| Port               | This field displays the port number. * means all ports (on the same Switch).                                                                                                                                                                                                                                     |
| *                  | Use this row to make the setting the same for all ports. Use this row first and then make adjustments to each port if necessary.<br><br>Note: Changes in this row are copied to all the ports as soon as you make them.                                                                                          |
| Rate Limit (pkt/s) | Enter a number from 0 to 256 to specify how many control packets this port can receive or transmit per second.<br><br><b>0</b> means no rate limit.<br><br>You can configure the action that the Switch takes when the limit is exceeded. See <a href="#">Section 33.5 on page 316</a> for detailed information. |
| Apply              | Click <b>Apply</b> to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the <b>Save</b> link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.                               |
| Cancel             | Click <b>Cancel</b> to begin configuring this screen afresh.                                                                                                                                                                                                                                                     |

## 33.5 Error-Disable Detect Configuration

Use this screen to have the Switch detect whether the control packets exceed the rate limit configured for a port and configure the action to take once the limit is exceeded. Click the **Click Here** link next to **Errdisable Detect** link in the **Advanced Application > Errdisable** screen to display the screen as shown.

Figure 218 Advanced Application > Errdisable > Errdisable Detect

| Cause | Active                   | Mode            |
|-------|--------------------------|-----------------|
| *     | <input type="checkbox"/> | inactive-port ▼ |
| ARP   | <input type="checkbox"/> | inactive-port ▼ |
| BPDU  | <input type="checkbox"/> | inactive-port ▼ |
| IGMP  | <input type="checkbox"/> | inactive-port ▼ |

Apply Cancel

The following table describes the labels in this screen.

Table 155 Advanced Application > Errdisable > Errdisable Detect

| LABEL  | DESCRIPTION                                                                                                                                                                                                                  |
|--------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Cause  | This field displays the types of control packet that may cause CPU overload.                                                                                                                                                 |
| *      | Use this row to make the setting the same for all entries. Use this row first and then make adjustments to each entry if necessary.<br><br>Note: Changes in this row are copied to all the entries as soon as you make them. |
| Active | Select this option to have the Switch detect if the configured rate limit for a specific control packet is exceeded and take the action selected below.                                                                      |



Table 155 Advanced Application &gt; Errdisable &gt; Errdisable Detect (continued)

| LABEL  | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|--------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Mode   | <p>Select the action that the Switch takes when the number of control packets exceed the rate limit on a port, set in the <b>Advanced Application &gt; Errdisable &gt; CPU protection</b> screen.</p> <ul style="list-style-type: none"> <li><b>inactive-port</b> - The Switch disables the port on which the control packets are received.</li> <li><b>inactive-reason</b> - The Switch drops all the specified control packets (such as BPDU) on the port.</li> <li><b>rate-limitation</b> - The Switch drops the additional control packets the port has to handle in every one second.</li> </ul> |
| Apply  | Click <b>Apply</b> to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the <b>Save</b> link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.                                                                                                                                                                                                                                                                                                                    |
| Cancel | Click <b>Cancel</b> to begin configuring this screen afresh.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |

## 33.6 Error-Disable Recovery Configuration

Use this screen to configure the Switch to automatically undo an action after the error is gone. Click the **Click Here** link next to **Errdisable Recovery** in the **Advanced Application > Errdisable** screen to display the screen as shown.

Figure 219 Advanced Application &gt; Errdisable &gt; Errdisable Recovery

| Reason        | Timer Status             | Interval |
|---------------|--------------------------|----------|
| *             | <input type="checkbox"/> |          |
| loopguard     | <input type="checkbox"/> | 300      |
| ARP           | <input type="checkbox"/> | 300      |
| BPDU          | <input type="checkbox"/> | 300      |
| IGMP          | <input type="checkbox"/> | 300      |
| anti-arp scan | <input type="checkbox"/> | 300      |
| bpduguard     | <input type="checkbox"/> | 300      |
| zuid          | <input type="checkbox"/> | 300      |

The following table describes the labels in this screen.

Table 156 Advanced Application &gt; Errdisable &gt; Errdisable Recovery

| LABEL  | DESCRIPTION                                                                                                                                                                                                                         |
|--------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Active | Select this option to turn on the error-disable recovery function on the Switch.                                                                                                                                                    |
| Reason | This field displays the supported features that allow the Switch to shut down a port or discard packets on a port according to the feature requirements and what action you configure.                                              |
| *      | <p>Use this row to make the setting the same for all entries. Use this row first and then make adjustments to each entry if necessary.</p> <p>Note: Changes in this row are copied to all the entries as soon as you make them.</p> |

Table 156 Advanced Application &gt; Errdisable &gt; Errdisable Recovery (continued)

| LABEL        | DESCRIPTION                                                                                                                                                                                                                                                                        |
|--------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Timer Status | Select this option to allow the Switch to wait for the specified time interval to activate a port or allow specific packets on a port, after the error was gone. Deselect this option to turn off this rule.                                                                       |
| Interval     | Enter the number of seconds (from 30 to 2592000) for the time interval.                                                                                                                                                                                                            |
| Apply        | Click <b>Apply</b> to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the <b>Save</b> link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel       | Click <b>Cancel</b> to begin configuring this screen afresh.                                                                                                                                                                                                                       |

# CHAPTER 34

## MAC Pinning

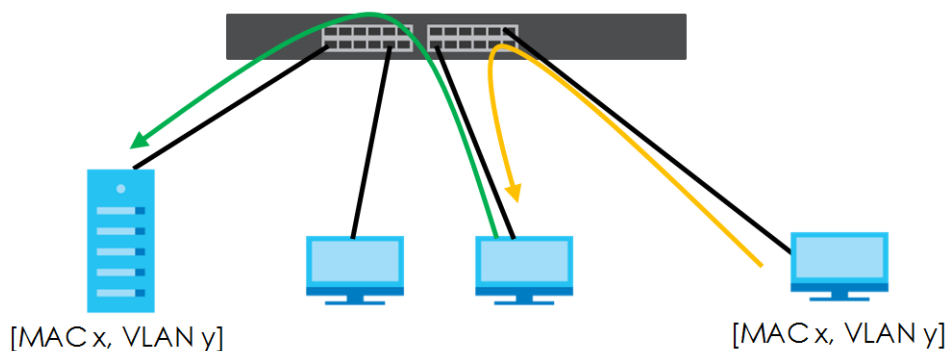
This chapter shows you how to configure MAC pinning on the Switch.

### 34.1 MAC Pinning Overview

When the Switch obtains a connected device's MAC address, it adds an entry in the MAC address forwarding table and uses the table to determine how to forward frames. In addition to the source MAC address of a received frame, the Switch also learns the VLAN to which the device belongs and the port on which the frame is received. If the Switch learns the same MAC address and same VLAN ID on another port, it updates the MAC address table immediately.

MAC pinning allows you to set a port or multiple ports to have priority over other ports in MAC address learning. That means when a MAC address (and VLAN ID) is learned on a MAC-pinning-enabled port, the MAC address will not be learned on any other port until the aging time for the dynamically learned MAC address in the table expires.

This helps enhance security. For example, when an attacker (**A**) sends packets to all connected clients by spoofing the source MAC address of a server (**B**) connected to one of the Switch's ports, on which MAC pinning is enabled, the responses from clients will still be forwarded to the server according to the Switch's MAC forwarding table.



### 34.2 MAC Pinning Configuration

Use this screen to enable MAC pinning on the Switch and on specific ports. Click **Advanced Application > MAC Pinning** in the navigation panel to open the following screen.

**Figure 220** Advanced Application > MAC Pinning

| Port | Active                   |
|------|--------------------------|
| *    | <input type="checkbox"/> |
| 1    | <input type="checkbox"/> |
| 2    | <input type="checkbox"/> |
| 3    | <input type="checkbox"/> |
| 4    | <input type="checkbox"/> |
| 5    | <input type="checkbox"/> |
| 6    | <input type="checkbox"/> |
| 7    | <input type="checkbox"/> |
| 8    | <input type="checkbox"/> |
| 9    | <input type="checkbox"/> |
| 10   | <input type="checkbox"/> |
| 11   | <input type="checkbox"/> |
| 12   | <input type="checkbox"/> |
| 13   | <input type="checkbox"/> |

Apply Cancel

The following table describes the labels in this screen.

Table 157 Advanced Application > MAC Pinning

| LABEL  | DESCRIPTION                                                                                                                                                                                                                                                                        |
|--------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Active | Select this option to turn on the MAC pinning function on the Switch.                                                                                                                                                                                                              |
| Port   | This field displays the port number. * means all ports (on the same Switch).                                                                                                                                                                                                       |
| *      | Use this row to make the setting the same for all ports. Use this row first and then make adjustments to each port if necessary.<br><br>Note: Changes in this row are copied to all the ports as soon as you make them.                                                            |
| Active | Select this check box to enable MAC pinning on this port. The port then has priority over other ports in MAC address learning.<br><br>Clear this check box to disable MAC pinning.                                                                                                 |
| Apply  | Click <b>Apply</b> to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the <b>Save</b> link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click <b>Cancel</b> to begin configuring this screen afresh.                                                                                                                                                                                                                       |

# CHAPTER 35

## Private VLAN

### 35.1 Private VLAN Overview

Use private VLAN if you want you to block traffic between ports in the same VLAN. **Community** and **Isolated** VLANs are secondary private VLANs that must be associated with a **Primary** private VLAN.

- **Primary:** Ports in a **Primary** VLAN are promiscuous and they can communicate with all promiscuous ports in the same primary VLAN, and all ports in associated community and isolated VLANs. They cannot communicate with ports in different primary VLANs.
- **Community:** Ports in a **Community** VLAN can communicate with promiscuous ports in an associated **Primary** VLAN and other community ports in the same **Community** VLAN. They cannot communicate with ports in **Isolated** VLANs, non-associated **Primary** VLAN promiscuous ports nor community ports in different **Community** VLANs.
- **Isolated:** Ports in an **Isolated** VLAN can communicate with promiscuous ports in an associated **Primary** VLAN only. They cannot communicate with other isolated ports in the same **Isolated** VLAN, non-associated **Primary** VLAN promiscuous ports nor any community ports.

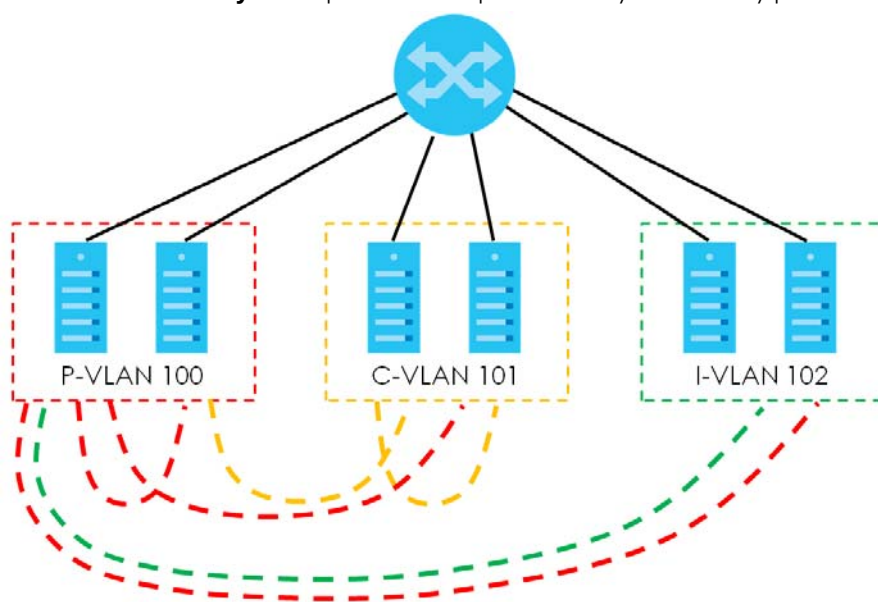


Table 158 PVLAN Graphic Key

| LABEL      | DESCRIPTION            |
|------------|------------------------|
| P-VLAN 100 | Primary private VLAN   |
| C-VLAN 101 | Community private VLAN |
| I-VLAN 102 | Isolated private VLAN  |

Tagged Private VLANs can span switches but trunking ports must be VLAN-trunking ports - see **Advanced > VLAN > VLAN Port Setting**.

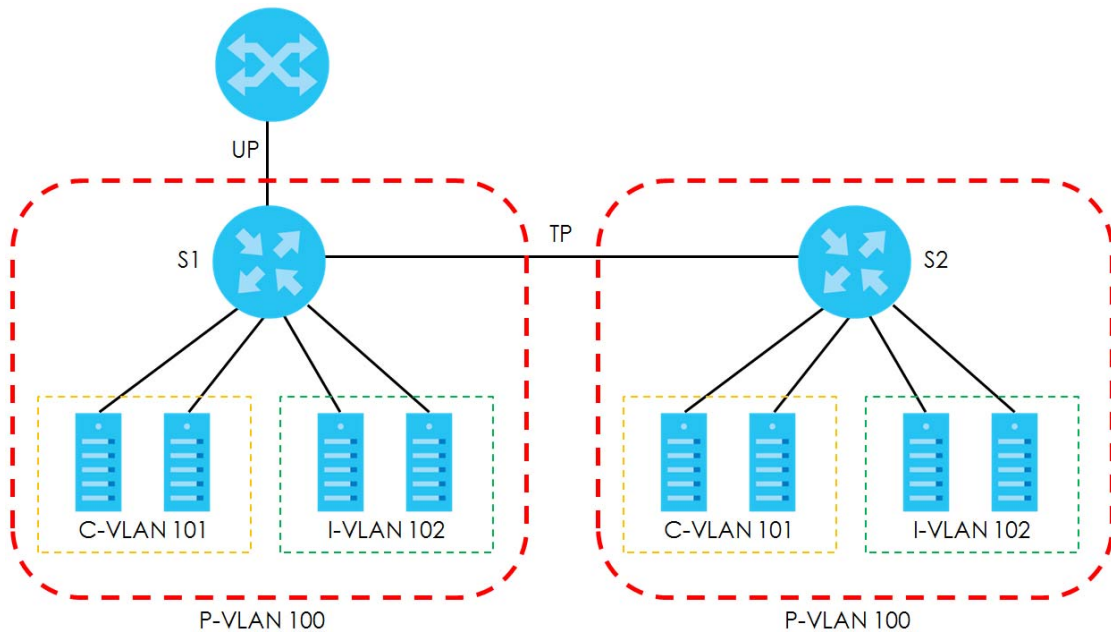


Table 159 Spanning PVLAN Graphic Key

| LABEL      | DESCRIPTION                                    |
|------------|------------------------------------------------|
| UP         | Uplink promiscuous port                        |
| TP         | VLAN-trunking ports                            |
| S1, S2     | Switch 1, Switch 2                             |
| P-VLAN 100 | Primary private VLAN with VLAN ID tag of 100   |
| C-VLAN 101 | Community private VLAN with VLAN ID tag of 101 |
| I-VLAN 102 | Isolated private VLAN with VLAN ID tag of 102  |

This is the communication process if primary VLAN **P-VLAN 100** is associated with community VLAN **C-VLAN 101** and isolated VLAN **I-VLAN 102**.

- Promiscuous ports in **P-VLAN 100** can communicate with all ports in **P-VLAN 100** including community ports in **C-VLAN 101** and isolated ports in **I-VLAN 102**.
- Community ports in **C-VLAN 101** can communicate with promiscuous ports in **P-VLAN 100** and other community ports in **C-VLAN 101**. They cannot communicate with isolated ports in **I-VLAN 102**.
- Isolated ports can communicate with promiscuous ports in **P-VLAN 100**. They cannot communicate with other isolated ports in **I-VLAN 102** nor community ports in **C-VLAN 101**.

Note: **Isolation** in **VLAN > VLAN Port Setting** (see [Section 9.7.2 on page 117](#)) has a higher priority than private VLAN settings, so promiscuous ports with **Isolation** in **VLAN > VLAN Port Setting** enabled will not be able to communicate with each other.

### 35.1.1 Configuration

You must go to the **Static VLAN** screen first (see [Section 9.7 on page 114](#)) to create VLAN IDs for **Primary**, **Isolated** or **Community** VLANs.

Click **Advanced Application > Private VLAN** to display the following screen.

**Figure 221** Advanced Application > Private VLAN

| Private VLAN |          |                 |                          |
|--------------|----------|-----------------|--------------------------|
| Port         | Mode     | Associated VLAN | Tagged                   |
| *            | Normal ▼ |                 | <input type="checkbox"/> |
| 1            | Normal ▼ | 0               | <input type="checkbox"/> |
| 2            | Normal ▼ | 0               | <input type="checkbox"/> |
| 3            | Normal ▼ | 0               | <input type="checkbox"/> |
| 4            | Normal ▼ | 0               | <input type="checkbox"/> |
| 5            | Normal ▼ | 0               | <input type="checkbox"/> |
| 6            | Normal ▼ | 0               | <input type="checkbox"/> |
| 7            | Normal ▼ | 0               | <input type="checkbox"/> |
| 8            | Normal ▼ | 0               | <input type="checkbox"/> |
| 9            | Normal ▼ | 0               | <input type="checkbox"/> |
| 10           | Normal ▼ | 0               | <input type="checkbox"/> |
| 11           | Normal ▼ | 0               | <input type="checkbox"/> |
| 12           | Normal ▼ | 0               | <input type="checkbox"/> |
| 13           | Normal ▼ | 0               | <input type="checkbox"/> |
| 14           | Normal ▼ | 0               | <input type="checkbox"/> |
|              | Normal ▼ | 0               | <input type="checkbox"/> |

The following table describes the labels in this screen.

Table 160 Advanced Application &gt; Private VLAN

| LABEL           | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|-----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Port            | This field displays the port number. * means all ports (on the same Switch).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Mode            | <p>This is the type of VLAN mapped to this port.</p> <ul style="list-style-type: none"> <li>• <b>Normal:</b> These are ports in a static VLAN. This is not a private VLAN.</li> <li>• <b>Promiscuous:</b> Ports in a <b>Primary</b> VLAN are <b>Promiscuous</b>. They can communicate with all ports in the <b>Primary</b> VLAN and associated <b>Community</b> and <b>Isolated</b> VLANs. They cannot communicate with <b>Promiscuous</b> ports in different primary VLANs.</li> <li>• <b>Community:</b> Ports in a <b>Community</b> VLAN can communicate with <b>Promiscuous</b> ports in an associated Primary VLAN and other community ports in the same <b>Community</b> VLAN. They cannot communicate with ports in an <b>Isolated</b> VLAN, non-associated <b>Primary</b> VLAN <b>Promiscuous</b> ports nor <b>Community</b> ports in different <b>Community</b> VLANs.</li> <li>• <b>Isolated:</b> Ports in an <b>Isolated</b> VLAN can communicate with <b>Promiscuous</b> ports in an associated <b>Primary</b> VLAN only. They cannot communicate with other <b>Isolated</b> ports in the same <b>Isolated</b> VLAN, non-associated <b>Primary</b> VLAN <b>Promiscuous</b> ports nor any <b>Community</b> ports.</li> </ul> |
| Associated VLAN | <p>Enter the VLAN ID of a previously created VLAN here.</p> <p>Note: The VLAN ID and <b>Mode</b> selected here must be the same as the VLAN ID and <b>VLAN Type</b> created in <b>Advanced Application &gt; VLAN &gt; Static VLAN</b>.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Tagged          | <p>A VLAN ID tag identifies VLAN membership of a frame across switches.</p> <p>Select this if the VLAN includes ports on multiple switches. The Switch forwards tagged frames through this port; it adds the PVID to untagged frames before sending them out.</p> <p>Clear this if the VLAN includes ports on this Switch only. The Switch forwards untagged frames through this port; it removes the VLAN ID from tagged frames before sending them out.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |

Table 160 Advanced Application > Private VLAN (continued)

| LABEL  | DESCRIPTION                                                                                                                                                                                                                                                                        |
|--------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Apply  | Click <b>Apply</b> to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the <b>Save</b> link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click <b>Cancel</b> to begin configuring this screen afresh.                                                                                                                                                                                                                       |



# CHAPTER 36

## Green Ethernet

This chapter shows you how to configure the Switch to reduce the power consumed by switch ports.

### 36.1 Green Ethernet Overview

Green Ethernet reduces switch port power consumption in the following ways.

- IEEE 802.3az Energy Efficient Ethernet (EEE)

If EEE is enabled, both sides of a link support EEE and there is no traffic, the port enters Low Power Idle (LPI) mode. LPI mode turns off some functions of the physical layer (becomes quiet) to save power. Periodically the port transmits a REFRESH signal to allow the link partner to keep the link alive. When there is traffic to be sent, a WAKE signal is sent to the link partner to return the link to active mode.

- Auto Power Down

**Auto Power Down** turns off almost all functions of the port's physical layer functions when the link is down, so the port only uses power to check for a link up pulse from the link partner. After the link up pulse is detected, the port wakes up from **Auto Power Down** and operates normally.

- Short Reach

Traditional Ethernet transmits all data with enough power to reach the maximum cable length. Shorter cables lose less power, so **Short Reach** saves power by adjusting the transmit power of each port according to the length of cable attached to that port.

### 36.2 Configuring Green Ethernet

Click **Advanced Application** > **Green Ethernet** in the navigation panel to display the screen as shown.

Note: EEE, Auto Power Down and Short Reach are not supported on an uplink port.

**Figure 222** Advanced Application > Green Ethernet

**Green Ethernet**

EEE ☐

Auto Power Down ☐

Short Reach ☐

| Port | EEE                      | Auto Power Down                     | Short Reach              |
|------|--------------------------|-------------------------------------|--------------------------|
| *    | <input type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/> |
| 1    | <input type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/> |
| 2    | <input type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/> |
| 3    | <input type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/> |
| 4    | <input type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/> |
| 5    | <input type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/> |
| 6    | <input type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/> |
| 7    | <input type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/> |
| 27   | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| 28   | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| 29   | <input type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/> |
| 30   | <input type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/> |
| 31   | <input type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/> |
| 32   | <input type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/> |

[Apply](#) [Cancel](#)

The following table describes the labels in this screen.

Table 161 Advanced Application &gt; Green Ethernet

| LABEL           | DESCRIPTION                                                                                                                                                                                                                                                                        |
|-----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| EEE             | Select this to activate Energy Efficient Ethernet globally.                                                                                                                                                                                                                        |
| Auto Power Down | Select this to activate Auto Power Down globally.                                                                                                                                                                                                                                  |
| Short Reach     | Select this to activate Short Reach globally.                                                                                                                                                                                                                                      |
| Port            | This field displays the port number. * means all ports (on the same Switch).                                                                                                                                                                                                       |
| *               | Use this row to make the setting the same for all ports. Use this row first and then make adjustments to each port if necessary.<br><br>Note: Changes in this row are copied to all the ports as soon as you make them.                                                            |
| EEE             | Select this to activate Energy Efficient Ethernet on this port.                                                                                                                                                                                                                    |
| Auto Power Down | Select this to activate Auto Power Down on this port.                                                                                                                                                                                                                              |
| Short Reach     | Select this to activate Short Reach on this port.                                                                                                                                                                                                                                  |
| Apply           | Click <b>Apply</b> to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the <b>Save</b> link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel          | Click <b>Cancel</b> to begin configuring this screen afresh.                                                                                                                                                                                                                       |

# CHAPTER 37

# Link Layer Discovery Protocol

# (LLDP)

## 37.1 LLDP Overview

The LLDP (Link Layer Discovery Protocol) is a layer 2 protocol. It allows a network device to advertise its identity and capabilities on the local network. It also allows the device to maintain and store information from adjacent devices which are directly connected to the network device. This helps an administrator discover network changes and perform necessary network reconfiguration and management. The device information is encapsulated in the LLDPDUs (LLDP data units) in the form of TLV (Type, Length, Value). Device information carried in the received LLDPDUs is stored in the standard MIB.

The Switch supports these basic management TLVs.

- End of LLDPDU (mandatory)
- Chassis ID (mandatory)
- Port ID (mandatory)
- Time to Live (mandatory)
- Port Description (optional)
- System Name (optional)
- System Description (optional)
- System Capabilities (optional)
- Management Address (optional)

The Switch also supports the IEEE 802.1 and IEEE 802.3 organizationally-specific TLVs.

IEEE 802.1 specific TLVs:

- Port VLAN ID TLV (optional)
- Port and Protocol VLAN ID TLV (optional)

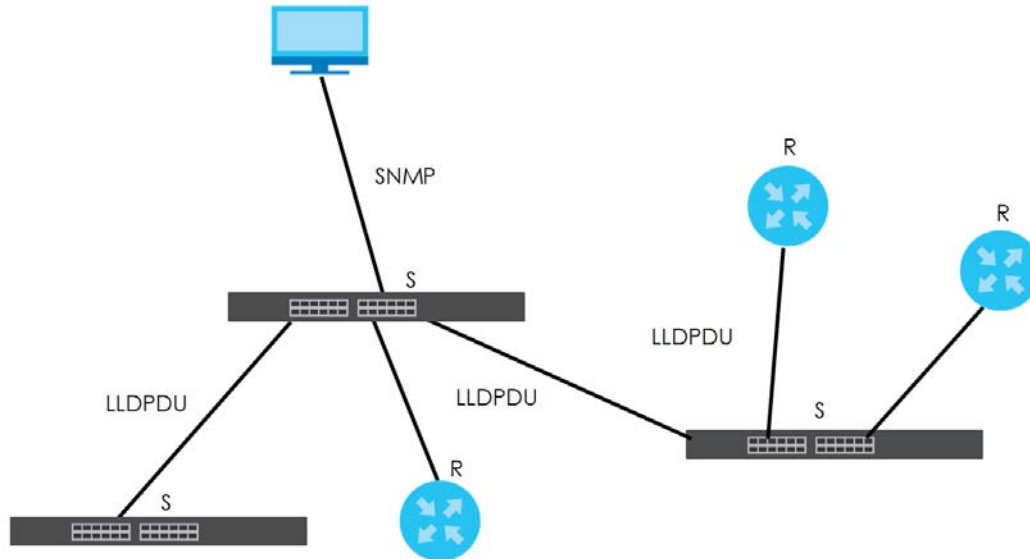
IEEE 802.3 specific TLVs:

- MAC/PHY Configuration/Status TLV (optional)
- Power via MDI TLV (optional, for PoE models only)
- Link Aggregation TLV (optional)
- Maximum Frame Size TLV (optional)

The optional TLVs are inserted between the Time To Live TLV and the End of LLDPDU TLV.

The next figure demonstrates that the network devices Switches and Routers (S and R) transmit and receive device information via LLDPDU and the network manager can query the information using Simple Network Management Protocol (SNMP).

**Figure 223** LLDP Overview



## 37.2 LLDP-MED Overview

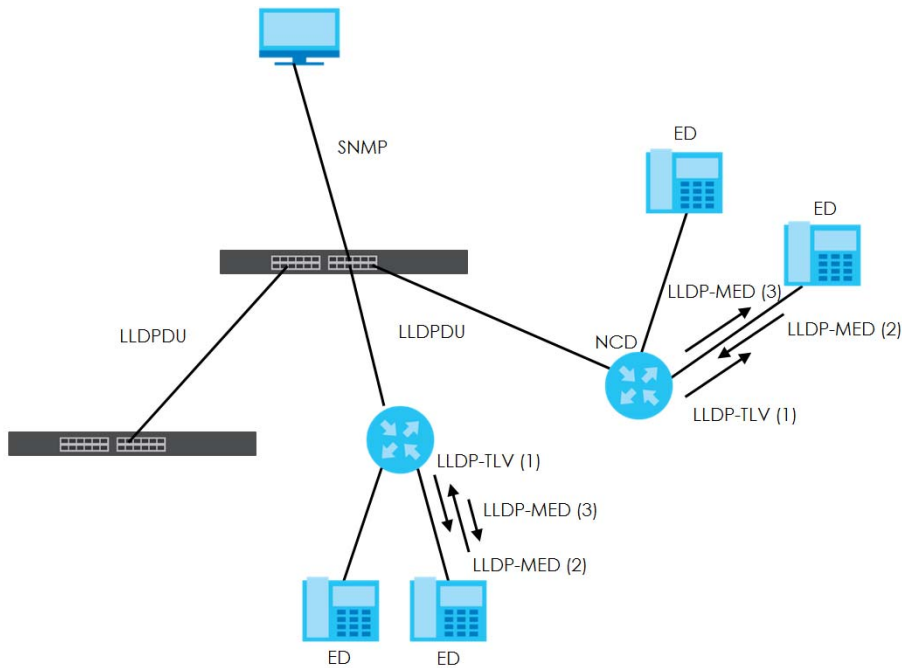
LLDP-MED (Link Layer Discovery Protocol for Media Endpoint Devices) is an extension to the standard LLDP developed by the Telecommunications Industry Association (TIA) TR-41.4 subcommittee which defines the enhanced discovery capabilities, such as VoIP applications, to enable network administrators manage their network topology application more efficiently. Unlike the traditional LLDP, which has some limitations when handling multiple application devices, the LLDP-MED offers display of accurate physical topology, interoperability of devices, and easy trouble shooting for misconfigured IP addresses. There are three classes of endpoint devices that the LLDP-MED supports:

Class I: IP Communications Controllers or other communication related servers

Class II: Voice Gateways, Conference Bridges or Media Servers

Class III: IP-Phones, PC-based Softphones, End user Communication Appliances supporting IP Media

The following figure shows that with the LLDP-MED, network connectivity devices (NCD) like Switches and Routers will transmit LLDP TLV to endpoint device (ED) like IP Phone first (1), to get its device type and capabilities information, then it will receive that information in LLDP-MED TLV back from endpoint devices (2), after that the network connectivity devices will transmit LLDP-MED TLV (3) to provision the endpoint device to such that the endpoint device's network policy and location identification information is updated. Since LLDPDU updates status and configuration information periodically, network managers may check the result of provision via remote status. The remote status is updated by receiving LLDP-MED TLVs from endpoint devices.

**Figure 224** LLDP-MED Overview

## 37.3 LLDP Screens

Click **Advanced Application** > **LLDP** in the navigation panel to display the screen as shown next.

**Figure 225** Advanced Application > LLDP

| LLDP     |                         |                            |
|----------|-------------------------|----------------------------|
| LLDP     | LLDP Local Status       | <a href="#">Click here</a> |
|          | LLDP Remote Status      | <a href="#">Click here</a> |
|          | LLDP Configuration      | <a href="#">Click here</a> |
| LLDP-MED | LLDP-MED Configuration  | <a href="#">Click here</a> |
|          | LLDP-MED Network Policy | <a href="#">Click here</a> |
|          | LLDP-MED Location       | <a href="#">Click here</a> |

The following table describes the labels in this screen.

Table 162 Advanced Application &gt; LLDP

| LABEL              | DESCRIPTION                                                                     |
|--------------------|---------------------------------------------------------------------------------|
| LLDP               |                                                                                 |
| LLDP Local Status  | Click here to show a screen with the Switch's LLDP information.                 |
| LLDP Remote Status | Click here to show a screen with LLDP information from the neighboring devices. |
| LLDP Configuration | Click here to show a screen to configure LLDP parameters.                       |

Table 162 Advanced Application &gt; LLDP (continued)

| LABEL                   | DESCRIPTION                                                                                                                             |
|-------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|
| LLDP-MED                |                                                                                                                                         |
| LLDP-MED Configuration  | Click here to show a screen to configure LLDP-MED (Link Layer Discovery Protocol for Media Endpoint Devices) parameters.                |
| LLDP-MED Network Policy | Click here to show a screen to configure LLDP-MED (Link Layer Discovery Protocol for Media Endpoint Devices) network policy parameters. |
| LLDP-MED Location       | Click here to show a screen to configure LLDP-MED (Link Layer Discovery Protocol for Media Endpoint Devices) location parameters.       |

## 37.4 LLDP Local Status

This screen displays a summary of LLDP status on this Switch. Click **Advanced Application > LLDP > LLDP Local Status** to display the screen as shown next.

Figure 226 Advanced Application &gt; LLDP &gt; LLDP Local Status

LLDP Local Status

LLDP System Information

Basic TLV

|                         |                               |                                       |
|-------------------------|-------------------------------|---------------------------------------|
| Chassis ID TLV          | Chassis ID Subtype            | mac-address                           |
|                         | Chassis ID                    | 1c:74:0d:fe:f6:5e                     |
| System Name TLV         | System Name                   | XGS4600                               |
| System Description TLV  | System Description            | V4.50(A8B1.0)b3_20170420   04/20/2017 |
| System Capabilities TLV | System Capabilities Supported | Bridge                                |
|                         | System Capabilities Enabled   | Bridge                                |
| Management Address TLV  | Management Address Subtype    | ipv4 / all-802                        |
|                         | Interface Number Subtype      | unknown                               |
|                         | Interface Number              | 0                                     |
|                         | Object Identifier             | 0                                     |

LLDP Port Information

| Local Port | Port ID Subtype | Port ID | Port Description |
|------------|-----------------|---------|------------------|
| 1          | local-assigned  | 1       |                  |
| 2          | local-assigned  | 2       |                  |
| 3          | local-assigned  | 3       |                  |
| 4          | local-assigned  | 4       |                  |
| 5          | local-assigned  | 5       |                  |
| 6          | local-assigned  | 6       |                  |
| 7          | local-assigned  | 7       |                  |
| 8          | local-assigned  | 8       |                  |
| 9          | local-assigned  | 9       |                  |
| 10         | local-assigned  |         |                  |
| 32         | local-assigned  | 32      |                  |

The following table describes the labels in this screen.

Table 163 Advanced Application > LLDP > LLDP Local Status

| LABEL                   | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|-------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Basic TLV               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Chassis ID TLV          | <p>This displays the chassis ID of the local Switch, that is the Switch you're configuring. The chassis ID is identified by the chassis ID subtype.</p> <p><b>Chassis ID Subtype</b> - this displays how the chassis of the Switch is identified.</p> <p><b>Chassis ID</b> - This displays the chassis ID of the local Switch.</p>                                                                                                                                                                                                                                                                                                                                                            |
| System Name TLV         | This shows the Host Name of the Switch.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| System Description TLV  | This shows the firmware version of the Switch.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| System Capabilities TLV | <p>This shows the System Capabilities enabled and supported on the local Switch.</p> <ul style="list-style-type: none"> <li>• <b>System Capabilities Supported</b> - Bridge</li> <li>• <b>System Capabilities Enabled</b> - Bridge</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Management Address TLV  | <p>The Management Address TLV identifies an address associated with the local LLDP agent that may be used to reach higher layer entities to assist discovery by network management. The TLV may also include the system interface number and an object identifier (OID) that are associated with this management address.</p> <p>This field displays the Management Address settings on the specified port(s).</p> <ul style="list-style-type: none"> <li>• <b>Management Address Subtype</b> - ipv4 / all-802</li> <li>• <b>Interface Number Subtype</b> - unknown</li> <li>• <b>Interface Number</b> - 0 (not supported)</li> <li>• <b>Object Identifier</b> - 0 (not supported)</li> </ul> |
| LLDP Port Information   | This displays the local port information.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Local Port              | This displays the number of the Switch port which receives the LLDPDU from the remote device. Click a port number to view the detailed LLDP status on this port at <b>LLDP Local Port Status Detail</b> screen.                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Port ID Subtype         | This indicates how the port ID field is identified.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Port ID                 | This is an alpha-numeric string that contains the specific identifier for the port from which this LLDPDU was transmitted.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Port Description        | This shows the port description that the Switch will advertise from this port.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |

### 37.4.1 LLDP Local Port Status Detail

This screen displays detailed LLDP status for each port on this Switch. Click **Advanced Application > LLDP > LLDP Local Status** and then click a port number, for example 1 in the **Local Port** column to display the screen as shown next.

**Figure 227** Advanced Application > LLDP > LLDP Local Status > LLDP Local Port Status Detail (Basic TLV)

| LLDP Local Port Status Detail      |                          |                                   | <a href="#">LLDP Local Status</a> |
|------------------------------------|--------------------------|-----------------------------------|-----------------------------------|
| Local Port: 1                      |                          |                                   |                                   |
| Basic TLV                          |                          |                                   |                                   |
| Port ID TLV                        | Port ID Subtype          | local-assigned                    |                                   |
|                                    | Port ID                  | 1                                 |                                   |
| Port Description TLV               | Port Description         |                                   |                                   |
| Dot1 TLV                           |                          |                                   |                                   |
| Port VLAN ID TLV                   | Port VLAN ID             | 1                                 |                                   |
| Port-Protocol VLAN ID TLV          | Port-Protocol VLAN ID    |                                   |                                   |
| Dot3 TLV                           |                          |                                   |                                   |
| MAC PHY Configuration & Status TLV | AN Supported             | Yes                               |                                   |
|                                    | AN Enabled               | Yes                               |                                   |
|                                    | AN Advertised Capability | 100baseTX 100baseTXFD 1000baseTFD |                                   |
|                                    | Oper MAU Type            | 30                                |                                   |
| Link Aggregation TLV               | Aggregation Capability   | Yes                               |                                   |
|                                    | Aggregation Status       | No                                |                                   |
|                                    | Aggregated Port ID       | 0                                 |                                   |
| Max Frame Size TLV                 | Max Frame Size           | 1518                              |                                   |

**Figure 228** Advanced Application > LLDP > LLDP Local Status > LLDP Local Port Status Detail (MED TLV)

|                             |                          |                      |
|-----------------------------|--------------------------|----------------------|
| MED TLV                     |                          |                      |
| Capabilities TLV            | Network Policy           | Yes                  |
|                             | Location                 | Yes                  |
|                             | Extend Power via MDI PSE | No                   |
|                             | Extend Power via MDI PD  | No                   |
|                             | Inventory Management     | No                   |
| Device Type TLV             | Device Type              | Network Connectivity |
| Network Policy TLV          | Voice                    |                      |
|                             | Voice-Signaling          |                      |
|                             | Guest-Voice              |                      |
|                             | Guest-Voice-Signaling    |                      |
|                             | Softphone-Voice          |                      |
|                             | Video-Conferencing       |                      |
|                             | Streaming-Video          |                      |
|                             | Video-Signaling          |                      |
| Location Identification TLV | Coordinate-base LCI      |                      |
|                             | Civic LCI                |                      |
|                             | ELIN                     |                      |



The following table describes the labels in this screen.

Table 164 Advanced Application > LLDP > LLDP Local Status > LLDP Local Port Status Detail

| <b>LABEL</b>                       | <b>DESCRIPTION</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Basic TLV                          | These are the Basic TLV flags                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Port ID TLV                        | <p>The port ID TLV identifies the specific port that transmitted the LLDP frame.</p> <ul style="list-style-type: none"> <li>Port ID Subtype: This shows how the port is identified.</li> <li>Port ID: This is the ID of the port.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Port Description TLV               | This displays the local port description.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Dot1 TLV                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Port VLAN ID TLV                   | This displays the VLAN ID sent by the IEEE 802.1 Port VLAN ID TLV.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Port-Protocol VLAN ID TLV          | This displays the IEEE 802.1 Port Protocol VLAN ID TLVs, which indicates whether the VLAN is enabled and supported.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Dot3 TLV                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| MAC PHY Configuration & Status TLV | <p>The MAC/PHY Configuration/Status TLV advertises the bit-rate and duplex capability of the sending 802.3 node. It also advertises the current duplex and bit-rating of the sending node. Lastly, it advertises whether these setting were the result of auto-negotiation during link initiation or manual override.</p> <ul style="list-style-type: none"> <li>AN Supported - Displays if the port supports or does not support auto-negotiation.</li> <li>AN Enabled - The current auto-negotiation status of the port.</li> <li>AN Advertised Capability - The auto-negotiation capabilities of the port.</li> <li>Oper MAU Type - The current Medium Attachment Unit (MAU) type of the port.</li> </ul> |
| Link Aggregation TLV               | <p>The Link Aggregation TLV indicates whether the link is capable of being aggregated, whether the link is currently in an aggregation, and if in an aggregation, the port identification of the aggregation.</p> <ul style="list-style-type: none"> <li>Aggregation Capability — The current aggregation capability of the port.</li> <li>Aggregation Status — The current aggregation status of the port.</li> <li>Aggregation Port ID — The aggregation ID of the current port.</li> </ul>                                                                                                                                                                                                                |
| Max Frame Size TLV                 | This displays the maximum supported frame size in octets.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| MED TLV                            | LLDP Media Endpoint Discovery (MED) is an extension of LLDP that provides additional capabilities to support media endpoint devices. MED enables advertisement and discovery of network policies, device location discovery to allow creation of location databases, and information for troubleshooting.                                                                                                                                                                                                                                                                                                                                                                                                    |
| Capabilities TLV                   | <p>This field displays which LLDP-MED TLV are capable to transmit on the Switch.</p> <ul style="list-style-type: none"> <li>Network Policy</li> <li>Location</li> <li>Extend Power via MDI PSE</li> <li>Extend Power via MDI PD</li> <li>Inventory Management</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Device Type TLV                    | <p>This is the LLDP-MED device class. The Zyxel Switch device type is:</p> <ul style="list-style-type: none"> <li>Network Connectivity</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |

Table 164 Advanced Application &gt; LLDP &gt; LLDP Local Status &gt; LLDP Local Port Status Detail

| LABEL                       | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|-----------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Network Policy TLV          | This displays a network policy for the specified application. <ul style="list-style-type: none"> <li>• Voice</li> <li>• Voice-Signaling</li> <li>• Guest-Voice</li> <li>• Guest-Voice-Signaling</li> <li>• Softphone-Voice</li> <li>• Video-Conferencing</li> <li>• Streaming-Video</li> <li>• Video-Signaling</li> </ul>                                                                                                                                                                                                     |
| Location Identification TLV | This shows the location information of a caller by its ELIN (Emergency Location Identifier Number) or the IETF Geopriv Civic Address based Location Configuration Information (Civic Address LCI). <ul style="list-style-type: none"> <li>• Coordinate-base LCI - latitude, longitude and altitude coordinates of the location Configuration Information (LCI)</li> <li>• Civic LCI - IETF Geopriv Civic Address based Location Configuration Information</li> <li>• ELIN - (Emergency Location Identifier Number)</li> </ul> |

## 37.5 LLDP Remote Status

This screen displays a summary of LLDP status for each LLDP connection to a neighboring Switch. Click **Advanced Application > LLDP > LLDP Remote Status** to display the screen as shown next.

Figure 229 Advanced Application &gt; LLDP &gt; LLDP Remote Status

| LLDP Remote Status <span style="float: right;"><a href="#">LLDP</a></span> |            |            |         |                  |             |                    |
|----------------------------------------------------------------------------|------------|------------|---------|------------------|-------------|--------------------|
| Index                                                                      | Local Port | Chassis ID | Port ID | Port Description | System Name | Management Address |

The following table describes the labels in this screen.

Table 165 Advanced Application &gt; LLDP &gt; LLDP Remote Status

| LABEL              | DESCRIPTION                                                                                                                                                                                                                 |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Index              | The index number shows the number of remote devices that are connected to the Switch. Click on an index number to view the detailed LLDP status for this remote device in the <b>LLDP Remote Port Status Detail</b> screen. |
| Local Port         | This is the number of the Switch's port that received LLDPDU from the remote device.                                                                                                                                        |
| Chassis ID         | This displays the chassis ID of the remote device associated with the transmitting LLDP agent. The chassis ID is identified by the chassis ID subtype. For example, the MAC address of the remote device.                   |
| Port ID            | This is an alpha-numeric string that contains the specific identifier for the port from which this LLDPDU was transmitted. The port ID is identified by the port ID subtype.                                                |
| Port Description   | This displays a description for the port from which this LLDPDU was transmitted.                                                                                                                                            |
| System Name        | This displays the system name of the remote device.                                                                                                                                                                         |
| Management Address | This displays the management address of the remote device. It could be the MAC address or IP address.                                                                                                                       |

### 37.5.1 LLDP Remote Port Status Detail

This screen displays detailed LLDP status of the remote device connected to the Switch. Click **Advanced Application > LLDP > LLDP Remote Status** and then click an index number, for example 1, in the **Index** column in the **LLDP Remote Status** screen to display the screen as shown next.

**Figure 230** Advanced Application > LLDP > LLDP Remote Status > LLDP Remote Port Status Detail (Basic TLV)

| LLDP Remote Port Status Detail |                               |                            | <a href="#">LLDP Remote Status</a> |
|--------------------------------|-------------------------------|----------------------------|------------------------------------|
| Local Port: 26                 |                               |                            |                                    |
| Basic TLV                      |                               |                            |                                    |
| Chassis ID TLV                 | Chassis ID Subtype            | mac-address                |                                    |
|                                | Chassis ID                    | 00:19:cb:01:01:02          |                                    |
| Port ID TLV                    | Port ID Subtype               | local-assigned             |                                    |
|                                | Port ID                       | 2                          |                                    |
| Time To Live TLV               | Time To Live                  | 120                        |                                    |
| Port Description TLV           | Port Description              |                            |                                    |
| System Name TLV                | System Name                   | GS3700                     |                                    |
| System Description TLV         | System Description            | V4.30(AAFZ.0)   10/20/2015 |                                    |
| System Capabilities TLV        | System Capabilities Supported | bridge                     |                                    |
|                                | System Capabilities Enabled   | bridge                     |                                    |
| Management Address TLV         | Management Address Subtype    | ipv4                       |                                    |
|                                | Management Address            | 172.16.1.100               |                                    |
|                                | Interface Number Subtype      | unknown                    |                                    |
|                                | Interface Number              | 0                          |                                    |
|                                | Object Identifier             |                            |                                    |

The following table describes the labels in Basic TLV part of the screen.

**Table 166** Advanced Application > LLDP > LLDP Remote Status > LLDP Remote Port Status Detail (Basic TLV)

| LABEL          | DESCRIPTION                                                                                                                                                                                                                                                              |
|----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Local Port     | This displays the number of the Switch's port to which the remote device is connected.                                                                                                                                                                                   |
| Basic TLV      |                                                                                                                                                                                                                                                                          |
| Chassis ID TLV | <ul style="list-style-type: none"> <li>Chassis ID Subtype - this displays how the chassis of the remote device is identified.</li> <li>Chassis ID - this displays the chassis ID of the remote device. The chassis ID is identified by the chassis ID subtype</li> </ul> |

Table 166 Advanced Application &gt; LLDP &gt; LLDP Remote Status &gt; LLDP Remote Port Status Detail (Basic TLV)

| LABEL                   | DESCRIPTION                                                                                                                                                                                                                                                                            |
|-------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Port ID TLV             | <ul style="list-style-type: none"> <li>Port ID Subtype - this displays how the port of the remote device is identified.</li> <li>Port ID - this displays the port ID of the remote device. The port ID is identified by the port ID subtype.</li> </ul>                                |
| Time To Live TLV        | This displays the time-to-live (TTL) multiplier of LLDP frames. The device information on the neighboring devices ages out and is discarded when its corresponding TTL expires. The TTL value is to multiply the TTL multiplier by the LLDP frames transmitting interval.              |
| Port Description TLV    | This displays the remote port description.                                                                                                                                                                                                                                             |
| System Name TLV         | This displays the system name of the remote device.                                                                                                                                                                                                                                    |
| System Description TLV  | This displays the system description of the remote device.                                                                                                                                                                                                                             |
| System Capabilities TLV | <p>This displays whether the system capabilities are enabled and supported on the remote device.</p> <ul style="list-style-type: none"> <li>System Capabilities Supported</li> <li>System Capabilities Enabled</li> </ul>                                                              |
| Management Address TLV  | <p>This displays the following management address parameters of the remote device.</p> <ul style="list-style-type: none"> <li>Management Address Subtype</li> <li>Management Address</li> <li>Interface Number Subtype</li> <li>Interface Number</li> <li>Object Identifier</li> </ul> |

**Figure 231** Advanced Application > LLDP > LLDP Remote Status > LLDP Remote Port Status Detail> (Dot 1 and Dot3 TLV)

|                                    |                                 |                                                        |
|------------------------------------|---------------------------------|--------------------------------------------------------|
| Dot1 TLV                           |                                 |                                                        |
| Port VLAN ID TLV                   | Port VLAN ID                    | 1                                                      |
| Port-Protocol VLAN ID TLV          | Port-Protocol VLAN ID           | 1                                                      |
|                                    | Port-Protocol VLAN ID Supported | Yes                                                    |
|                                    | Port-Protocol VLAN ID Enabled   | Yes                                                    |
| Vlan Name TLV                      | VLAN ID                         |                                                        |
|                                    | VLAN Name                       |                                                        |
| Protocol Identity TLV              | Protocol ID                     |                                                        |
| Dot3 TLV                           |                                 |                                                        |
| MAC PHY Configuration & Status TLV | AN Supported                    | Yes                                                    |
|                                    | AN Enabled                      | Yes                                                    |
|                                    | AN Advertised Capability        | 10baseT 10baseTFD 100baseTX<br>100baseTXFD 1000baseTFD |
|                                    | Oper MAU type                   | 30                                                     |
| Link Aggregation TLV               | Aggregation Capability          | Yes                                                    |
|                                    | Aggregation Status              | No                                                     |
|                                    | Aggregated Port ID              | 2                                                      |
| Power Via MDI TLV                  | Port Class                      | PSE                                                    |
|                                    | MDI Supported                   | Yes                                                    |
|                                    | MDI Enabled                     | Yes                                                    |
|                                    | Pair Controlable                | No                                                     |
|                                    | PSE Power Pairs                 | 1                                                      |
|                                    | Power Class                     | 1                                                      |
| Max Frame Size TLV                 | Max Frame Size                  | 1518                                                   |

The following table describes the labels in the Dot1 and Dot3 parts of the screen.

Table 167 Advanced Application &gt; LLDP &gt; LLDP Remote Status &gt; LLDP Remote Port Status Detail (Dot1 and Dot3 TLV)

| LABEL            | DESCRIPTION                                                  |
|------------------|--------------------------------------------------------------|
| Dot1 TLV         |                                                              |
| Port VLAN ID TLV | This displays the VLAN ID of this port on the remote device. |

Table 167 Advanced Application &gt; LLDP &gt; LLDP Remote Status &gt; LLDP Remote Port Status Detail (Dot1 and Dot3 TLV)

| LABEL                              | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Port-Protocol VLAN ID TLV          | <p>This displays the IEEE 802.1 Port Protocol VLAN ID TLV, which indicates whether the VLAN ID and whether it is enabled and supported on the port of remote Switch which sent the LLDPDU.</p> <ul style="list-style-type: none"> <li>• Port-Protocol VLAN ID</li> <li>• Port-Protocol VLAN ID Supported</li> <li>• Port-Protocol VLAN ID Enabled</li> </ul>                                                                                                                                                                                                                                                                                                                                                        |
| Vlan Name TLV                      | <p>This shows the VLAN ID and name for remote device port.</p> <ul style="list-style-type: none"> <li>• VLAN ID</li> <li>• VLAN Name</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Protocol Identity TLV              | <p>The Protocol Identity TLV allows the Switch to advertise the particular protocols that are accessible through its port.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Dot3 TLV                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| MAC PHY Configuration & Status TLV | <p>The MAC/PHY Configuration/Status TLV advertises the bit-rate and duplex capability of the sending 802.3 node. It also advertises the current duplex and bit-rating of the sending node. Lastly, it advertises whether these setting were the result of auto-negotiation during link initiation or manual override.</p> <ul style="list-style-type: none"> <li>• AN Supported - Displays if the port supports or does not support auto-negotiation.</li> <li>• AN Enabled - The current auto-negotiation status of the port.</li> <li>• AN Advertised Capability - The auto-negotiation capabilities of the port.</li> <li>• Oper MAU Type - The current Medium Attachment Unit (MAU) type of the port</li> </ul> |
| Link Aggregation TLV               | <p>The Link Aggregation TLV indicates whether the link is capable of being aggregated, whether the link is currently in an aggregation, and if in an aggregation, the port identification of the aggregation.</p> <ul style="list-style-type: none"> <li>• Aggregation Capability — The current aggregation capability of the port.</li> <li>• Aggregation Status — The current aggregation status of the port.</li> <li>• Aggregation Port ID — The aggregation ID of the current port.</li> </ul>                                                                                                                                                                                                                 |
| Power Via MDI TLV                  | <p>The Power Via MDI TLV allows network management to advertise and discover the MDI power support capabilities of the sending port on the remote device.</p> <ul style="list-style-type: none"> <li>• Port Class</li> <li>• MDI Supported</li> <li>• MDI Enabled</li> <li>• Pair Controlable</li> <li>• PSE Power Pairs</li> <li>• Power Class</li> </ul>                                                                                                                                                                                                                                                                                                                                                          |
| Max Frame Size TLV                 | <p>This displays the maximum supported frame size in octets.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |

**Figure 232** Advanced Application > LLDP > LLDP Remote Status > LLDP Remote Port Status Detail (MED TLV)

|                             |                          |                                                                               |
|-----------------------------|--------------------------|-------------------------------------------------------------------------------|
| MED TLV                     |                          |                                                                               |
| Capabilities TLV            | Network Policy           | Yes                                                                           |
|                             | Location                 | Yes                                                                           |
|                             | Extend Power via MDI PSE | No                                                                            |
|                             | Extend Power via MDI PD  | No                                                                            |
|                             | Inventory Management     | No                                                                            |
| Device Type TLV             | Device Type              | Network Connectivity                                                          |
| Network Policy TLV          | Voice                    | VLAN ID 10, tagged, known, L2-priority 7, DSCP 63                             |
|                             | Voice-Signaling          | VLAN ID 100, tagged, known, L2-priority 2, DSCP 10                            |
|                             | Guest-Voice              | VLAN ID 20, tagged, known, L2-priority 3, DSCP 12                             |
|                             | Guest-Voice-Signaling    | VLAN ID 0, untagged, known, L2-priority 0, DSCP 0                             |
|                             | Softphone-Voice          | VLAN ID 200, tagged, known, L2-priority 1, DSCP 1                             |
|                             | Video-Conferencing       | VLAN ID 0, untagged, known, L2-priority 0, DSCP 0                             |
|                             | Streaming-Video          | VLAN ID 300, tagged, known, L2-priority 4, DSCP 20                            |
|                             | Video-Signaling          | VLAN ID 400, tagged, known, L2-priority 6, DSCP 55                            |
| Location Identification TLV | Coordinate-base LCI      | latitude north 0.0 longitude east 0.9995 altitude meters 0.0 datum NAD83-MLLW |
|                             | Civic LCI                | country TW city HSINCHU building ZYXEL                                        |
|                             | ELIN                     | 1234567890                                                                    |
| Inventory TLV               | Hardware Revision        | V20131114   11/14/2013                                                        |
|                             | Software Revision        | V4.10(AAOA.0)   11/15/2013                                                    |
|                             | Firmware Revision        | V4.10(AAOA.0)   11/15/2013                                                    |
|                             | Model Name               | GS3700-HP                                                                     |
|                             | Manufacturer             | 123456789                                                                     |
|                             | Serial Number            | 123456789                                                                     |
|                             | Asset ID                 | 123456789                                                                     |
| Extended Power via MDI TLV  | Power Type               | PSE Device                                                                    |
|                             | Power Source             | PSE                                                                           |
|                             | Power Priority           | High                                                                          |
|                             | Power Value              | Available power 130.0 Watts                                                   |

The following table describes the labels in the MED TLV part of the screen.

Table 168 Advanced Application > LLDP > LLDP Remote Status > LLDP Remote Port Status Detail (MED TLV)

| LABEL                       | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|-----------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| MED TLV                     | LLDP Media Endpoint Discovery (MED) is an extension of LLDP that provides additional capabilities to support media endpoint devices. MED enables advertisement and discovery of network policies, device location discovery to allow creation of location databases, and information for troubleshooting.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Capabilities TLV            | This displays the MED capabilities the remote port supports. <ul style="list-style-type: none"> <li>• Network Policy</li> <li>• Location</li> <li>• Extend Power via MDI PSE</li> <li>• Extend Power via MDI PD</li> <li>• Inventory Management</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Device Type TLV             | LLDP-MED endpoint device classes: <ul style="list-style-type: none"> <li>• Endpoint Class I</li> <li>• Endpoint Class II</li> <li>• Endpoint Class III</li> <li>• Network Connectivity</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Network Policy TLV          | This displays a network policy for the specified application. <ul style="list-style-type: none"> <li>• Voice</li> <li>• Voice-Signaling</li> <li>• Guest-Voice</li> <li>• Guest-Voice-Signaling</li> <li>• Softphone-Voice</li> <li>• Video-Conferencing</li> <li>• Streaming-Video</li> <li>• Video-Signaling</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Location Identification TLV | This shows the location information of a caller by its: <ul style="list-style-type: none"> <li>• Coordinate-base LCI - latitude and longitude coordinates of the Location Configuration Information (LCI)</li> <li>• Civic LCI - IETF Geopriv Civic Address based Location Configuration Information</li> <li>• ELIN - (Emergency Location Identifier Number)</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Inventory TLV               | The majority of IP Phones lack support of management protocols such as SNMP, so LLDP-MED inventory TLVs are used to provide their inventory information to the Network Connectivity Devices such as the Switch. The Inventory TLV may contain the following information. <ul style="list-style-type: none"> <li>• Hardware Revision</li> <li>• Software Revision</li> <li>• Firmware Revision</li> <li>• Model Name</li> <li>• Manufacturer</li> <li>• Serial Number</li> <li>• Asset ID</li> </ul>                                                                                                                                                                                                                                                                                                                                 |
| Extended Power via MDI TLV  | Extended Power Via MDI Discovery enables detailed power information to be advertised by Media Endpoints, such as IP phones and Network Connectivity Devices such as the Switch. <ul style="list-style-type: none"> <li>• Power Type - whether it is currently operating from primary power or is on backup power (backup power may indicate to the Endpoint Device that it should move to a power conservation mode).</li> <li>• Power Source - whether or not the Endpoint is currently operating from an external power source.</li> <li>• Power Priority - the Endpoint Device's power priority (which the Network Connectivity Device may use to prioritize which devices will remain in service during power shortages)</li> <li>• Power Value - power requirement, in fractions of Watts, in current configuration</li> </ul> |



## 37.6 LLDP Configuration

Use this screen to configure global LLDP settings on the Switch. Click **Advanced Application > LLDP > LLDP Configuration** to display the screen as shown next.

**Figure 233** Advanced Application > LLDP > LLDP Configuration

The screenshot shows the 'LLDP Configuration' screen. At the top, there are tabs: 'LLDP Configuration' (selected), 'LLDP', 'Basic TLV Setting', and 'Org-specific TLV Setting'. Below the tabs, there are five configuration rows: 'Active' with a checked checkbox, 'Transmit Interval' set to 30 seconds, 'Transmit Hold' set to 4 times, 'Transmit Delay' set to 2 seconds, and 'Reinitialize Delay' set to 2 seconds. Below these rows are 'Apply' and 'Cancel' buttons. The main part of the screen is a table with three columns: 'Port', 'Admin Status', and 'Notification'. The table lists ports from 1 to 32. For each port, the 'Admin Status' is 'Tx-Rx' and the 'Notification' checkbox is unchecked. A wavy line indicates the table continues. At the bottom of the table are 'Apply' and 'Cancel' buttons.

The following table describes the labels in this screen.

Table 169 Advanced Application > LLDP > LLDP Configuration

| LABEL              | DESCRIPTION                                                                                                                                                                                                                                                                        |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Active             | Select to enable LLDP on the Switch. It is enabled by default.                                                                                                                                                                                                                     |
| Transmit Interval  | Enter how many seconds the Switch waits before sending LLDP packets.                                                                                                                                                                                                               |
| Transmit Hold      | Enter the time-to-live (TTL) multiplier of LLDP frames. The device information on the neighboring devices ages out and is discarded when its corresponding TTL expires. The TTL value is to multiply the TTL multiplier by the LLDP packets transmitting interval.                 |
| Transmit Delay     | Enter the delay (in seconds) between successive LLDPDU transmissions initiated by value or status changes in the Switch MIB.                                                                                                                                                       |
| Reinitialize Delay | Enter the number of seconds for LLDP to wait before initializing on a port.                                                                                                                                                                                                        |
| Apply              | Click <b>Apply</b> to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the <b>Save</b> link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel             | Click <b>Cancel</b> to begin configuring this screen afresh.                                                                                                                                                                                                                       |
| Port               | This displays the Switch's port number. * means all ports (on the same Switch).                                                                                                                                                                                                    |

Table 169 Advanced Application &gt; LLDP &gt; LLDP Configuration

| LABEL        | DESCRIPTION                                                                                                                                                                                                                                                                        |
|--------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Admin Status | Select whether LLDP transmission and/or reception is allowed on this port. <ul style="list-style-type: none"> <li>• Disable - not allowed</li> <li>• Tx-Only - transmit only</li> <li>• Rx-Only - receive only</li> <li>• Tx-Rx - transmit and receive</li> </ul>                  |
| Notification | Select whether LLDP notification is enabled on this port.                                                                                                                                                                                                                          |
| Apply        | Click <b>Apply</b> to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the <b>Save</b> link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel       | Click <b>Cancel</b> to begin configuring this screen afresh.                                                                                                                                                                                                                       |

### 37.6.1 LLDP Configuration Basic TLV Setting

Use this screen to configure Basic TLV settings. Click **Advanced Application > LLDP > LLDP Configuration > Basic TLV Setting** to display the screen as shown next.

Figure 234 Advanced Application &gt; LLDP &gt; LLDP Configuration&gt; Basic TLV Setting

| Port | Management Address                  | Port Description                    | System Capabilities                 | System Description                  | System Name                         |
|------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|
| *    | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            |
| 1    | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> |
| 2    | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> |
| 3    | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> |
| 4    | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> |
| 5    | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> |
| 6    | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> |
| 7    | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> |
| 8    | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> |
| 9    | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> |
| 10   | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> |
| 11   | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> |
| 12   | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> |
| 13   | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> |
| 14   | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> |
| 15   | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> |
| 16   | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> |
| 17   | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> |

Apply Cancel

The following table describes the labels in this screen.

Table 170 Advanced Application &gt; LLDP &gt; LLDP Configuration &gt; Basic TLV Setting

| LABEL              | DESCRIPTION                                                                                          |
|--------------------|------------------------------------------------------------------------------------------------------|
| Port               | This displays the Switch's port number.                                                              |
| Management Address | Select the check box(es) to enable or disable the sending of Management Address TLVs on the port(s). |
| Port Description   | Select the check box(es) to enable or disable the sending of Port Description TLVs on the port(s).   |

Table 170 Advanced Application &gt; LLDP &gt; LLDP Configuration &gt; Basic TLV Setting

| LABEL               | DESCRIPTION                                                                                                                                                                                                                                                                        |
|---------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| System Capabilities | Select the check box(es) to enable or disable the sending of System Capabilities TLVs on the port(s).                                                                                                                                                                              |
| System Description  | Select the check box(es) to enable or disable the sending of System Description TLVs on the port(s).                                                                                                                                                                               |
| System Name         | Select the check box(es) to enable or disable the sending of System Name TLVs on the port(s).                                                                                                                                                                                      |
| Apply               | Click <b>Apply</b> to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the <b>Save</b> link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel              | Click <b>Cancel</b> to begin configuring this screen afresh.                                                                                                                                                                                                                       |

### 37.6.2 LLDP Configuration Basic Org-specific TLV Setting

Use this screen to configure organization-specific TLV settings. Click **Advanced Application > LLDP > LLDP Configuration > Org-specific TLV Setting** to display the screen as shown next.

Figure 235 Advanced Application &gt; LLDP &gt; LLDP Configuration&gt; Org-specific TLV Setting

| Port | Port-Protocol            | VLAN ID                             | Port VLAN ID                        | Link Aggregation         | Dot3 TLV MAC/PHY                    | Max Frame Size           |
|------|--------------------------|-------------------------------------|-------------------------------------|--------------------------|-------------------------------------|--------------------------|
| *    | <input type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/> |
| 1    | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| 2    | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| 3    | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| 4    | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| 5    | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| 6    | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| 7    | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| 8    | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| 9    | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| 10   | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| 11   | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| 12   | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| 13   | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| 14   | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| 15   | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| 16   | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| 17   | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| 18   | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| 19   | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| 20   | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| 21   | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| 22   | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| 23   | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| 24   | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| 25   | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| 26   | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| 27   | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| 28   | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| 29   | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| 30   | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| 31   | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| 32   | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> |

Apply Cancel

The following table describes the labels in this screen.

Table 171 Advanced Application &gt; LLDP &gt; LLDP Configuration &gt; Org-specific TLV Setting

| LABEL                 | DESCRIPTION                                                                                                                                                      |
|-----------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Port                  | This displays the Switch's port number.                                                                                                                          |
| Dot1 TLV              |                                                                                                                                                                  |
| Port-Protocol VLAN ID | Select the check box(es) to enable or disable the sending of IEEE 802.1 Port and Protocol VLAN ID TLVs on the port(s).                                           |
| Port VLAN ID          | Select the check box(es) to enable or disable the sending of IEEE 802.1 Port VLAN ID TLVs on the port(s). All check boxes in this column are enabled by default. |
| Dot3 TLV              |                                                                                                                                                                  |

Table 171 Advanced Application &gt; LLDP &gt; LLDP Configuration &gt; Org-specific TLV Setting

| LABEL            | DESCRIPTION                                                                                                                                                                                                                                                                        |
|------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Link Aggregation | Select the check box(es) to enable or disable the sending of IEEE 802.3 Link Aggregation TLVs on the port(s).                                                                                                                                                                      |
| MAC/PHY          | Select the check box(es) to enable or disable the sending of IEEE 802.3 MAC/PHY Configuration/Status TLVs on the port(s). All check boxes in this column are enabled by default.                                                                                                   |
| Max Frame Size   | Select the check box(es) to enable or disable the sending of IEEE 802.3 Max Frame Size TLVs on the port(s).                                                                                                                                                                        |
| Apply            | Click <b>Apply</b> to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the <b>Save</b> link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel           | Click <b>Cancel</b> to begin configuring this screen afresh.                                                                                                                                                                                                                       |

## 37.7 LLDP-MED Configuration

Click **Advanced Application > LLDP > LLDP-MED Configuration** to display the screen as shown next.

Figure 236 Advanced Application &gt; LLDP &gt; LLDP-MED Configuration

| Port | Notification Topology Change | Location                 | MED TLV Setting Network Policy |
|------|------------------------------|--------------------------|--------------------------------|
| *    | <input type="checkbox"/>     | <input type="checkbox"/> | <input type="checkbox"/>       |
| 1    | <input type="checkbox"/>     | <input type="checkbox"/> | <input type="checkbox"/>       |
| 2    | <input type="checkbox"/>     | <input type="checkbox"/> | <input type="checkbox"/>       |
| 3    | <input type="checkbox"/>     | <input type="checkbox"/> | <input type="checkbox"/>       |
| 4    | <input type="checkbox"/>     | <input type="checkbox"/> | <input type="checkbox"/>       |
| 5    | <input type="checkbox"/>     | <input type="checkbox"/> | <input type="checkbox"/>       |
| 6    | <input type="checkbox"/>     | <input type="checkbox"/> | <input type="checkbox"/>       |
| 7    | <input type="checkbox"/>     | <input type="checkbox"/> | <input type="checkbox"/>       |
| 8    | <input type="checkbox"/>     | <input type="checkbox"/> | <input type="checkbox"/>       |
| 9    | <input type="checkbox"/>     | <input type="checkbox"/> | <input type="checkbox"/>       |
| 10   | <input type="checkbox"/>     | <input type="checkbox"/> | <input type="checkbox"/>       |
| 11   | <input type="checkbox"/>     | <input type="checkbox"/> | <input type="checkbox"/>       |
| 12   | <input type="checkbox"/>     | <input type="checkbox"/> | <input type="checkbox"/>       |
| 13   | <input type="checkbox"/>     | <input type="checkbox"/> | <input type="checkbox"/>       |
| 14   | <input type="checkbox"/>     | <input type="checkbox"/> | <input type="checkbox"/>       |
| 15   | <input type="checkbox"/>     | <input type="checkbox"/> | <input type="checkbox"/>       |
| 16   | <input type="checkbox"/>     | <input type="checkbox"/> | <input type="checkbox"/>       |

Apply Cancel

The following table describes the labels in this screen.

Table 172 Advanced Application &gt; LLDP &gt; LLDP-MED Configuration

| LABEL           | DESCRIPTION                                                                                                  |
|-----------------|--------------------------------------------------------------------------------------------------------------|
| Port            | This displays the Switch's port number. Select * to configure all ports (in the same Switch) simultaneously. |
| Notification    |                                                                                                              |
| Topology Change | Select to enable LLDP-MED topology change traps on this port.                                                |
| MED TLV Setting |                                                                                                              |

Table 172 Advanced Application &gt; LLDP &gt; LLDP-MED Configuration

| LABEL          | DESCRIPTION                                                                                                                                                                                                                                                                |
|----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Location       | Select to enable transmitting LLDP-MED location TLV.                                                                                                                                                                                                                       |
| Network Policy | Select to enable transmitting LLDP-MED Network Policy TLV.                                                                                                                                                                                                                 |
| Apply          | Click <b>Apply</b> to save the changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the Save link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel         | Click <b>Cancel</b> to begin configuring this screen afresh.                                                                                                                                                                                                               |

## 37.8 LLDP-MED Network Policy

Click **Advanced Application > LLDP > LLDP-MED Network Policy** to display the screen as shown next.

Figure 237 Advanced Application &gt; LLDP &gt; LLDP-MED Network Policy

The following table describes the labels in this screen.

Table 173 Advanced Application &gt; LLDP &gt; LLDP-MED Network Policy

| LABEL            | DESCRIPTION                                                                                                                                                                                                                                                                                                            |
|------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Port             | Enter the port number to set up the LLDP-MED network policy.                                                                                                                                                                                                                                                           |
| Application Type | Select the type of application used in the network policy. <ul style="list-style-type: none"> <li>• voice</li> <li>• voice-signaling</li> <li>• guest-voice</li> <li>• guest-voice-signaling</li> <li>• softphone-voice</li> <li>• video-conferencing</li> <li>• streaming-video</li> <li>• video-signaling</li> </ul> |
| Tag              | Select to tag or untag in the network policy. <ul style="list-style-type: none"> <li>• tagged</li> <li>• untagged</li> </ul>                                                                                                                                                                                           |
| VLAN             | Enter the VLAN ID number. It should be from 1 to 4094. For priority tagged frames, enter "0".                                                                                                                                                                                                                          |

Table 173 Advanced Application &gt; LLDP &gt; LLDP-MED Network Policy

| LABEL            | DESCRIPTION                                                                                                                               |
|------------------|-------------------------------------------------------------------------------------------------------------------------------------------|
| DSCP             | Enter the DSCP value of the network policy. The value is defined from 0 through 63 with the 0 representing use of the default DSCP value. |
| Priority         | Enter the priority value for the network policy.                                                                                          |
| Add              | Click <b>Add</b> after finish entering the network policy information. A summary table will list all the Switch you've added.             |
| Cancel           | Click <b>Cancel</b> to begin entering the information afresh.                                                                             |
| Index            | This field displays the of index number of the network policy. Click an index number to edit the rule.                                    |
| Port             | This field displays the port number of the network policy.                                                                                |
| Application Type | This field displays the application type of the network policy.                                                                           |
| Tag              | This field displays the Tag Status of the network policy.                                                                                 |
| VLAN             | This field displays the VLANID of the network policy.                                                                                     |
| Priority         | This field displays the priority value of the network policy.                                                                             |
| DSCP             | This field displays the DSCP value of the network policy.                                                                                 |
|                  | Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries.   |
| Delete           | Check the rules that you want to remove, then click the Delete button.                                                                    |
| Cancel           | Click <b>Cancel</b> to clear the selected checkboxes.                                                                                     |

## 37.9 LLDP-MED Location

Click **Advanced Application > LLDP > LLDP-MED Location** to display the screen as shown next.

**Figure 238** Advanced Application > LLDP > LLDP-MED Location

The following table describes the labels in this screen.

Table 174 Advanced Application &gt; LLDP &gt; LLDP-MED Location

| LABEL                | DESCRIPTION                                                                                                                                                                                                                                                                                    |
|----------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Port                 | Enter the port number you want to set up the location within the LLDP-MED network.                                                                                                                                                                                                             |
| Location Coordinates | The LLDP-MED uses geographical coordinates and Civic Address to set the location information of the remote device. Geographical based coordinates includes latitude, longitude, altitude and datum. Civic Address includes Country, State, County, City, Street and other related information. |
| Latitude             | Enter the latitude information. The value should be from 0° to 90°. <ul style="list-style-type: none"> <li>• north</li> <li>• south</li> </ul>                                                                                                                                                 |
| Longitude            | Enter the longitude information. The value should be from 0° to 180°. <ul style="list-style-type: none"> <li>• west</li> <li>• east</li> </ul>                                                                                                                                                 |
| Altitude             | Enter the altitude information. The value should be from -2097151 to 2097151 in meters or in floors. <ul style="list-style-type: none"> <li>• meters</li> <li>• floor</li> </ul>                                                                                                               |

Table 174 Advanced Application &gt; LLDP &gt; LLDP-MED Location

| LABEL                | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|----------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Datum                | <p>Select the appropriate geodetic datum used by GPS.</p> <ul style="list-style-type: none"> <li>• WGS84</li> <li>• NAD83-NAVD88</li> <li>• NAD83-MLLW</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Civic Address        | <p>Enter the Civic Address by providing information such as Country, State, County, City, Street, Number, ZIP code and other additional information. Enter at least two field in this configuration including the Country. The valid length of the Country field is 2 characters and all other fields are up to 32 characters.</p> <ul style="list-style-type: none"> <li>• Country</li> <li>• State</li> <li>• County</li> <li>• City</li> <li>• Division</li> <li>• Neighbor</li> <li>• Street</li> <li>• Leading-Street-Direction</li> <li>• Street-Suffix</li> <li>• Trailing-Street-Suffix</li> <li>• House-Number</li> <li>• House-Number-Suffix</li> <li>• Landmark</li> <li>• Additional-Location</li> <li>• Name</li> <li>• Zip-Code</li> <li>• Building</li> <li>• Unit</li> <li>• Floor</li> <li>• Room-Number</li> <li>• Place-Type</li> <li>• Postal-Community-Name</li> <li>• Post-Office-Box</li> <li>• Additional-Code</li> </ul> |
| ELIN Number          | <p>Enter a numerical digit string, corresponding to the ELIN identifier which is used during emergency call setup to a traditional CAMA or ISDN trunk-based PSAP. The valid length is from 10 characters to 25 characters.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Add                  | <p>Click <b>Add</b> after finish entering the location information.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Cancel               | <p>Click <b>Cancel</b> to begin entering the location information afresh.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Index                | <p>This lists the index number of the location configuration. Click an index number to view or edit the location.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Port                 | <p>This lists the port number of the location configuration. I</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Location Coordinates | <p>This field displays the location configuration information based on geographical coordinates that includes longitude, latitude, altitude and datum.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Civic Address        | <p>This field displays the Civic Address for the remote device using information such as Country, State, County, City, Street, Number, ZIP code and additional information.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| ELIN Number          | <p>This field shows the Emergency Location Identification Number (ELIN), which is used to identify endpoint devices when they issue emergency call services. The valid length is form 10 characters to 25 characters.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|                      | <p>Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Delete               | <p>Check the locations that you want to remove, then click the <b>Delete</b> button.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Cancel               | <p>Click <b>Cancel</b> to clear the selected check boxes.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |



# CHAPTER 38

## Anti-Arpscan

### 38.1 Anti-Arpscan Overview

Address Resolution Protocol (ARP), RFC 826, is a protocol used to convert a network-layer IP address to a link-layer MAC address. ARP scan is used to scan the network of a certain interface for alive hosts. It shows the IP address and MAC addresses of all hosts found. Hackers could use ARP scan to find targets in your network. **Anti-arpscan** is used to detect unusual ARP scan activity and block suspicious hosts or ports.

Unusual ARP scan activity is determined by port and host thresholds that you set. A port threshold is determined by the number of packets received per second on the port. If the received packet rate is over the threshold, then the port is put into an **Err-Disable** state. You can recover the normal state of the port manually if this happens and after you identify the cause of the problem.

A host threshold is determined by the number of ARP-request packets received per second. There is a global threshold rate for all hosts. If the rate of a host is over the threshold, then that host is blocked by using a MAC address filter. A blocked host is released automatically after the MAC aging time expires.

Note: A port-based threshold must be larger than the host-based threshold or the host-based threshold will not work.

#### 38.1.1 What You Can Do

- Use the **Anti-Arpscan Status** screen ([Section 38.2 on page 350](#)) to see what ports are trusted and are forwarding traffic or are disabled.
- Use the **Anti-Arpscan Host Status** screen ([Section 38.3 on page 351](#)) to view blocked hosts and clear selected ones.
- Use the **Anti-Arpscan Trust Host** screen ([Section 38.4 on page 351](#)) to create or remove trusted hosts identified by IP address and subnet mask. **Anti-arpscan** is not performed on trusted hosts.
- Use this **Anti-Arpscan Configure** screen ([Section 38.5 on page 352](#)) to enable anti-arpscan, set port and host thresholds as well as configure ports to be trusted or untrusted.

#### 38.1.2 What You Need to Know

- You should set an uplink port as a trusted port before enabling **Anti-arpscan** so as to prevent the port from being shutdown due to receiving too many ARP messages.
- When a port is configured as a trusted port, **Anti-arpscan** is not performed on the port. Both host and port thresholds are ignored for trusted ports. If the received ARP packet rate on a port or the received ARP-requests from a host exceed the thresholds, the trusted port will not be closed.
- If a port on the Switch is closed by **Anti-arpscan**, and you want to recover it, then do one of the following:

- Go to **Basic Setting > Port Setup**. Clear **Active** and click **Apply**. Then select **Active** and click **Apply** again.
- Go to **Application > Errdisable > Errdisable Recovery** and set the interval for **Anti-arpscan**. After the interval expires, the closed port(s) will become active and start receiving packets again.
- Use the command `port no inactive`.
- Refer to the port logs to see when a port was closed.

## 38.2 Anti-Arpscan Status

Use this screen to see what ports are trusted and are forwarding traffic or are disabled. To open this screen, click **Advanced Application > Anti-Arpscan**.

**Figure 239** Advanced Application > Anti-Arpscan Status

| Port | Trusted | State      |
|------|---------|------------|
| 1    | No      | Forwarding |
| 2    | No      | Forwarding |
| 3    | No      | Forwarding |
| 4    | No      | Forwarding |
| 5    | No      | Forwarding |
| 6    | No      | Forwarding |
| 7    | No      | Forwarding |
| 8    | No      | Forwarding |
| 9    | No      | Forwarding |
| 10   | No      | Forwarding |
| 11   | No      | Forwarding |
| 12   | No      | Forwarding |
| 13   | No      | Forwarding |
| 14   | No      | Forwarding |
| 15   | No      | Forwarding |
| 16   | No      | Forwarding |

The following table describes the fields in the above screen.

**Table 175** Advanced Application > Anti-Arpscan Status

| LABEL               | DESCRIPTION                                                                                                                    |
|---------------------|--------------------------------------------------------------------------------------------------------------------------------|
| Anti-Arpscan is.... | This shows whether <b>Anti-arpscan</b> is enabled or disabled on the Switch.                                                   |
| Port                | This field displays the port number of the Switch.                                                                             |
| Trusted             | This field displays whether the port is trusted or untrusted. <b>Anti-arpscan</b> is not performed on a trusted port.          |
| State               | This field displays whether the port can forward traffic normally ( <b>Forwarding</b> ) or is disabled ( <b>Err-Disable</b> ). |

## 38.3 Anti-Arpscan Host Status

Use this screen to view blocked hosts and unblock ones connected to certain ports. To open this screen, click **Advanced Application > Anti-Arpscan > Host Status**.

**Figure 240** Advanced Application > Anti-Arpscan > Host Status

Anti-Arpscan Host Status [Status](#)

[Clear filtered host](#)

Port List  [Clear](#)

Filtered host

| Index | Host IP | MAC | VLAN | Port | State |
|-------|---------|-----|------|------|-------|
|-------|---------|-----|------|------|-------|

The following table describes the fields in the above screen.

Table 176 Advanced Application > Anti-Arpscan > Host Status

| LABEL                | DESCRIPTION                                                                                                                                               |
|----------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|
| Clear Filtered host: | A filtered host is a blocked IP address.                                                                                                                  |
| Port List            | Type a port number or a series of port numbers separated by commas and spaces, and then click <b>Clear</b> to unblock all hosts connected to these ports. |
| Filtered host:       | This table lists information on blocked hosts.                                                                                                            |
| Index                | This displays the index number of an IP address (a host) that has been blocked.                                                                           |
| Host IP              | This displays the IP address of the blocked host.                                                                                                         |
| MAC                  | This displays the MAC address of the blocked host.                                                                                                        |
| VLAN                 | This displays the VLAN ID that shows which VLAN the blocked host is in.                                                                                   |
| Port                 | This displays the port number to which the blocked host is connected.                                                                                     |
| State                | This shows <b>Err-Disable</b> if the ARP-request rate from this host is over the threshold. Forwarding hosts are not displayed.                           |

## 38.4 Anti-Arpscan Trust Host

Use this screen to create or remove trusted hosts identified by IP address and subnet mask. **Anti-arpscan** is not performed on trusted hosts. To open this screen, click **Advanced Application > Anti-Arpscan > Trust Host**.

**Figure 241** Advanced Application > Anti-Arpscan > Trust Host

| Anti-Arpscan Trust Host |  |         |  | <a href="#">Status</a> |
|-------------------------|--|---------|--|------------------------|
| Name                    |  |         |  |                        |
| Host IP                 |  | 0.0.0.0 |  |                        |
| Mask                    |  | 0.0.0.0 |  |                        |

[Add](#)
[Cancel](#)
[Clear](#)

| Index | Name | Host IP | Mask | <input type="checkbox"/> |
|-------|------|---------|------|--------------------------|
|       |      |         |      |                          |

[Delete](#)
[Cancel](#)

The following table describes the fields in the above screen.

**Table 177** Advanced Application > Anti-Arpscan > Trust Host

| LABEL   | DESCRIPTION                                                                                                                             |
|---------|-----------------------------------------------------------------------------------------------------------------------------------------|
| Name    | Type a descriptive name of up to 32 printable ASCII characters to identify this host.                                                   |
| Host IP | Type the IP address of the host.                                                                                                        |
| Mask    | A trusted host may consist of a subnet of IP addresses. Type a subnet mask to create a single host or a subnet of hosts.                |
| Add     | Click this to create the trusted host.                                                                                                  |
| Cancel  | Click this to reset the values above based or, if not applicable, to clear the fields above.                                            |
| Clear   | Click this to clear the fields above.                                                                                                   |
| Index   | This field displays a sequential number for each trusted host.                                                                          |
| Name    | This field displays the name of the trusted host.                                                                                       |
| Host IP | This field displays the IP address of the trusted host.                                                                                 |
| Mask    | This field displays the subnet mask of the trusted host.                                                                                |
|         | Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries. |
| Delete  | Select an entry checkbox and click <b>Delete</b> to remove the specified entry.                                                         |
| Cancel  | Click this to clear the check boxes above.                                                                                              |

## 38.5 Anti-Arpscan Configure

Use this screen to enable **Anti-Arpscan**, set port and host thresholds as well as configure ports to be trusted or untrusted. To open this screen, click **Advanced Application > Anti-Arpscan > Configure**.

**Figure 242** Advanced Application > Anti-Arpscan > Configure

**Anti-Arpscan Configure** [Status](#)

Active ☐

Port Threshold 100 pps

Host Threshold 10 pps

| Port | Trusted State |
|------|---------------|
| *    | Untrusted ▼   |
| 1    | Untrusted ▼   |
| 2    | Untrusted ▼   |
| 3    | Untrusted ▼   |
| 4    | Untrusted ▼   |
| 5    | Untrusted ▼   |
| 6    | Untrusted ▼   |
| 7    | Untrusted ▼   |
| 8    | Untrusted ▼   |
| 9    | Untrusted ▼   |
| 10   | Untrusted ▼   |
| 11   | Untrusted ▼   |
| 12   | Untrusted ▼   |
| 13   | Untrusted ▼   |
| 14   | Untrusted ▼   |
| 32   | Untrusted ▼   |

[Apply](#) [Cancel](#)

The following table describes the fields in the above screen.

**Table 178** Advanced Application > Anti-Arpscan > Configure

| LABEL          | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Active         | Select this to enable <b>Anti-arpscan</b> on the Switch.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Port Threshold | <p>A port threshold is determined by the number of packets received per second on the port. If the received packet rate is over the threshold, then the port is put into an <b>Err-Disable</b> state. Type the maximum number of packets per second allowed on the port before it is blocked.</p> <p>Note: The allowed range is 2 to 255 packets received per second.</p>                                                                                                                                                                                                                                                                      |
| Host Threshold | <p>A host threshold is determined by the number of ARP-request packets received per second. This is the global threshold rate for all hosts. If the rate of a host is over the threshold, then that host is blocked by using a MAC address filter. A blocked host is released automatically after the MAC aging time expires.</p> <p>Type the maximum number of ARP-request packets allowed by a host before it is blocked.</p> <p>Note: The allowed range is 2 to 100 ARP-request packets per second.</p> <p>Note: The port-based threshold must be larger than the host-based threshold or the host-based threshold will not be applied.</p> |
| Port           | Use port * to have all ports be <b>Untrusted</b> or <b>Trusted</b> . <b>Anti-arpscan</b> is not performed on trusted hosts.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Trusted State  | Select <b>Untrusted</b> or <b>Trusted</b> for the associated port.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |

Table 178 Advanced Application &gt; Anti-Arpscan &gt; Configure

| LABEL  | DESCRIPTION                                                                                                                                                                                                                                                                        |
|--------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Apply  | Click <b>Apply</b> to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the <b>Save</b> link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click this to reset the values in this screen to their last-saved values.                                                                                                                                                                                                          |

# CHAPTER 39

## BPDU Guard

### 39.1 BPDU Guard Overview

A BPDU (Bridge Protocol Data Units) is a data frame that contains information about STP. STP-aware switches exchange BPDUs periodically.

The BPDU guard feature allows you to prevent any new STP-aware switch from connecting to an existing network and causing STP topology changes in the network. If there is any BPDU detected on the port(s) on which BPDU guard is enabled, the Switch disables the port(s) automatically. You can then enable the port(s) manually in the **Basic Setting > Port Setup** screen ([Section 8.5 on page 90](#)) or use the **Errdisable Recovery** screen (see [Section 33.6 on page 317](#)) to have the port(s) become active after a certain time interval.

#### 39.1.1 What You Can Do

- Use the **BPDU Guard Status** screen ([Section 39.2 on page 355](#)) to view the BPDU guard status.
- Use the **BPDU Guard Configuration** screen ([Section 39.3 on page 356](#)) to enable BPDU guard on the Switch.

### 39.2 BPDU Guard Status

Use this screen to view whether BPDU guard is enabled on the Switch and the port status. Click **Advanced Application > BPDU Guard** in the navigation panel.

**Figure 243** Advanced Application > BPDU Guard Status

| BPDU Guard Status                          |        |            | <a href="#">Configuration</a> |
|--------------------------------------------|--------|------------|-------------------------------|
| BPDU guard globally configuration: Disable |        |            |                               |
| Port                                       | Active | Status     |                               |
| 1                                          | No     | Forwarding |                               |
| 2                                          | No     | Forwarding |                               |
| 3                                          | No     | Forwarding |                               |
| 4                                          | No     | Forwarding |                               |
| 5                                          | No     | Forwarding |                               |
| 6                                          | No     | Forwarding |                               |
| 7                                          | No     | Forwarding |                               |
| 8                                          | No     | Forwarding |                               |
| 9                                          | No     | Forwarding |                               |
| 10                                         | No     | Forwarding |                               |
| 11                                         | No     | Forwarding |                               |
| 12                                         | No     | Forwarding |                               |
| 13                                         | No     | Forwarding |                               |
| 14                                         | No     | Forwarding |                               |
| 15                                         | No     | Forwarding |                               |
| 16                                         | No     | Forwarding |                               |
| 17                                         | No     | Forwarding |                               |

The following table describes the fields in the above screen.

Table 179 Advanced Application &gt; BPDU Guard Status

| LABEL                             | DESCRIPTION                                                                                                        |
|-----------------------------------|--------------------------------------------------------------------------------------------------------------------|
| BPDU guard globally configuration | This field displays whether BPDU guard is activated on the Switch.                                                 |
| Port                              | This is the number of the port on the Switch.                                                                      |
| Active                            | This shows whether BPDU guard is activated on the port.                                                            |
| Status                            | This shows whether the port is shut down ( <b>Err-disable</b> ) or able to transmit packets ( <b>Forwarding</b> ). |

## 39.3 BPDU Guard Configuration

Use this screen to turn on the BPDU guard feature on the Switch and port(s).

In the **BPDU Guard Status** screen click **Configuration** to display the configuration screen as shown.



**Figure 244** Advanced Application > BPDU Guard > BPDU Guard Configuration

| Port | Active                   |
|------|--------------------------|
| *    | <input type="checkbox"/> |
| 1    | <input type="checkbox"/> |
| 2    | <input type="checkbox"/> |
| 3    | <input type="checkbox"/> |
| 4    | <input type="checkbox"/> |
| 5    | <input type="checkbox"/> |
| 6    | <input type="checkbox"/> |
| 7    | <input type="checkbox"/> |
| 8    | <input type="checkbox"/> |
| 9    | <input type="checkbox"/> |
| 10   | <input type="checkbox"/> |
| 11   | <input type="checkbox"/> |
| 12   | <input type="checkbox"/> |
| 13   | <input type="checkbox"/> |
| 14   | <input type="checkbox"/> |
| 15   | <input type="checkbox"/> |
| 16   | <input type="checkbox"/> |
| 17   | <input type="checkbox"/> |

The following table describes the fields in the above screen.

Table 180 Advanced Application &gt; BPDU Guard &gt; BPDU Guard Configuration

| LABEL  | DESCRIPTION                                                                                                                                                                                                                                                                        |
|--------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Active | Select this option to enable BPDU guard on the Switch.                                                                                                                                                                                                                             |
| Port   | This field displays the Switch's port number                                                                                                                                                                                                                                       |
| *      | Use this row to make the setting the same for all ports. Use this row first and then make adjustments on a port-by-port basis.<br><br>Note: Changes in this row are copied to all the ports as soon as you make them.                                                              |
| Active | Select this check box to enable the BPDU guard feature on this port. The Switch shuts down this port if there is any BPDU received on the port.<br><br>Clear this check box to disable the BPDU guard feature.                                                                     |
| Apply  | Click <b>Apply</b> to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the <b>Save</b> link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click <b>Cancel</b> to begin configuring this screen afresh.                                                                                                                                                                                                                       |

# CHAPTER 40

# OAM

## 40.1 OAM Overview

Link layer Ethernet OAM (Operations, Administration and Maintenance) as described in IEEE 802.3ah is a link monitoring protocol. It utilizes OAM Protocol Data Units or OAM PDUs to transmit link status information between directly connected Ethernet devices. Both devices must support IEEE 802.3ah. Because link layer Ethernet OAM operates at layer two of the OSI (Open Systems Interconnection Basic Reference) model, neither IP or SNMP are necessary to monitor or troubleshoot network connection problems.

The Switch supports the following IEEE 802.3ah features:

- Discovery - this identifies the devices on each end of the Ethernet link and their OAM configuration.
- Remote Loopback - this can initiate a loopback test between Ethernet devices.

### 40.1.1 What You Can Do

- Use the **OAM Status** screen ([Section 40.2 on page 358](#)) to view the configuration of ports on which Ethernet OAM is enabled.
- Use the **OAM Configuration** screen ([Section 40.3 on page 363](#)) to enable Ethernet OAM on the Switch.
- Use the **OAM Remote Loopback** screen ([Section 40.4 on page 364](#)) to perform remote-loopback tests.

## 40.2 OAM Status

Use this screen to view the configuration of ports on which Ethernet OAM is enabled. Click **Advanced Application > OAM** in the navigation panel.

**Figure 245** Advanced Application > OAM Status

| Local              |      | Remote      |     |      |        |
|--------------------|------|-------------|-----|------|--------|
| Port               | Mode | Mac Address | OUI | Mode | Config |
| <a href="#">1</a>  |      |             |     |      |        |
| <a href="#">2</a>  |      |             |     |      |        |
| <a href="#">3</a>  |      |             |     |      |        |
| <a href="#">4</a>  |      |             |     |      |        |
| <a href="#">5</a>  |      |             |     |      |        |
| <a href="#">6</a>  |      |             |     |      |        |
| <a href="#">7</a>  |      |             |     |      |        |
| <a href="#">8</a>  |      |             |     |      |        |
| <a href="#">9</a>  |      |             |     |      |        |
| <a href="#">10</a> |      |             |     |      |        |
| <a href="#">11</a> |      |             |     |      |        |
| <a href="#">12</a> |      |             |     |      |        |
| <a href="#">13</a> |      |             |     |      |        |
| <a href="#">14</a> |      |             |     |      |        |
| <a href="#">15</a> |      |             |     |      |        |
| <a href="#">16</a> |      |             |     |      |        |
| <a href="#">17</a> |      |             |     |      |        |
| <a href="#">18</a> |      |             |     |      |        |
| <a href="#">19</a> |      |             |     |      |        |

The following table describes the fields in the above screen.

**Table 181** Advanced Application > OAM Status

| LABEL                                                            | DESCRIPTION                                                                                                                                                                                                                                       |
|------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Local                                                            |                                                                                                                                                                                                                                                   |
| This section displays information about the ports on the Switch. |                                                                                                                                                                                                                                                   |
| Port                                                             | This field displays the number of the port on the Switch.                                                                                                                                                                                         |
| Mode                                                             | This field displays the operational state of the port when OAM is enabled on the port.<br><b>Active</b> - Allows the port to issue and respond to Ethernet OAM commands.<br><b>Passive</b> - Allows the port to respond to Ethernet OAM commands. |
| Remote                                                           |                                                                                                                                                                                                                                                   |
| This section displays information about the remote device.       |                                                                                                                                                                                                                                                   |
| Mac Address                                                      | This field displays the MAC address of the remote device.                                                                                                                                                                                         |
| OUI                                                              | This field displays the OUI (first three bytes of the MAC address) of the remote device.                                                                                                                                                          |
| Mode                                                             | This field displays the operational state of the port when OAM is enabled on the port.<br><b>Active</b> - Allows the port to issue and respond to Ethernet OAM commands.<br><b>Passive</b> - Allows the port to respond to Ethernet OAM commands. |
| Config                                                           | This field displays the capabilities of the Switch and remote device.                                                                                                                                                                             |

### 40.2.1 OAM Details

Use this screen to view OAM configuration details and operational status of a specific port. Click a number in the **Port** column in the **OAM Status** screen to display the screen as shown next.

**Figure 246** Advanced Application > OAM Status > OAM Details

| OAM Details |                              | <a href="#">OAM Status</a> |
|-------------|------------------------------|----------------------------|
| Port No: 1  |                              |                            |
| Discovery   | Local Client                 | OAM configurations         |
|             | Mode                         |                            |
|             | Unidirectional               |                            |
|             | Remote loopback              |                            |
|             | Link events                  |                            |
|             | Variable retrieval           |                            |
|             | Max. OAMPDU size             |                            |
|             | Local Client                 | Operational status         |
|             | Link status                  |                            |
|             | Info. revision               |                            |
|             | Parser state                 |                            |
|             | Discovery state              |                            |
|             | Remote Client                |                            |
|             | MAC address                  |                            |
|             | Vendor(oui)                  |                            |
|             | Remote Client                | OAM configurations         |
|             | Mode                         |                            |
|             | Unidirectional               |                            |
|             | Remote loopback              |                            |
|             | Link events                  |                            |
|             | Variable retrieval           |                            |
|             | Max OAMPDU size              |                            |
|             | Remote Client                | Operational status         |
|             | Info revision                |                            |
| Statistics  |                              |                            |
|             | Information OAMPDU Tx        |                            |
|             | Information OAMPDU Rx        |                            |
|             | Event Notification OAMPDU Tx |                            |
|             | Event Notification OAMPDU Rx |                            |
|             | Loopback Control OAMPDU Tx   |                            |
|             | Loopback Control OAMPDU Rx   |                            |
|             | Variable Request OAMPDU Tx   |                            |
|             | Variable Request OAMPDU Rx   |                            |
|             | Variable Response OAMPDU Tx  |                            |
|             | Variable Response OAMPDU Rx  |                            |
|             | Unsupported OAMPDU Tx        |                            |
|             | Unsupported OAMPDU Rx        |                            |

The following table describes the fields in the above screen.

**Table 182** Advanced Application > OAM Status > OAM Details

| LABEL                      | DESCRIPTION                                                                                                                |
|----------------------------|----------------------------------------------------------------------------------------------------------------------------|
| Discovery                  | This section displays OAM configuration details and operational status of the port on the Switch and/or the remote device. |
| Local Client/Remote Client |                                                                                                                            |
| OAM configurations         |                                                                                                                            |

Table 182 Advanced Application &gt; OAM Status &gt; OAM Details

| LABEL                                            | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|--------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Mode                                             | <p>This field displays the OAM mode. The device in active mode (typically the service provider's device) controls the device in passive mode (typically the subscriber's device).</p> <p><b>Active:</b> The port initiates OAM discovery; sends information PDUs; and may send event notification PDUs, variable request/response PDUs, or loopback control PDUs.</p> <p><b>Passive:</b> The port waits for the remote device to initiate OAM discovery; sends information PDUs; may send event notification PDUs; and may respond to variable request PDUs or loopback control PDUs.</p> <p>The Switch might not support some types of PDUs, as indicated in the fields below.</p> |
| Unidirectional                                   | This field indicates whether or not the port can send information PDUs to transmit fault information when the receive path is non-operational.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Remote loopback                                  | This field indicates whether or not the port can use loopback control PDUs to put the remote device into loopback mode.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Link events                                      | This field indicates whether or not the port can interpret link events, such as link fault and dying gasp. Link events are sent in event notification PDUs and indicate when the number of errors in a given interval (time, number of frames, number of symbols, or number of errored frame seconds) exceeds a specified threshold. Organizations may create organization-specific link event TLVs as well.                                                                                                                                                                                                                                                                        |
| Variable retrieval                               | This field indicates whether or not the port can respond to requests for more information, such as requests for Ethernet counters and statistics, about link events.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Max. OAMPDU size                                 | This field displays the maximum size of PDU for receipt and delivery.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Local Client/Remote Client<br>Operational status |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Link status                                      | This field indicates that the link between the Switch port and a connected IEEE 802.3ah-enabled remote Ethernet device is up or down.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Info. revision                                   | This field displays the current version of local state and configuration. This two-octet value starts at zero and increments every time the local state or configuration changes.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Parser state                                     | <p>This field indicates the current state of the parser.</p> <p><b>Forward:</b> The port is forwarding packets normally.</p> <p><b>Loopback:</b> The port is in loopback mode.</p> <p><b>Discard:</b> The port is discarding non-OAM PDUs because it is trying to or has put the remote device into loopback mode.</p>                                                                                                                                                                                                                                                                                                                                                              |

Table 182 Advanced Application &gt; OAM Status &gt; OAM Details

| LABEL                                                                                  | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|----------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Discovery state                                                                        | <p>This field indicates the state in the OAM discovery process. OAM-enabled devices use this process to detect each other and to exchange information about their OAM configuration and capabilities. OAM discovery is a handshake protocol.</p> <p><b>Fault:</b> One of the devices is transmitting OAM PDUs with link fault information, or the interface is not operational.</p> <p><b>Active Send Local:</b> The port is in active mode and is trying to see if the remote device supports OAM.</p> <p><b>Passive Wait:</b> The port is in passive mode and is waiting for the remote device to begin OAM discovery.</p> <p><b>Send Local Remote:</b> This state occurs in the following circumstances.</p> <ul style="list-style-type: none"> <li>The port has discovered the remote device but has not accepted or rejected the connection yet.</li> <li>The port has discovered the remote device and rejected the connection.</li> </ul> <p><b>Send Local Remote OK:</b> The port has discovered the remote device and has accepted the connection. In addition, the remote device has not accepted or rejected the connection yet, or the remote device has rejected the connection.</p> <p><b>Send Any:</b> The port and the remote device have accepted the connection. This is the operating state for OAM links that are fully operational.</p> |
| Remote Client                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| MAC Address                                                                            | This field displays the MAC address of the IEEE 802.3ah-enabled remote Ethernet device that is connected to the Switch.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Vendor(oui)                                                                            | This field displays the Organizationally Unique Identifiers (OUI) representing the vendor of the IEEE 802.3ah-enabled remote Ethernet device that is connected to the Switch.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Statistics                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| This section displays the number of OAM packets transferred on the port of the Switch. |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Information OAMPDU Tx                                                                  | This field displays the number of OAM PDUs sent on the port.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Information OAMPDU Rx                                                                  | This field displays the number of OAM PDUs received on the port.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Event Notification OAMPDU Tx                                                           | This field displays the number of unique or duplicate OAM event notification PDUs sent on the port.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Event Notification OAMPDU Rx                                                           | This field displays the number of unique or duplicate OAM event notification PDUs received on the port.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Loopback Control OAMPDU Tx                                                             | This field displays the number of loopback control OAM PDUs sent on the port.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Loopback Control OAMPDU Rx                                                             | This field displays the number of loopback control OAM PDUs received on the port.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Variable Request OAMPDU Tx                                                             | This field displays the number of OAM PDUs sent to request MIB objects on the remote device.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Variable Request OAMPDU Rx                                                             | This field displays the number of OAM PDUs received requesting MIB objects on the Switch.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Variable Response OAMPDU Tx                                                            | This field displays the number of OAM PDUs sent by the Switch in response to requests.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Variable Response OAMPDU Rx                                                            | This field displays the number of OAM PDUs sent by the remote device in response to requests.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |

Table 182 Advanced Application &gt; OAM Status &gt; OAM Details

| LABEL                 | DESCRIPTION                                                                  |
|-----------------------|------------------------------------------------------------------------------|
| Unsupported OAMPDU Tx | This field displays the number of unsupported OAM PDUs sent on the port.     |
| Unsupported OAMPDU Rx | This field displays the number of unsupported OAM PDUs received on the port. |

## 40.3 OAM Configuration

Use this screen to turn on Ethernet OAM on the Switch and port(s) and configure the related settings.

In the **OAM Status** screen click **Configuration** to display the configuration screen as shown.

Figure 247 Advanced Application &gt; OAM &gt; OAM Configuration

| Port | Active                   | Mode     | Remote Loopback Supported | Remote Loopback Ignore-Rx |
|------|--------------------------|----------|---------------------------|---------------------------|
| *    | <input type="checkbox"/> | Active ▼ | <input type="checkbox"/>  | <input type="checkbox"/>  |
| 1    | <input type="checkbox"/> | Active ▼ | <input type="checkbox"/>  | <input type="checkbox"/>  |
| 2    | <input type="checkbox"/> | Active ▼ | <input type="checkbox"/>  | <input type="checkbox"/>  |
| 3    | <input type="checkbox"/> | Active ▼ | <input type="checkbox"/>  | <input type="checkbox"/>  |
| 4    | <input type="checkbox"/> | Active ▼ | <input type="checkbox"/>  | <input type="checkbox"/>  |
| 5    | <input type="checkbox"/> | Active ▼ | <input type="checkbox"/>  | <input type="checkbox"/>  |
| 6    | <input type="checkbox"/> | Active ▼ | <input type="checkbox"/>  | <input type="checkbox"/>  |
| 7    | <input type="checkbox"/> | Active ▼ | <input type="checkbox"/>  | <input type="checkbox"/>  |
| 8    | <input type="checkbox"/> | Active ▼ | <input type="checkbox"/>  | <input type="checkbox"/>  |
| 9    | <input type="checkbox"/> | Active ▼ | <input type="checkbox"/>  | <input type="checkbox"/>  |
| 10   | <input type="checkbox"/> | Active ▼ | <input type="checkbox"/>  | <input type="checkbox"/>  |
| 11   | <input type="checkbox"/> | Active ▼ | <input type="checkbox"/>  | <input type="checkbox"/>  |
| 12   | <input type="checkbox"/> | Active ▼ | <input type="checkbox"/>  | <input type="checkbox"/>  |
| 13   | <input type="checkbox"/> | Active ▼ | <input type="checkbox"/>  | <input type="checkbox"/>  |
| 14   | <input type="checkbox"/> | Active ▼ | <input type="checkbox"/>  | <input type="checkbox"/>  |
| 15   | <input type="checkbox"/> | Active ▼ | <input type="checkbox"/>  | <input type="checkbox"/>  |
| 16   | <input type="checkbox"/> | Active ▼ | <input type="checkbox"/>  | <input type="checkbox"/>  |

Apply Cancel

The following table describes the fields in the above screen.

Table 183 Advanced Application &gt; OAM &gt; OAM Configuration

| LABEL  | DESCRIPTION                                                                           |
|--------|---------------------------------------------------------------------------------------|
| Active | Select this option to enable Ethernet OAM on the Switch.                              |
| Port   | This field displays the Switch's port number. * means all ports (on the same Switch). |

Table 183 Advanced Application &gt; OAM &gt; OAM Configuration

| LABEL                     | DESCRIPTION                                                                                                                                                                                                                                                                        |
|---------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| *                         | Use this row to make the setting the same for all ports. Use this row first and then make adjustments on a port-by-port basis.<br><br>Note: Changes in this row are copied to all the ports as soon as you make them.                                                              |
| Active                    | Select this check box to enable Ethernet OAM on this port.<br><br>Clear this check box to disable Ethernet OAM on the port.                                                                                                                                                        |
| Mode                      | Specify the OAM mode on the port.<br><br>Select <b>Active</b> to allow the port to issue and respond to Ethernet OAM commands.<br><br>Select <b>Passive</b> to allow the port to respond to Ethernet OAM commands.                                                                 |
| Remote Loopback Supported | Select this check box to enable the remote loopback feature on the port. Otherwise, clear the check box to disable it.                                                                                                                                                             |
| Remote Loopback Ignore-Rx | Select this check box to set the Switch to process loopback commands received on the port. Otherwise, clear the check box to have the Switch ignore loopback commands received on the port.                                                                                        |
| Apply                     | Click <b>Apply</b> to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the <b>Save</b> link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel                    | Click <b>Cancel</b> to begin configuring this screen afresh.                                                                                                                                                                                                                       |

## 40.4 OAM Remote Loopback

Use this screen to perform a remote-loopback test. In the **OAM Status** screen click **Remote Loopback** to display the screen as shown.

Figure 248 Advanced Application &gt; OAM &gt; OAM Remote Loopback

The screenshot shows the 'OAM Remote Loopback' configuration interface. At the top, there's a header 'OAM Remote Loopback' and a link 'OAM Status'. Below this is a large text area labeled '- Info -'. At the bottom, there are two sections: 'Remote Loopback Test' and 'Remote Loopback Mode'. The 'Remote Loopback Test' section has fields for 'Port', 'Number of Packet', and 'Packet Size', followed by a 'Test' button. The 'Remote Loopback Mode' section has a 'Port' field, followed by 'Start' and 'Stop' buttons.



The following table describes the fields in the above screen.

Table 184 Advanced Application > OAM > OAM Remote Loopback

| LABEL                | DESCRIPTION                                                                                                                                  |
|----------------------|----------------------------------------------------------------------------------------------------------------------------------------------|
| Remote Loopback Test |                                                                                                                                              |
| Port                 | Enter the number of the port from which the Switch performs a remote-loopback test.                                                          |
| Number of Packet     | Define the allowable packet number of the loopback test frames.                                                                              |
| Packet Size          | Define the allowable packet size of the loopback test frames.                                                                                |
| Test                 | Click <b>Test</b> to begin the test.                                                                                                         |
| Remote Loopback Mode |                                                                                                                                              |
| Port                 | Enter the number of the port from which the Switch sends loopback control PDUs to initiate or terminate a remote-loopback test.              |
| Start                | Click <b>Start</b> to initiate a remote-loopback test from the specified port by sending Enable Loopback Control PDUs to the remote device.  |
| Stop                 | Click <b>Stop</b> to terminate a remote-loopback test from the specified port by sending Disable Loopback Control PDUs to the remote device. |

# CHAPTER 41

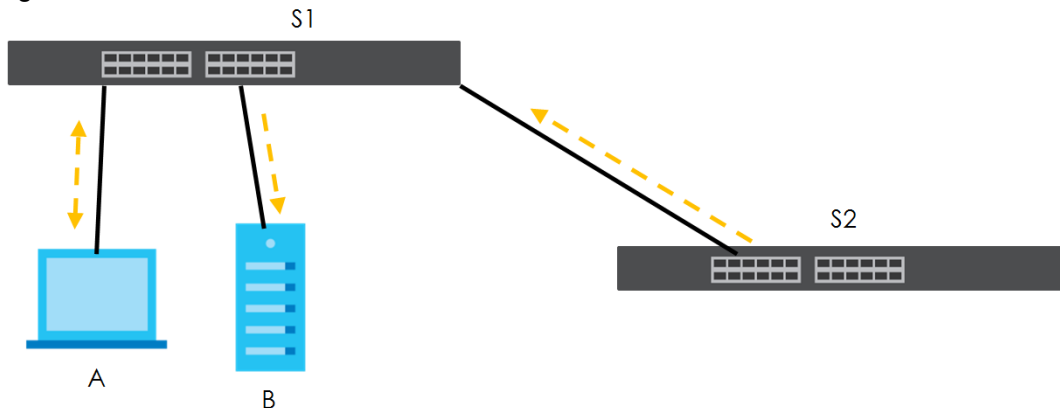
## ZULD

### 41.1 ZULD Overview

A unidirectional link is a connection where the link is up on both ends, but only one end can receive packets. This may happen if OAM was initially enabled but then disabled, there are misconfigured transmitting or receiving lines or the hardware is malfunctioning. Zyxel Unidirectional Link Detection (**ZULD**) is a layer-2 protocol that can detect and disable these physical one-way links before they cause loops or communication malfunction.

In the figure below, S1 - A is a bidirectional link as both ends can send packets to each other. S1-B is unidirectional as B cannot send packets to S1 (although the S1-B link is up). Similarly, S2-S1 is unidirectional as S1 cannot send packets to S2 (although the S1-S2 link is up).

**Figure 249** ZULD Overview



#### 41.1.1 What You Can Do

- Use the **ZULD Status** screen ([Section 41.2 on page 367](#)) to see details on ZULD.
- Use the **ZULD Configuration** screen ([Section 41.3 on page 368](#)) to enable ZULD on a port, configure a mode and set the probe time.

#### 41.1.2 What You Need to Know

- ZULD must be enabled on the Switch and the port(s) in order to detect unidirectional links by monitoring OAMPDUs.
- Ports advertise their unidirectional link detection capability using OAMPDUs, so all connected devices must support **OAM** as well as **ZULD**. You need to enable OAM on the Switch by going to **Advanced Application > OAM > Configuration** and selecting **Active**. OAM must be enabled on other connected devices too. If OAM is not enabled initially, **ZULD** will not work.

- If OAM is enabled initially and later disabled on one end of a link, the link will be unidirectional as that end cannot send OAMPDUs.
- OAM discovery, the sending of OAMPDUs to other ports, is initiated by an active port.
- When **ZULD** detects a unidirectional link, it sends a syslog and SNMP trap and may shut down the affected port (**Aggressive Mode**).
- If a port on the Switch is shut down by **ZULD**, and you want to recover it, then do one of the following:
  - Go to **Basic Setting > Port Setup**. Clear **Active** and click **Apply**. Then select **Active** and click **Apply** again.
  - Go to **Application > Errdisable > Errdisable Recovery** and set the interval for **ZULD**. After the interval expires, the closed port(s) will become active and start receiving packets again.
  - Use the command `port no inactive`.
- Refer to the ZULD logs to see when a unidirectional link is detected and when it is recovered to a bidirectional link.

## 41.2 ZULD Status

Use this screen to see details of unidirectional and bidirectional links discovered by **ZULD**. To open this screen, click **Advanced Application > ZULD**.

**Figure 250** Advanced Application > ZULD Status

| Port | Active | Mode   | Probe Time | Link State | Remote Operation | Remote MAC Addr | Remote Port |
|------|--------|--------|------------|------------|------------------|-----------------|-------------|
| 1    | No     | Normal |            |            |                  |                 |             |
| 2    | No     | Normal |            |            |                  |                 |             |
| 3    | No     | Normal |            |            |                  |                 |             |
| 4    | No     | Normal |            |            |                  |                 |             |
| 5    | No     | Normal |            |            |                  |                 |             |
| 6    | No     | Normal |            |            |                  |                 |             |
| 7    | No     | Normal |            |            |                  |                 |             |
| 8    | No     | Normal |            |            |                  |                 |             |
| 9    | No     | Normal |            |            |                  |                 |             |
| 10   | No     | Normal |            |            |                  |                 |             |
| 11   | No     | Normal |            |            |                  |                 |             |
| 12   | No     | Normal |            |            |                  |                 |             |
| 13   | No     | Normal |            |            |                  |                 |             |
| 14   | No     | Normal |            |            |                  |                 |             |
| 15   | No     | Normal |            |            |                  |                 |             |
| 16   | No     | Normal |            |            |                  |                 |             |

The following table describes the fields in the above screen.

Table 185 Advanced Application > ZULD Status

| LABEL       | DESCRIPTION                                                                                                                                  |
|-------------|----------------------------------------------------------------------------------------------------------------------------------------------|
| ZULD is.... | This shows whether <b>ZULD</b> is enabled or disabled on the Switch.                                                                         |
| Port        | This field displays the port number of the Switch.                                                                                           |
| Active      | This field displays whether ZULD is enabled on the port or not. ZULD must be enabled to detect an unidirectional link by monitoring OAMPDUs. |

Table 185 Advanced Application &gt; ZULD Status

| LABEL            | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Mode             | This field indicates what <b>ZULD</b> will do when a unidirectional link is detected. In <b>Normal</b> mode, <b>ZULD</b> only sends a syslog and trap when it detects a unidirectional link. In <b>Aggressive</b> mode, <b>ZULD</b> shuts down the port (puts it into an <b>ErrDisable</b> state) as well as sends a syslog and trap when it detects a unidirectional link.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Probe Time       | Probe time is the length of time that <b>ZULD</b> waits before declaring that a link is unidirectional. When the probe time expires, and one port (either on the Switch or the connected device) still has not received an OAMPDU, then <b>ZULD</b> declares that the link is unidirectional.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Link State       | This field shows the following link states: <ul style="list-style-type: none"> <li>• <b>Linkdown:</b> This is an initialization state, where the port is not yet up.</li> <li>• <b>Probe:</b> This indicates that <b>ZULD</b> is discovering the connected device on this link.</li> <li>• <b>Bidirectional:</b> Traffic sent by the Switch is received by the connected device on this link, and traffic from the connected device on this link is received by the Switch.</li> <li>• <b>Unidirectional:</b> The state of the link between the port and its connected port cannot be determined either because no ZULD message was received, or one port is not capable of sending traffic.</li> <li>• <b>Shutdown:</b> The port has been shut down because its link with the connected device is unidirectional and <b>ZULD</b> is in <b>Aggressive</b> mode.</li> </ul> |
| Remote Operation | This field displays whether ZULD is enabled or disabled on the connected device on this link. ZULD must be enabled on the connected device and on the port that's connecting to the Switch.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Remote MAC Addr  | This is the MAC address of the port on the connected device to which the port of the Switch is connected.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Remote Port      | This is the port number of the port on the connected device to which the port of the Switch is connected.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |

## 41.3 ZULD Configuration

Use this screen to enable ZULD on a port, configure a mode and set the probe time. To open this screen, click **Advanced Application > ZULD > Configuration**.

**Figure 251** Advanced Application > ZULD > Configuration

| Port | Active                   | Mode     | Probe Time |
|------|--------------------------|----------|------------|
| *    | <input type="checkbox"/> | Normal ▼ |            |
| 1    | <input type="checkbox"/> | Normal ▼ | 5          |
| 2    | <input type="checkbox"/> | Normal ▼ | 5          |
| 3    | <input type="checkbox"/> | Normal ▼ | 5          |
| 4    | <input type="checkbox"/> | Normal ▼ | 5          |
| 5    | <input type="checkbox"/> | Normal ▼ | 5          |
| 6    | <input type="checkbox"/> | Normal ▼ | 5          |
| 7    | <input type="checkbox"/> | Normal ▼ | 5          |
| 8    | <input type="checkbox"/> | Normal ▼ | 5          |
| 9    | <input type="checkbox"/> | Normal ▼ | 5          |
| 10   | <input type="checkbox"/> | Normal ▼ | 5          |
| 11   | <input type="checkbox"/> | Normal ▼ | 5          |
| 12   | <input type="checkbox"/> | Normal ▼ | 5          |
| 13   | <input type="checkbox"/> | Normal ▼ | 5          |
| 14   | <input type="checkbox"/> | Normal ▼ | 5          |
| 15   | <input type="checkbox"/> | Normal ▼ | 5          |
| 16   | <input type="checkbox"/> | Normal ▼ | 5          |

Apply Cancel

The following table describes the fields in the above screen.

Table 186 Advanced Application &gt; ZULD &gt; Configuration

| LABEL      | DESCRIPTION                                                                                                                                                                                                                                                                                                                                 |
|------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Active     | Select this to enable <b>ZULD</b> on the Switch.                                                                                                                                                                                                                                                                                            |
| Port       | Use port * to configure all ports to have the same settings. Alternatively, select individual ports for different settings.                                                                                                                                                                                                                 |
| Active     | Select this to enable <b>ZULD</b> on the port. ZULD must be enabled to detect an unidirectional link by monitoring OAMPDUs.                                                                                                                                                                                                                 |
| Mode       | Select <b>Normal</b> or <b>Aggressive</b> . In <b>Normal</b> mode, ZULD only sends a syslog and trap when it detects a unidirectional link. In <b>Aggressive</b> mode, ZULD shuts down the port (puts it into an <b>ErrDisable</b> state) as well as sends a syslog and trap when it detects a unidirectional link.                         |
| Probe Time | Type the length of time that <b>ZULD</b> waits before declaring that a link is unidirectional. When the probe time expires, and one port (either on the Switch or the connected device) still has not received an OAMPDU, then <b>ZULD</b> declares that the link is unidirectional.<br><br>The allowed time range is from 5-65535 seconds. |
| Apply      | Click <b>Apply</b> to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the <b>Save</b> link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.                                                          |
| Cancel     | Click this to reset the values in this screen to their last-saved values.                                                                                                                                                                                                                                                                   |

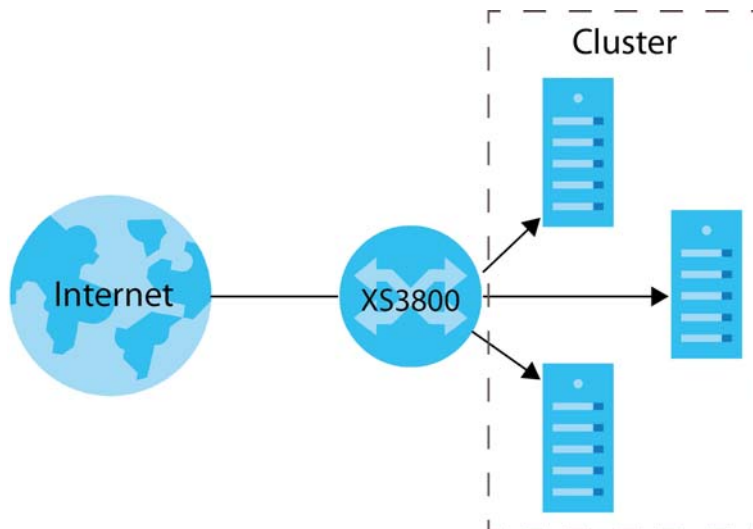
# CHAPTER 42

## NLB

### 42.1 NLB Overview

The Switch supports NLB (Network Load Balancing) traffic distribution. The Switch will copy and forward the incoming traffic to a cluster(s). Each server in a cluster tackles a separate copy of traffic.

**Figure 252** NLB Traffic Distribution



The Switch only supports up to 2 clusters for NLB traffic distribution.

Note: NLB settings are configured on the servers.

See [Section 42.1.2 on page 371](#) for more information about NLB.

#### 42.1.1 What You Can Do

- Use the **MAC Forwarding** screen ([Section 42.2 on page 371](#)) to configure to which MAC addresses and ports the Switch should forward the incoming NLB traffic.
- Use the **IP Configuration** screen ([Section 42.3 on page 373](#)) to map the IP address to the MAC address of a cluster for layer-3 forwarding.

## 42.1.2 What You Need to Know

### NLB

Network Load Balancing (NLB) is a feature developed by Microsoft. NLB enhances the performance reliability for critical applications by sharing traffic with multiple servers in a cluster using TCP/IP protocol. Each server of a cluster tackles a copy of a traffic. You can create a cluster by grouping up to 32 servers together.

If a server in a cluster fails, traffic will be redistributed to the other operating servers. When the server is back in service, it will join the cluster automatically and share the traffic.

### Unicast Mode

NLB replaces the real MAC addresses of the servers in a cluster with a unicast MAC address. Each server uses the same unicast MAC address, and a switch can't map the unicast MAC address to a port. This forces a switch to flood traffic meant for the cluster to all ports of the switch to make sure the traffic is forwarded to the right destination.

The servers in a cluster can't communicate with each other, because they use the same unicast MAC address.

### Multicast Mode

NLB assigns a multicast MAC address to the servers in a cluster. Therefore, each server has two MAC addresses, the real MAC address and the multicast MAC address.

Create static ARP entries on a switch for the servers, so the switch will only forward traffic to the servers of the cluster.

The servers in a cluster can communicate with each other, because they keep their real MAC address and already have their own IP addresses.

## 42.2 MAC Forwarding

Use this screen to configure to which MAC addresses and ports the Switch should forward the incoming NLB traffic.

Click **Advanced Application > NLB** in the navigation panel to display the screen as shown.

Note: The following screens cannot have duplicate settings as the **Advanced Application > NLB** screen.

- **Advanced Application > Static MAC Forwarding**
- **Advanced Application > Static Multicast Forwarding**
- **Advanced Application > Filtering**

**Figure 253** Advanced Application > NLB

The following table describes the labels in this screen.

**Table 187** Advanced Application > NLB

| LABEL          | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| MAC forwarding |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Name           | Enter a descriptive name for identification purposes for this rule.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| MAC Address    | <p>Enter a multicast or unicast MAC address of a cluster.</p> <p>The last binary bit of the first octet pair in a multicast MAC address must be 1. For example, the first octet pair 00000001 is 01 and 00000011 is 03 in hexadecimal, so 01:00:5e:00:00:0A and 03:00:5e:00:00:27 are valid multicast MAC addresses.</p> <p>The last binary bit of the first octet pair in a unicast MAC address must be 0. For example, the first octet pair 00000000 is 00 and 00000010 is 02 in hexadecimal, so 00:00:5e:00:00:0A and 02:00:5e:00:00:27 are valid unicast MAC addresses.</p> |
| VID            | <p>Enter the VLAN identification number. If you don't have a specific target VLAN, enter 1.</p> <p>The Switch will forward traffic to ports in this VLAN group.</p>                                                                                                                                                                                                                                                                                                                                                                                                             |
| Port           | <p>Enter the port(s) to which you want the Switch to forward the incoming NLB traffic.</p> <p>You can enter multiple ports separated by (no space) comma (,) or hyphen (-). For example, enter "3-5" for ports 3, 4, and 5. Enter "3,5,7" for ports 3, 5, and 7.</p>                                                                                                                                                                                                                                                                                                            |
| Add            | Click <b>Add</b> to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the <b>Save</b> link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.                                                                                                                                                                                                                                                                                                |
| Cancel         | Click <b>Cancel</b> to begin configuring this screen afresh.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Clear          | Click <b>Clear</b> to reset the fields to the factory defaults.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Index          | This field displays the index number of the rule.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Name           | This field displays the descriptive name of the rule.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| MAC Address    | This field displays the multicast/unicast MAC address of this rule.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| VID            | This field displays the VLAN group identification number.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Port           | This field displays the ports to which the Switch will forward the incoming NLB traffic.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|                | Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries.                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Delete         | Click <b>Delete</b> to remove the selected entry from the summary table.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Cancel         | Click <b>Cancel</b> to clear the check boxes.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |



## 42.3 IP Configuration

Use this screen to map the IP address to the MAC address of a cluster for layer-3 forwarding. Use the MAC address added in the **Advanced Application > NLB** screen.

Click **Advanced Application > NLB > IP configuration** in the navigation panel to display the screen as shown.

Note: The settings configured in the **Advanced Application > NLB > IP configuration** and **IP Application > ARP Setup > Static ARP** screens cannot duplicate.

**Figure 254** Advanced Application > NLB > IP configuration

The following table describes the labels in this screen.

Table 188 Advanced Application > NLB > IP configuration

| LABEL          | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| MAC forwarding |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Name           | Enter a descriptive name for identification purposes for this rule.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| IP Address     | Enter an IPv4 or IPv6 address for a cluster.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| MAC Address    | Enter a multicast or unicast MAC address added in the <b>Advanced Application &gt; NLB</b> screen.<br><br>The last binary bit of the first octet pair in a multicast MAC address must be 1. For example, the first octet pair 00000001 is 01 and 00000011 is 03 in hexadecimal, so 01:00:5e:00:00:0A and 03:00:5e:00:00:27 are valid multicast MAC addresses.<br><br>The last binary bit of the first octet pair in a unicast MAC address must be 0. For example, the first octet pair 00000000 is 00 and 00000010 is 02 in hexadecimal, so 00:00:5e:00:00:0A and 02:00:5e:00:00:27 are valid unicast MAC addresses. |
| Add            | Click <b>Add</b> to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the <b>Save</b> link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.                                                                                                                                                                                                                                                                                                                                     |
| Cancel         | Click <b>Cancel</b> to begin configuring this screen afresh.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Clear          | Click <b>Clear</b> to reset the fields to the factory defaults.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Index          | This field displays the index number of the rule.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Name           | This field displays the descriptive name of the rule.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| IP Address     | This field displays the IP address of the cluster.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| MAC Address    | This field displays the multicast/unicast MAC address of this rule.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|                | Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries.                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |

Table 188 Advanced Application &gt; NLB &gt; IP configuration (continued)

| LABEL  | DESCRIPTION                                                              |
|--------|--------------------------------------------------------------------------|
| Delete | Click <b>Delete</b> to remove the selected entry from the summary table. |
| Cancel | Click <b>Cancel</b> to clear the check boxes.                            |

# CHAPTER 43

## Wol Relay

### 43.1 Wol Relay Overview

Wake On LAN is a feature to remotely turn on a device on the LAN network. A device is turned on by receiving a magic packet. To use this feature the remote hardware (for example the network adapter on a computer) must support Wake On LAN using the "Magic Packet" method.

A magic packet is a UDP broadcast packet. The device that you want to turn on is off, so it can't respond to a TCP packet. Therefore, It has to be a UDP broadcast packet to turn on a device.

Broadcast packets are generally not routed. A magic packet can't be routed. This prevents DDoS attacks, but also prohibits you from sending magic packets to other devices in different subnets. The Switch's Wake On LAN relay feature allows you to send magic packets to devices across different subnets.

### 43.2 Wol Relay

Use this screen to configure settings on Wake On LAN relay. Click **Advanced Application > Wol Relay** to open the following screen.

**Figure 255** Advanced Application > Wol Relay

| Wol Relay                   |     |             |                  |  |
|-----------------------------|-----|-------------|------------------|--|
| UDP                         |     |             |                  |  |
| Source VLAN                 |     |             |                  |  |
| Destination VLAN            |     |             |                  |  |
| <div>Add Cancel Clear</div> |     |             |                  |  |
| Index                       | UDP | Source VLAN | Destination VLAN |  |
| <div>Delete Cancel</div>    |     |             |                  |  |

The following table describes the labels in this screen.

Table 189 Advanced Application > Wol Relay

| LABEL            | DESCRIPTION                                                                                                                                                                                                                                                                      |
|------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Wol Relay        |                                                                                                                                                                                                                                                                                  |
| UDP              | Enter a UDP port number that magic packets are sent through.<br>The most common port for transmission is UDP port 9.                                                                                                                                                             |
| Source VLAN      | Enter the source VLAN ID where the magic packet originates from.                                                                                                                                                                                                                 |
| Destination VLAN | Enter the destination VLAN ID where the magic packet will be sent to.                                                                                                                                                                                                            |
| Add              | Click <b>Add</b> to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the <b>Save</b> link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel           | Click Cancel to begin configuring this screen afresh.                                                                                                                                                                                                                            |
| Clear            | Click <b>Clear</b> to reset the fields to the factory defaults.                                                                                                                                                                                                                  |
| Index            | This field displays the index number of the rule.                                                                                                                                                                                                                                |
| UDP              | This field displays the UDP port of the rule.                                                                                                                                                                                                                                    |
| Source VLAN      | This field displays the source VLAN ID of the rule.                                                                                                                                                                                                                              |
| Destination VLAN | This field displays the destination VLAN ID of the rule.                                                                                                                                                                                                                         |
| Delete           | Click <b>Delete</b> to remove the selected entry from the summary table.                                                                                                                                                                                                         |
| Cancel           | Click <b>Cancel</b> to clear the check boxes.                                                                                                                                                                                                                                    |

# CHAPTER 44

## Static Route

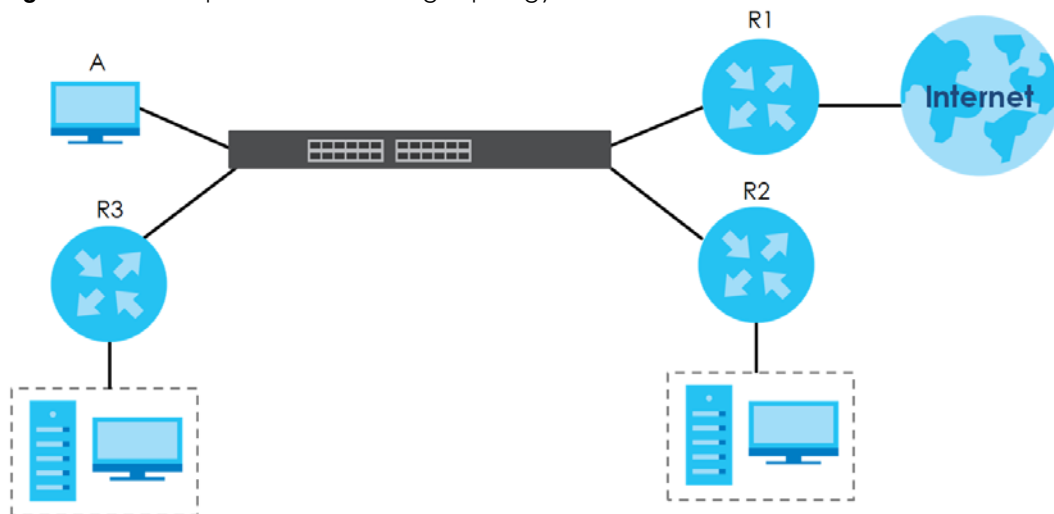
This chapter shows you how to configure static routes.

### 44.1 Static Routing Overview

The Switch usually uses the default gateway to route outbound traffic from computers on the LAN to the Internet. To have the Switch send data to devices not reachable through the default gateway, use static routes.

For example, the next figure shows a computer (**A**) connected to the Switch. The Switch routes most traffic from **A** to the Internet through the Switch's default gateway (**R1**). You create one static route to connect to services offered by your ISP behind router **R2**. You create another static route to communicate with a separate network behind a router **R3** connected to the Switch.

**Figure 256** Example of Static Routing Topology



### 44.2 Static Routing

Click **IP Application > Static Routing** in the navigation panel to display the screen as shown. Click the link next to **IPv4 Static Route** to open a screen where you can create IPv4 static routing rules. Click the link next to **IPv6 Static Route** to open a screen where you can create IPv6 static routing rules.

**Figure 257** IP Application > Static Routing

| Static Routing    |                            |
|-------------------|----------------------------|
| IPv4 Static Route | <a href="#">Click Here</a> |
| IPv6 Static Route | <a href="#">Click Here</a> |

## 44.3 Configuring IPv4 Static Route

Click the link next to **IPv4 Static Route** in the **IP Application > Static Routing** screen to display the screen as shown.

**Figure 258** IP Application > Static Routing > IPv4 Static Route

IPv4 Static Route [Static Routing](#)

Active ☐

Name

Destination IP Address

IP Subnet Mask

Gateway IP Address

Metric

Add Cancel Clear

| Index         | Active | Name | Destination Address | Subnet Mask | Gateway Address | Metric |
|---------------|--------|------|---------------------|-------------|-----------------|--------|
| Delete Cancel |        |      |                     |             |                 |        |

The following table describes the related labels you use to create a static route.

Table 190 IP Application &gt; Static Routing &gt; IPv4 Static Route

| LABEL                  | DESCRIPTION                                                                                                                                                                                                                                                                                                                                               |
|------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Active                 | This field allows you to activate/deactivate this static route.                                                                                                                                                                                                                                                                                           |
| Name                   | Enter a descriptive name (up to 10 printable ASCII characters) for identification purposes.                                                                                                                                                                                                                                                               |
| Destination IP Address | This parameter specifies the IP network address of the final destination. Routing is always based on network number. If you need to specify a route to a single host, use a subnet mask of 255.255.255.255 in the subnet mask field to force the network number to be identical to the host ID.                                                           |
| IP Subnet Mask         | Enter the subnet mask for this destination.                                                                                                                                                                                                                                                                                                               |
| Gateway IP Address     | Enter the IP address of the gateway. The gateway is an immediate neighbor of your Switch that will forward the packet to the destination. The gateway must be a router on the same segment as your Switch.                                                                                                                                                |
| Metric                 | The metric represents the "cost" of transmission for routing purposes. IP routing uses hop count as the measurement of cost, with a minimum of 1 for directly connected networks. Enter a number that approximates the cost for this link. The number need not be precise, but it must be between 1 and 15. In practice, 2 or 3 is usually a good number. |

Table 190 IP Application &gt; Static Routing &gt; IPv4 Static Route (continued)

| LABEL               | DESCRIPTION                                                                                                                                                                                                                                                                              |
|---------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Add                 | Click <b>Add</b> to insert a new static route to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the <b>Save</b> link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel              | Click <b>Cancel</b> to begin configuring this screen afresh.                                                                                                                                                                                                                             |
| Clear               | Click <b>Clear</b> to set the above fields back to the factory defaults.                                                                                                                                                                                                                 |
| Index               | This field displays the index number of the route. Click a number to edit the static route entry.                                                                                                                                                                                        |
| Active              | This field displays <b>Yes</b> when the static route is activated and <b>NO</b> when it is deactivated.                                                                                                                                                                                  |
| Name                | This field displays the descriptive name for this route. This is for identification purposes only.                                                                                                                                                                                       |
| Destination Address | This field displays the IP network address of the final destination.                                                                                                                                                                                                                     |
| Subnet Mask         | This field displays the subnet mask for this destination.                                                                                                                                                                                                                                |
| Gateway Address     | This field displays the IP address of the gateway. The gateway is the immediate neighbor of your Switch that will forward the packet to the destination.                                                                                                                                 |
| Metric              | This field displays the cost of transmission for routing purposes.                                                                                                                                                                                                                       |
|                     | Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries.                                                                                                                                                  |
| Delete              | Click <b>Delete</b> to remove the selected entry from the summary table.                                                                                                                                                                                                                 |
| Cancel              | Click <b>Cancel</b> to clear the check boxes.                                                                                                                                                                                                                                            |

## 44.4 Configuring IPv6 Static Route

Click the link next to **IPv6 Static Route** in the **IP Application > Static Routing** screen to display the screen as shown.

Figure 259 IP Application &gt; Static Routing &gt; IPv6 Static Route

The screenshot shows the 'IPv6 Static Route' configuration interface. At the top, there's a title bar with 'IPv6 Static Route' and a link to 'Static Routing'. Below this, there are several input fields: 'Route Destination', 'Prefix Length', 'Next Hop', 'Interface Type' (which has a dropdown menu currently showing 'VLAN'), and 'Interface ID'. Underneath these fields are two buttons: 'Add' and 'Cancel'. At the bottom of the screen, there is a table with the following columns: 'Index', 'Interface', 'Route Destination/Prefix Length', 'Next Hop', and a checkbox. Below the table are two more buttons: 'Delete' and 'Cancel'.

The following table describes the related labels you use to create a static route.

Table 191 IP Application > Static Routing > IPv6 Static Route

| LABEL                           | DESCRIPTION                                                                                                                                                                                                                                                                              |
|---------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Route Destination               | Enter the IPv6 address of the final destination.                                                                                                                                                                                                                                         |
| Prefix Length                   | Enter the prefix length number of up to 64 for this destination.                                                                                                                                                                                                                         |
| Next Hop                        | Enter the IPv6 address of the next-hop router.                                                                                                                                                                                                                                           |
| Interface Type                  | Select the type of the IPv6 interface through which the IPv6 packets are forwarded.<br>The Switch supports only the VLAN interface type at the time of writing.                                                                                                                          |
| Interface ID                    | Enter the ID number of the IPv6 interface through which the IPv6 packets are forwarded.                                                                                                                                                                                                  |
| Add                             | Click <b>Add</b> to insert a new static route to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the <b>Save</b> link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel                          | Click <b>Cancel</b> to begin configuring this screen afresh.                                                                                                                                                                                                                             |
| Index                           | This field displays the index number of the route. Click a number to edit the static route entry.                                                                                                                                                                                        |
| Interface                       | This field displays the descriptive name of the interface that is used to forward the packets to the destination.                                                                                                                                                                        |
| Route Destination/Prefix Length | This field displays the IPv6 subnet prefix and prefix length of the final destination.                                                                                                                                                                                                   |
| Next Hop                        | This field displays the IPv6 address of the gateway that helps forward the packet to the destination.                                                                                                                                                                                    |
|                                 | Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries.                                                                                                                                                  |
| Delete                          | Click <b>Delete</b> to remove the selected entry from the summary table.                                                                                                                                                                                                                 |
| Cancel                          | Click <b>Cancel</b> to clear the check boxes.                                                                                                                                                                                                                                            |



# CHAPTER 45

## Policy Routing

This chapter shows you how to configure policy routing rules.

### 45.1 Policy Route Overview

Traditionally, routing is based on the destination address only and the Switch takes the shortest path to forward a packet. Policy routing provides a mechanism to override the default routing behavior and alter the packet forwarding based on the policy defined by the network administrator. Policy-based routing is applied to incoming packets prior to the normal routing.

Individual routing policies are used as part of the overall policy routing process. A routing policy defines the action to take when a packet meets the criteria in a specified classifier. The action is taken only when all the criteria are met.

#### 45.1.1 Benefits

- **Source-Based Routing** – Network administrators can use policy-based routing to direct traffic from different users through different connections.
- **Cost Savings** – Policy routing allows organizations to distribute interactive traffic on high-bandwidth, high-cost paths while using low-cost paths for batch traffic.
- **Load Sharing** – Network administrators can use policy routing to distribute traffic among multiple paths.

### 45.2 Configuring Policy Routing Profile

Click **IP Application > Policy Routing** in the navigation panel to display the screen as shown. Use this screen to configure a policy routing profile, which can consist of multiple policy routing rules.

**Figure 260** IP Application > Policy Routing

The screenshot shows a web-based configuration interface for Policy Routing. At the top, there's a header bar with 'Policy Route' on the left and a blue link 'Rule Configuration' on the right. Below this is a form area with two main sections. The first section contains an 'Active' checkbox and a 'Profile Name' text input field. Below these is a row of three blue buttons: 'Add', 'Cancel', and 'Clear'. The second section is a table with three columns: 'Index', 'Active', and 'Profile name'. The 'Active' column has a checkbox. Below the table is a row of two blue buttons: 'Delete' and 'Cancel'.

The following table describes the labels in this screen.

Table 192 IP Application > Policy Routing

| LABEL        | DESCRIPTION                                                                                                                                                                                                                                                                                                                              |
|--------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Active       | This field allows you to activate/deactivate this policy routing profile and rules in the profile.                                                                                                                                                                                                                                       |
| Profile Name | Enter a descriptive name (up to 32 printable ASCII characters) for identification purposes. Spaces are allowed.                                                                                                                                                                                                                          |
| Add          | Click this to create a new entry or to update an existing one.<br><br>This saves your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the <b>Save</b> link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel       | Click <b>Cancel</b> to reset the fields to your previous configuration.                                                                                                                                                                                                                                                                  |
| Clear        | Click <b>Clear</b> to set the above fields back to the factory defaults.                                                                                                                                                                                                                                                                 |
| Index        | This field displays the index number of the policy routing profile. Click a number to edit the policy routing profile entry.                                                                                                                                                                                                             |
| Active       | This field displays <b>Yes</b> when the policy routing profile is activated and <b>No</b> when it is deactivated.                                                                                                                                                                                                                        |
| Profile Name | This field displays the descriptive name for this profile. This is for identification purposes only.                                                                                                                                                                                                                                     |
|              | Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries.                                                                                                                                                                                                  |
| Delete       | Click <b>Delete</b> to remove the selected entry from the summary table.                                                                                                                                                                                                                                                                 |
| Cancel       | Click <b>Cancel</b> to clear the check boxes.                                                                                                                                                                                                                                                                                            |

## 45.2.1 Policy Routing Rule Configuration

You must first configure a layer-3 classifier in the **Classifier** screen (see [Section 21.2 on page 199](#)) and a policy routing profile in the **Policy Routing** screen (see [Section 45.2 on page 381](#)).

Use this screen to configure a policy route to override the default (shortest path) routing behavior and forward packets based on the classifier and action you specify. A policy route rule defines the matching classifier and the action to take when a packet meets the criteria in the classifier. The action is taken only when all the criteria are met. Policy-based routing is applied to incoming packets on a per interface basis before normal routing. The Switch does not perform normal routing on packets that match any of the policy routes.

Click **Rule Configuration** in the **IP Application > Policy Routing** screen to display the screen as shown.

**Figure 261** IP Application > Policy Routing > Rule Configuration

The following table describes the labels in this screen.

**Table 193** IP Application > Policy Routing > Rule Configuration

| LABEL        | DESCRIPTION                                                                                                                                                                                                                                                                                                                              |
|--------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Profile Name | This field displays the policy routing profile(s) you configure in the <b>IP Application &gt; Policy Routing</b> screen.<br><br>Select a profile for which you want to configure a policy routing rule.                                                                                                                                  |
| Sequence     | Enter the rule number from 1 to 64. The ordering of your rules is important as rules are applied in turn.<br><br>You can not specify a number already in use by another rule.                                                                                                                                                            |
| Statement    | Select <b>Permit</b> to forward traffic that matches this rule to the gateway specified in the rule.<br><br>Select <b>Deny</b> to disable the rule action and forward traffic that matches this rule according to the routing table on the Switch.                                                                                       |
| Classifier   | This field displays the available active classifiers you configure in the <b>Classifier</b> screen (see <a href="#">Chapter 21 on page 199</a> ), which are not used by any policy rule or policy routing rule.<br><br>Select a classifier to which this policy routing rule applies.                                                    |
| Action       | Enter the IP address of the gateway. The gateway is an immediate neighbor of your Switch that will forward the packet to the destination.                                                                                                                                                                                                |
| Add          | Click this to create a new entry or to update an existing one.<br><br>This saves your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the <b>Save</b> link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel       | Click <b>Cancel</b> to reset the fields to your previous configuration.                                                                                                                                                                                                                                                                  |
| Clear        | Click <b>Clear</b> to set the above fields back to the factory defaults.                                                                                                                                                                                                                                                                 |
| Active       | This field displays whether the policy route profile is enabled or not.                                                                                                                                                                                                                                                                  |
| Profile Name | This field displays the name of the policy route profile with which the rule is associated.                                                                                                                                                                                                                                              |

Table 193 IP Application &gt; Policy Routing &gt; Rule Configuration (continued)

| LABEL      | DESCRIPTION                                                                                                                                              |
|------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|
| Seq        | This field displays the rule index number that you configure in the <b>Sequence</b> field. Click an index number to change the rule's <b>Statement</b> . |
| State      | This field displays <b>permit</b> when the rule action is activated and <b>deny</b> when is it deactivated.                                              |
| Classifier | This field displays the name of the classifier to which this policy applies.                                                                             |
|            | Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries.                  |
| Delete     | Click <b>Delete</b> to remove the selected entry(ies) from the summary table.                                                                            |
| Cancel     | Click <b>Cancel</b> to clear the check boxes.                                                                                                            |

# CHAPTER 46

## Differentiated Services

This chapter shows you how to configure Differentiated Services (DiffServ) on the Switch.

### 46.1 DiffServ Overview

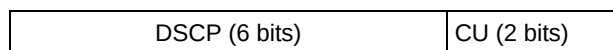
Quality of Service (QoS) is used to prioritize source-to-destination traffic flows. All packets in the flow are given the same priority. You can use CoS (class of service) to give different priorities to different packet types.

DiffServ is a class of service (CoS) model that marks packets so that they receive specific per-hop treatment at DiffServ-compliant network devices along the route based on the application types and traffic flow. Packets are marked with DiffServ Code Points (DSCPs) indicating the level of service desired. This allows the intermediary DiffServ-compliant network devices to handle the packets differently depending on the code points without the need to negotiate paths or remember state information for every flow. In addition, applications do not have to request a particular service or give advanced notice of where the traffic is going.

#### 46.1.1 DSCP and Per-Hop Behavior

DiffServ defines a new DS (Differentiated Services) field to replace the Type of Service (ToS) field in the IP header. The DS field contains a 6-bit DSCP field which can define up to 64 service levels and the remaining 2 bits are defined as currently unused (CU). The following figure illustrates the DS field.

**Figure 262** DiffServ: Differentiated Service Field



DSCP is backward compatible with the three precedence bits in the ToS octet so that non-DiffServ compliant, ToS-enabled network device will not conflict with the DSCP mapping.

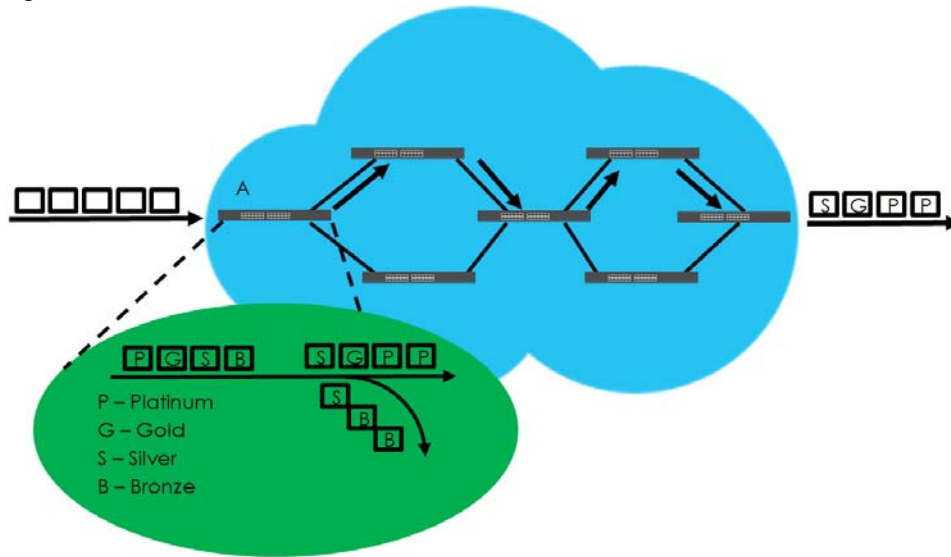
The DSCP value determines the PHB (Per-Hop Behavior), that each packet gets as it is forwarded across the DiffServ network. Based on the marking rule different kinds of traffic can be marked for different priorities of forwarding. Resources can then be allocated according to the DSCP values and the configured policies.

#### 46.1.2 DiffServ Network Example

The following figure depicts a DiffServ network consisting of a group of directly connected DiffServ-compliant network devices. The boundary node (**A** in [Figure 263](#)) in a DiffServ network classifies (marks with a DSCP value) the incoming packets into different traffic flows (**Platinum, Gold, Silver, Bronze**) based on the configured marking rules. A network administrator can then apply various traffic policies to the traffic flows. For example, one traffic policy would be to give higher drop precedence to one traffic

flow over others. In our example packets in the **Bronze** traffic flow are more likely to be dropped when congestion occurs than the packets in the **Platinum** traffic flow as they move across the DiffServ network.

**Figure 263** DiffServ Network



## 46.2 Activating DiffServ

Activate DiffServ to apply marking rules or IEEE 802.1p priority mapping on the selected port(s).

Click **IP Application > DiffServ** in the navigation panel to display the screen as shown.

**Figure 264** IP Application > DiffServ

| Port | Active                   |
|------|--------------------------|
| *    | <input type="checkbox"/> |
| 1    | <input type="checkbox"/> |
| 2    | <input type="checkbox"/> |
| 3    | <input type="checkbox"/> |
| 4    | <input type="checkbox"/> |
| 5    | <input type="checkbox"/> |
| 6    | <input type="checkbox"/> |
| 7    | <input type="checkbox"/> |
| 8    | <input type="checkbox"/> |
| 9    | <input type="checkbox"/> |
| 10   | <input type="checkbox"/> |
| 11   | <input type="checkbox"/> |
| 12   | <input type="checkbox"/> |
| 13   | <input type="checkbox"/> |
| 14   | <input type="checkbox"/> |
| 15   | <input type="checkbox"/> |

The following table describes the labels in this screen.

Table 194 IP Application > DiffServ

| LABEL  | DESCRIPTION                                                                                                                                                                                                                                                                                                         |
|--------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Active | Select this option to enable DiffServ on the Switch.                                                                                                                                                                                                                                                                |
| Port   | This field displays the index number of a port on the Switch. * means all ports (on the same Switch).                                                                                                                                                                                                               |
| *      | Settings in this row apply to all ports.<br><br>Use this row only if you want to make some settings the same for all ports. Use this row first to set the common settings and then make adjustments on a port-by-port basis.<br><br>Note: Changes in this row are copied to all the ports as soon as you make them. |
| Active | Select <b>Active</b> to enable DiffServ on the port.                                                                                                                                                                                                                                                                |
| Apply  | Click <b>Apply</b> to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the <b>Save</b> link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.                                  |
| Cancel | Click <b>Cancel</b> to begin configuring this screen afresh.                                                                                                                                                                                                                                                        |

## 46.3 DSCP-to-IEEE 802.1p Priority Settings

You can configure the DSCP to IEEE 802.1p mapping to allow the Switch to prioritize all traffic based on the incoming DSCP value according to the DiffServ to IEEE 802.1p mapping table.

The following table shows the default DSCP-to-IEEE802.1p mapping.

Table 195 Default DSCP-IEEE 802.1p Mapping

| DSCP VALUE  | 0 – 7 | 8 – 15 | 16 – 23 | 24 – 31 | 32 – 39 | 40 – 47 | 48 – 55 | 56 – 63 |
|-------------|-------|--------|---------|---------|---------|---------|---------|---------|
| IEEE 802.1p | 0     | 1      | 2       | 3       | 4       | 5       | 6       | 7       |

### 46.3.1 Configuring DSCP Settings

To change the DSCP-IEEE 802.1p mapping, click the **DSCP Setting** link in the **DiffServ** screen to display the screen as shown next.

Figure 265 IP Application > DiffServ > DSCP Setting

**DSCP Setting** [Diffserv](#)

**DSCP to 802.1p Mapping**

|    |     |    |     |    |     |    |     |    |     |    |     |    |     |    |     |
|----|-----|----|-----|----|-----|----|-----|----|-----|----|-----|----|-----|----|-----|
| 0  | 0 ▼ | 1  | 0 ▼ | 2  | 0 ▼ | 3  | 0 ▼ | 4  | 0 ▼ | 5  | 0 ▼ | 6  | 0 ▼ | 7  | 0 ▼ |
| 8  | 1 ▼ | 9  | 1 ▼ | 10 | 1 ▼ | 11 | 1 ▼ | 12 | 1 ▼ | 13 | 1 ▼ | 14 | 1 ▼ | 15 | 1 ▼ |
| 16 | 2 ▼ | 17 | 2 ▼ | 18 | 2 ▼ | 19 | 2 ▼ | 20 | 2 ▼ | 21 | 2 ▼ | 22 | 2 ▼ | 23 | 2 ▼ |
| 24 | 3 ▼ | 25 | 3 ▼ | 26 | 3 ▼ | 27 | 3 ▼ | 28 | 3 ▼ | 29 | 3 ▼ | 30 | 3 ▼ | 31 | 3 ▼ |
| 32 | 4 ▼ | 33 | 4 ▼ | 34 | 4 ▼ | 35 | 4 ▼ | 36 | 4 ▼ | 37 | 4 ▼ | 38 | 4 ▼ | 39 | 4 ▼ |
| 40 | 5 ▼ | 41 | 5 ▼ | 42 | 5 ▼ | 43 | 5 ▼ | 44 | 5 ▼ | 45 | 5 ▼ | 46 | 5 ▼ | 47 | 5 ▼ |
| 48 | 6 ▼ | 49 | 6 ▼ | 50 | 6 ▼ | 51 | 6 ▼ | 52 | 6 ▼ | 53 | 6 ▼ | 54 | 6 ▼ | 55 | 6 ▼ |
| 56 | 7 ▼ | 57 | 7 ▼ | 58 | 7 ▼ | 59 | 7 ▼ | 60 | 7 ▼ | 61 | 7 ▼ | 62 | 7 ▼ | 63 | 7 ▼ |

[Apply](#) [Cancel](#)

The following table describes the labels in this screen.

Table 196 IP Application > DiffServ > DSCP Setting

| LABEL    | DESCRIPTION                                                                                                                                                                                                                                                                        |
|----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 0 ... 63 | This is the DSCP classification identification number.<br>To set the IEEE 802.1p priority mapping, select the priority level from the drop-down list box.                                                                                                                          |
| Apply    | Click <b>Apply</b> to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the <b>Save</b> link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel   | Click <b>Cancel</b> to begin configuring this screen afresh.                                                                                                                                                                                                                       |



# CHAPTER 47

## DHCP

This chapter shows you how to configure the DHCP feature.

### 47.1 DHCP Overview

DHCP (Dynamic Host Configuration Protocol RFC 2131 and RFC 2132) allows individual computers to obtain TCP/IP configuration at start-up from a server. You can configure the Switch as a DHCP server or a DHCP relay agent. When configured as a server, the Switch provides the TCP/IP configuration for the clients. If you configure the Switch as a relay agent, then the Switch forwards DHCP requests to DHCP server on your network. If you don't configure the Switch as a DHCP server or relay agent then you must have a DHCP server in the broadcast domain of the client computers or else the client computers must be configured manually.

#### 47.1.1 DHCP Modes

The Switch can be configured as a DHCP server or DHCP relay agent.

- If you configure the Switch as a DHCP server, it will maintain the pool of IP addresses along with subnet masks, DNS server and default gateway information and distribute them to your LAN computers.
- If there is already a DHCP server on your network, then you can configure the Switch as a DHCP relay agent. When the Switch receives a request from a computer on your network, it contacts the DHCP server for the necessary IP information, and then relays the assigned information back to the computer.

#### 47.1.2 DHCP Configuration Options

The DHCP configuration on the Switch is divided into **Global** and **VLAN** screens. The screen you should use for configuration depends on the DHCP services you want to offer the DHCP clients on your network. Choose the configuration screen based on the following criteria:

- **Global** - The Switch forwards all DHCP requests to the same DHCP server.
- **VLAN** - The Switch is configured on a VLAN by VLAN basis. The Switch can be configured as a DHCP server for one VLAN and at the same time the Switch can be configured to relay DHCP requests for clients in another VLAN.

## 47.2 DHCP Configuration

Click **IP Application > DHCP** in the navigation panel to display the screen as shown. Click the link next to **DHCPv4** to open screens where you can enable and configure DHCPv4 server/relay settings and create option 82 profiles. Click the link next to **DHCPv6** to open screens where you can configure DHCPv6 settings.

**Figure 266** IP Application > DHCP

| DHCP   |                            |
|--------|----------------------------|
| DHCPv4 | <a href="#">Click Here</a> |
| DHCPv6 | <a href="#">Click Here</a> |

## 47.3 DHCPv4 Status

Click **IP Application > DHCP > DHCPv4** in the navigation panel. The **DHCP Status** screen displays.

**Figure 267** IP Application > DHCP > DHCPv4

DHCP Status

[DHCP](#)

[Option 82 Profile](#)

[Global](#)

[VLAN](#)

Server Status

| Index | VID | Server Status | IP Pool Size |
|-------|-----|---------------|--------------|
|       |     |               |              |

Relay Status

|            |           |
|------------|-----------|
| Relay Mode | VLAN: 123 |
|------------|-----------|

| VID | Current Source Address |
|-----|------------------------|
| 123 | 10.2.1.23              |

The following table describes the labels in this screen.

Table 197 IP Application > DHCP > DHCPv4

| LABEL         | DESCRIPTION                                                                                                                                                                                                                                                                                                                                               |
|---------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Server Status | This section displays configuration settings related to the Switch's DHCP server mode.                                                                                                                                                                                                                                                                    |
| Index         | This is the index number. Click an index number to change the settings.                                                                                                                                                                                                                                                                                   |
| VID           | This field displays the VLAN ID for which the Switch is a DHCP server.                                                                                                                                                                                                                                                                                    |
| Server Status | This field displays the starting DHCP client IP address.                                                                                                                                                                                                                                                                                                  |
| IP Pool Size  | This field displays the number of IP addresses that can be assigned to clients.                                                                                                                                                                                                                                                                           |
| Relay Status  | This section displays configuration settings related to the Switch's DHCP relay mode.                                                                                                                                                                                                                                                                     |
| Relay Mode    | This field displays: <ul style="list-style-type: none"> <li><b>None</b> - if the Switch is not configured as a DHCP relay agent.</li> <li><b>Global</b> - if the Switch is configured as a DHCP relay agent only.</li> <li><b>VLAN</b> - followed by a VLAN ID or multiple VLAN IDs if it is configured as a relay agent for specific VLAN(s).</li> </ul> |

Table 197 IP Application &gt; DHCP &gt; DHCPv4

| LABEL                  | DESCRIPTION                                                                                               |
|------------------------|-----------------------------------------------------------------------------------------------------------|
| VID                    | This field displays the ID number of the VLAN for which the Switch acts as a DHCP relay agent.            |
| Current Source Address | This field displays the source IP address of the DHCP requests that the Switch forwards to a DHCP server. |

### 47.3.1 DHCPv4 Server Status Detail

Click **IP Application > DHCP > DHCPv4** in the navigation panel and then click an existing index number of a DHCP server configuration to view the screen as shown. Use this screen to view details regarding DHCP server settings configured on the Switch.

Figure 268 IP Application &gt; DHCP &gt; DHCPv4 &gt; Server Status Detail

Figure 2-50: Application: DHCP: DHCP V1: Server Status Detail

| Server Status Detail |                       | DHCP Status |
|----------------------|-----------------------|-------------|
| Start IP Address     | 192.168.11.100        |             |
| End IP Address       | 192.168.11.104        |             |
| Subnet Mask          | 255.255.255.0         |             |
| Default Gateway      | 192.168.11.254        |             |
| Primary DNS Server   | 0.0.0.0               |             |
| Secondary DNS Server | 0.0.0.0               |             |
| Lease Time           | 3 day 0 hour 0 minute |             |

Address Leases

| Index | IP Address | Timer | Hardware Address | Hostname |
|-------|------------|-------|------------------|----------|
|       |            |       |                  |          |

The following table describes the labels in this screen.

Table 198 IP Application &gt; DHCP &gt; DHCPv4 &gt; Server Status Detail

| LABEL                | DESCRIPTION                                                                                                                                                                                                    |
|----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Start IP Address     | This field displays the starting IP address of the IP address pool configured for this DHCP server instance.                                                                                                   |
| End IP Address       | This field displays the last IP address of the IP address pool configured for this DHCP server instance.                                                                                                       |
| Subnet Mask          | This field displays the subnet mask value sent to clients from this DHCP server instance.                                                                                                                      |
| Default Gateway      | This field displays the default gateway value sent to clients from this DHCP server instance.                                                                                                                  |
| Primary DNS Server   | This field displays the primary DNS server value sent to clients from this DHCP server instance.                                                                                                               |
| Secondary DNS Server | This field displays the secondary DNS server value sent to clients from this DHCP server instance.                                                                                                             |
| Lease Time           | This field displays the amount of time that the IP address is valid.                                                                                                                                           |
| Address Leases       | This section displays information about the IP addresses this DHCP server issued to clients.                                                                                                                   |
| Index                | This field displays a sequential number for each DHCP request handled by the Switch.                                                                                                                           |
| IP Address           | This is the IP address issued to a DHCP client.                                                                                                                                                                |
| Timer                | This field displays the time remaining before the DHCP client has to renew its IP address.                                                                                                                     |
| Hardware Address     | This field displays the MAC address of the DHCP client.<br><br>It may also display <b>SELF OCCUPIED ADDRESS</b> if the IP address cannot be used for DHCP because it is already assigned to the Switch itself. |
| Hostname             | This field displays the system name of the client.                                                                                                                                                             |

## 47.4 DHCPv4 Relay

Configure DHCP relay on the Switch if the DHCP clients and the DHCP server are not in the same broadcast domain. During the initial IP address leasing, the Switch helps to relay network information (such as the IP address and subnet mask) between a DHCP client and a DHCP server. Once the DHCP client obtains an IP address and can connect to the network, network information renewal is done between the DHCP client and the DHCP server without the help of the Switch.

The Switch can be configured as a global DHCP relay. This means that the Switch forwards all DHCP requests from all domains to the same DHCP server. You can also configure the Switch to relay DHCP information based on the VLAN membership of the DHCP clients.

### 47.4.1 DHCPv4 Relay Agent Information

The Switch can add information about the source of client DHCP requests that it relays to a DHCP server by adding **Relay Agent Information**. This helps provide authentication about the source of the requests. The DHCP server can then provide an IP address based on this information. Please refer to RFC 3046 for more details.

The DHCP **Relay Agent Information** feature adds an Agent Information field (also known as the **Option 82** field) to DHCP requests. The **Option 82** field is in the DHCP headers of client DHCP request frames that the Switch relays to a DHCP server.

#### 47.4.1.1 DHCPv4 Relay Agent Information Format

A DHCP Relay Agent Information option has the following format.

Table 199 DHCP Relay Agent Information Option Format

|              |               |    |    |     |    |
|--------------|---------------|----|----|-----|----|
| Code<br>(82) | Length<br>(N) | i1 | i2 | ... | iN |
|--------------|---------------|----|----|-----|----|

i1, i2 and iN are DHCP relay agent sub-options, which contain additional information about the DHCP client. You need to define at least one sub-option.

#### 47.4.1.2 Sub-Option Format

There are two types of sub-option: "Agent Circuit ID Sub-option" and "Agent Remote ID Sub-option". They have the following formats.

Table 200 DHCP Relay Agent Circuit ID Sub-option Format

| SubOpt Code   | Length        | Value                                            |
|---------------|---------------|--------------------------------------------------|
| 1<br>(1 byte) | N<br>(1 byte) | Slot ID, Port ID, VLAN ID, System Name or String |

Table 201 DHCP Relay Agent Remote ID Sub-option Format

| SubOpt Code   | Length        | Value                 |
|---------------|---------------|-----------------------|
| 2<br>(1 byte) | N<br>(1 byte) | MAC Address or String |

The 1 in the first field identifies this as an Agent Circuit ID sub-option and 2 identifies this as an Agent Remote ID sub-option. The next field specifies the length of the field.

## 47.4.2 DHCPv4 Option 82 Profile

Use this screen to create DHCPv4 option 82 profiles. Click **IP Application > DHCP > DHCPv4** in the navigation panel and click the **Option 82 Profile** link to display the screen as shown.

**Figure 269** IP Application > DHCP > DHCPv4 > Option 82 Profile

| Profile Name             | Enable | Circuit-ID Field          | Remote-ID Enable | Remote-ID Field |                          |
|--------------------------|--------|---------------------------|------------------|-----------------|--------------------------|
| <a href="#">default1</a> | Yes    | slot-port, vlan           | No               | -               | <input type="checkbox"/> |
| <a href="#">default2</a> | Yes    | slot-port, vlan, hostname | No               | -               | <input type="checkbox"/> |

The following table describes the labels in this screen.

Table 202 IP Application > DHCP > DHCPv4 > Option 82 Profile

| LABEL      | DESCRIPTION                                                                                                                                                                                                           |
|------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Name       | Enter a descriptive name for the profile for identification purposes. You can use up to 32 ASCII characters. Spaces are allowed.                                                                                      |
| Circuit-ID | Use this section to configure the Circuit ID sub-option to include information that is specific to the relay agent (the Switch).                                                                                      |
| Enable     | Select this option to have the Switch add the Circuit ID sub-option to client DHCP requests that it relays to a DHCP server.                                                                                          |
| slot-port  | Select this option to have the Switch add the number of port that the DHCP client is connected to.                                                                                                                    |
| vlan       | Select this option to have the Switch add the ID of VLAN which the port belongs to.                                                                                                                                   |
| hostname   | This is the system name you configure in the <b>Basic Setting &gt; General Setup</b> screen.<br>Select this option for the Switch to add the system name to the client DHCP requests that it relays to a DHCP server. |
| string     | Enter a string of up to 64 ASCII characters that the Switch adds into the client DHCP requests. Spaces are allowed.                                                                                                   |
| Remote-ID  | Use this section to configure the Remote ID sub-option to include information that identifies the relay agent (the Switch).                                                                                           |
| Enable     | Select this option to have the Switch append the Remote ID sub-option to the option 82 field of DHCP requests.                                                                                                        |

Table 202 IP Application &gt; DHCP &gt; DHCPv4 &gt; Option 82 Profile (continued)

| LABEL        | DESCRIPTION                                                                                                                                                                                                                                                                                                                              |
|--------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| mac          | Select this option to have the Switch add its MAC address to the client DHCP requests that it relays to a DHCP server.                                                                                                                                                                                                                   |
| string       | Enter a string of up to 64 ASCII characters for the remote ID information in this field. Spaces are allowed.                                                                                                                                                                                                                             |
| Add          | Click this to create a new entry or to update an existing one.<br><br>This saves your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the <b>Save</b> link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel       | Click <b>Cancel</b> to reset the fields to their last saved values.                                                                                                                                                                                                                                                                      |
| Profile Name | This field displays the descriptive name of the profile. Click the name to change the settings.                                                                                                                                                                                                                                          |
| Circuit-ID   |                                                                                                                                                                                                                                                                                                                                          |
| Enable       | This field displays whether the Circuit ID sub-option is added to client DHCP requests.                                                                                                                                                                                                                                                  |
| Field        | This field displays the information that is included in the Circuit ID sub-option.                                                                                                                                                                                                                                                       |
| Remote-ID    |                                                                                                                                                                                                                                                                                                                                          |
| Enable       | This field displays whether the Remote ID sub-option is added to client DHCP requests.                                                                                                                                                                                                                                                   |
| Field        | This field displays the information that is included in the Remote ID sub-option.                                                                                                                                                                                                                                                        |
|              | Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries.                                                                                                                                                                                                  |
| Delete       | Check the entry(ies) that you want to remove and then click the <b>Delete</b> button.                                                                                                                                                                                                                                                    |
| Cancel       | Click <b>Cancel</b> to clear the selected checkbox(es).                                                                                                                                                                                                                                                                                  |

### 47.4.3 Configuring DHCPv4 Global Relay

Use this screen to configure global DHCPv4 relay. Click **IP Application > DHCP > DHCPv4** in the navigation panel and click the **Global** link to display the screen as shown.

Figure 270 IP Application &gt; DHCP &gt; DHCPv4 &gt; Global

The following table describes the labels in this screen.

Table 203 IP Application &gt; DHCP &gt; DHCPv4 &gt; Global

| LABEL                     | DESCRIPTION                                                                                                                                                                                                                          |
|---------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Active                    | Select this check box to enable DHCPv4 relay.                                                                                                                                                                                        |
| Remote DHCP Server 1 .. 3 | Enter the IP address of a DHCPv4 server in dotted decimal notation.                                                                                                                                                                  |
| Option 82 Profile         | Select a pre-defined DHCPv4 option 82 profile that the Switch applies to all ports. The Switch adds the Circuit ID sub-option and/or Remote ID sub-option specified in the profile to DHCP requests that it relays to a DHCP server. |

Table 203 IP Application &gt; DHCP &gt; DHCPv4 &gt; Global (continued)

| LABEL  | DESCRIPTION                                                                                                                                                                                                                                                                        |
|--------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Apply  | Click <b>Apply</b> to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the <b>Save</b> link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click <b>Cancel</b> to begin configuring this screen afresh.                                                                                                                                                                                                                       |

## 47.4.4 DHCPv4 Global Relay Port Configure

Use this screen to apply a different DHCP option 82 profile to certain ports on the Switch. To open this screen, click **IP Application > DHCP > DHCPv4 > Global > Port**.

Figure 271 IP Application &gt; DHCP &gt; DHCPv4 &gt; Global &gt; Port

The following table describes the labels in this screen.

Table 204 IP Application &gt; DHCP &gt; DHCPv4 &gt; Global &gt; Port

| LABEL             | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                     |
|-------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Port              | Enter the number of port(s) to which you want to apply the specified DHCP option 82 profile.<br><br>You can enter multiple ports separated by (no space) comma (,) or hyphen (-) for a range. For example, enter "3-5" for ports 3, 4, and 5. Enter "3,5,7" for ports 3, 5, and 7.                                                                                              |
| Option 82 Profile | Select a pre-defined DHCP option 82 profile that the Switch applies to the specified port(s). The Switch adds the Circuit ID sub-option and/or Remote ID sub-option specified in the profile to DHCP requests that it relays to a DHCP server.<br><br>Note: The profile you select here has priority over the one you select in the <b>DHCP &gt; DHCPv4 &gt; Global</b> screen. |
| Add               | Click this to create a new entry or to update an existing one.<br><br>This saves your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the <b>Save</b> link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.                                        |
| Cancel            | Click this to reset the values above based on the last selected entry or, if not applicable, to clear the fields above.                                                                                                                                                                                                                                                         |
| Clear             | Click <b>Clear</b> to reset the fields to the factory defaults.                                                                                                                                                                                                                                                                                                                 |
| Index             | This field displays a sequential number for each entry. Click an index number to change the settings.                                                                                                                                                                                                                                                                           |
| Port              | This field displays the port(s) to which the Switch applies the settings.                                                                                                                                                                                                                                                                                                       |
| Profile Name      | This field displays the DHCP option 82 profile that the Switch applies to the port(s).                                                                                                                                                                                                                                                                                          |

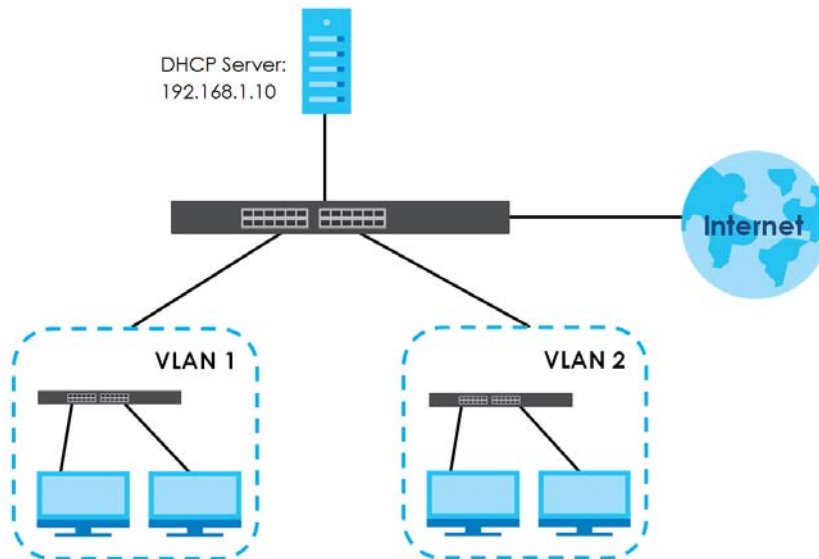
Table 204 IP Application &gt; DHCP &gt; DHCPv4 &gt; Global &gt; Port (continued)

| LABEL  | DESCRIPTION                                                                                                                             |
|--------|-----------------------------------------------------------------------------------------------------------------------------------------|
|        | Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries. |
| Delete | Select the entry(ies) that you want to remove, then click the <b>Delete</b> button to remove the selected entry(ies) from the table.    |
| Cancel | Click this to clear the check boxes above.                                                                                              |

## 47.4.5 Global DHCP Relay Configuration Example

The follow figure shows a network example where the Switch is used to relay DHCP requests for the **VLAN1** and **VLAN2** domains. There is only one DHCP server that services the DHCP clients in both domains.

Figure 272 Global DHCP Relay Network Example



Configure the **DHCP Relay** screen as shown. Make sure you select a DHCP option 82 profile (**default1** in this example) to set the Switch to send additional information (such as the VLAN ID) together with the DHCP requests to the DHCP server. This allows the DHCP server to assign the appropriate IP address according to the VLAN ID.

Figure 273 DHCP Relay Configuration Example

| DHCP Relay           |                                     | <a href="#">Status</a> | <a href="#">Port</a> |
|----------------------|-------------------------------------|------------------------|----------------------|
| Active               | <input checked="" type="checkbox"/> |                        |                      |
| Remote DHCP Server 1 | 192.168.1.100                       |                        |                      |
| Remote DHCP Server 2 | 0.0.0.0                             |                        |                      |
| Remote DHCP Server 3 | 0.0.0.0                             |                        |                      |
| Option 82 Profile    | default1 ▼                          |                        |                      |

[Apply](#) [Cancel](#)

**EXAMPLE**



## 47.5 Configuring DHCP VLAN Settings

Use this screen to configure your DHCP settings based on the VLAN domain of the DHCP clients. Click **IP Application** > **DHCP** > **DHCPv4** in the navigation panel, then click the **VLAN** link in the **DHCP Status** screen that displays.

Note: You must set up a management IP address for each VLAN that you want to configure DHCP settings for on the Switch. See [Section 8.4 on page 85](#) for information on how to do this.

**Figure 274** IP Application > DHCP > DHCPv4 > VLAN

**VLAN Setting** [Status](#) [Port](#)

VID:

DHCP Status: ☒ Server ☐ Relay

**Server**

Client IP Pool Starting Address:

Size of Client IP Pool:

IP Subnet Mask:

Default Gateway:

Primary DNS Server:

Secondary DNS Server:

Lease Time: ☐ Infinite ☒ Days  Hours  Minutes

**Relay**

Remote DHCP Server 1:

Remote DHCP Server 2:

Remote DHCP Server 3:

Source Address:

Option 82 Profile:

[Add](#) [Cancel](#) [Clear](#)

| VID                | Type   | DHCP Status      | Source Address |                                     |
|--------------------|--------|------------------|----------------|-------------------------------------|
| <a href="#">11</a> | Server | 192.168.11.100/5 |                | <input checked="" type="checkbox"/> |

[Delete](#) [Cancel](#)

The following table describes the labels in this screen.

Table 205 IP Application > DHCP > DHCPv4 > VLAN

| LABEL       | DESCRIPTION                                                                                                                                                                                                         |
|-------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| VID         | Enter the ID number of the VLAN to which these DHCP settings apply.                                                                                                                                                 |
| DHCP Status | Select whether the Switch should function as a DHCP <b>Server</b> or <b>Relay</b> for the specified VID. If you select <b>Server</b> then fields related to DHCP relay configuration are grayed out and vice versa. |
| Server      | Use this section if you want to configure the Switch to function as a DHCP server for this VLAN.                                                                                                                    |

Table 205 IP Application &gt; DHCP &gt; DHCPv4 &gt; VLAN (continued)

| LABEL                           | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|---------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Client IP Pool Starting Address | Specify the first of the contiguous addresses in the IP address pool.                                                                                                                                                                                                                                                                                                                                                                                    |
| Size of Client IP Pool          | Specify the size, or count of the IP address pool. The Switch can issue from 1 to 253 IP addresses to DHCP clients.                                                                                                                                                                                                                                                                                                                                      |
| IP Subnet Mask                  | Enter the subnet mask for the client IP pool.                                                                                                                                                                                                                                                                                                                                                                                                            |
| Default Gateway                 | Enter the IP address of the default gateway device.                                                                                                                                                                                                                                                                                                                                                                                                      |
| Primary/Secondary DNS Server    | Enter the IP addresses of the DNS servers. The DNS servers are passed to the DHCP clients along with the IP address and the subnet mask.                                                                                                                                                                                                                                                                                                                 |
| Lease Time                      | Select <b>Infinite</b> to have the binding always valid. Select the second radio button to set up the binding's valid days, hours and minutes.                                                                                                                                                                                                                                                                                                           |
| Relay                           | Use this section if you want to configure the Switch to function as a DHCP relay for this VLAN.                                                                                                                                                                                                                                                                                                                                                          |
| Remote DHCP Server 1 .. 3       | Enter the IP address of a DHCP server in dotted decimal notation.                                                                                                                                                                                                                                                                                                                                                                                        |
| Source Address                  | Enter the source IP address that the Switch adds to DHCP requests from clients on this VLAN before forwarding them. If you leave this field set to <b>0.0.0.0</b> , the Switch automatically sets the source IP address of the DHCP requests to the IP address of the interface on which the packet is received.<br><br>The source IP address helps DHCP clients obtain an appropriate IP address when you configure multiple routing domains on a VLAN. |
| Option 82 Profile               | Select a pre-defined DHCP option 82 profile that the Switch applies to all ports in this VLAN. The Switch adds the Circuit ID sub-option and/or Remote ID sub-option specified in the profile to DHCP requests that it relays to a DHCP server.                                                                                                                                                                                                          |
| Add                             | Click this to create a new entry or to update an existing one.<br><br>This saves your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the <b>Save</b> link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.                                                                                                                 |
| Cancel                          | Click <b>Cancel</b> to begin configuring this screen afresh.                                                                                                                                                                                                                                                                                                                                                                                             |
| Clear                           | Click <b>Clear</b> to reset the fields to the factory defaults.                                                                                                                                                                                                                                                                                                                                                                                          |
| VID                             | This field displays the ID number of the VLAN group to which this DHCP settings apply.                                                                                                                                                                                                                                                                                                                                                                   |
| Type                            | This field displays <b>Server</b> or <b>Relay</b> for the DHCP mode.                                                                                                                                                                                                                                                                                                                                                                                     |
| DHCP Status                     | For DHCP server configuration, this field displays the starting IP address and the size of the IP address pool.<br><br>For DHCP relay configuration, this field displays the first remote DHCP server IP address.                                                                                                                                                                                                                                        |
| Source Address                  | This field displays the source IP address you configured for DHCP requests from clients on this VLAN.                                                                                                                                                                                                                                                                                                                                                    |
|                                 | Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries.                                                                                                                                                                                                                                                                                                                  |
| Delete                          | Select the configuration entries you want to remove and click <b>Delete</b> to remove them.                                                                                                                                                                                                                                                                                                                                                              |
| Cancel                          | Click <b>Cancel</b> to clear the check boxes.                                                                                                                                                                                                                                                                                                                                                                                                            |

### 47.5.1 DHCPv4 VLAN Port Configure

Use this screen to apply a different DHCP option 82 profile to certain ports in a VLAN. To open this screen, click **IP Application > DHCP > DHCPv4 > VLAN > Port**.

**Figure 275** IP Application > DHCP > DHCPv4 > VLAN > Port

The following table describes the labels in this screen.

Table 206 IP Application &gt; DHCP &gt; DHCPv4 &gt; VLAN &gt; Port

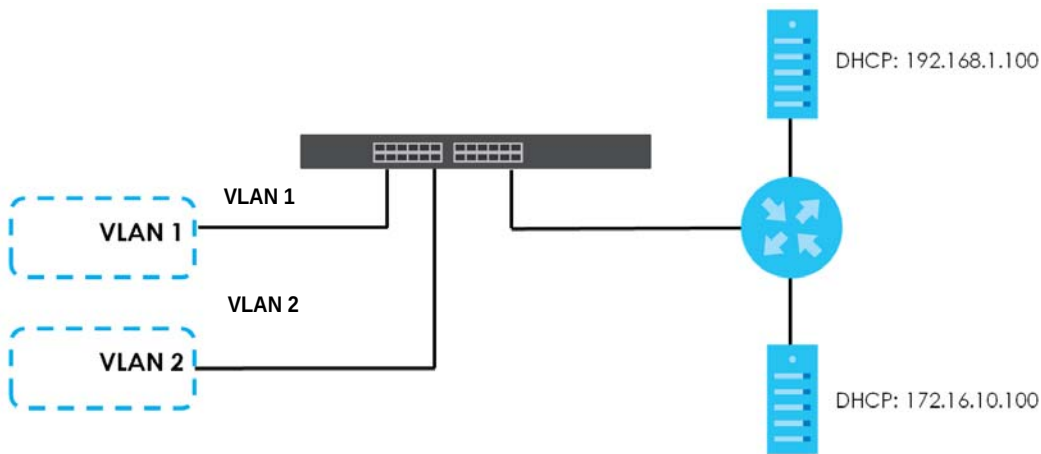
| LABEL             | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                |
|-------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| VID               | Enter the ID number of the VLAN you want to configure here.                                                                                                                                                                                                                                                                                                                                |
| Port              | Enter the number of port(s) to which you want to apply the specified DHCP option 82 profile.<br>You can enter multiple ports separated by (no space) comma (,) or hyphen (-) for a range. For example, enter "3-5" for ports 3, 4, and 5. Enter "3,5,7" for ports 3, 5, and 7.                                                                                                             |
| Option 82 Profile | Select a pre-defined DHCP option 82 profile that the Switch applies to the specified port(s) in this VLAN. The Switch adds the Circuit ID sub-option and/or Remote ID sub-option specified in the profile to DHCP requests that it relays to a DHCP server.<br><br>Note: The profile you select here has priority over the one you select in the <b>DHCP &gt; DHCPv4 &gt; VLAN</b> screen. |
| Add               | Click this to create a new entry or to update an existing one.<br><br>This saves your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the <b>Save</b> link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.                                                   |
| Cancel            | Click this to reset the values above based on the last selected entry or, if not applicable, to clear the fields above.                                                                                                                                                                                                                                                                    |
| Clear             | Click <b>Clear</b> to reset the fields to the factory defaults.                                                                                                                                                                                                                                                                                                                            |
| Index             | This field displays a sequential number for each entry. Click an index number to change the settings.                                                                                                                                                                                                                                                                                      |
| VID               | This field displays the VLAN to which the port(s) belongs.                                                                                                                                                                                                                                                                                                                                 |
| Port              | This field displays the port(s) to which the Switch applies the settings.                                                                                                                                                                                                                                                                                                                  |
| Profile Name      | This field displays the DHCP option 82 profile that the Switch applies to the port(s) in this VLAN.                                                                                                                                                                                                                                                                                        |
|                   | Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries.                                                                                                                                                                                                                                                    |
| Delete            | Select the configuration entries you want to remove and click <b>Delete</b> to remove them.                                                                                                                                                                                                                                                                                                |
| Cancel            | Click <b>Cancel</b> to clear the check boxes.                                                                                                                                                                                                                                                                                                                                              |

## 47.5.2 Example: DHCP Relay for Two VLANs

The following example displays two VLANs (VIDs 1 and 2) for a campus network. Two DHCP servers are installed to serve each VLAN. The system is set up to forward DHCP requests from the dormitory rooms

(VLAN 1) to the DHCP server with an IP address of 192.168.1.100. Requests from the academic buildings (VLAN 2) are sent to the other DHCP server with an IP address of 172.16.10.100.

Figure 276 DHCP Relay for Two VLANs



For the example network, configure the **VLAN Setting** screen as shown.

Figure 277 DHCP Relay for Two VLANs Configuration Example

| VLAN Setting                    |                                                                                               | Status      | Port           |
|---------------------------------|-----------------------------------------------------------------------------------------------|-------------|----------------|
| VID                             | 2                                                                                             |             |                |
| DHCP Status                     | <input type="radio"/> Server<br><input checked="" type="radio"/> Relay                        |             |                |
| Server                          |                                                                                               |             |                |
| Client IP Pool Starting Address | 0.0.0.0                                                                                       |             |                |
| Size of Client IP Pool          |                                                                                               |             |                |
| IP Subnet Mask                  | 0.0.0.0                                                                                       |             |                |
| Default Gateway                 | 0.0.0.0                                                                                       |             |                |
| Primary DNS Server              | 0.0.0.0                                                                                       |             |                |
| Secondary DNS Server            | 0.0.0.0                                                                                       |             |                |
| Lease Time                      | <input type="radio"/> Infinite<br><input checked="" type="radio"/> Days 3 Hours 00 Minutes 00 |             |                |
| Relay                           |                                                                                               |             |                |
| Remote DHCP Server 1            | 172.16.10.100                                                                                 |             |                |
| Remote DHCP Server 2            | 0.0.0.0                                                                                       |             |                |
| Remote DHCP Server 3            | 0.0.0.0                                                                                       |             |                |
| Source Address                  | 0.0.0.0                                                                                       |             |                |
| Option 82 Profile               |                                                                                               |             |                |
| <div>Add Cancel Clear</div>     |                                                                                               |             |                |
| VID                             | Type                                                                                          | DHCP Status | Source Address |

EXAMPLE

## 47.6 DHCPv6 Status

Click **IP Application > DHCP > DHCPv6** in the navigation panel to see information on the DHCPv6 server. The **DHCP Status** screen displays.

**Figure 278** IP Application > DHCP > DHCPv6

| DHCPv6 Status |     | <a href="#">DHCP</a> <a href="#">Information</a> <a href="#">Prefix Delegation</a> <a href="#">DHCPv6 Relay</a> |                   |            |
|---------------|-----|-----------------------------------------------------------------------------------------------------------------|-------------------|------------|
| Server Status |     |                                                                                                                 |                   |            |
| Index         | VID | DHCP Server                                                                                                     |                   | DHCP Relay |
|               |     | Information                                                                                                     | Prefix Delegation |            |

The following table describes the labels in this screen.

Table 207 IP Application > DHCP > DHCPv6

| LABEL             | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|-------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Server Status     | This section displays configuration settings related to the Switch's DHCP server mode.                                                                                                                                                                                                                                                                                                                                                             |
| Index             | This is the index number of a DHCPv6 server information                                                                                                                                                                                                                                                                                                                                                                                            |
| VID               | This field displays the VLAN ID to which the DHCP server belongs.                                                                                                                                                                                                                                                                                                                                                                                  |
| DHCP Server       | The Dynamic Host Configuration Protocol for IPv6 (DHCPv6, RFC 3315) is a server-client protocol that allows a DHCP server to assign and pass IPv6 network addresses, prefixes and other configuration information to DHCP clients. DHCPv6 servers and clients exchange DHCP messages using UDP.                                                                                                                                                    |
| Information       | This field displays <b>Yes</b> when the entry supports display of the refresh time and DNS server; it shows <b>No</b> when it does not.                                                                                                                                                                                                                                                                                                            |
| Prefix Delegation | This field displays <b>Yes</b> when the entry supports the prefix delegation; it shows <b>No</b> when it does not. The prefix delegation is used by an IPv6 device to generate its IP address.                                                                                                                                                                                                                                                     |
| DHCP Relay        | A DHCPv6 relay agent is on the same network as the DHCPv6 clients and helps forward messages between the DHCPv6 server (that's in another network) and the DHCPv6 clients.<br><br>This field displays <b>Yes</b> when the Switch supports DHCPv6 Relay and <b>No</b> when it does not. <b>Yes</b> means the Switch forwards all DHCP requests to the same DHCP server. <b>No</b> means the Switch does not forward DHCP requests to a DHCP server. |

## 47.7 DHCPv6 Information

Use this screen to configure DHCPv6 and DNS server settings on the Switch. Click **IP Application > DHCP > DHCPv6 > Information** in the navigation panel to display the screen as shown.

**Figure 279** IP Application > DHCP > DHCPv6 > Information

**DHCPv6 Server Information** [DHCPv6 Status](#)

**Information Table**

|              |                          |
|--------------|--------------------------|
| Active       | <input type="checkbox"/> |
| VID          | <input type="text"/>     |
| Refresh Time | <input type="text"/>     |
| DNS Server   | <input type="text"/>     |

[Add](#) [Cancel](#) [Clear](#)

| index | Active | VID | Refresh Time | DNS Server |                          |
|-------|--------|-----|--------------|------------|--------------------------|
|       |        |     |              |            | <input type="checkbox"/> |

[Delete](#) [Cancel](#)

The following table describes the labels in this screen.

**Table 208** IP Application > DHCP > DHCPv6 > Information

| LABEL        | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|--------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Active       | Select this check box to enable the Switch to get DHCPv6 and DNS server settings.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| VID          | Enter the ID number of the VLAN to which the DHCPv6 server belongs here.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Refresh Time | Enter the number of seconds a DHCPv6 client should wait before refreshing information retrieved from a DHCPv6 server. The allowed range is 600 to 4294967295 seconds.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| DNS Server   | <p>Specify the IPv6 address of the DNS server for the DHCP clients to use here.</p> <p>An 128-bit IPv6 address is written as eight 16-bit hexadecimal blocks separated by colons (:). This is an example IPv6 address '2001:0db8:1a2b:0015:0000:0000:1a2f:0000'.</p> <p>IPv6 addresses can be abbreviated in two ways:</p> <ul style="list-style-type: none"> <li>Leading zeros in a block can be omitted. So '2001:0db8:1a2b:0015:0000:0000:1a2f:0000' can be written as '2001:db8:1a2b:15:0:0:1a2f:0'.</li> <li>Any number of consecutive blocks of zeros can be replaced by a double colon. A double colon can only appear once in an IPv6 address. So '2001:0db8:0000:0000:1a2f:0000:0000:0015' can be written as '2001:0db8::1a2f:0000:0000:0015', '2001:0db8:0000:0000:1a2f::0015', '2001:db8::1a2f:0:0:15' or '2001:db8:0:0:1a2f::15'.</li> </ul> |
| Add          | <p>Click this to create a new entry or to update an existing one.</p> <p>This saves your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the <b>Save</b> link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Cancel       | Click <b>Cancel</b> to reset the fields to their last saved values.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Clear        | Click <b>Clear</b> to reset the fields to the factory defaults.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Index        | This field displays a sequential number for each entry. Click an index number to change its settings.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Active       | This field displays whether the DHCPv6 is activated or not.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| VID          | This field displays the ID number of the VLAN to which the DHCPv6 server belongs.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Refresh Time | This field displays the number of seconds a DHCPv6 client should wait before refreshing information retrieved from a DHCPv6 server. It displays <b>disable</b> if <b>Refresh Time</b> is not configured.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| DNS Server   | This field displays the IPv6 address of the DNS server that the DHCP clients will use. It displays <b>disable</b> when it is not configured.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|              | Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |

Table 208 IP Application &gt; DHCP &gt; DHCPv6 &gt; Information (continued)

| LABEL  | DESCRIPTION                                                                           |
|--------|---------------------------------------------------------------------------------------|
| Delete | Check the entry(ies) that you want to remove and then click the <b>Delete</b> button. |
| Cancel | Click <b>Cancel</b> to clear the selected checkbox(es).                               |

## 47.8 DHCPv6 Prefix Delegation

Prefix delegation enables an IPv6 device to use the received IPv6 prefix (for example, '2001:db2::/48') to generate its IP address. The Switch passes the IPv6 prefix information to its connected hosts (according to VLAN) so that they can generate their IPv6 addresses.

Use this screen to configure DHCPv6 client and IPv6 prefix settings for a specific VLAN on the Switch. Click **IP Application > DHCP > DHCPv6 > Prefix Delegation** in the navigation panel to display the screen as shown.

Figure 280 IP Application &gt; DHCP &gt; DHCPv6 &gt; Prefix Delegation

The screenshot shows the 'DHCPv6 Server Prefix Delegation' configuration interface. It includes a 'Prefix Delegation Table' with the following fields: Client DUID, Client Name, VID, Prefix Address, and Prefix Length. Below these fields are 'Add', 'Cancel', and 'Clear' buttons. At the bottom, there is a table with columns 'Index', 'Client DUID', 'Client Name', and 'VID', and 'Delete' and 'Cancel' buttons.

The following table describes the labels in this screen.

Table 209 IP Application &gt; DHCP &gt; DHCPv6 &gt; Prefix Delegation

| LABEL          | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Client DUID    | Each DHCP client and server has a unique DHCP Unique Identifier (DUID), which is used for identification when they are exchanging DHCPv6 messages. The DUID is generated from the MAC address, time, vendor assigned ID and/or the vendor's private enterprise number registered with the IANA. Type the client DUID for the devices connected to the Switch in this field.                                                                                                                                                      |
| Client Name    | Type a name to identify the DHCPv6 client in this field.                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| VID            | Type the ID number of the VLAN to which the DHCPv6 client belongs here.                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Prefix Address | IPv6 uses an address prefix to represent the network address. An IPv6 prefix length specifies how many most significant bits (start from the left) in the address compose the network address. The prefix length is written as "/x" where x is a number. For example, '2001:db8:1a2b:15::1a2f:0/32' is a prefix address with prefix length.<br><br>/32 means that the first 32 bits ('2001:db8') from the left is the network prefix.<br><br>Type the prefix address in this field. For example, type '2001:db8:1a2b:15::1a2f:0' |
| Prefix Length  | Type the prefix length in this field. For example, type 32.                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |

Table 209 IP Application &gt; DHCP &gt; DHCPv6 &gt; Prefix Delegation (continued)

| LABEL       | DESCRIPTION                                                                                                                                                                                                                                                                                                                              |
|-------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Add         | Click this to create a new entry or to update an existing one.<br><br>This saves your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the <b>Save</b> link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel      | Click <b>Cancel</b> to reset the fields to their last saved values.                                                                                                                                                                                                                                                                      |
| Clear       | Click <b>Clear</b> to reset the fields to the factory defaults.                                                                                                                                                                                                                                                                          |
| Index       | This field displays a sequential number for each entry. Click an index number to change its settings.                                                                                                                                                                                                                                    |
| Client DUID | This field displays the client DHCP Unique IDentifier (DUID) which uniquely identifies the client.                                                                                                                                                                                                                                       |
| Client Name | This field displays a name to identify the DHCPv6 client.                                                                                                                                                                                                                                                                                |
| VID         | This field displays the ID number of the VLAN to which the DHCPv6 client belongs.                                                                                                                                                                                                                                                        |
|             | Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries.                                                                                                                                                                                                  |
| Delete      | Check the entry(ies) that you want to remove and then click the <b>Delete</b> button.                                                                                                                                                                                                                                                    |
| Cancel      | Click <b>Cancel</b> to clear the selected checkbox(es).                                                                                                                                                                                                                                                                                  |

## 47.9 DHCPv6 Relay

A DHCPv6 relay agent is on the same network as the DHCPv6 clients and helps forward messages between the DHCPv6 server (that's in another network) and the DHCPv6 clients.

The DHCPv6 relay agent can add the remote identification (remote-ID) option and the interface-ID option to the Relay-Forward DHCPv6 messages. The remote-ID option carries a user-defined string, such as the system name. The interface-ID option provides slot number, port information and the VLAN ID to the DHCPv6 server. The remote-ID option (if any) is stripped from the Relay-Reply messages before the relay agent sends the packets to the clients. The DHCPv6 server copies the interface-ID option from the Relay-Forward message into the Relay-Reply message and sends it to the relay agent. The interface-ID should not change even after the relay agent restarts.

Use this screen to configure DHCPv6 relay settings for a specific VLAN on the Switch. Click **IP Application > DHCP > DHCPv6 > DHCPv6 Relay** in the navigation panel to display the screen as shown.



**Figure 281** IP Application > DHCP > DHCPv6 > DHCPv6 Relay

The screenshot shows the DHCPv6 Relay configuration interface. At the top, there's a header 'DHCPv6 Relay' and a link to 'DHCP'. The main form has three input fields: 'VID', 'Helper Address', and 'Remote ID'. There is also a checkbox for 'Interface ID'. Below these fields are three buttons: 'Add', 'Cancel', and 'Clear'. At the bottom, there is a table with the following columns: 'VID', 'Helper Address', 'Interface ID', 'Remote ID', and a checkbox. Below the table are two buttons: 'Delete' and 'Cancel'.

The following table describes the labels in this screen.

Table 210 IP Application &gt; DHCP &gt; DHCPv6&gt; DHCPv6 Relay

| LABEL          | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| VID            | Enter the ID number of the VLAN to which the DHCPv6 server that will assign IP information belongs here.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Helper Address | <p>Enter the IPv6 address of the DHCPv6 server that will assign IP information here.</p> <p>An 128-bit IPv6 address is written as eight 16-bit hexadecimal blocks separated by colons (:). This is an example IPv6 address '2001:0db8:1a2b:0015:0000:0000:1a2f:0000'.</p> <p>IPv6 addresses can be abbreviated in two ways:</p> <ul style="list-style-type: none"> <li>Leading zeros in a block can be omitted. So '2001:0db8:1a2b:0015:0000:0000:1a2f:0000' can be written as '2001:db8:1a2b:15:0:0:1a2f:0'.</li> <li>Any number of consecutive blocks of zeros can be replaced by a double colon. A double colon can only appear once in an IPv6 address. So '2001:0db8:0000:0000:1a2f:0000:0000:0015' can be written as '2001:0db8::1a2f:0000:0000:0015', '2001:0db8:0000:0000:1a2f::0015', '2001:db8::1a2f:0:0:15' or '2001:db8:0:0:1a2f::15'.</li> </ul> |
| Options        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Interface ID   | Select this option to have the Switch add the interface-ID option in the DHCPv6 requests from the clients in the specified VLAN before the Switch forwards them to a DHCPv6 server.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Remote ID      | Enter a string of up to 64 printable characters to be carried in the remote-ID option. The Switch adds the remote-ID option in the DHCPv6 requests from the clients in the specified VLAN before the Switch forwards them to a DHCPv6 server.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Add            | <p>Click this to create a new entry or to update an existing one.</p> <p>This saves your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the <b>Save</b> link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Cancel         | Click <b>Cancel</b> to reset the fields to their last saved values.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Clear          | Click <b>Clear</b> to reset the fields to the factory defaults.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| VID            | This field displays the VLAN ID number. Click the VLAN ID to change the settings.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Helper Address | This field displays the IPv6 address of the remote DHCPv6 server for this VLAN.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Interface ID   | This field displays whether the interface-ID option is added to DHCPv6 requests from clients in this VLAN.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Remote ID      | This field displays whether the remote-ID option is added to DHCPv6 requests from clients in this VLAN.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|                | Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |

Table 210 IP Application &gt; DHCP &gt; DHCPv6&gt; DHCPv6 Relay (continued)

| LABEL  | DESCRIPTION                                                                           |
|--------|---------------------------------------------------------------------------------------|
| Delete | Check the entry(ies) that you want to remove and then click the <b>Delete</b> button. |
| Cancel | Click <b>Cancel</b> to clear the selected checkbox(es).                               |

# CHAPTER 48

## VRRP

This chapter shows you how to configure and monitor the Virtual Router Redundancy Protocol (VRRP) on the Switch.

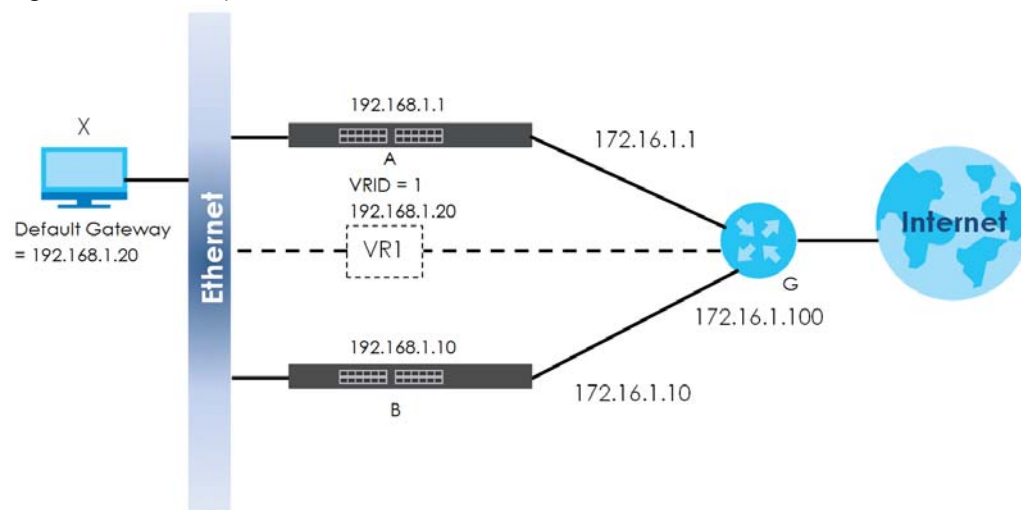
### 48.1 VRRP Overview

Each host on a network is configured to send packets to a statically configured default gateway (this Switch). The default gateway can become a single point of failure. Virtual Router Redundancy Protocol (VRRP), defined in RFC 2338, allows you to create redundant backup gateways to ensure that the default gateway of a host is always available.

In VRRP, a virtual router (VR) represents a number of physical layer-3 devices. An IP address is associated with the virtual router. A layer-3 device having the same IP address is the preferred master router while the other Layer-3 devices are the backup routers. The master router forwards traffic for the virtual router. When the master router becomes unavailable, a backup router assumes the role of the master router until the master router comes back up and takes over.

The following figure shows a VRRP network example with the switches (**A** and **B**) implementing one virtual router **VR1** to ensure the link between the host **X** and the uplink gateway **G**. Host **X** is configured to use **VR1** (192.168.1.20) as the default gateway. If switch **A** has a higher priority, it is the master router. Switch **B**, having a lower priority, is the backup router.

**Figure 282** : Example 1



If switch **A** (the master router) is unavailable, switch **B** takes over. Traffic is then processed by switch **B**.

## 48.2 VRRP Status

Click **IP Application > VRRP** in the navigation panel to display the **VRRP Status** screen as shown next.

**Figure 283** IP Application > VRRP Status

| VRRP Status <a href="#">Configuration</a> |         |      |           |               |
|-------------------------------------------|---------|------|-----------|---------------|
| Index                                     | Network | VRID | VR Status | Uplink Status |
|                                           |         |      |           |               |

Poll Interval(s)  [Set Interval](#) [Stop](#)

The following table describes the labels in this screen.

Table 211 IP Application > VRRP Status

| LABEL            | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                   |
|------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Index            | This field displays the index number of a rule.                                                                                                                                                                                                                                                                                                                                                               |
| Network          | This field displays the IP address and the subnet mask bits of an IP routing domain that is associated to a virtual router.                                                                                                                                                                                                                                                                                   |
| VRID             | This field displays the ID number of the virtual router.                                                                                                                                                                                                                                                                                                                                                      |
| VR Status        | <p>This field displays the status of the virtual router.</p> <p>This field is <b>Master</b> indicating that this Switch functions as the master router.</p> <p>This field is <b>Backup</b> indicating that this Switch functions as a backup router.</p> <p>This field displays <b>Init</b> when this Switch is initiating the VRRP protocol or when the <b>Uplink Status</b> field displays <b>Dead</b>.</p> |
| Uplink Status    | <p>This field displays the status of the link between this Switch and the uplink gateway.</p> <p>This field is <b>Alive</b> indicating that the link between this Switch and the uplink gateway is up. Otherwise, this field is <b>Dead</b>.</p> <p>This field displays <b>Probe</b> when this Switch is check for the link state.</p>                                                                        |
| Poll Interval(s) | The text box displays how often (in seconds) this screen refreshes. You may change the refresh interval by typing a new number in the text box and then clicking <b>Set Interval</b> .                                                                                                                                                                                                                        |
| Stop             | Click <b>Stop</b> to halt system statistic polling.                                                                                                                                                                                                                                                                                                                                                           |

## 48.3 VRRP Configuration

The following sections describe the different parts of the **VRRP Configuration** screen.

### 48.3.1 IP Interface Setup

Before configuring VRRP, first create an IP interface (or routing domain) in the **IP Setup** screen (see the [Section 8.4 on page 85](#) for more information).

Click **IP Application**, **VRRP** and click the **Configuration** link to display the **VRRP Configuration** screen as shown next.

Note: You can only configure VRRP on interfaces with unique VLAN IDs.

Note: Routing domains with the same VLAN ID are not displayed in the table indicated.

**Figure 284** IP Application > VRRP Configuration: IP Interface

**VRRP Configuration** [Status](#)

| Index | Network         | Authentication | Key |
|-------|-----------------|----------------|-----|
| 1     | 10.2.1.23/24    | None ▼         |     |
| 2     | 192.168.1.1/24  | None ▼         |     |
| 3     | 192.168.11.1/24 | None ▼         |     |

[Apply](#) [Cancel](#)

Active ☐

Name

Network

Virtual Router ID

Advertisement Interval

Preempt Mode ☒

Priority

Uplink Gateway

Response Ping ☐

Primary Virtual IP

Secondary Virtual IP

[Add](#) [Cancel](#) [Clear](#)

| Index | Active | Name | Network | VRID | Primary VIP | Uplink Gateway | Priority |
|-------|--------|------|---------|------|-------------|----------------|----------|
|-------|--------|------|---------|------|-------------|----------------|----------|

[Delete](#) [Cancel](#)

The following table describes the labels in this screen.

Table 212 IP Application > VRRP Configuration: IP Interface

| LABEL          | DESCRIPTION                                                                                                                                                                                                                                                                        |
|----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Index          | This field displays the index number of an entry.                                                                                                                                                                                                                                  |
| Network        | This field displays the IP address and number of subnet mask bit of an IP domain.                                                                                                                                                                                                  |
| Authentication | Select <b>None</b> to disable authentication. This is the default setting.<br><br>Select <b>Simple</b> to use a simple password to authenticate VRRP packet exchanges on this interface.                                                                                           |
| Key            | When you select <b>Simple</b> in the <b>Authentication</b> field, enter a password key (up to eight printable ASCII character long) in this field.                                                                                                                                 |
| Apply          | Click <b>Apply</b> to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the <b>Save</b> link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel         | Click <b>Cancel</b> to discard all changes made in this table.                                                                                                                                                                                                                     |

## 48.3.2 VRRP Parameters

This section describes the VRRP parameters.

### 48.3.2.1 Advertisement Interval

The master router sends out Hello messages to let the other backup routers know that it is still up and running. The time interval between sending the Hello messages is the advertisement interval. By default, a Hello message is sent out every second.

If the backup routers do not receive a Hello message from the master router after this interval expires, it is assumed that the master router is down. Then the backup router with the highest priority becomes the master router.

Note: All routers participating in the virtual router must use the same advertisement interval.

### 48.3.2.2 Priority

Configure the priority level (1 to 254) to set which backup router to take over in case the master router goes down. The backup router with the highest priority will take over. The priority of the VRRP router that owns the IP address(es) associated with the virtual router is 255.

### 48.3.2.3 Preempt Mode

If the master router is unavailable, a backup router assumes the role of the master router. However, when another backup router with a higher priority joins the network, it will preempt the lower priority backup router that is the master. Disable preempt mode to prevent this from happening.

By default, a layer 3 device with the same IP address as the virtual router will become the master router regardless of the preempt mode.

## 48.3.3 Configuring VRRP Parameters

After you set up an IP interface, configure the VRRP parameters in the **VRRP Configuration** screen.

**Figure 285** IP Application > VRRP Configuration: VRRP Parameters

|                        |                                     |
|------------------------|-------------------------------------|
| Active                 | <input type="checkbox"/>            |
| Name                   | name                                |
| Network                | 192.168.1.1/24 ▼                    |
| Virtual Router ID      | 1 ▼                                 |
| Advertisement Interval | 1                                   |
| Preempt Mode           | <input checked="" type="checkbox"/> |
| Priority               | 100                                 |
| Uplink Gateway         | 0.0.0.0                             |
| Response Ping          | <input type="checkbox"/>            |
| Primary Virtual IP     | 0.0.0.0                             |
| Secondary Virtual IP   | 0.0.0.0                             |

The following table describes the labels in this screen.

Table 213 IP Application > VRRP Configuration: VRRP Parameters

| LABEL                  | DESCRIPTION                                                                                                                                                                                                                                                                                                                              |
|------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Active                 | Select this option to enable this VRRP entry.                                                                                                                                                                                                                                                                                            |
| Name                   | Enter a descriptive name (up to 32 printable ASCII characters) for identification purposes.                                                                                                                                                                                                                                              |
| Network                | Select an IP domain to which this VRRP entry applies.                                                                                                                                                                                                                                                                                    |
| Virtual Router ID      | Select a virtual router number (1 to 7) for which this VRRP entry is created.<br>You can configure up to seven virtual routers for one network.                                                                                                                                                                                          |
| Advertisement Interval | Specify the number of seconds between Hello message transmissions. The default is <b>1</b> .                                                                                                                                                                                                                                             |
| Preempt Mode           | Select this option to activate preempt mode.                                                                                                                                                                                                                                                                                             |
| Priority               | Enter a number (between 1 and 254) to set the priority level. The bigger the number, the higher the priority.<br>This field is <b>100</b> by default.                                                                                                                                                                                    |
| Uplink Gateway         | Enter the IP address of the uplink gateway in dotted decimal notation.<br>The Switch checks the link to the uplink gateway.                                                                                                                                                                                                              |
| Response Ping          | Select this option to have the Switch respond to a ping that is sent to the virtual IP address.                                                                                                                                                                                                                                          |
| Primary Virtual IP     | Enter the IP address of the primary virtual router in dotted decimal notation.                                                                                                                                                                                                                                                           |
| Secondary Virtual IP   | This field is optional. Enter the IP address of a secondary virtual router in dotted decimal notation. This field is ignored when you enter <b>0.0.0.0</b> .                                                                                                                                                                             |
| Add                    | Click this to create a new entry or to update an existing one.<br><br>This saves your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the <b>Save</b> link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel                 | Click <b>Cancel</b> to discard all changes made in this table.                                                                                                                                                                                                                                                                           |
| Clear                  | Click <b>Clear</b> to set the above fields back to the factory defaults.                                                                                                                                                                                                                                                                 |

### 48.3.4 Viewing VRRP Summary

View the VRRP configuration summary at the bottom of the screen.

Figure 286 IP Application > VRRP Configuration: Summary



| Index                      | Active | Name | Network | VRID | Primary VIP | Uplink Gateway | Priority |  |
|----------------------------|--------|------|---------|------|-------------|----------------|----------|--|
| <div> Delete Cancel </div> |        |      |         |      |             |                |          |  |

The following table describes the labels in this screen.

Table 214 IP Application > VRRP Configuration: Summary

| LABEL       | DESCRIPTION                                                                                     |
|-------------|-------------------------------------------------------------------------------------------------|
| Index       | This field displays the index number of an entry. Click an index number to change the settings. |
| Active      | This field shows whether a VRRP entry is enabled ( <b>Yes</b> ) or disabled ( <b>No</b> ).      |
| Name        | This field displays a descriptive name of an entry.                                             |
| Network     | This field displays the IP address and subnet mask of an interface.                             |
| VRID        | This field displays the ID number of a virtual router.                                          |
| Primary VIP | This field displays the IP address of the primary virtual router.                               |

Table 214 IP Application &gt; VRRP Configuration: Summary (continued)

| LABEL          | DESCRIPTION                                                                                                                             |
|----------------|-----------------------------------------------------------------------------------------------------------------------------------------|
| Uplink Gateway | This field displays the IP address of the uplink gateway.                                                                               |
| Priority       | This field displays the priority level (1 to 255) of the entry.                                                                         |
|                | Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries. |
| Delete         | Click <b>Delete</b> to remove the selected entry from the summary table.                                                                |
| Cancel         | Click <b>Cancel</b> to clear the check boxes.                                                                                           |

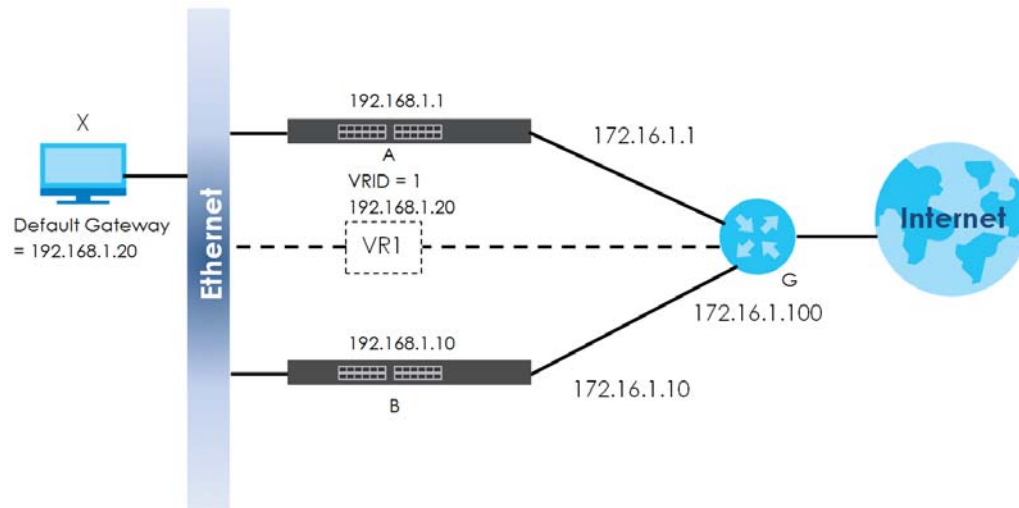
## 48.4 VRRP Configuration Examples

The following sections show two VRRP configuration examples on the Switch.

### 48.4.1 One Subnet Network Example

The figure below shows a simple VRRP network with only one virtual router **VR1** (VRID = 1) and two switches. The network is connected to the WAN via an uplink gateway **G** (172.16.1.100). The host computer **X** is set to use **VR1** as the default gateway.

**Figure 287** VRRP Configuration Example: One Virtual Router Network



You want to set switch **A** as the master router. Configure the VRRP parameters in the **VRRP Configuration** screens on the switches as shown in the figures below.



**Figure 288** VRRP Example 1: VRRP Parameter Settings on Switch A

|                        |                                     |
|------------------------|-------------------------------------|
| Active                 | <input checked="" type="checkbox"/> |
| Name                   | Example1                            |
| Network                | 192.168.1.1/24                      |
| Virtual Router ID      | 1                                   |
| Advertisement Interval | 1                                   |
| Preempt Mode           | <input checked="" type="checkbox"/> |
| Priority               | 110                                 |
| Uplink Gateway         | 172.16.1.100                        |
| Response Ping          | <input checked="" type="checkbox"/> |
| Primary Virtual IP     | 192.168.1.20                        |
| Secondary Virtual IP   | 0.0.0.0                             |

**EXAMPLE**

[Add](#) [Cancel](#) [Clear](#)

**Figure 289** VRRP Example 1: VRRP Parameter Settings on Switch B

|                        |                                     |
|------------------------|-------------------------------------|
| Active                 | <input checked="" type="checkbox"/> |
| Name                   | Example1                            |
| Network                | 192.168.1.10/24                     |
| Virtual Router ID      | 1                                   |
| Advertisement Interval | 1                                   |
| Preempt Mode           | <input checked="" type="checkbox"/> |
| Priority               | 110                                 |
| Uplink Gateway         | 172.16.1.100                        |
| Response Ping          | <input checked="" type="checkbox"/> |
| Primary Virtual IP     | 192.168.1.20                        |
| Secondary Virtual IP   | 0.0.0.0                             |

**EXAMPLE**

[Add](#) [Cancel](#) [Clear](#)

After configuring and saving the VRRP configuration, the **VRRP Status** screens for both switches are shown next.

**Figure 290** VRRP Example 1: VRRP Status on Switch A

| VRRP Status |                |      |           | <a href="#">Configuration</a> |
|-------------|----------------|------|-----------|-------------------------------|
| Index       | Network        | VRID | VR Status | Uplink Status                 |
| 1           | 192.168.1.1/24 | 1    | Master    | Alive                         |

**EXAMPLE**

**Figure 291** VRRP Example 1: VRRP Status on Switch B

| VRRP Status |                 |      |           | <a href="#">Configuration</a> |
|-------------|-----------------|------|-----------|-------------------------------|
| Index       | Network         | VRID | VR Status | Uplink Status                 |
| 1           | 192.168.1.10/24 | 1    | Backup    | Alive                         |

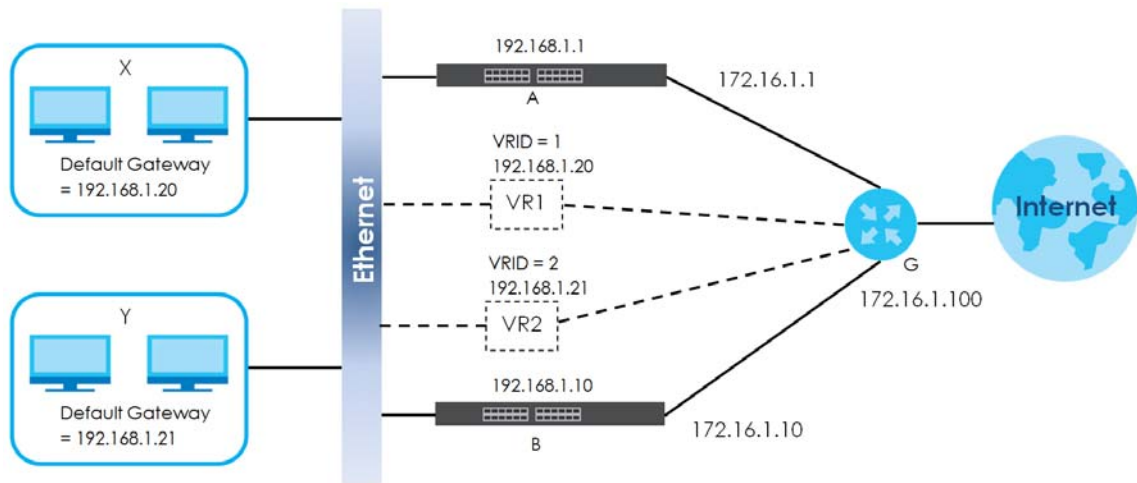
**EXAMPLE**

## 48.4.2 Two Subnets Example

The following figure depicts an example in which two switches share the network traffic. Hosts in the two network groups use different default gateways. Each switch is configured to backup a virtual router using VRRP.

You wish to configure switch **A** as the master router for virtual router **VR1** and as a backup for virtual router **VR2**. On the other hand, switch **B** is the master for **VR2** and a backup for **VR1**.

**Figure 292** VRRP Configuration Example: Two Virtual Router Network



You need to configure the **VRRP Configuration** screen for virtual router VR2 on each switch, while keeping the VRRP configuration in example 1 for virtual router **VR1** (refer to [Section 48.4.2 on page 413](#)). Configure the VRRP parameters on the switches as shown in the figures below.

**Figure 293** VRRP Example 2: VRRP Parameter Settings for VR2 on Switch A

|                        |                                     |
|------------------------|-------------------------------------|
| Active                 | <input checked="" type="checkbox"/> |
| Name                   | Example2                            |
| Network                | 192.168.1.1/24                      |
| Virtual Router ID      | 2                                   |
| Advertisement Interval | 1                                   |
| Preempt Mode           | <input checked="" type="checkbox"/> |
| Priority               | 100                                 |
| Uplink Gateway         | 172.16.1.100                        |
| Response Ping          | <input checked="" type="checkbox"/> |
| Primary Virtual IP     | 192.168.1.21                        |
| Secondary Virtual IP   | 0.0.0.0                             |

**EXAMPLE**

[Add](#) [Cancel](#) [Clear](#)

**Figure 294** VRRP Example 2: VRRP Parameter Settings for VR2 on Switch B

|                        |                                     |
|------------------------|-------------------------------------|
| Active                 | <input checked="" type="checkbox"/> |
| Name                   | Example2                            |
| Network                | 192.168.1.10/24                     |
| Virtual Router ID      | 2                                   |
| Advertisement Interval | 1                                   |
| Preempt Mode           | <input checked="" type="checkbox"/> |
| Priority               | 100                                 |
| Uplink Gateway         | 172.16.1.100                        |
| Response Ping          | <input checked="" type="checkbox"/> |
| Primary Virtual IP     | 192.168.1.21                        |
| Secondary Virtual IP   | 0.0.0.0                             |

**EXAMPLE**

[Add](#) [Cancel](#) [Clear](#)

After configuring and saving the VRRP configuration, the **VRRP Status** screens for both switches are shown next.

**Figure 295** VRRP Example 2: VRRP Status on Switch A

| VRRP Status |                |      |           | <a href="#">Configuration</a> |
|-------------|----------------|------|-----------|-------------------------------|
| Index       | Network        | VRID | VR Status | Uplink Status                 |
| 1           | 192.168.1.1/24 | 2    | Backup    | Alive                         |
| 2           | 192.168.1.1/24 | 1    | Master    | Alive                         |

**EXAMPLE**

**Figure 296** VRRP Example 2: VRRP Status on Switch B

| VRRP Status |                 |      |           | <a href="#">Configuration</a> |
|-------------|-----------------|------|-----------|-------------------------------|
| Index       | Network         | VRID | VR Status | Uplink Status                 |
| 1           | 192.168.1.10/24 | 2    | Master    | Alive                         |
| 2           | 192.168.1.10/24 | 1    | Backup    | Alive                         |

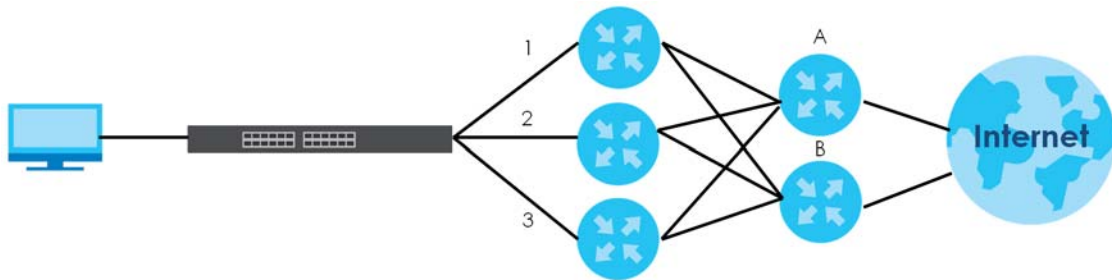
**EXAMPLE**

# CHAPTER 49

## Router Setup

### 49.1 Router Setup Overview

The Switch learns the next-hop(s) using ARP and determines routing path(s) for a destination. The Switch supports Equal-Cost MultiPath (ECMP) to forward packets destined to the same device (**A** for example) through different routing paths (**1**, **2** and **3**) of equal path cost. This allows you to balance or share traffic loads between multiple routing paths when the Switch is connected to more than one next-hop. ECMP works with static routes or a routing protocol, such as OSPF. With ECMP, packets are routed through the paths of equal cost according to the hash algorithm output.



### 49.2 Configuring Router Setup

Click **IP Application > Router Setup** in the navigation panel to display the screen as shown next.

**Figure 297** IP Application > Router Setup

| Load Sharing  |                          |
|---------------|--------------------------|
| Active        | <input type="checkbox"/> |
| Criteria      | src-dst-ip ▼             |
| Aging Time    | 1200 seconds             |
| Discover Time | 3600 seconds             |
| Maximum Paths | 8                        |

The following table describes the labels in this screen.

Table 215 IP Application > Load Sharing

| LABEL         | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|---------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Active        | Select this option to enable Equal-Cost MultiPath (ECMP) routing on the Switch.                                                                                                                                                                                                                                                                                                                                                                                       |
| Criteria      | <p>Select the criteria the Switch uses to determine the routing path for a packet.</p> <p>Select <b>src-ip</b> to have the Switch use a hash algorithm to convert a packet's source IP address into a hash value which acts as an index to a route path.</p> <p>Select <b>src-dst-ip</b> to have the Switch use a hash algorithm to convert a packet's source and destination IP addresses into a hash value which acts as an index to a route path.</p>              |
| Aging Time    | Specify the time interval (from 0 to 86400 in increments of 10) in seconds at which the Switch sends an ARP request to update a resolved next-hop's MAC address.                                                                                                                                                                                                                                                                                                      |
| Discover Time | Specify the time interval (from 0 to 86400 in increments of 10) in seconds at which the Switch sends an ARP request to update an unresolved next-hop's MAC address.                                                                                                                                                                                                                                                                                                   |
| Maximum Paths | <p>Set the maximum number of paths for one ECMP (Equal-Cost MultiPath) route. The maximum number varies by Switch. A smaller number of maximum-paths means more ECMP routes are allowed and a larger number of maximum-paths means fewer ECMP routes are allowed.</p> <p>The number of paths for a static route for ECMP cannot be bigger than the maximum-paths value configured here.</p> <p>Throughput may be influenced while configuring ECMP maximum-paths.</p> |
| Apply         | Click <b>Apply</b> to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the <b>Save</b> link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.                                                                                                                                                                                    |
| Cancel        | Click <b>Cancel</b> to begin configuring this screen afresh.                                                                                                                                                                                                                                                                                                                                                                                                          |

# CHAPTER 50

## ARP Setup

### 50.1 ARP Overview

Address Resolution Protocol (ARP) is a protocol for mapping an Internet Protocol address (IP address) to a physical machine address, also known as a Media Access Control or MAC address, on the local area network.

An IP (version 4) address is 32 bits long. In an Ethernet LAN, MAC addresses are 48 bits long. The ARP table maintains an association between each MAC address and its corresponding IP address.

#### 50.1.1 How ARP Works

When an incoming packet destined for a host device on a local area network arrives at the Switch, the Switch looks in the ARP Table and if it finds the address, it sends it to the device.

If no entry is found for the IP address, ARP broadcasts the request to all the devices on the LAN. The Switch fills in its own MAC and IP address in the sender address fields, and puts the known IP address of the target in the target IP address field. In addition, the Switch puts all ones in the target MAC field (FF.FF.FF.FF.FF.FF is the Ethernet broadcast address). The replying device (which is either the IP address of the device being sought or the router that knows the way) replaces the broadcast address with the target's MAC address, swaps the sender and target pairs, and unicasts the answer directly back to the requesting machine. ARP updates the ARP Table for future reference and then sends the packet to the MAC address that replied.

#### 50.1.2 ARP Learning Mode

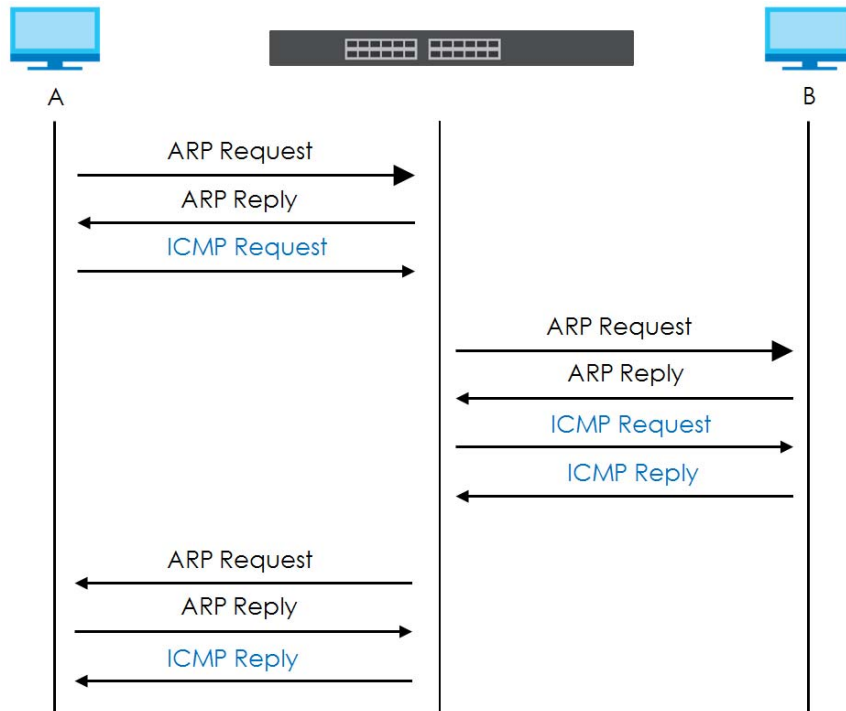
The Switch supports three ARP learning modes: ARP-Reply, Gratuitous-ARP, and ARP-Request.

##### 50.1.2.1 ARP-Reply

The Switch in ARP-Reply learning mode updates the ARP table only with the ARP replies to the ARP requests sent by the Switch. This can help prevent ARP spoofing.

In the following example, the Switch does not have IP address and MAC address mapping information for hosts **A** and **B** in its ARP table, and host **A** wants to ping host **B**. Host **A** sends an ARP request to the Switch and then sends an ICMP request after getting the ARP reply from the Switch. The Switch finds no matched entry for host **B** in the ARP table and broadcasts the ARP request to all the devices on the LAN. When the Switch receives the ARP reply from host **B**, it updates its ARP table and also forwards host **A**'s ICMP request to host **B**. After the Switch gets the ICMP reply from host **B**, it sends out an ARP request to

get host **A**'s MAC address and updates the ARP table with host **A**'s ARP reply. The Switch then can forward host **B**'s ICMP reply to host **A**.



### 50.1.2.2 Gratuitous-ARP

A gratuitous ARP is an ARP request in which both the source and destination IP address fields are set to the IP address of the device that sends this request and the destination MAC address field is set to the broadcast address. There will be no reply to a gratuitous ARP request.

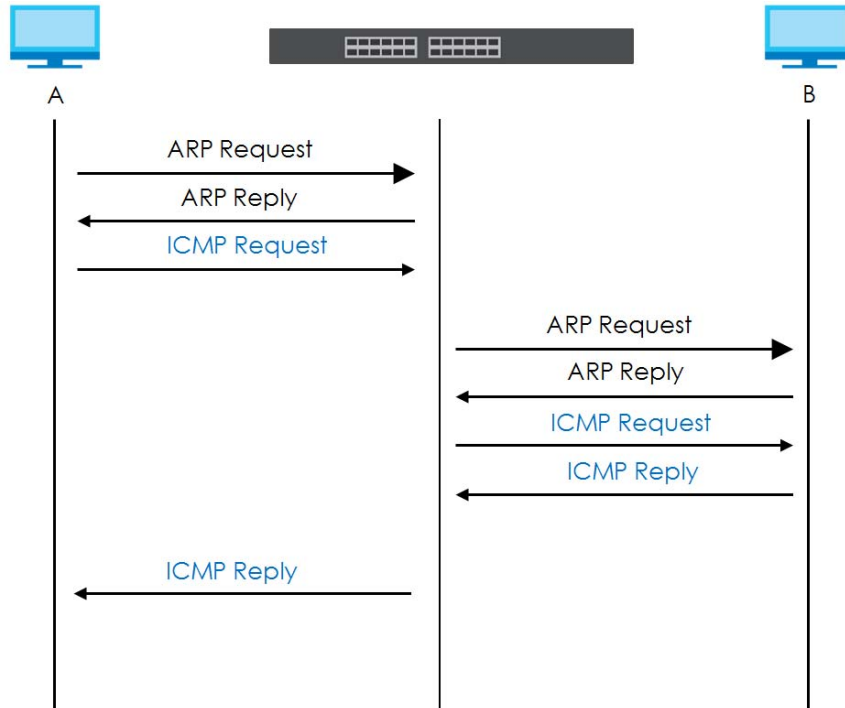
A device may send a gratuitous ARP packet to detect IP collisions. If a device restarts or its MAC address is changed, it can also use gratuitous ARP to inform other devices in the same network to update their ARP table with the new mapping information.

In Gratuitous-ARP learning mode, the Switch updates its ARP table with either an ARP reply or a gratuitous ARP request.

### 50.1.2.3 ARP-Request

When the Switch is in ARP-Request learning mode, it updates the ARP table with both ARP replies, gratuitous ARP requests and ARP requests.

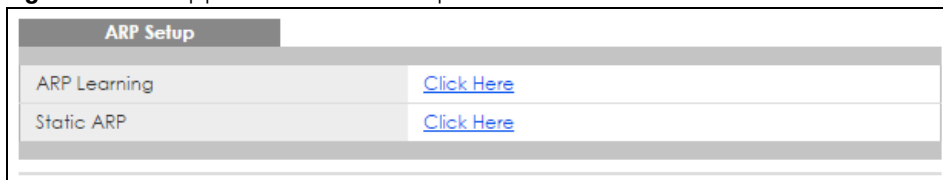
Therefore in the following example, the Switch can learn host **A**'s MAC address from the ARP request sent by host **A**. The Switch then forwards host **B**'s ICMP reply to host **A** right after getting host **B**'s MAC address and ICMP reply.



## 50.2 ARP Setup

Click **IP Application > ARP Setup** in the navigation panel to display the screen as shown. Click the link next to **ARP Learning** to open a screen where you can set the ARP learning mode for each port. Click the link next to **Static ARP** to open a screen where you can create static ARP entries on the Switch.

**Figure 298** IP Application > ARP Setup



### 50.2.1 ARP Learning

Use this screen to configure each port's ARP learning mode. Click the link next to **ARP Learning** in the **IP Application > ARP Setup** screen to display the screen as shown next.



**Figure 299** IP Application > ARP Setup > ARP Learning

| Port | ARP Learning Mode |
|------|-------------------|
| *    | ARP-Reply ▼       |
| 1    | ARP-Reply ▼       |
| 2    | ARP-Reply ▼       |
| 3    | ARP-Reply ▼       |
| 4    | ARP-Reply ▼       |
| 5    | ARP-Reply ▼       |
| 6    | ARP-Reply ▼       |
| 7    | ARP-Reply ▼       |
| 8    | ARP-Reply ▼       |
| 9    | ARP-Reply ▼       |
| 10   | ARP-Reply ▼       |
| 11   | ARP-Reply ▼       |
| 12   | ARP-Reply ▼       |
| 13   | ARP-Reply ▼       |
| 14   | ARP-Reply ▼       |
| 15   | ARP-Reply ▼       |
| 16   | ARP-Reply ▼       |

Apply Cancel

The following table describes the labels in this screen.

**Table 216** IP Application > ARP Setup > ARP Learning

| LABEL             | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|-------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Port              | This field displays the port number.                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| *                 | <p>Settings in this row apply to all ports.</p> <p>Use this row only if you want to make some settings the same for all ports. Use this row first to set the common settings and then make adjustments on a port-by-port basis.</p> <p>Note: Changes in this row are copied to all the ports as soon as you make them.</p>                                                                                                                                                            |
| ARP Learning Mode | <p>Select the ARP learning mode the Switch uses on the port.</p> <p>Select <b>ARP-Reply</b> to have the Switch update the ARP table only with the ARP replies to the ARP requests sent by the Switch.</p> <p>Select <b>Gratuitous-ARP</b> to have the Switch update its ARP table with either an ARP reply or a gratuitous ARP request.</p> <p>Select <b>ARP-Request</b> to have the Switch update the ARP table with both ARP replies, gratuitous ARP requests and ARP requests.</p> |
| Apply             | Click <b>Apply</b> to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the <b>Save</b> link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.                                                                                                                                                                                                    |
| Cancel            | Click <b>Cancel</b> to begin configuring this screen afresh.                                                                                                                                                                                                                                                                                                                                                                                                                          |

## 50.2.2 Static ARP

Use this screen to create static ARP entries that will display in the **Management > ARP Table** screen and will not age out. Click the link next to **Static ARP** in the **IP Application > ARP Setup** screen to display the screen as shown.

**Figure 300** IP Application > ARP Setup > Static ARP

The screenshot shows the 'Static ARP' configuration interface. At the top, there's a header 'Static ARP' and a link 'ARP Setup'. Below this is a form with the following fields: 'Active' (a checkbox), 'Name' (a text input), 'IP Address' (a text input), 'MAC Address' (a text input), 'VID' (a text input), and 'Port' (a text input). Under the form are three buttons: 'Add', 'Cancel', and 'Clear'. At the bottom of the screen is a table with the following columns: 'Index', 'Active', 'Name', 'IP Address', 'MAC Address', 'VID', 'Port', and a checkbox. Below the table are two buttons: 'Delete' and 'Cancel'.

The following table describes the related labels in this screen.

Table 217 IP Application > ARP Setup > Static ARP

| LABEL       | DESCRIPTION                                                                                                                                                                                                                                                                                                                              |
|-------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Active      | Select this check box to activate your rule. You may temporarily deactivate a rule without deleting it by clearing this check box.                                                                                                                                                                                                       |
| Name        | Enter a descriptive name (up to 32 printable ASCII characters) for identification purposes.                                                                                                                                                                                                                                              |
| IP Address  | Enter the IP address of a device connected to a Switch port with the corresponding MAC address below.                                                                                                                                                                                                                                    |
| MAC Address | Enter the MAC address of the device with the corresponding IP address above.                                                                                                                                                                                                                                                             |
| VID         | Enter the ID number of VLAN to which the device belongs.                                                                                                                                                                                                                                                                                 |
| Port        | Enter the number of port to which the device connects.                                                                                                                                                                                                                                                                                   |
| Add         | Click this to create a new entry or to update an existing one.<br><br>This saves your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the <b>Save</b> link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel      | Click <b>Cancel</b> to begin configuring this screen afresh.                                                                                                                                                                                                                                                                             |
| Clear       | Click <b>Clear</b> to set the above fields back to the factory defaults.                                                                                                                                                                                                                                                                 |
| Index       | This field displays the index number of an entry. Click an index number to change the settings.                                                                                                                                                                                                                                          |
| Active      | This field displays <b>Yes</b> when the entry is activated and <b>NO</b> when it is deactivated.                                                                                                                                                                                                                                         |
| Name        | This field displays the descriptive name for this entry. This is for identification purposes only.                                                                                                                                                                                                                                       |
| IP Address  | This is the IP address of a device connected to a Switch port with the corresponding MAC address below.                                                                                                                                                                                                                                  |
| MAC Address | This is the MAC address of the device with the corresponding IP address above.                                                                                                                                                                                                                                                           |
| VID         | This field displays the VLAN to which the device belongs.                                                                                                                                                                                                                                                                                |
| Port        | This field displays the port to which the device connects.                                                                                                                                                                                                                                                                               |

Table 217 IP Application &gt; ARP Setup &gt; Static ARP (continued)

| LABEL  | DESCRIPTION                                                                                                                             |
|--------|-----------------------------------------------------------------------------------------------------------------------------------------|
|        | Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries. |
| Delete | Click <b>Delete</b> to remove the selected entry from the summary table.                                                                |
| Cancel | Click <b>Cancel</b> to clear the check boxes.                                                                                           |

# CHAPTER 51

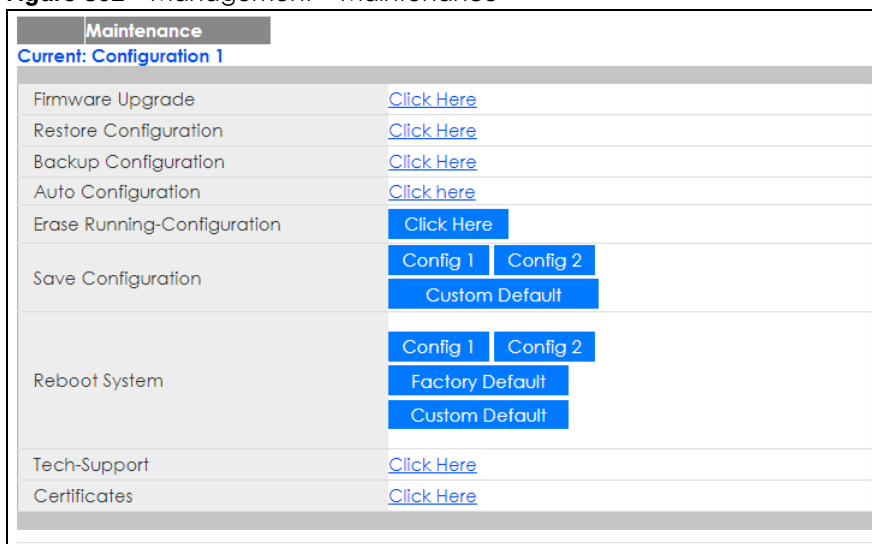
## Maintenance

This chapter explains how to configure the maintenance screens that let you maintain the firmware and configuration files.

### 51.1 The Maintenance Screen

Use this screen to manage firmware and your configuration files. Click **Management > Maintenance** in the navigation panel to open the following screen.

**Figure 301** Management > Maintenance



The following table describes the labels in this screen.

Table 218 Management > Maintenance

| LABEL                 | DESCRIPTION                                                                                                                        |
|-----------------------|------------------------------------------------------------------------------------------------------------------------------------|
| Current               | This field displays which configuration ( <b>Configuration 1</b> or <b>Configuration 2</b> ) is currently operating on the Switch. |
| Firmware Upgrade      | Click <b>Click Here</b> to go to the <b>Firmware Upgrade</b> screen.                                                               |
| Restore Configuration | Click <b>Click Here</b> to go to the <b>Restore Configuration</b> screen.                                                          |
| Backup Configuration  | Click <b>Click Here</b> to go to the <b>Backup Configuration</b> screen.                                                           |
| Auto Configuration    | Click <b>Click Here</b> to go to the <b>Auto Configuration</b> screen.                                                             |

Table 218 Management &gt; Maintenance (continued)

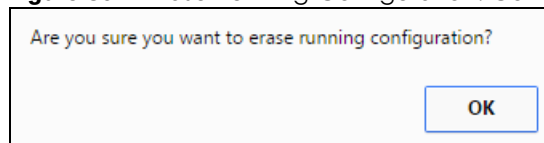
| LABEL                       | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|-----------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Erase Running-Configuration | Click <b>Click Here</b> to reset the current configuration of the Switch. Note that this will not reset the configuration to the factory default settings.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Save Configuration          | Click <b>Config 1</b> to save the current configuration settings to <b>Configuration 1</b> on the Switch.<br>Click <b>Config 2</b> to save the current configuration settings to <b>Configuration 2</b> on the Switch.<br>Click <b>Custom Default</b> to save the current configuration settings to a custom default file on the Switch.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Reboot System               | Click <b>Config 1</b> to reboot the system and load <b>Configuration 1</b> on the Switch.<br>Click <b>Config 2</b> to reboot the system and load <b>Configuration 2</b> on the Switch.<br>Click <b>Factory Default</b> to reboot the system and load the factory default configuration on the Switch.<br>Click <b>Custom Default</b> to reboot the system and load a saved <b>Custom Default</b> configuration file on the Switch. This will save the custom default configuration settings to both <b>Configuration 1</b> and <b>Configuration 2</b> . If a <b>Custom Default</b> configuration file was not saved, clicking <b>Custom Default</b> loads the factory default configuration on the Switch.<br><br>Note: Make sure to click the <b>Save</b> button in any screen to save your settings to the current configuration on the Switch. |
| Tech-Support                | Click <b>Click Here</b> to see the <b>Tech-Support</b> screen. You can set CPU and memory thresholds for log reports and download related log reports for issue analysis. Log reports include CPU history and utilization, crash and memory.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Certificates                | Click <b>Click Here</b> to see the <b>Certificate</b> screen and import the VMG's CA-signed certificates.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |

## 51.2 Erase Running-Configuration

Follow the steps below to clear current configuration on the Switch. Note that this will NOT reset the Switch back to its factory defaults. If you want to change the Switch to its factory default mode, click the **Factory Default** button in Reboot System.

- 1 In the **Maintenance** screen, click the **Click Here** button next to **Erase Running-Configuration** to clear all Switch configuration information you configured on the Switch.
- 2 Click **OK** to reset all Switch configurations.

Figure 302 Erase Running-Configuration: Confirmation



- 3 In the web configurator, click the **Save** button in the top of the screen to make the changes take effect. If you want to access the Switch web configurator again, you may need to change the IP address of your computer to be in the same subnet as that of the default Switch IP address (192.168.1.1 or DHCP-assigned IP).

## 51.3 Save Configuration

Click **Config 1** to save the current configuration settings permanently to configuration one on the Switch.

Click **Config 2** to save the current configuration settings permanently to configuration two on the Switch.

Click **Custom Default** to save the current configuration settings permanently to a custom default file on the Switch. If configuration changes cause the Switch to behave abnormally, click **Custom Default** (next to **Reboot System**) to have the Switch automatically reboot and restore the saved **Custom Default** configuration file.

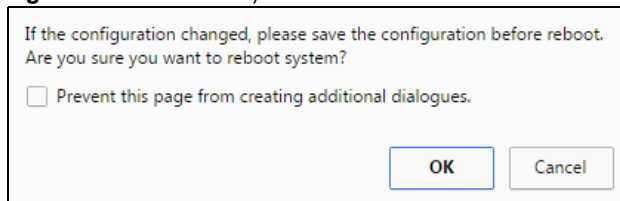
Alternatively, click **Save** on the top right-hand corner in any screen to save the configuration changes to the current configuration.

## 51.4 Reboot System

**Reboot System** allows you to restart the Switch without physically turning the power off. It also allows you to load configuration one (**Config 1**), configuration two (**Config 2**), a **Custom Default** or **Factory Default** when you reboot. Follow the steps below to reboot the Switch.

- 1 In the **Maintenance** screen, click a configuration button to reboot and load that configuration file. The following screen displays.

**Figure 303** Reboot System: Confirmation



- 2 Click **OK** again and then wait for the Switch to restart. This takes up to two minutes. This does not affect the Switch's configuration.

Click **Config 1** and follow steps 1 to 2 to reboot and load configuration one on the Switch.

Click **Config 2** and follow steps 1 to 2 to reboot and load configuration two on the Switch.

Click **Factory Default** and follow steps 1 to 2 to reboot and load default configuration settings on the Switch.

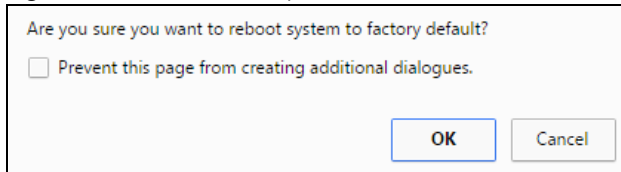
Click **Custom Default** and follow steps 1 to 2 to reboot and load **Custom Default** configuration settings on the Switch. This will save the custom default configuration settings to both **Configuration 1** and **Configuration 2**.

### 51.4.1 Factory Default

Follow the steps below to reset the Switch back to the factory defaults.

- 1 Click the **Factory Default** button.
- 2 Click **OK** to continue or **Cancel** to abort.

**Figure 304** Load Factory Default: Start



If you want to access the Switch web configurator again, you may need to change the IP address of your computer to be in the same subnet as that of the default Switch IP address (192.168.1.1 or DHCP-assigned IP).

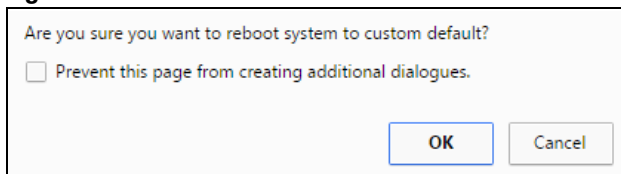
## 51.4.2 Custom Default

Follow the steps below to reset the Switch back to the **Custom Default** configurations file you created. This will save the custom default configuration settings to both **Configuration 1** and **Configuration 2**.

- 1 Click the **Custom Default** button.
- 2 Click **OK** to continue or **Cancel** to abort.

Note: If you did not save a **Custom Default** file in the web configurator or CLI using `copy running-config custom-default`, then the factory default file is restored after you press click **Custom Default** (next to **Reboot System**) on the Switch. You will then have to make all your configurations again on the Switch.

**Figure 305** Load Custom Default: Start



## 51.5 Firmware Upgrade

Make sure you have downloaded (and unzipped) the correct model firmware and version to your computer before uploading to the device.

**Be sure to upload the correct model firmware as uploading the wrong model firmware may damage your device.**

The Switch supports dual firmware images, **Firmware 1** and **Firmware 2**. Use this screen to specify which image is updated when firmware is uploaded using the web configurator and to specify which image is loaded when the Switch starts up.

Click **Management > Maintenance > Firmware Upgrade** to view the screen as shown next.

**Figure 306** Management > Maintenance > Firmware Upgrade

| Firmware Upgrade |            | <a href="#">Maintenance</a>  |
|------------------|------------|------------------------------|
| Name             | Version    |                              |
| XS3800-28        | Running    | V4.60(ABML.0)b3   08/22/2018 |
|                  | Firmware 1 | V4.60(ABML.0)b3   08/22/2018 |
|                  | Firmware 2 | V4.60(ABML.0)b3   08/22/2018 |

|                    |              |
|--------------------|--------------|
| Current Boot Image | Firmware 2   |
| Config Boot Image  | Firmware 2 ▼ |

[Apply](#) [Cancel](#)

To upgrade the internal switch firmware, browse the location of the binary (.BIN) file and click Upgrade button.

|          |     |           |                             |                |
|----------|-----|-----------|-----------------------------|----------------|
| Firmware | 1 ▼ | File Path | <a href="#">Choose File</a> | No file chosen |
|----------|-----|-----------|-----------------------------|----------------|

[Upgrade](#)

The top of firmware upgrade screen shows which firmware version is currently running on the Switch. Type the path and file name of the firmware file you wish to upload to the Switch in the **File Path** text box or click **Browse** to locate it. Firmware upgrades are only applied after a reboot. Click **Upgrade** to load the new firmware. Select the **Config Boot Image** drop-down list box if you want to reboot the Switch and click **Apply** to apply the new firmware immediately. Click **Upgrade** to load the new firmware.

After the firmware upgrade process is complete, see the **System Info** screen to verify your current firmware version number.

Table 219 Management &gt; Maintenance&gt; Firmware Upgrade

| LABEL              | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Name               | This is the name of the Switch that you're configuring.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Version            | <p>The Switch has two firmware sets, <b>Firmware 1</b> and <b>Firmware 2</b>, residing in flash.</p> <ul style="list-style-type: none"> <li><b>Running</b> shows the version number (and model code) and MM/DD/YYYY creation date of the firmware currently in use on the Switch (<b>Firmware 1</b> or <b>Firmware 2</b>). The firmware information is also displayed at System Information in Basic Settings.</li> <li><b>Firmware 1</b> shows its version number (and model code) and MM/DD/YYYY creation date.</li> <li><b>Firmware 2</b> shows its version number (and model code) and MM/DD/YYYY creation date.</li> </ul> |
| Current Boot Image | This displays which firmware is currently in use on the Switch ( <b>Firmware 1</b> or <b>Firmware 2</b> ).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Config Boot Image  | Select which firmware ( <b>Firmware 1</b> or <b>Firmware 2</b> ) should load after rebooting. Click Apply and reboot the Switch to see changes including in the <b>Current Boot Image</b> field.                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Apply              | Click <b>Apply</b> to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the <b>Save</b> link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.                                                                                                                                                                                                                                                                                                                                              |
| Cancel             | Click <b>Cancel</b> to begin configuring this screen afresh.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Firmware           | Choose to upload the new firmware to (Firmware) <b>1</b> or (Firmware) <b>2</b> .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |



Table 219 Management &gt; Maintenance&gt; Firmware Upgrade (continued)

| LABEL       | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                          |
|-------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Choose File | Click this and locate the path and file name of the firmware file you wish to upload to the Switch.                                                                                                                                                                                                                                                                                                  |
| Upgrade     | Click <b>Upgrade</b> to load the new firmware. Firmware upgrades are only applied after a reboot. To reboot, go to <b>Management &gt; Maintenance &gt; Reboot System</b> . You may also click <b>Config 1</b> , <b>Config 2</b> , or <b>Factory Default</b> ( <b>Config 1</b> , <b>Config 2</b> and <b>Factory Default</b> are the configuration files you want the Switch to use when it restarts). |

## 51.6 Restore Configuration

Restore a previously saved configuration from your computer to the Switch using the **Restore Configuration** screen.

Figure 307 Management &gt; Maintenance &gt; Restore Configuration

Click the **Choose File** button to upload the path and file name of the configuration file you wish to restore in the **File Path** text box. After you have specified the file, click **Restore**. "config" is the name of the configuration file on the Switch, so your backup configuration file is automatically renamed when you restore using this screen.

## 51.7 Backup Configuration

Backing up your Switch configurations allows you to create various "snapshots" of your device from which you may restore at a later date.

Back up your current Switch configuration to a computer using the **Backup Configuration** screen.

Figure 308 Management &gt; Maintenance &gt; Backup Configuration

Follow the steps below to back up the current Switch configuration to your computer in this screen.

- 1 Select which Switch configuration file you want to download to your computer.

- 2 Click **Backup**.
- 3 If the current configuration file is open and/or downloaded to your computer automatically, you can click **File > Save As** to save the file to a specific place.

If a dialog box pops up asking whether you want to open or save the file, click **Save** or **Save File** to download it to the default downloads folder on your computer. If a **Save As** screen displays after you click **Save** or **Save File**, Choose a location to save the file on your computer from the **Save in** drop-down list box and type a descriptive name for it in the **File name** list box. Click **Save** to save the configuration file to your computer.

## 51.8 Auto Configuration

The Switch can download an pre-saved auto configuration file automatically when you reboot the Switch using the DHCP or HTTPS mode. This will overwrite the running configuration stored in the Switch's RAM instead of the startup configuration stored in the Switch's flash memory.

**Figure 309** Management > Maintenance > Auto Configuration

The following table describes the labels in this screen.

Table 220 Management > Maintenance > Auto Configuration

| LABEL                                                                                  | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                           |
|----------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Use this section to view the auto configuration status after you restarted the Switch. |                                                                                                                                                                                                                                                                                                                                                                       |
| Mode                                                                                   | This field shows the mode ( <b>DHCP</b> or <b>HTTPS</b> ) that is used for auto configuration after you enabled auto configuration and restarted the Switch.<br><br>It shows <b>None</b> if auto configuration was not enabled.                                                                                                                                       |
| State                                                                                  | This field shows whether auto configuration was executed successfully the last time the Switch rebooted.<br><br><b>None</b> - Auto configuration was disabled and not executed.<br><br><b>Success</b> - An auto configuration file was downloaded successfully to the Switch.<br><br><b>Un-success</b> - An auto configuration file was not downloaded to the Switch. |

Table 220 Management &gt; Maintenance &gt; Auto Configuration

| LABEL                                                                                                          | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|----------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Filename                                                                                                       | This field displays the name of the auto configuration file that was downloaded the last time the Switch rebooted.<br><br>It shows <b>None</b> if auto configuration was not enabled or not executed successfully.                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Use this section to enable auto configuration and select the mode that you want to use for auto configuration. |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Active                                                                                                         | Select the checkbox to enable auto configuration.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Mode                                                                                                           | Select <b>DHCP</b> to have the Switch use the TFTP server IP address and auto configuration file name assigned by a DHCP server to download a pre-saved configuration file when the Switch reboots.<br><br>Note: The Switch should act as a DHCP client to send a DHCP request so that it can get the TFTP server address and configuration file name from the DHCP server. See <a href="#">Section 6.4 on page 66</a> for more information about how to use auto configuration.<br><br>Select <b>HTTPS</b> to have the Switch use the URL you specified in the <b>HTTPS URL</b> field to access a web server and download the auto configuration file using HTTPS. |
| DHCP VLAN ID                                                                                                   | Enter the VLAN ID of the DHCP server that assigns the TFTP server IP address and auto configuration file name to the Switch.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| HTTPS URL                                                                                                      | Type the URL that can be used to access and download the auto configuration file from a web server using HTTPS. For example, https://webserverIPaddress/configfilename.cfg.<br><br>Note: You must fill in this field if you select <b>HTTPS</b> in the <b>Mode</b> field. Otherwise, auto configuration won't work.                                                                                                                                                                                                                                                                                                                                                 |
| Apply                                                                                                          | Click <b>Apply</b> to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the <b>Save</b> link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.                                                                                                                                                                                                                                                                                                                                                                                  |
| Cancel                                                                                                         | Click <b>Cancel</b> to begin configuring this screen afresh.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |

## 51.9 Tech-Support

The Tech-Support feature is a log enhancement tool that logs useful information such as CPU utilization history, memory and Mbuf (Memory Buffer) log and crash reports for issue analysis by customer support should you have difficulty with your Switch. The Tech Support menu eases your effort in obtaining reports and it is also available in CLI command by typing "Show tech-support" command.

Click **Menu > Management > Maintenance > Tech-Support** to see the following screen.

**Figure 310** Management > Maintenance > Tech-Support

| Tech-Support |           | Maintenance |                |
|--------------|-----------|-------------|----------------|
| CPU          | threshold | 100         | keep 5 seconds |
| Mbuf         | threshold | 50          | %              |

Apply Cancel

|                |          |
|----------------|----------|
| All            | Download |
| Crash          | Download |
| CPU history    | Download |
| Memory section | Download |
| Mbuf           | Download |
| ROM            | Download |
| L3             | Download |

You may need WordPad or similar software to see the log report correctly. The table below describes the fields in the above screen.

Table 221 Management &gt; Maintenance &gt; Tech-Support

| LABEL          | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| CPU            | <p>Type a number ranging from 50 to 100 in the CPU threshold box, and type another number ranging from 5 to 60 in the seconds box then click <b>Apply</b>.</p> <p>For example, 80 for CPU threshold and 5 for seconds means a log will be created when CPU utilization reaches over 80% and lasts for 5 seconds.</p> <p>The log report holds 7 days of CPU log data and is stored in volatile memory (RAM). The data is lost if the Switch is turned off or in event of power outage. After 7 days, the logs wrap around and new ones replace the earliest ones.</p> <p>The higher the CPU threshold number, the fewer logs will be created, and the less data technical support will have to analyze and vice versa.</p> |
| Mbuf           | <p>Type a number ranging from 50 to 100 in the Mbuf (Memory Buffer) threshold box. The Mbuf log report is stored in flash (permanent) memory.</p> <p>For example, Mbuf 50 means a log will be created when the Mbuf utilization is over 50%.</p> <p>The higher the Mbuf threshold number, the fewer logs will be created, and the less data technical support will have to analyze and vice versa.</p>                                                                                                                                                                                                                                                                                                                    |
| Apply          | Click <b>Apply</b> to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the <b>Save</b> link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Cancel         | Click <b>Cancel</b> to begin configuring this screen afresh.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| All            | Click <b>Download</b> to see all the log report and system status. This log report is stored in flash memory. If the <b>All</b> log report is too large, you can download the log reports separately below.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Crash          | Click <b>Download</b> to see the crash log report. The log will include information of the last crash and is stored in flash memory.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| CPU history    | Click <b>Download</b> to see the CPU history log report. The 7-days log is stored in RAM and you will need to save it, otherwise it will be lost in event of Switch shutdown or power outage.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Memory Section | Click <b>Download</b> to see the memory section log report. This log report is stored in flash memory.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |

Table 221 Management &gt; Maintenance &gt; Tech-Support (continued)

| LABEL | DESCRIPTION                                                                                                                                           |
|-------|-------------------------------------------------------------------------------------------------------------------------------------------------------|
| Mbuf  | Click <b>Download</b> to see the Mbuf log report. The log includes Mbuf over threshold information. This log report is stored in flash memory.        |
| ROM   | Click <b>Download</b> to see the Read Only Memory (ROM) log report. This report is stored in flash memory.                                            |
| L3    | Click <b>Download</b> to see the layer-3 Switch log report. The log only applies to the layer-3 Switch models. This report is stored in flash memory. |

## 51.10 Certificates

The Switch can use HTTPS certificates that are verified by a third party to create secure HTTPS connections between your computer and the Switch. This way, you may securely access the Switch using the web configurator. See [Section 52.8 on page 452](#) for more information about HTTPS.

Certificates are based on public-private key pairs. A certificate contains the certificate owner's identity and public key. Certificates provide a way to exchange public keys for use in authentication.

Click **Management > Maintenance > Certificates** to open the following screen. Use this screen to import the Switch's CA-signed certificates.

Figure 311 Management &gt; Maintenance &gt; Certificates

**Certificates** [Maintenance](#)

Please specify the location of the HTTPS certificate file to be imported. The certificate file must be the Binary PKCS#12 format.

File Path  No file chosen

Password

| Service               | Subject                 | Issuer                  | Valid From              | Valid To                 |                                       |
|-----------------------|-------------------------|-------------------------|-------------------------|--------------------------|---------------------------------------|
| <a href="#">HTTPS</a> | /CN=XS3800 bc99119bb6e3 | /CN=XS3800 bc99119bb6e3 | Jan 1 00:00:35 2016 GMT | Mar 26 00:00:35 2076 GMT | <input type="button" value="Delete"/> |

The following table describes the labels in this screen.

Table 222 Management &gt; Maintenance &gt; Certificates

| LABEL     | DESCRIPTION                                                                                                                                                                                                                                                        |
|-----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| File Path | Click <b>Choose File</b> to find the certificate file you want to upload.                                                                                                                                                                                          |
| Password  | Type the certificate file's password that was created when the PKCS #12 file was exported. The password consists of up to 32 ASCII characters.                                                                                                                     |
| Import    | Click this button to save the certificate that you have enrolled from a certification authority from your computer to the Switch.                                                                                                                                  |
| Service   | This field displays the service type that this certificate is for.                                                                                                                                                                                                 |
| Subject   | This field displays identifying information about the certificate's owner, such as CN (Common Name), OU (Organizational Unit or department), O (Organization or company) and C (Country). It is recommended that each certificate have unique subject information. |

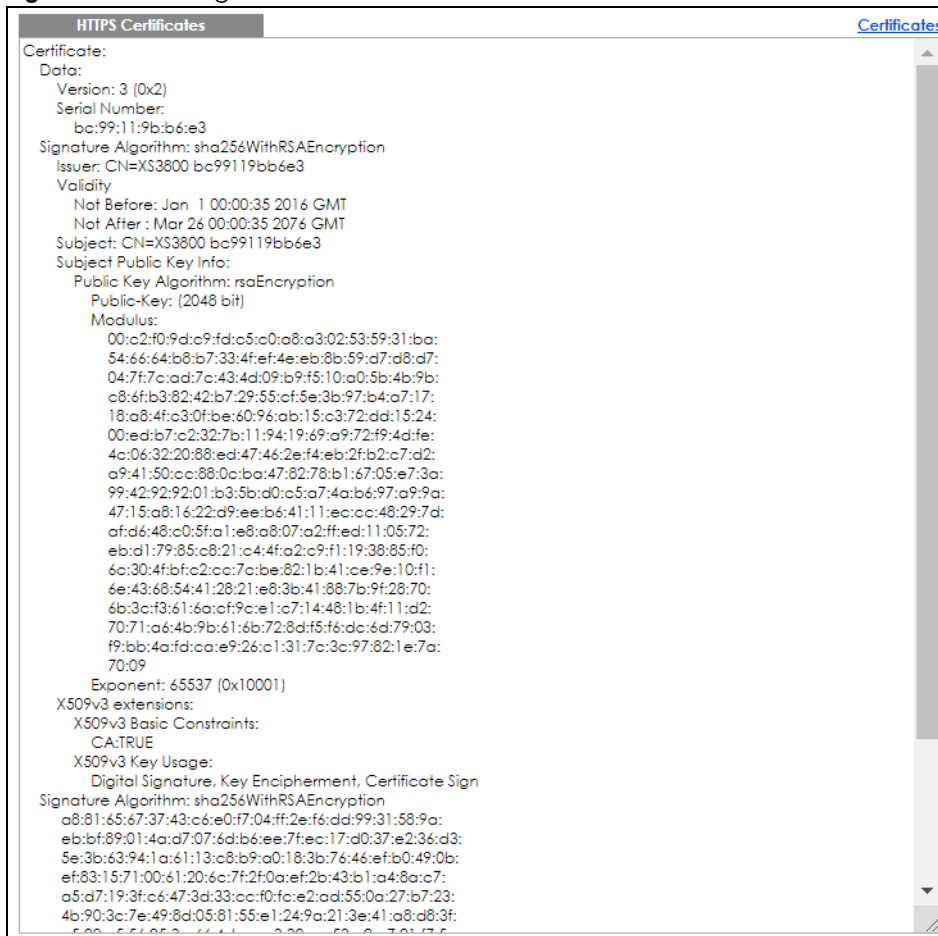
Table 222 Management &gt; Maintenance &gt; Certificates

| LABEL      | DESCRIPTION                                                                                                                                                                                         |
|------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Issuer     | This field displays identifying information about the certificate's issuing certification authority, such as a common name, organizational unit or department, organization or company and country. |
| Valid From | This field displays the date that the certificate becomes applicable.                                                                                                                               |
| Valid To   | This field displays the date that the certificate expires.                                                                                                                                          |
|            | Select an entry's check box to select a specific entry.                                                                                                                                             |
| Delete     | Click this button to delete the certificate (or certification request). You cannot delete a certificate that one or more features is configured to use.                                             |

## 51.10.1 HTTPS Certificates

Use this screen to view the HTTPS certificate details. Click a hyperlink in the **Service** column in the **Management > Maintenance > Certificates** screen to open the following screen.

Figure 312 Management &gt; Maintenance &gt; Certificates &gt; HTTPS



## 51.11 FTP Command Line

This section shows some examples of uploading to or downloading files from the Switch using FTP commands. First, understand the filename conventions.

### 51.11.1 Filename Conventions

The configuration file (also known as the romfile or ROM) contains the factory default settings in the screens such as password, Switch setup, IP Setup, and so on. Once you have customized the Switch's settings, they can be saved back to your computer under a filename of your choosing.

ZyNOS (Zyxel Network Operating System, sometimes referred to as the "ras" file) is the system firmware and has a "bin" filename extension.

Table 223 Filename Conventions

| FILE TYPE          | INTERNAL NAME  | EXTERNAL NAME | DESCRIPTION                                                                                                                                                                                                                                                         |
|--------------------|----------------|---------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Configuration File | config         | .cfg          | This is the configuration (config) filename on the Switch. Uploading the config file replaces the specified configuration file system, including your Switch configurations, system-related data (including the default password), the error log and the trace log. |
| Firmware           | ras-0<br>ras-1 | *.bin         | This is the generic name for the ZyNOS firmware on the Switch. ras-0 is image 1; ras-1 is image 2.                                                                                                                                                                  |

You can store up to two images, or firmware files of the same device model, on the Switch. Only one image is used at a time.

- Run the `boot image <1|2>` command to specify which image is updated when firmware is loaded using the web configurator and to specify which image is loaded when the Switch starts up.
- You can also use FTP commands to upload firmware to any image.

The Switch supports dual firmware images, ras-0 and ras-1. You can switch from one to the other by using the `boot image <index>` command, where <index> is 1 (ras-0) or 2 (ras-1). See the CLI Reference Guide for more information about using commands. The system does not reboot after it switches from one image to the other.

#### 51.11.1.1 Example FTP Commands

```
ftp> put firmware.bin ras-0
```

This is a sample FTP session showing the transfer of the computer file "firmware.bin" to the Switch.

```
ftp> get config config.cfg
```

This is a sample FTP session saving the current configuration to a file called "config.cfg" on your computer.

If your (T)FTP client does not allow you to have a destination filename different than the source, you will need to rename them as the Switch only recognizes "config", "ras-0", and "ras-1". Be sure you keep unaltered copies of both files for later use.

**Be sure to upload the correct model firmware as uploading the wrong model firmware may damage your device.**

## 51.11.2 FTP Command Line Procedure

- 1 Launch the FTP client on your computer.
- 2 Enter `open`, followed by a space and the IP address of your Switch.
- 3 Press [ENTER] when prompted for a username (the default is "admin").
- 4 Enter your password as requested (the default is "1234").
- 5 Enter `bin` to set transfer mode to binary.
- 6 Use `put` to transfer files from the computer to the Switch, for example, `put firmware.bin ras-0` transfers the firmware on your computer (firmware.bin) to the Switch and renames it to "ras-0". Similarly, `put config.cfg config` transfers the configuration file on your computer (config.cfg) to the Switch and renames it to "config". Likewise `get config config.cfg` transfers the configuration file on the Switch to your computer and renames it to "config.cfg". See [Table 223 on page 435](#) for more information on filename conventions.
- 7 Enter `quit` to exit the ftp prompt.

## 51.11.3 GUI-based FTP Clients

The following table describes some of the commands that you may see in GUI-based FTP clients.

Table 224 General Commands for GUI-based FTP Clients

| COMMAND                  | DESCRIPTION                                                                                                                                                                                                                                                                                           |
|--------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Host Address             | Enter the address of the host server.                                                                                                                                                                                                                                                                 |
| Login Type               | Anonymous.<br><br>This is when a user I.D. and password is automatically supplied to the server for anonymous access. Anonymous logins will work only if your ISP or service administrator has enabled this option.<br><br>Normal.<br><br>The server requires a unique User ID and Password to login. |
| Transfer Type            | Transfer files in either ASCII (plain text format) or in binary mode. Configuration and firmware files should be transferred in binary mode.                                                                                                                                                          |
| Initial Remote Directory | Specify the default remote directory (path).                                                                                                                                                                                                                                                          |
| Initial Local Directory  | Specify the default local directory (path).                                                                                                                                                                                                                                                           |

## 51.11.4 FTP Restrictions

FTP will not work when:

- FTP service is disabled in the **Service Access Control** screen.
- The IP address(es) in the **Remote Management** screen does not match the client IP address. If it does not match, the Switch will disconnect the FTP session immediately.



# CHAPTER 52

## Access Control

This chapter describes how to control access to the Switch.

### 52.1 Access Control Overview

A console port and FTP are allowed one session each, Telnet and SSH share nine sessions, up to five Web sessions (five different usernames and passwords) and/or limitless SNMP access control sessions are allowed.

Table 225 Access Control Overview

| Console Port | SSH                       | Telnet | FTP         | Web                 | SNMP     |
|--------------|---------------------------|--------|-------------|---------------------|----------|
| One session  | Share up to nine sessions |        | One session | Up to five accounts | No limit |

A console port access control session and Telnet access control session cannot coexist when multi-login is disabled. See the Ethernet Switch CLI Reference Guide for more information on disabling multi-login.

#### 52.1.1 What You Can Do

- Use the **Access Control** screen ([Section 52.2 on page 437](#)) to display the main screen.
- Use the **SNMP** screen ([Section 52.3.4 on page 443](#)) to configure your SNMP settings.
- Use the **Trap Group** screen ([Section 52.3.5 on page 445](#)) to specify the types of SNMP traps that should be sent to each SNMP manager.
- Use the **User Information** screen ([Section 52.3.7 on page 446](#)) to create SNMP users for authentication with managers using SNMP v3 and associate them to SNMP groups.
- Use the **Logins** screens ([Section 52.4 on page 448](#)) to assign which users can access the Switch via web configurator at any one time.
- Use the **Service Access Control** screen ([Section 52.10 on page 457](#)) to decide what services you may use to access the Switch.
- Use the **Remote Management** screen ([Section 52.11 on page 458](#)) to specify a group of one or more "trusted computers" from which an administrator may use a service to manage the Switch.

### 52.2 The Access Control Main Screen

Use this screen to display the main screen. Click **Management > Access Control** in the navigation panel to display the main screen as shown.

**Figure 313** Management > Access Control

| Access Control         |                            |
|------------------------|----------------------------|
| SNMP                   | <a href="#">Click Here</a> |
| Logins                 | <a href="#">Click Here</a> |
| Service Access Control | <a href="#">Click Here</a> |
| Remote Management      | <a href="#">Click Here</a> |

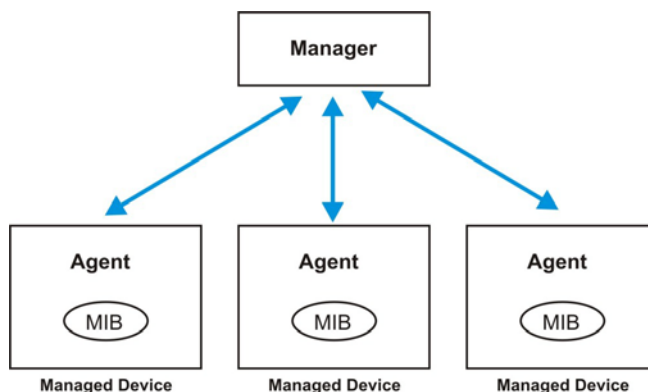
The following table describes the labels in this screen.

**Table 226** Management > Access Control

| LABEL                  | DESCRIPTION                                                                                                                               |
|------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|
| SNMP                   | Click this link to configure your SNMP settings.                                                                                          |
| Logins                 | Click this link to assign which users can access the Switch via web configurator at any one time.                                         |
| Service Access Control | Click this link to decide what services you may use to access the Switch.                                                                 |
| Remote Management      | Click this link to specify a group of one or more "trusted computers" from which an administrator may use a service to manage the Switch. |

## 52.3 About SNMP

Simple Network Management Protocol (SNMP) is an application layer protocol used to manage and monitor TCP/IP-based devices. SNMP is used to exchange management information between the network management system (NMS) and a network element (NE). A manager station can manage and monitor the Switch through the network via SNMP version 1 (SNMPv1), SNMP version 2c or SNMP version 3. The next figure illustrates an SNMP management operation. SNMP is only available if TCP/IP is configured.

**Figure 314** SNMP Management Model

An SNMP managed network consists of two main components: agents and a manager.

An agent is a management software module that resides in a managed Switch (the Switch). An agent translates the local management information from the managed Switch into a form compatible with SNMP. The manager is the console through which network administrators perform network management functions. It executes applications that control and monitor managed devices.

The managed devices contain object variables/managed objects that define each piece of information to be collected about a Switch. Examples of variables include number of packets received, node port status and so on. A Management Information Base (MIB) is a collection of managed objects. SNMP allows a manager and agents to communicate for the purpose of accessing these objects.

SNMP itself is a simple request/response protocol based on the manager/agent model. The manager issues a request and the agent returns responses using the following protocol operations:

Table 227 SNMP Commands

| COMMAND | DESCRIPTION                                                                                                                                                                                                                                                |
|---------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Get     | Allows the manager to retrieve an object variable from the agent.                                                                                                                                                                                          |
| GetNext | Allows the manager to retrieve the next object variable from a table or list within an agent. In SNMPv1, when a manager wants to retrieve all elements of a table from an agent, it initiates a Get operation, followed by a series of GetNext operations. |
| Set     | Allows the manager to set values for object variables within an agent.                                                                                                                                                                                     |
| Trap    | Used by the agent to inform the manager of some events.                                                                                                                                                                                                    |

### 52.3.1 SNMP v3 and Security

SNMP v3 enhances security for SNMP management. SNMP managers can be required to authenticate with agents before conducting SNMP management sessions.

Security can be further enhanced by encrypting the SNMP messages sent from the managers. Encryption protects the contents of the SNMP messages. When the contents of the SNMP messages are encrypted, only the intended recipients can read them.

### 52.3.2 Supported MIBs

MIBs let administrators collect statistics and monitor status and performance.

The Switch supports the following MIBs:

- SNMP MIB II (RFC 1213)
- RFC 1157 SNMP v1
- RFC 1493 Bridge MIBs
- RFC 1643 Ethernet MIBs
- RFC 1155 SMI
- RFC 2674 SNMPv2, SNMPv2c
- RFC 1757 RMON
- SNMPv2, SNMPv2c or later version, compliant with RFC 2011 SNMPv2 MIB for IP, RFC 2012 SNMPv2 MIB for TCP, RFC 2013 SNMPv2 MIB for UDP

### 52.3.3 SNMP Traps

The Switch sends traps to an SNMP manager when an event occurs. The following tables outline the SNMP traps by category.

An OID (Object ID) that begins with “**1.3.6.1.4.1.890.1.15**” is defined in private MIBs. Otherwise, it is a standard MIB OID.

Table 228 SNMP System Traps

| OPTION        | OBJECT LABEL                            | OBJECT ID                     | DESCRIPTION                                                                                                                                                                   |
|---------------|-----------------------------------------|-------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| coldstart     | coldStart                               | 1.3.6.1.6.3.1.1.5.1           | This trap is sent when the Switch is turned on.                                                                                                                               |
| warmstart     | warmStart                               | 1.3.6.1.6.3.1.1.5.2           | This trap is sent when the Switch restarts.                                                                                                                                   |
| fanspeed      | zyHwMonitorFanSpeedOutOfRange           | 1.3.6.1.4.1.890.1.15.3.26.2.1 | This trap is sent when the fan speed goes above or below the normal operating range.                                                                                          |
| temperature   | zyHwMonitorTemperatureOutOfRange        | 1.3.6.1.4.1.890.1.15.3.26.2.2 | This trap is sent when the temperature goes above or below the normal operating range.                                                                                        |
| voltage       | zyHwMonitorPowerSupplyVoltageOutOfRange | 1.3.6.1.4.1.890.1.15.3.26.2.3 | This trap is sent when the voltage goes above or below the normal operating range.                                                                                            |
| reset         | zySysMgmtUncontrolledSystemReset        | 1.3.6.1.4.1.890.1.15.3.49.2.1 | This trap is sent when the Switch automatically resets.                                                                                                                       |
|               | zySysMgmtControlledSystemReset          | 1.3.6.1.4.1.890.1.15.3.49.2.2 | This trap is sent when the Switch resets by an administrator through a management interface.                                                                                  |
|               | zySysMgmtBootImageInconsistence         | 1.3.6.1.4.1.890.1.15.3.49.2.3 | This trap is sent when the index number of image which is loaded when the Switch starts up is different from what is specified via the CLI.                                   |
|               | RebootEvent                             | 1.3.6.1.4.1.890.1.5.1.1.2     | This trap is sent when the Switch reboots by an administrator through a management interface.                                                                                 |
| timesync      | zyDateTimeTrapTimeServerNotReachable    | 1.3.6.1.4.1.890.1.15.3.82.3.1 | This trap is sent when the Switch's date and time is not manually entered or the specified time server is not reachable.                                                      |
| intrusionlock | zyPortIntrusionLock                     | 1.3.6.1.4.1.890.1.15.3.61.3.2 | This trap is sent when intrusion lock occurs on a port.                                                                                                                       |
| loopguard     | zyLoopGuardLoopDetect                   | 1.3.6.1.4.1.890.1.15.3.45.2.1 | This trap is sent when loopguard shuts down a port.                                                                                                                           |
| errdisable    | zyErrdisableDetect                      | 1.3.6.1.4.1.890.1.15.3.24.4.1 | This trap is sent when an error is detected on a port, such as a loop occurs or the rate limit for specific control packets is exceeded.                                      |
|               | zyErrdisableRecovery                    | 1.3.6.1.4.1.890.1.15.3.24.4.2 | This trap is sent when the Switch ceases the action taken on a port, such as shutting down the port or discarding packets on the port, after the specified recovery interval. |
| loginrecord   | zyAccessControlLoginRecord              | 1.3.6.1.4.1.890.1.15.3.9.4.1  | This trap is sent when users log in.                                                                                                                                          |
|               | zyAccessControlLogoutRecord             | 1.3.6.1.4.1.890.1.15.3.9.4.2  | This trap is sent when users log out.                                                                                                                                         |
|               | zyAccessControlLoginFail                | 1.3.6.1.4.1.890.1.15.3.9.4.3  | This trap is sent when users fail in login.                                                                                                                                   |

Table 229 SNMP Interface Traps

| OPTION          | OBJECT LABEL                           | OBJECT ID                      | DESCRIPTION                                                                                                                                                                                                                                                                   |
|-----------------|----------------------------------------|--------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| linkup          | linkUp                                 | 1.3.6.1.6.3.1.1.5.4            | This trap is sent when the Ethernet link is up.                                                                                                                                                                                                                               |
| linkdown        | linkDown                               | 1.3.6.1.6.3.1.1.5.3            | This trap is sent when the Ethernet link is down.                                                                                                                                                                                                                             |
| autonegotiation | zyPortAutonegotiationFailed            | 1.3.6.1.4.1.890.1.15.3.61.3.1  | This trap is sent when an Ethernet interface fails to auto-negotiate with the peer Ethernet interface.                                                                                                                                                                        |
| lldp            | lldpRemTablesChange                    | 1.0.8802.1.1.2.0.0.1           | The trap is sent when entries in the remote database have any updates.<br><br>Link Layer Discovery Protocol (LLDP), defined as IEEE 802.1ab, enables LAN devices that support LLDP to exchange their configured settings. This helps eliminate configuration mismatch issues. |
| transceiver-ddm | zyTransceiverDdmiTemperatureOutOfRange | 1.3.6.1.4.1.890.1.15.3.84.3.1  | This trap is sent when the transceiver temperature is above or below the normal operating range.                                                                                                                                                                              |
|                 | zyTransceiverDdmiTxPowerOutOfRange     | 1.3.6.1.4.1.890.1.15.3.84.3.2  | This trap is sent when the transmitted optical power is above or below the normal operating range.                                                                                                                                                                            |
|                 | zyTransceiverDdmiRxPowerOutOfRange     | 1.3.6.1.4.1.890.1.15.3.84.3.3  | This trap is sent when the received optical power is above or below the normal operating range.                                                                                                                                                                               |
|                 | zyTransceiverDdmiVoltageOutOfRange     | 1.3.6.1.4.1.890.1.15.3.84.3.4  | This trap is sent when the transceiver supply voltage is above or below the normal operating range.                                                                                                                                                                           |
|                 | zyTransceiverDdmiTxBiasOutOfRange      | 1.3.6.1.4.1.890.1.15.3.84.3.5  | This trap is sent when the transmitter laser bias current is above or below the normal operating range.                                                                                                                                                                       |
| storm-control   | zyPortStormControlTrap                 | 1.3.6.1.4.1.890.1.15.3.78.2.1  | This trap is sent when storm control is detected on a specific port. A packet filter action has been applied on the interface.                                                                                                                                                |
| zuld            | zyZuldUnidirectionalDetected           | 1.3.6.1.4.1.890.1.15.3.110.3.1 | This trap is sent when a unidirectional link is detected.                                                                                                                                                                                                                     |
|                 | zyZuldBidirectionalRecovered           | 1.3.6.1.4.1.890.1.15.3.110.3.2 | This trap is sent when the port which is shut down by ZULD becomes active again.                                                                                                                                                                                              |

Table 230 AAA Traps

| OPTION         | OBJECT LABEL                                   | OBJECT ID                     | DESCRIPTION                                                                                 |
|----------------|------------------------------------------------|-------------------------------|---------------------------------------------------------------------------------------------|
| authentication | authenticationFailure                          | 1.3.6.1.6.3.1.1.5.5           | This trap is sent when authentication fails due to incorrect user name and/or password.     |
|                | zyAaaAuthenticationFailure                     | 1.3.6.1.4.1.890.1.15.3.8.3.1  | This trap is sent when authentication fails due to incorrect user name and/or password.     |
|                | zyRadiusServerAuthenticationServerNotReachable | 1.3.6.1.4.1.890.1.15.3.71.2.1 | This trap is sent when there is no response message from the RADIUS authentication server.  |
|                | zyTacacsServerAuthenticationServerUnreachable  | 1.3.6.1.4.1.890.1.15.3.83.2.1 | This trap is sent when there is no response message from the TACACS+ authentication server. |
| authorization  | zyAaaAuthorizationFailure                      | 1.3.6.1.4.1.890.1.15.3.8.3.2  | This trap is sent when management connection authorization failed.                          |
| accounting     | zyRadiusServerAccountingServerNotReachable     | 1.3.6.1.4.1.890.1.15.3.71.2.2 | This trap is sent when there is no response message from the RADIUS accounting server.      |
|                | zyTacacsServerAccountingServerUnreachable      | 1.3.6.1.4.1.890.1.15.3.83.2.2 | This trap is sent when there is no response message from the TACACS+ accounting server.     |

Table 231 SNMP IP Traps

| OPTION     | OBJECT LABEL            | OBJECT ID          | DESCRIPTION                                                                       |
|------------|-------------------------|--------------------|-----------------------------------------------------------------------------------|
| ping       | pingProbeFailed         | 1.3.6.1.2.1.80.0.1 | This trap is sent when a single ping probe fails.                                 |
|            | pingTestFailed          | 1.3.6.1.2.1.80.0.2 | This trap is sent when a ping test (consisting of a series of ping probes) fails. |
|            | pingTestCompleted       | 1.3.6.1.2.1.80.0.3 | This trap is sent when a ping test is completed.                                  |
| traceroute | traceRouteTestFailed    | 1.3.6.1.2.1.81.0.2 | This trap is sent when a traceroute test fails.                                   |
|            | traceRouteTestCompleted | 1.3.6.1.2.1.81.0.3 | This trap is sent when a traceroute test is completed.                            |

Table 232 SNMP Switch Traps

| OPTION     | OBJECT LABEL                     | OBJECT ID                      | DESCRIPTION                                                                                                 |
|------------|----------------------------------|--------------------------------|-------------------------------------------------------------------------------------------------------------|
| stp        | STPNewRoot                       | 1.3.6.1.2.1.17.0.1             | This trap is sent when the STP root switch changes.                                                         |
|            | zyMrstpNewRoot                   | 1.3.6.1.4.1.890.1.15.3.52.3.1  | This trap is sent when the MRSTP root switch changes.                                                       |
|            | zyMstpNewRoot                    | 1.3.6.1.4.1.890.1.15.3.53.3.1  | This trap is sent when the MSTP root switch changes.                                                        |
|            | STPTopologyChange                | 1.3.6.1.2.1.17.0.2             | This trap is sent when the STP topology changes.                                                            |
|            | zyMrstpTopologyChange            | 1.3.6.1.4.1.890.1.15.3.52.3.2  | This trap is sent when the MRSTP topology changes.                                                          |
|            | zyMstpTopologyChange             | 1.3.6.1.4.1.890.1.15.3.53.3.2  | This trap is sent when the MSTP root switch changes.                                                        |
| mactable   | zyMacForwardingTableFull         | 1.3.6.1.4.1.890.1.15.3.48.2.1  | This trap is sent when more than 99% of the MAC table is used.                                              |
| rmon       | RmonRisingAlarm                  | 1.3.6.1.2.1.16.0.1             | This trap is sent when a variable goes over the RMON "rising" threshold.                                    |
|            | RmonFallingAlarm                 | 1.3.6.1.2.1.16.0.2             | This trap is sent when the variable falls below the RMON "falling" threshold.                               |
| classifier | zyAcIv2ClassifierLogNotification | 1.3.6.1.4.1.890.1.15.3.105.4.1 | This trap is sent when the Switch detects classifier log information.                                       |
| rip        | zyRipExceedMaxDynamicRoute       | 1.3.6.1.4.1.890.1.15.3.74.2.1  | This trap is sent when the maximum allowed number of dynamic routes learned through RIP has been exceeded.  |
| ospf       | zyOspfExceedMaxDynamicRoute Path | 1.3.6.1.4.1.890.1.15.3.57.3.1  | This trap is sent when the maximum allowed number of dynamic routes learned through OSPF has been exceeded. |

### 52.3.4 Configuring SNMP

From the **Access Control** screen, display the **SNMP** screen. You can click **Access Control** to go back to the **Access Control** screen.

**Figure 315** Management > Access Control > SNMP

**SNMP** [Access Control](#) [Trap Group](#) [User](#)

**General Setting**

|                |        |
|----------------|--------|
| Version        | v2c ▼  |
| Get Community  | public |
| Set Community  | public |
| Trap Community | public |

**Trap Destination**

| Version | IP      | Port | Username |
|---------|---------|------|----------|
| v2c ▼   | 0.0.0.0 | 162  |          |
| v2c ▼   | 0.0.0.0 | 162  |          |
| v2c ▼   | 0.0.0.0 | 162  |          |
| v2c ▼   | 0.0.0.0 | 162  |          |

[Apply](#) [Cancel](#)

The following table describes the labels in this screen.

**Table 233** Management > Access Control > SNMP

| LABEL            | DESCRIPTION                                                                                                                                                                                                                                                                                 |
|------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| General Setting  | Use this section to specify the SNMP version and community (password) values.                                                                                                                                                                                                               |
| Version          | <p>Select the SNMP version for the Switch. The SNMP version on the Switch must match the version on the SNMP manager. Choose SNMP version 2c (<b>v2c</b>), SNMP version 3 (<b>v3</b>) or both (<b>v3v2c</b>).</p> <p>Note: SNMP version 2c is backwards compatible with SNMP version 1.</p> |
| Get Community    | <p>Enter the <b>Get Community</b> string, which is the password for the incoming Get- and GetNext-requests from the management station.</p> <p>The <b>Get Community</b> string is only used by SNMP managers using SNMP version 2c or lower.</p>                                            |
| Set Community    | <p>Enter the <b>Set Community</b> string, which is the password for the incoming Set- requests from the management station.</p> <p>The <b>Set Community</b> string is only used by SNMP managers using SNMP version 2c or lower.</p>                                                        |
| Trap Community   | <p>Enter the <b>Trap Community</b> string, which is the password sent with each trap to the SNMP manager.</p> <p>The <b>Trap Community</b> string is only used by SNMP managers using SNMP version 2c or lower.</p>                                                                         |
| Trap Destination | Use this section to configure where to send SNMP traps from the Switch.                                                                                                                                                                                                                     |
| Version          | Specify the version of the SNMP trap messages.                                                                                                                                                                                                                                              |
| IP               | Enter the IP addresses of up to four managers to send your SNMP traps to.                                                                                                                                                                                                                   |
| Port             | Enter the port number upon which the manager listens for SNMP traps.                                                                                                                                                                                                                        |
| Username         | <p>Enter the username to be sent to the SNMP manager along with the SNMP v3 trap.</p> <p>Note: This username must match an existing account on the Switch (configured in the <b>Management &gt; Access Control &gt; SNMP &gt; User</b> screen).</p>                                         |
| Apply            | Click <b>Apply</b> to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the <b>Save</b> link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.          |
| Cancel           | Click <b>Cancel</b> to begin configuring this screen afresh.                                                                                                                                                                                                                                |



### 52.3.5 Configuring SNMP Trap Group

From the **SNMP** screen, click **Trap Group** to view the screen as shown. Use the **Trap Group** screen to specify the types of SNMP traps that should be sent to each SNMP manager.

**Figure 316** Management > Access Control > SNMP > Trap Group

| Type      | Options                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|-----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| System    | <input type="checkbox"/> *<br><input type="checkbox"/> coldstart<br><input type="checkbox"/> temperature<br><input type="checkbox"/> timesync<br><input type="checkbox"/> powersource<br><input type="checkbox"/> custom-ca<br><input type="checkbox"/> warmstart<br><input type="checkbox"/> voltage<br><input type="checkbox"/> loopguard<br><input type="checkbox"/> loginrecord<br><input type="checkbox"/> fanspeed<br><input type="checkbox"/> reset<br><input type="checkbox"/> errdisable<br><input type="checkbox"/> service-register |
| Interface | <input type="checkbox"/> *<br><input type="checkbox"/> linkup<br><input type="checkbox"/> lldp<br><input type="checkbox"/> zuid<br><input type="checkbox"/> linkdown<br><input type="checkbox"/> transceiver-ddm<br><input type="checkbox"/> autonegotiation<br><input type="checkbox"/> storm-control                                                                                                                                                                                                                                         |
| AAA       | <input type="checkbox"/> *<br><input type="checkbox"/> authentication<br><input type="checkbox"/> authorization<br><input type="checkbox"/> accounting                                                                                                                                                                                                                                                                                                                                                                                         |
| IP        | <input type="checkbox"/> *<br><input type="checkbox"/> ping<br><input type="checkbox"/> traceroute                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Switch    | <input type="checkbox"/> *<br><input type="checkbox"/> stp<br><input type="checkbox"/> mactable<br><input type="checkbox"/> rmon<br><input type="checkbox"/> classifier                                                                                                                                                                                                                                                                                                                                                                        |

The following table describes the labels in this screen.

Table 234 Management > Access Control > SNMP > Trap Group

| LABEL               | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|---------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Trap Destination IP | Select one of your configured trap destination IP addresses. These are the IP addresses of the SNMP managers. You must first configure a trap destination IP address in the <b>SNMP Setting</b> screen.<br><br>Use the rest of the screen to select which traps the Switch sends to that SNMP manager.                                                                                                                                                                                                                                          |
| Type                | Select the categories of SNMP traps that the Switch is to send to the SNMP manager.                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Options             | Select the individual SNMP traps that the Switch is to send to the SNMP station. See <a href="#">Section 52.3.3 on page 439</a> for individual trap descriptions.<br><br>The traps are grouped by category. Selecting a category automatically selects all of the category's traps. Clear the check boxes for individual traps that you do not want the Switch to send to the SNMP station. Clearing a category's check box automatically clears all of the category's trap check boxes (the Switch only sends traps from selected categories). |
| Apply               | Click <b>Apply</b> to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the <b>Save</b> link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.                                                                                                                                                                                                                                                              |
| Cancel              | Click <b>Cancel</b> to begin configuring this screen afresh.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |

### 52.3.6 Enabling/Disabling Sending of SNMP Traps on a Port

From the **SNMP > Trap Group** screen, click **Port** to view the screen as shown. Use this screen to set whether a trap received on the port(s) would be sent to the SNMP manager.

**Figure 317** Management > Access Control > SNMP > Trap Group > Port

Port [Trap Group](#)

Option: intrusionlock ▼

| Port | Active                              |
|------|-------------------------------------|
| *    | <input type="checkbox"/>            |
| 1    | <input checked="" type="checkbox"/> |
| 2    | <input checked="" type="checkbox"/> |
| 3    | <input checked="" type="checkbox"/> |
| 4    | <input checked="" type="checkbox"/> |
| 5    | <input checked="" type="checkbox"/> |
| 6    | <input checked="" type="checkbox"/> |
| 7    | <input checked="" type="checkbox"/> |
| 8    | <input checked="" type="checkbox"/> |
| 9    | <input checked="" type="checkbox"/> |
| 10   | <input checked="" type="checkbox"/> |
| 11   | <input checked="" type="checkbox"/> |
| 12   | <input checked="" type="checkbox"/> |
| 13   | <input checked="" type="checkbox"/> |
| 14   | <input checked="" type="checkbox"/> |
| 15   | <input checked="" type="checkbox"/> |

[Apply](#) [Cancel](#)

The following table describes the labels in this screen.

Table 235 Management &gt; Access Control &gt; SNMP &gt; Trap Group &gt; Port

| LABEL  | DESCRIPTION                                                                                                                                                                                                                                                                                                                |
|--------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Option | Select the trap type you want to configure here.                                                                                                                                                                                                                                                                           |
| Port   | This field displays a port number.                                                                                                                                                                                                                                                                                         |
| *      | <p>Settings in this row apply to all ports.</p> <p>Use this row only if you want to make some settings the same for all ports. Use this row first to set the common settings and then make adjustments on a port-by-port basis.</p> <p>Note: Changes in this row are copied to all the ports as soon as you make them.</p> |
| Active | <p>Select this check box to enable the sending of SNMP traps on this port. The Switch sends the related traps received on this port to the SNMP manager.</p> <p>Clear this check box to disable the sending of SNMP traps on this port.</p>                                                                                |
| Apply  | Click <b>Apply</b> to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the <b>Save</b> link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.                                         |
| Cancel | Click <b>Cancel</b> to begin configuring this screen afresh.                                                                                                                                                                                                                                                               |

### 52.3.7 Configuring SNMP User

From the **SNMP** screen, click **User** to view the screen as shown. Use the **User** screen to create SNMP users for authentication with managers using SNMP v3 and associate them to SNMP groups. An SNMP user is an SNMP manager.

**Figure 318** Management > Access Control > SNMP > User

The screenshot shows the 'User Information' tab of the SNMP User configuration page. It includes input fields for Username, Security Level (set to 'noauth'), Authentication (set to 'MD5'), Privacy (set to 'DES'), and Group (set to 'admin'). There are also two Password fields. Below the form are 'Add', 'Cancel', and 'Clear' buttons. At the bottom, there is a table with columns: Index, Username, SecurityLevel, Authentication, Privacy, Group, and a checkbox. Below the table are 'Delete' and 'Cancel' buttons.

The following table describes the labels in this screen.

**Table 236** Management > Access Control > SNMP > User

| LABEL            | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| User Information | Note: Use the username and password of the login accounts you specify in this screen to create accounts on the SNMP v3 manager.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Username         | Specify the username of a login account on the Switch.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Security Level   | <p>Select whether you want to implement authentication and/or encryption for SNMP communication from this user. Choose:</p> <ul style="list-style-type: none"> <li><b>noauth</b> -to use the username as the password string to send to the SNMP manager. This is equivalent to the Get, Set and Trap Community in SNMP v2c. This is the lowest security level.</li> <li><b>auth</b> - to implement an authentication algorithm for SNMP messages sent by this user.</li> <li><b>priv</b> - to implement authentication and encryption for SNMP messages sent by this user. This is the highest security level.</li> </ul> <p>Note: The settings on the SNMP manager must be set at the same security level or higher than the security level settings on the Switch.</p> |
| Authentication   | Select an authentication algorithm. <b>MD5</b> (Message Digest 5) and <b>SHA</b> (Secure Hash Algorithm) are hash algorithms used to authenticate SNMP data. SHA authentication is generally considered stronger than MD5, but is slower.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Password         | Enter the password of up to 32 ASCII characters for SNMP user authentication.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Privacy          | <p>Specify the encryption method for SNMP communication from this user. You can choose one of the following:</p> <ul style="list-style-type: none"> <li><b>DES</b> - Data Encryption Standard is a widely used (but breakable) method of data encryption. It applies a 56-bit key to each 64-bit block of data.</li> <li><b>AES</b> - Advanced Encryption Standard is another method for data encryption that also uses a secret key. AES applies a 128-bit key to 128-bit blocks of data.</li> </ul>                                                                                                                                                                                                                                                                     |
| Password         | Enter the password of up to 32 ASCII characters for encrypting SNMP packets.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |

Table 236 Management &gt; Access Control &gt; SNMP &gt; User (continued)

| LABEL          | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Group          | <p>SNMP v3 adopts the concept of View-based Access Control Model (VACM) group. SNMP managers in one group are assigned common access rights to MIBs. Specify in which SNMP group this user is.</p> <p><b>admin</b> - Members of this group can perform all types of system configuration, including the management of administrator accounts.</p> <p><b>readwrite</b> - Members of this group have read and write rights, meaning that the user can create and edit the MIBs on the Switch, except the user account and AAA configuration.</p> <p><b>readonly</b> - Members of this group have read rights only, meaning the user can collect information from the Switch.</p> |
| Add            | <p>Click this to create a new entry or to update an existing one.</p> <p>This saves your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the <b>Save</b> link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.</p>                                                                                                                                                                                                                                                                                                                                |
| Cancel         | Click <b>Cancel</b> to reset the fields to your previous configuration.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Clear          | Click <b>Clear</b> to reset the fields to the factory defaults.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Index          | This is a read-only number identifying a login account on the Switch. Click on an index number to view more details and edit an existing account.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Username       | This field displays the username of a login account on the Switch.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Security Level | This field displays whether you want to implement authentication and/or encryption for SNMP communication with this user.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Authentication | This field displays the authentication algorithm used for SNMP communication with this user.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Privacy        | This field displays the encryption method used for SNMP communication with this user.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Group          | This field displays the SNMP group to which this user belongs.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|                | Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Delete         | Click <b>Delete</b> to remove the selected entry from the summary table.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Cancel         | Click <b>Cancel</b> to begin configuring this screen afresh.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |

## 52.4 Setting Up Login Accounts

Up to five people (one administrator and four non-administrators) may access the Switch via web configurator at any one time.

- An administrator is someone who can both view and configure Switch changes. The username for the Administrator is always **admin**. The default administrator password is **1234**.

Note: It is highly recommended that you change the default administrator password (**1234**).

- A non-administrator (username is something other than **admin**) is someone who can view but not configure Switch settings.

Click **Management > Access Control > Logins** to view the screen as shown.

**Figure 319** Management > Access Control > Logins

**Logins** [Access Control](#)

**Administrator**

|                   |  |  |
|-------------------|--|--|
| Old Password      |  |  |
| New Password      |  |  |
| Retype to confirm |  |  |

Please record your new password whenever you change it. The system will lock you out if you have forgotten your password.

**Edit Logins**

| Login | User Name | Password | Retype to confirm | Privilege |
|-------|-----------|----------|-------------------|-----------|
| 1     |           |          |                   |           |
| 2     |           |          |                   |           |
| 3     |           |          |                   |           |
| 4     |           |          |                   |           |

[Apply](#) [Cancel](#)

The following table describes the labels in this screen.

Table 237 Management &gt; Access Control &gt; Logins

| LABEL             | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|-------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Administrator     | This is the default administrator account with the "admin" user name. You cannot change the default administrator user name. Only the administrator has read/write access.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Old Password      | Type the existing system password ( <b>1234</b> is the default password when shipped).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| New Password      | Enter your new system password.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Retype to confirm | Retype your new system password for confirmation                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Edit Logins       | You may configure passwords for up to four users. These users have read-only access. You can give users higher privileges via the CLI. For more information on assigning privileges see the Ethernet Switch CLI Reference Guide.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| User Name         | Set a user name (up to 32 ASCII characters long).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Password          | Enter your new system password.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Retype to confirm | Retype your new system password for confirmation                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Privilege         | <p>Type the privilege level for this user. At the time of writing, users may have a privilege level of 0, 3, 13, or 14 representing different configuration rights as shown below.</p> <ul style="list-style-type: none"> <li>0 - Display basic system information.</li> <li>3 - Display configuration or status.</li> <li>13 - Configure features except for login accounts, SNMP user accounts, the authentication method sequence and authorization settings, multiple logins, administrator and enable passwords, and configuration information display.</li> <li>14 - Configure login accounts, SNMP user accounts, the authentication method sequence and authorization settings, multiple logins, and administrator and enable passwords, and display configuration information.</li> </ul> <p>Users can run command lines if the session's privilege level is greater than or equal to the command's privilege level. The session privilege initially comes from the privilege of the login account. For example, if the user has a privilege of 5, he/she can run commands that requires privilege level of 5 or less but not more.</p> |

Table 237 Management &gt; Access Control &gt; Logins (continued)

| LABEL  | DESCRIPTION                                                                                                                                                                                                                                                                        |
|--------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Apply  | Click <b>Apply</b> to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the <b>Save</b> link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click <b>Cancel</b> to begin configuring this screen afresh.                                                                                                                                                                                                                       |

## 52.5 SSH Overview

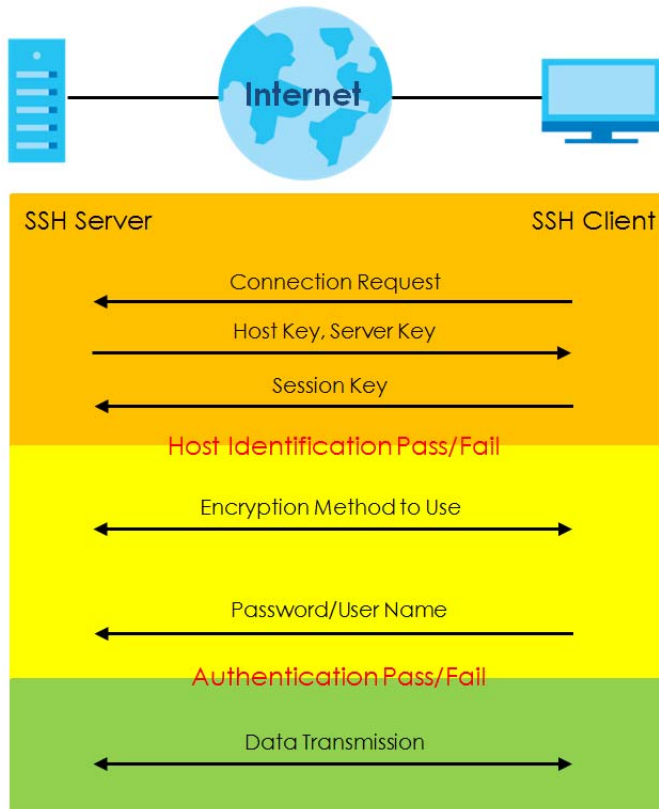
Unlike Telnet or FTP, which transmit data in clear text, SSH (Secure Shell) is a secure communication protocol that combines authentication and data encryption to provide secure encrypted communication between two hosts over an unsecured network.

**Figure 320** SSH Communication Example



## 52.6 How SSH works

The following table summarizes how a secure connection is established between two remote hosts.

**Figure 321** How SSH Works**1** Host Identification

The SSH client sends a connection request to the SSH server. The server identifies itself with a host key. The client encrypts a randomly generated session key with the host key and server key and sends the result back to the server.

The client automatically saves any new server public keys. In subsequent connections, the server public key is checked against the saved version on the client computer.

**2** Encryption Method

Once the identification is verified, both the client and server must agree on the type of encryption method to use.

**3** Authentication and Data Transmission

After the identification is verified and data encryption activated, a secure tunnel is established between the client and the server. The client then sends its authentication information (user name and password) to the server to log in to the server.

## 52.7 SSH Implementation on the Switch

Your Switch supports SSH version 2 using RSA authentication and three encryption methods (DES, 3DES and Blowfish). The SSH server is implemented on the Switch for remote management and file transfer on port 22. Only one SSH connection is allowed at a time.

### 52.7.1 Requirements for Using SSH

You must install an SSH client program on a client computer (Windows or Linux operating system) that is used to connect to the Switch over SSH.

## 52.8 Introduction to HTTPS

HTTPS (HyperText Transfer Protocol over Secure Socket Layer, or HTTP over SSL) is a web protocol that encrypts and decrypts web pages. Secure Socket Layer (SSL) is an application-level protocol that enables secure transactions of data by ensuring confidentiality (an unauthorized party cannot read the transferred data), authentication (one party can identify the other party) and data integrity (you know if data has been changed).

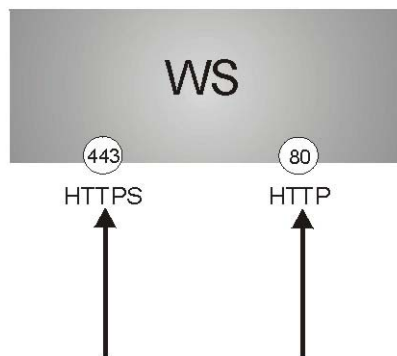
It relies upon certificates, public keys, and private keys.

HTTPS on the Switch is used so that you may securely access the Switch using the web configurator. The SSL protocol specifies that the SSL server (the Switch) must always authenticate itself to the SSL client (the computer which requests the HTTPS connection with the Switch), whereas the SSL client only should authenticate itself when the SSL server requires it to do so. Authenticating client certificates is optional and if selected means the SSL-client must send the Switch a certificate. You must apply for a certificate for the browser from a Certificate Authority (CA) that is a trusted CA on the Switch.

Please refer to the following figure.

- 1 HTTPS connection requests from an SSL-aware web browser go to port 443 (by default) on the Switch's WS (web server).
- 2 HTTP connection requests from a web browser go to port 80 (by default) on the Switch's WS (web server).

**Figure 322** HTTPS Implementation



Note: If you disable **HTTP** in the **Service Access Control** screen, then the Switch blocks all HTTP connection attempts.



## 52.9 HTTPS Example

If you haven't changed the default HTTPS port on the Switch, then in your browser enter "https://Switch IP Address/" as the web site address where "Switch IP Address" is the IP address or domain name of the Switch you wish to access.

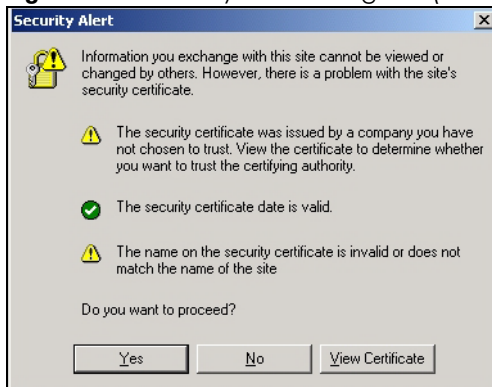
### 52.9.1 Internet Explorer Warning Messages

#### 52.9.1.1 Internet Explorer 6

When you attempt to access the Switch HTTPS server, a Windows dialog box pops up asking if you trust the server certificate.

You see the following **Security Alert** screen in Internet Explorer. Select **Yes** to proceed to the web configurator login screen; if you select **No**, then web configurator access is blocked.

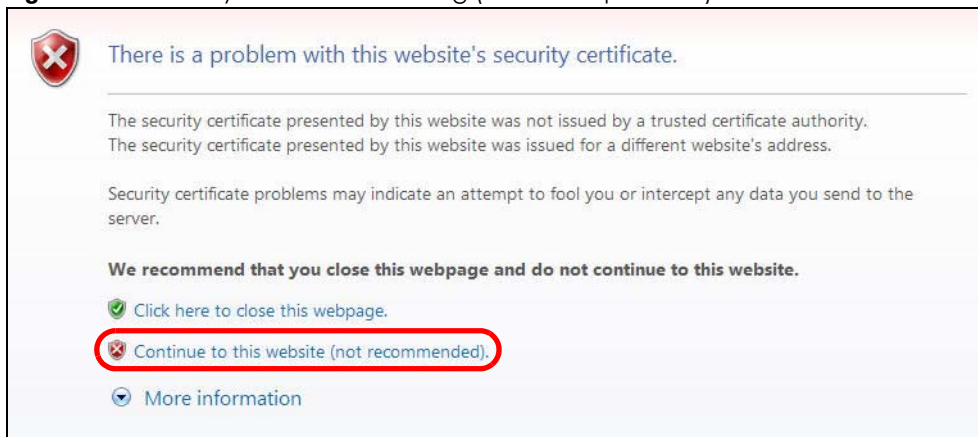
**Figure 323** Security Alert Dialog Box (Internet Explorer 6)



#### 52.9.1.2 Internet Explorer 7 or later version

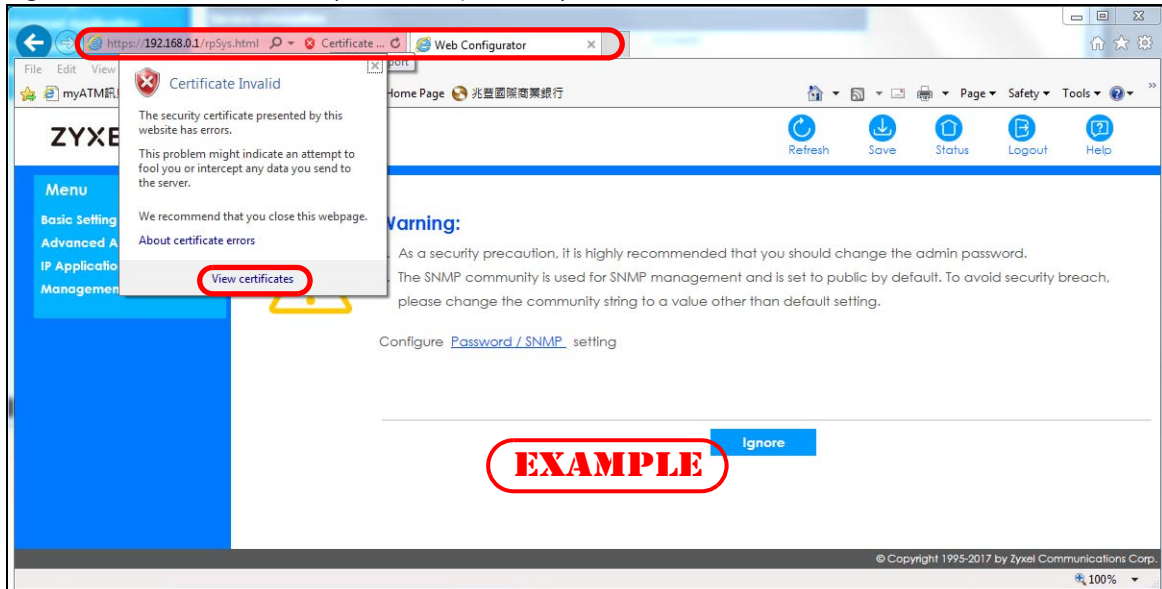
When you attempt to access the Switch HTTPS server, a screen with the message "There is a problem with this website's security certificate." may display. If that is the case, click **Continue to this website (not recommended)** to proceed to the web configurator login screen.

**Figure 324** Security Certificate Warning (Internet Explorer 11)



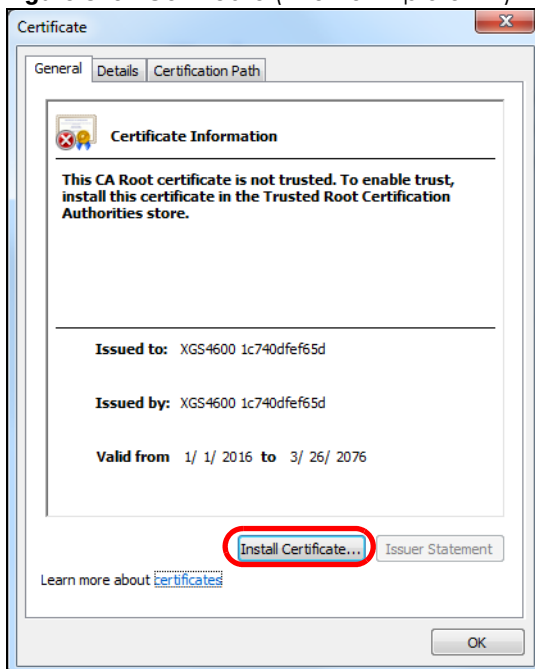
After you log in, you will see the red address bar with the message **Certificate Error**. Click on **Certificate Error** next to the address bar and click **View certificates**.

**Figure 325** Certificate Error (Internet Explorer 11)



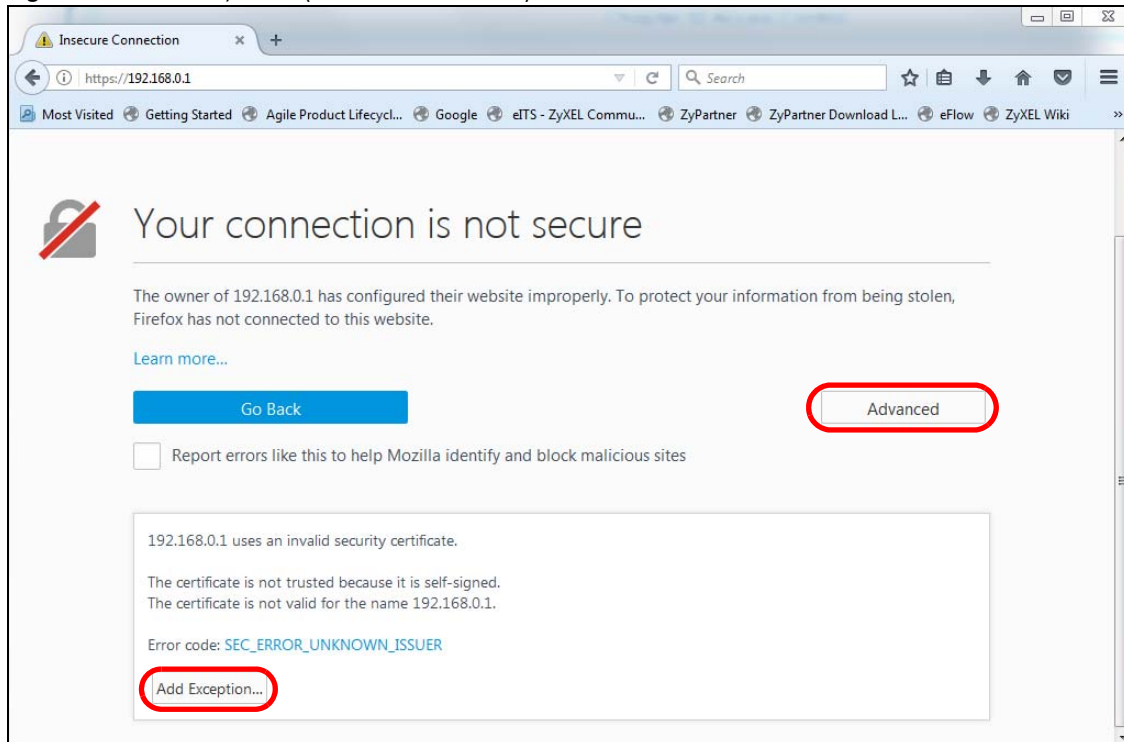
Click **Install Certificate...** and follow the on-screen instructions to install the certificate in your browser.

**Figure 326** Certificate (Internet Explorer 11)

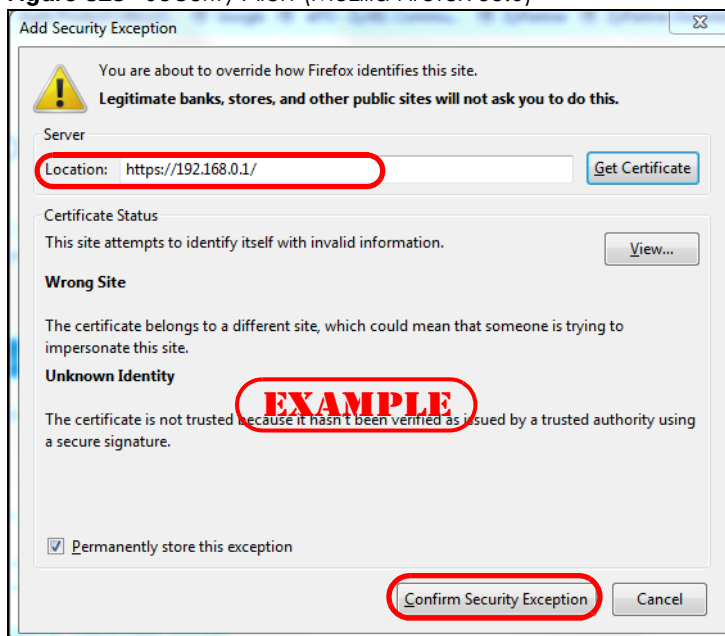


## 52.9.2 Mozilla Firefox Warning Messages

When you attempt to access the Switch HTTPS server, a **This Connection is Untrusted** or **Your connection is not secure** screen may display. If that is the case, click **I Understand the Risks** or **Advanced** and then the **Add Exception...** button.

**Figure 327** Security Alert (Mozilla Firefox 53.0)

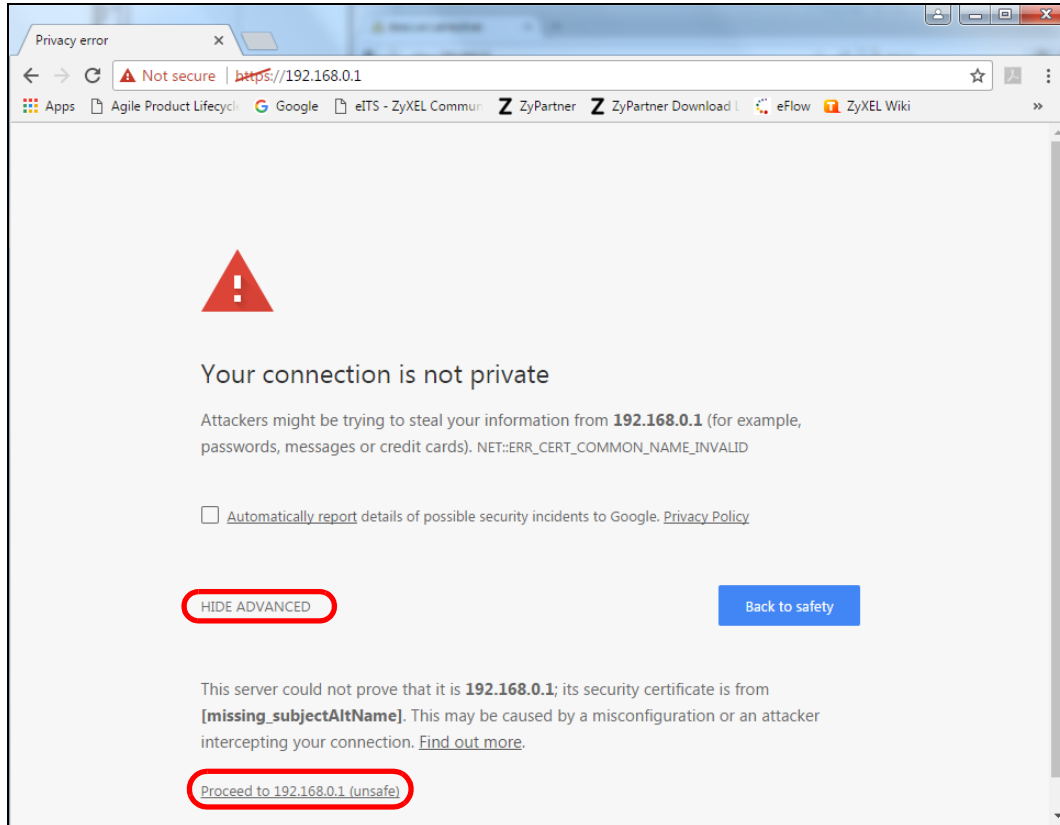
Confirm the HTTPS server URL matches. Click **Confirm Security Exception** to proceed to the web configurator login screen.

**Figure 328** Security Alert (Mozilla Firefox 53.0)

### 52.9.3 Google Chrome Warning Messages

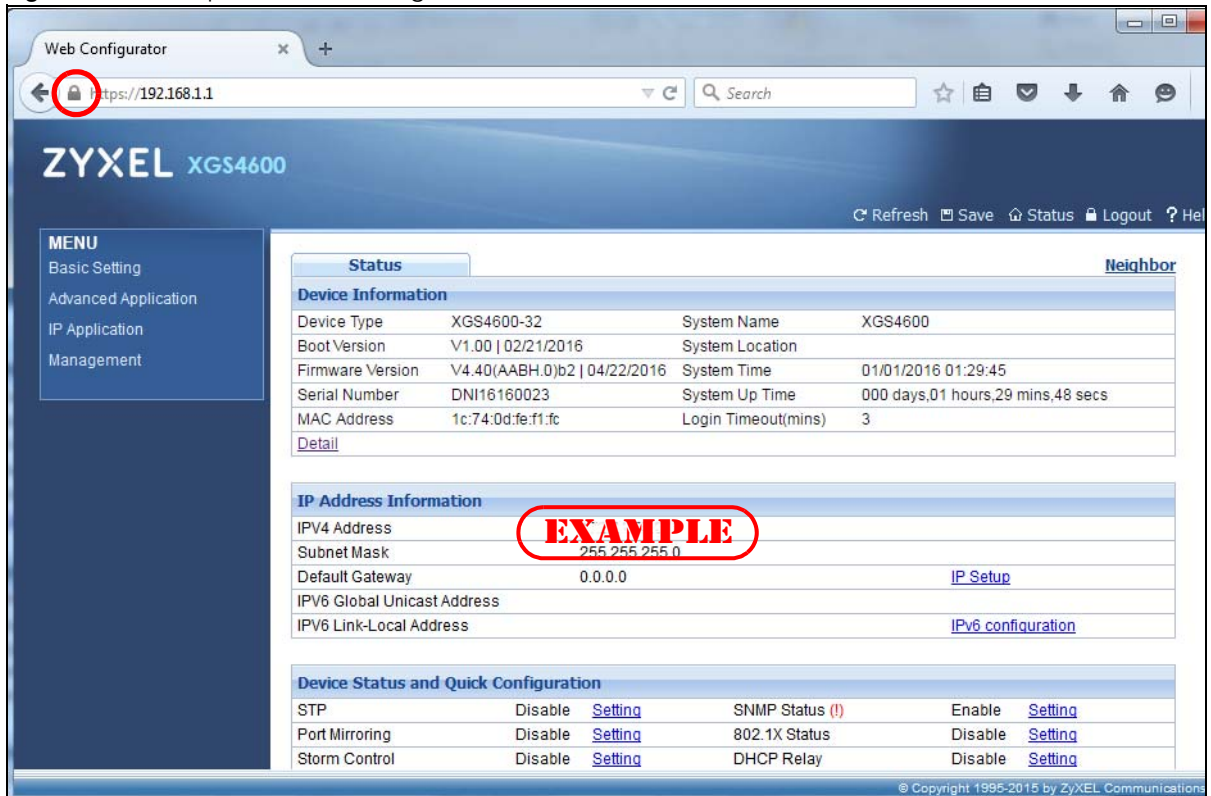
When you attempt to access the Switch HTTPS server, a **Your connection is not private** screen may display. If that is the case, click **Advanced** and then **Proceed to x.x.x.x (unsafe)** to proceed to the web configurator login screen.

**Figure 329** Security Alert (Google Chrome 58.0.3029.110)



### 52.9.4 The Main Screen

After you accept the certificate and enter the login username and password, the Switch main screen appears. The lock displayed in the bottom right of the browser status bar or next to the website address denotes a secure connection.

**Figure 330** Example: Lock Denoting a Secure Connection

## 52.10 Service Access Control

Service Access Control allows you to decide what services you may use to access the Switch. You may also change the default service port and configure “trusted computer(s)” for each service in the **Remote Management** screen (discussed later). Click **Access Control** to go back to the main **Access Control** screen.

**Figure 331** Management > Access Control > Service Access Control

Service Access Control

Access Control

| Services | Active                              | Service Port | Timeout |         |
|----------|-------------------------------------|--------------|---------|---------|
| Console  |                                     |              | 5       | Minutes |
| Telnet   | <input checked="" type="checkbox"/> | 23           | 5       | Minutes |
| SSH      | <input checked="" type="checkbox"/> | 22           |         |         |
| FTP      | <input checked="" type="checkbox"/> | 21           | 5       | Minutes |
| HTTP     | <input checked="" type="checkbox"/> | 80           | 3       | Minutes |
| HTTPS    | <input checked="" type="checkbox"/> | 443          |         |         |
| ICMP     | <input checked="" type="checkbox"/> |              |         |         |
| SNMP     | <input checked="" type="checkbox"/> |              |         |         |

Apply

Cancel

The following table describes the fields in this screen.

Table 238 Management > Access Control > Service Access Control

| LABEL        | DESCRIPTION                                                                                                                                                                                                                                                                                           |
|--------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Services     | Services you may use to access the Switch are listed here.                                                                                                                                                                                                                                            |
| Active       | Select this option for the corresponding services that you want to allow to access the Switch.                                                                                                                                                                                                        |
| Service Port | For Telnet, SSH, FTP, HTTP or HTTPS services, you may change the default service port by typing the new port number in the <b>Service Port</b> field. If you change the default port number then you will have to let people (who wish to use the service) know the new port number for that service. |
| Timeout      | Type how many minutes (from 1 to 255) a management session can be left idle before the session times out. After it times out you have to log in with your password again. Very long idle timeouts may have security risks.                                                                            |
| Apply        | Click <b>Apply</b> to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the <b>Save</b> link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.                    |
| Cancel       | Click <b>Cancel</b> to begin configuring this screen afresh.                                                                                                                                                                                                                                          |

## 52.11 Remote Management

From the **Access Control** screen, display the **Remote Management** screen as shown next.

You can specify a group of one or more "trusted computers" from which an administrator may use a service to manage the Switch. Click **Access Control** to return to the **Access Control** screen.

Figure 332 Management > Access Control > Remote Management

Remote Management

[Access Control](#)

Secured Client Setup

| Entry | Active                              | Start Address | End Address | Telnet                              | FTP                                 | HTTP                                | ICMP                                | SNMP                                | SSH                                 | HTTPS                               |
|-------|-------------------------------------|---------------|-------------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|
| 1     | <input checked="" type="checkbox"/> | 0.0.0.0       | 0.0.0.0     | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> |
| 2     | <input type="checkbox"/>            | 0.0.0.0       | 0.0.0.0     | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            |
| 3     | <input type="checkbox"/>            | 0.0.0.0       | 0.0.0.0     | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            |
| 4     | <input type="checkbox"/>            | 0.0.0.0       | 0.0.0.0     | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            |
| 5     | <input type="checkbox"/>            | 0.0.0.0       | 0.0.0.0     | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            |
| 6     | <input type="checkbox"/>            | 0.0.0.0       | 0.0.0.0     | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            |
| 7     | <input type="checkbox"/>            | 0.0.0.0       | 0.0.0.0     | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            |
| 8     | <input type="checkbox"/>            | 0.0.0.0       | 0.0.0.0     | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            |
| 9     | <input type="checkbox"/>            | 0.0.0.0       | 0.0.0.0     | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            |
| 10    | <input type="checkbox"/>            | 0.0.0.0       | 0.0.0.0     | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            |
| 11    | <input type="checkbox"/>            | 0.0.0.0       | 0.0.0.0     | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            |
| 12    | <input type="checkbox"/>            | 0.0.0.0       | 0.0.0.0     | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            |
| 13    | <input type="checkbox"/>            | 0.0.0.0       | 0.0.0.0     | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            |
| 14    | <input type="checkbox"/>            | 0.0.0.0       | 0.0.0.0     | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            |
| 15    | <input type="checkbox"/>            | 0.0.0.0       | 0.0.0.0     | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            |
| 16    | <input type="checkbox"/>            | 0.0.0.0       | 0.0.0.0     | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            |

Apply

Cancel

The following table describes the labels in this screen.

Table 239 Management > Access Control > Remote Management

| LABEL                                       | DESCRIPTION                                                                                                                                                                                                                                                                        |
|---------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Entry                                       | This is the client set index number. A "client set" is a group of one or more "trusted computers" from which an administrator may use a service to manage the Switch.                                                                                                              |
| Active                                      | Select this check box to activate this secured client set. Clear the check box if you wish to temporarily disable the set without deleting it.                                                                                                                                     |
| Start Address                               | Configure the IP address range of trusted computers from which you can manage this Switch.                                                                                                                                                                                         |
| End Address                                 | The Switch checks if the client IP address of a computer requesting a service or protocol matches the range set here. The Switch immediately disconnects the session if it does not match.                                                                                         |
| Telnet/FTP/HTTP/<br>ICMP/SNMP/<br>SSH/HTTPS | Select services that may be used for managing the Switch from the specified trusted computers.                                                                                                                                                                                     |
| Apply                                       | Click <b>Apply</b> to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the <b>Save</b> link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel                                      | Click <b>Cancel</b> to begin configuring this screen afresh.                                                                                                                                                                                                                       |

# CHAPTER 53

## Diagnostic

This chapter explains the **Diagnostic** screen. You can use this screen to help you identify problems.

### 53.1 Diagnostic

Click **Management > Diagnostic** in the navigation panel to open this screen. Use this screen to check system logs, ping IP addresses or perform port tests.

**Figure 333** Management > Diagnostic

| Diagnostic |         |             |                  |                       |
|------------|---------|-------------|------------------|-----------------------|
| Port       | Channel | Pair status | Cable length (m) | Distance to fault (m) |
| 26         | pairA   | Ok          | 2.00             | N/A                   |
|            | pairB   | Ok          | 4.00             | N/A                   |
|            | pairC   | Open        | N/A              | 0.00                  |
|            | pairD   | Open        | N/A              | 0.00                  |

|                    |                                       |           |                          |                    |
|--------------------|---------------------------------------|-----------|--------------------------|--------------------|
| Ping Test          | <input checked="" type="radio"/> IPv4 | -         |                          | <b>Ping</b>        |
|                    | <input type="radio"/> IPv6            | -         |                          |                    |
|                    | IP Address/Host Name                  |           |                          |                    |
|                    | Source IP Address                     |           |                          |                    |
|                    | Count                                 | 3         |                          |                    |
| Trace Route Test   | <input checked="" type="radio"/> IPv4 | -         |                          | <b>Trace Route</b> |
|                    | <input type="radio"/> IPv6            |           |                          |                    |
|                    | IP Address/Host Name                  |           |                          |                    |
|                    | TTL                                   | 30        |                          |                    |
|                    | Wait Time                             | 2 Seconds |                          |                    |
|                    | Queries                               | 3         |                          |                    |
| Ethernet Port Test | Port                                  |           | <b>Port Test</b>         |                    |
| Cable Diagnostics  | Port                                  |           | <b>Diagnose</b>          |                    |
| Locator LED        | 30                                    | Minutes   | <b>Blink</b> <b>Stop</b> |                    |



The following table describes the labels in this screen.

Table 240 Management > Diagnostic

| LABEL                | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|----------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Ping Test            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| IPv4                 | <p>Select this option if you want to ping an IPv4 address, and select which traffic flow (<b>in-band</b> or <b>out-of-band</b>) the Switch is to send ping frames.</p> <p>If you select <b>in-band</b>, the Switch sends the frames to all ports except the management port (labeled <b>MGMT</b>).</p> <p>If you select <b>out-of-band</b>, the Switch sends the frames to the management port (labeled <b>MGMT</b>).</p> <p>Otherwise, select - to send ping requests to all VLANs on the Switch.</p> |
| IPv6                 | <p>Select this option if you want to ping an IPv6 address. You can also select <b>vlan</b> and specify the ID number of the VLAN to which the Switch is to send ping requests. Otherwise, select - to send ping requests to all VLANs on the Switch.</p>                                                                                                                                                                                                                                               |
| IP Address/Host Name | <p>Type the IP address or host name of a device that you want to ping in order to test a connection.</p> <p>Click <b>Ping</b> to have the Switch ping the IP address.</p>                                                                                                                                                                                                                                                                                                                              |
| Source IP Address    | <p>Type the source IP address that you want to ping in order to test a connection.</p> <p>Click <b>Ping</b> to have the Switch ping the IP address.</p>                                                                                                                                                                                                                                                                                                                                                |
| Count                | Enter the number of ICMP Echo Request (ping) messages the Switch continuously sends.                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Trace Route Test     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| IPv4                 | <p>Select this option if you want to trace the route packets take to a device with an IPv4 address, and select <b>in-band</b> or <b>out-of-band</b> on which the Switch traces the path. Otherwise, select - to trace the path on any VLAN.</p>                                                                                                                                                                                                                                                        |
| IPv6                 | <p>Select this option if you want to trace the route packets take to a device with an IPv6 address.</p>                                                                                                                                                                                                                                                                                                                                                                                                |
| IP Address/Host Name | <p>Enter the IP address or host name of a device to which you want to perform a traceroute.</p> <p>Click <b>Trace Route</b> to have the Switch perform the traceroute function. This determines the path a packet takes to the specified device.</p>                                                                                                                                                                                                                                                   |
| TTL                  | <p>Enter the Time To Live (TTL) value for the ICMP Echo Request packets. This is to set the maximum number of the hops (routers) a packet can travel through. Each router along the path will decrement the TTL value by one and forward the packets. When the TTL value becomes zero and the destination is not found, the router drops the packets and informs the sender.</p>                                                                                                                       |
| Wait Time            | Specify how many seconds the Switch waits for a response to a probe before running another traceroute.                                                                                                                                                                                                                                                                                                                                                                                                 |
| Queries              | Specify how many times the Switch performs the traceroute function.                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Ethernet Port Test   | Click the drop-down list to choose the slot number of the Switch in a stack. Enter a port number and click <b>Port Test</b> to perform an internal loopback test.                                                                                                                                                                                                                                                                                                                                      |
| Cable Diagnostics    | <p>Click the drop-down list to choose the slot number of the Switch in a stack. Enter an Ethernet port number and click <b>Diagnose</b> to perform a physical wire-pair test of the Ethernet connections on the specified port(s). The following fields display when you diagnose a port.</p> <p>This field is available only on the Switch that has one or more copper Ethernet ports (except the <b>MGMT</b> port).</p>                                                                              |
| Port                 | This is the number of the physical Ethernet port on the Switch.                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Channel              | <p>An Ethernet cable usually has four pairs of wires. A 10BASE-T or 100BASE-TX port only use and test two pairs, while a 1000BASE-T port requires all four pairs.</p> <p>This displays the descriptive name of the wire-pair in the cable.</p>                                                                                                                                                                                                                                                         |

Table 240 Management &gt; Diagnostic (continued)

| LABEL                 | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                |
|-----------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Pair status           | <p><b>Ok:</b> The physical connection between the wire-pair is okay.</p> <p><b>Open:</b> There is no physical connection (an open circuit detected) between the wire-pair.</p> <p><b>Short:</b> There is an short circuit detected between the wire-pair.</p> <p><b>Unknown:</b> The Switch failed to run cable diagnostics on the cable connected this port.</p> <p><b>Unsupported:</b> The port is a fiber port or it is not active.</p> |
| Cable length (m)      | <p>This displays the total length of the Ethernet cable that is connected to the port when the <b>Pair status</b> is <b>Ok</b> and the Switch chipset supports this feature.</p> <p>This shows <b>N/A</b> if the <b>Pair status</b> is <b>Open</b> or <b>Short</b>. Check the <b>Distance to fault</b>.</p> <p>This shows <b>Unsupported</b> if the Switch chipset does not support to show the cable length.</p>                          |
| Distance to fault (m) | <p>This displays the distance between the port and the location where the cable is open or shorted.</p> <p>This shows <b>N/A</b> if the <b>Pair status</b> is <b>Ok</b>.</p> <p>This shows <b>Unsupported</b> if the Switch chipset does not support to show the distance.</p>                                                                                                                                                             |
| Locator LED           | <p>Enter a time interval (in minutes) and click <b>Blink</b> to show the actual location of the Switch between several devices in a rack.</p> <p>The default time interval is 30 minutes.</p> <p>Click <b>Stop</b> to have the Switch terminate the blinking locator LED.</p>                                                                                                                                                              |

# CHAPTER 54

## System Log

### 54.1 Overview

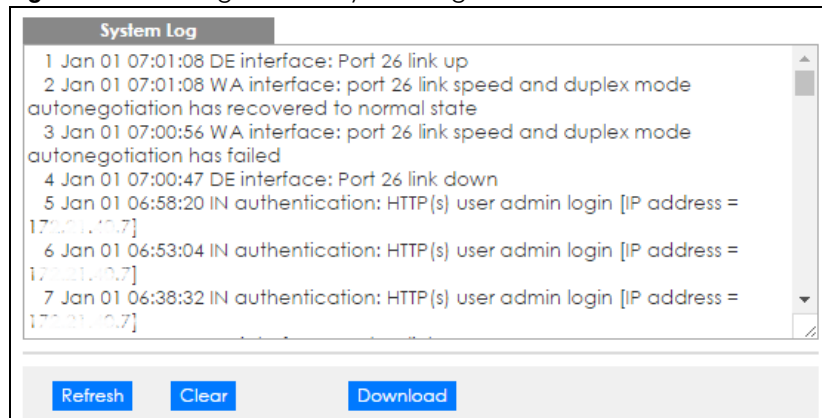
A log message stores the information for viewing.

### 54.2 System Log

Click **Management > System Log** in the navigation panel to open this screen. Use this screen to check current system logs.

Note: When a log reaches the maximum number of log messages, new log messages automatically overwrite existing log messages, starting with the oldest existing log message first.

**Figure 334** Management > System Log



The summary table shows the time the log message was recorded and the reason the log message was generated. Click **Refresh** to update this screen. Click **Clear** to clear the whole log, regardless of what is currently displayed on the screen. Click **Download** to save the log to your computer.

# CHAPTER 55

## Syslog Setup

This chapter explains the syslog screens.

### 55.1 Syslog Overview

The syslog protocol allows devices to send event notification messages across an IP network to syslog servers that collect the event messages. A syslog-enabled device can generate a syslog message and send it to a syslog server.

Syslog is defined in RFC 3164. The RFC defines the packet format, content and system log related information of syslog messages. Each syslog message has a facility and severity level. The syslog facility identifies a file in the syslog server. Refer to the documentation of your syslog program for details. The following table describes the syslog severity levels.

Table 241 Syslog Severity Levels

| CODE | SEVERITY                                                           |
|------|--------------------------------------------------------------------|
| 0    | Emergency: The system is unusable.                                 |
| 1    | Alert: Action must be taken immediately.                           |
| 2    | Critical: The system condition is critical.                        |
| 3    | Error: There is an error condition on the system.                  |
| 4    | Warning: There is a warning condition on the system.               |
| 5    | Notice: There is a normal but significant condition on the system. |
| 6    | Informational: The syslog contains an informational message.       |
| 7    | Debug: The message is intended for debug-level purposes.           |

### 55.2 Syslog Setup

Click **Management > Syslog** in the navigation panel to display this screen. The syslog feature sends logs to an external syslog server. Use this screen to configure the device's system logging settings and configure a list of external syslog servers.

**Figure 335** Management > Syslog Setup

**Syslog Setup**

Syslog ☐ Active

| Logging type | Active                   | Facility      |
|--------------|--------------------------|---------------|
| System       | <input type="checkbox"/> | local use 0 ▼ |
| Interface    | <input type="checkbox"/> | local use 0 ▼ |
| Switch       | <input type="checkbox"/> | local use 0 ▼ |
| AAA          | <input type="checkbox"/> | local use 0 ▼ |
| IP           | <input type="checkbox"/> | local use 0 ▼ |

[Apply](#) [Cancel](#)

**Syslog Server Setup**

Active ☐

Server Address

UDP Port

Log Level  ▼

[Add](#) [Cancel](#) [Clear](#)

| Index | Active                   | IP Address | UDP Port | Log Level |
|-------|--------------------------|------------|----------|-----------|
|       | <input type="checkbox"/> |            |          |           |

[Delete](#) [Cancel](#)

The following table describes the labels in this screen.

**Table 242** Management > Syslog Setup

| LABEL               | DESCRIPTION                                                                                                                                                                                                                                                                        |
|---------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Syslog              | Select <b>Active</b> to turn on syslog (system logging) and then configure the syslog setting                                                                                                                                                                                      |
| Logging Type        | This column displays the names of the categories of logs that the device can generate.                                                                                                                                                                                             |
| Active              | Select this option to set the device to generate logs for the corresponding category.                                                                                                                                                                                              |
| Facility            | The log facility allows you to send logs to different files in the syslog server. Refer to the documentation of your syslog program for more details.                                                                                                                              |
| Apply               | Click <b>Apply</b> to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the <b>Save</b> link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel              | Click <b>Cancel</b> to begin configuring this screen afresh.                                                                                                                                                                                                                       |
| Syslog Server Setup |                                                                                                                                                                                                                                                                                    |
| Active              | Select this check box to have the device send logs to this syslog server. Clear the check box if you want to create a syslog server entry but not have the device send logs to it (you can edit the entry later).                                                                  |
| Server Address      | Enter the IPv4 or IPv6 address of the syslog server.                                                                                                                                                                                                                               |

Table 242 Management &gt; Syslog Setup

| LABEL      | DESCRIPTION                                                                                                                                                                                                                                                                      |
|------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| UDP Port   | The default syslog server port is 514. If your syslog server uses a different port, configure the one it uses here.                                                                                                                                                              |
| Log Level  | Select the severity level(s) of the logs that you want the device to send to this syslog server. The lower the number, the more critical the logs are.                                                                                                                           |
| Add        | Click <b>Add</b> to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the <b>Save</b> link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel     | Click <b>Cancel</b> to begin configuring this screen afresh.                                                                                                                                                                                                                     |
| Clear      | Click <b>Clear</b> to return the fields to the factory defaults.                                                                                                                                                                                                                 |
| Index      | This is the index number of a syslog server entry. Click this number to edit the entry.                                                                                                                                                                                          |
| Active     | This field displays <b>Yes</b> if the device is to send logs to the syslog server. <b>No</b> displays if the device is not to send logs to the syslog server.                                                                                                                    |
| IP Address | This field displays the IP address of the syslog server.                                                                                                                                                                                                                         |
| UDP Port   | This field displays the UDP port used by the syslog server.                                                                                                                                                                                                                      |
| Log Level  | This field displays the severity level of the logs that the device is to send to this syslog server.                                                                                                                                                                             |
|            | Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries.                                                                                                                                          |
| Delete     | Click <b>Delete</b> to remove the selected entry(ies).                                                                                                                                                                                                                           |
| Cancel     | Click Cancel to begin configuring this screen afresh.                                                                                                                                                                                                                            |

# CHAPTER 56

## Cluster Management

This chapter introduces cluster management.

### 56.1 Cluster Management Status Overview

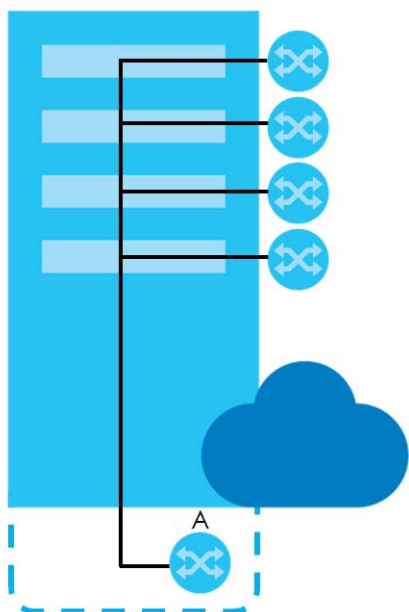
Cluster Management allows you to manage switches through one Switch, called the cluster manager. The switches must be directly connected and be in the same VLAN group so as to be able to communicate with one another.

Table 243 Zyxel Clustering Management Specifications

|                                   |                                                                                         |
|-----------------------------------|-----------------------------------------------------------------------------------------|
| Maximum number of cluster members | 24                                                                                      |
| Cluster Member Models             | Cluster member models must be compatible with Zyxel cluster management implementation.  |
| Cluster Manager                   | The cluster manager is the Switch through which you manage the cluster member switches. |
| Cluster Members                   | Cluster members are the switches being managed by the cluster manager switch.           |

In the following example, switch **A** in the basement is the cluster manager and the other switches on the upper floors of the building are cluster members.

**Figure 336** Clustering Application Example



## 56.2 Cluster Management Status

Click **Management > Cluster Management** in the navigation panel to display the following screen.

Note: A cluster can only have one manager.

**Figure 337** Management > Cluster Management

| Clustering Management Status |                   | <a href="#">Configuration</a> |
|------------------------------|-------------------|-------------------------------|
| Status                       | None              |                               |
| Manager                      | 00:00:00:00:00:00 |                               |

The Number Of Member = 0

| Index | MacAddr | Name | Model | Status |
|-------|---------|------|-------|--------|
|-------|---------|------|-------|--------|

The following table describes the labels in this screen.

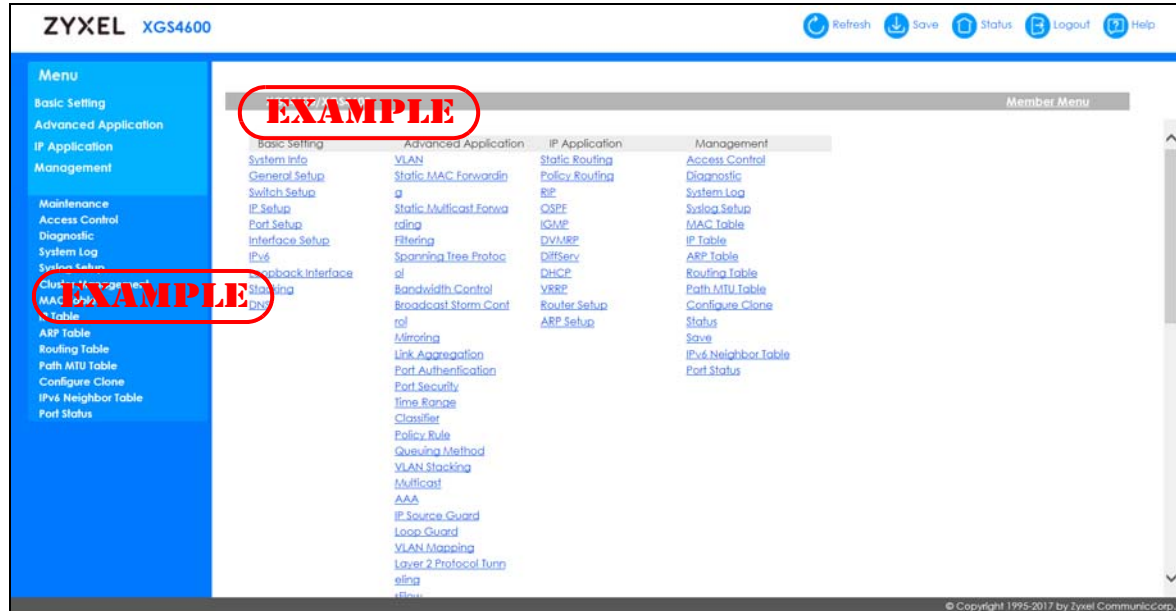
Table 244 Management > Cluster Management

| LABEL                | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                         |
|----------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Status               | <p>This field displays the role of this Switch within the cluster.</p> <p><b>Manager</b></p> <p><b>Member</b> (you see this if you access this screen in the cluster member switch directly and not via the cluster manager)</p> <p><b>None</b> (neither a manager nor a member of a cluster)</p>                                                                                                                   |
| Manager              | This field displays the cluster manager switch's hardware MAC address.                                                                                                                                                                                                                                                                                                                                              |
| The Number of Member | This field displays the number of switches that make up this cluster. The following fields describe the cluster member switches.                                                                                                                                                                                                                                                                                    |
| Index                | You can manage cluster member switches via the cluster manager switch. Each number in the <b>Index</b> column is a hyperlink leading to the cluster member switch's web configurator (see <a href="#">Figure 338 on page 469</a> ).                                                                                                                                                                                 |
| MacAddr              | This is the cluster member switch's hardware MAC address.                                                                                                                                                                                                                                                                                                                                                           |
| Name                 | This is the cluster member switch's <b>System Name</b> .                                                                                                                                                                                                                                                                                                                                                            |
| Model                | This field displays the model name.                                                                                                                                                                                                                                                                                                                                                                                 |
| Status               | <p>This field displays:</p> <p><b>Online</b> (the cluster member switch is accessible)</p> <p><b>Error</b> (for example, the cluster member switch password was changed or the switch was set as the manager and so left the member list, etc.)</p> <p><b>Offline</b> (the switch is disconnected - <b>Offline</b> shows approximately 1.5 minutes after the link between cluster member and manager goes down)</p> |

### 56.2.1 Cluster Member Switch Management

Go to the **Clustering Management Status** screen of the cluster manager switch and then select an **Index** hyperlink from the list of members to go to that cluster member switch's web configurator home page. This cluster member web configurator home page and the home page that you'd see if you accessed it directly are different.



**Figure 338** Cluster Management: Cluster Member Web Configurator Screen

### 56.2.1.1 Uploading Firmware to a Cluster Member Switch

You can use FTP to upload firmware to a cluster member switch through the cluster manager switch as shown in the following example.

**Figure 339** Example: Uploading Firmware to a Cluster Member Switch

```
C:\>ftp 192.168.1.1
Connected to 192.168.1.1.
220 Switch FTP version 1.0 ready at Thu Jan  1 00:58:46 1970
User (192.168.0.1:(none)): admin
331 Enter PASS command
Password:
230 Logged in
ftp> ls
200 Port command okay
150 Opening data connection for LIST
--w--w--w-  1 owner   group      6173152 Jul  01 12:00 ras-0
--w--w--w-  1 owner   group      6173152 Jul  01 12:00 ras-1
-rw-rw-rw-  1 owner   group     33554432 Jul  01 12:00 config
--w--w--w-  1 owner   group           0 Jul  01 12:00 ras-00-a0-c5-01-23-46
-rw-rw-rw-  1 owner   group           0 Jul  01 12:00 config-00-a0-c5-01-23-46
226 File sent OK
ftp: 297 bytes received in 0.00Seconds 297000.00Kbytes/sec.
ftp> bin
200 Type I OK
ftp> put 410AAGB0.bin ras-00-a0-c5-01-23-46
200 Port command okay
150 Opening data connection for STOR ras-00-a0-c5-01-23-46
226 File received OK
ftp: 262144 bytes sent in 0.63Seconds 415.44Kbytes/sec.
ftp>
```

The following table explains some of the FTP parameters.

Table 245 FTP Upload to Cluster Member Example

| FTP PARAMETER            | DESCRIPTION                                                                                        |
|--------------------------|----------------------------------------------------------------------------------------------------|
| User                     | Enter "admin".                                                                                     |
| Password                 | The web configurator password default is 1234.                                                     |
| ls                       | Enter this command to list the name of cluster member switch's firmware and configuration file.    |
| 410AAGB0.bin             | This is the name of the firmware file you want to upload to the cluster member switch.             |
| ras-00-a0-c5-01-23-46    | This is the cluster member switch's firmware name as seen in the cluster manager switch.           |
| config-00-a0-c5-01-23-46 | This is the cluster member switch's configuration file name as seen in the cluster manager switch. |

## 56.3 Clustering Management Configuration

Use this screen to configure clustering management. Click **Configuration** from the **Cluster Management** screen to display the next screen.

**Figure 340** Management > Clustering Management > Configuration

**Clustering Management Configuration** [Status](#)

**Clustering Manager**

Active ☐

Name

VID

[Apply](#) [Cancel](#)

**Clustering Candidate**

List

Password

[Add](#) [Cancel](#) [Refresh](#)

| Index | MacAddr | Name | Model |
|-------|---------|------|-------|
|       |         |      |       |

[Remove](#) [Cancel](#)

The following table describes the labels in this screen.

Table 246 Management > Clustering Management > Configuration

| LABEL                                                                               | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|-------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Clustering Manager                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Active                                                                              | Select <b>Active</b> to have this Switch become the cluster manager switch. A cluster can only have one manager. Other (directly connected) switches that are set to be cluster managers will not be visible in the <b>Clustering Candidates</b> list. If a switch that was previously a cluster member is later set to become a cluster manager, then its <b>Status</b> is displayed as <b>Error</b> in the <b>Cluster Management Status</b> screen appears in the member summary list below.                                                                                   |
| Name                                                                                | Type a name to identify the <b>Clustering Manager</b> . You may use up to 32 printable characters (spaces are allowed).                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| VID                                                                                 | This is the VLAN ID and is only applicable if the Switch is set to <b>802.1Q</b> VLAN. All switches must be directly connected and in the same VLAN group to belong to the same cluster. Switches that are not in the same VLAN group are not visible in the <b>Clustering Candidates</b> list. This field is ignored if the <b>Clustering Manager</b> is using <b>Port-based</b> VLAN.                                                                                                                                                                                          |
| Apply                                                                               | Click <b>Apply</b> to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the <b>Save</b> link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.                                                                                                                                                                                                                                                                                               |
| Cancel                                                                              | Click <b>Cancel</b> to begin configuring this screen afresh.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Clustering Candidate                                                                | The following fields relate to the switches that are potential cluster members.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| List                                                                                | A list of suitable candidates found by auto-discovery is shown here. The switches must be directly connected. Directly connected switches that are set to be cluster managers will not be visible in the <b>Clustering Candidate</b> list. Switches that are not in the same management VLAN group will not be visible in the <b>Clustering Candidate</b> list.                                                                                                                                                                                                                  |
| Password                                                                            | Each cluster member's password is its web configurator password. Select a member in the <b>Clustering Candidate</b> list and then enter its web configurator password. If that switch administrator changes the web configurator password afterwards, then it cannot be managed from the <b>Cluster Manager</b> . Its <b>Status</b> is displayed as <b>Error</b> in the <b>Cluster Management Status</b> screen.<br><br>If multiple devices have the same password then hold [SHIFT] and click those switches to select them. Then enter their common web configurator password. |
| Add                                                                                 | Click <b>Add</b> to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the <b>Save</b> link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.                                                                                                                                                                                                                                                                                                 |
| Cancel                                                                              | Click <b>Cancel</b> to begin configuring this screen afresh.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Refresh                                                                             | Click <b>Refresh</b> to perform auto-discovery again to list potential cluster members.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| The next summary table shows the information for the clustering members configured. |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Index                                                                               | This is the index number of a cluster member switch.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| MacAddr                                                                             | This is the cluster member switch's hardware MAC address.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Name                                                                                | This is the cluster member switch's <b>System Name</b> .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Model                                                                               | This is the cluster member switch's model name.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|                                                                                     | Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries.                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Remove                                                                              | Click the <b>Remove</b> button to remove the selected cluster member switch(es) from the cluster.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Cancel                                                                              | Click <b>Cancel</b> to begin configuring this screen afresh.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |

# CHAPTER 57

## MAC Table

This chapter introduces the **MAC Table** screen.

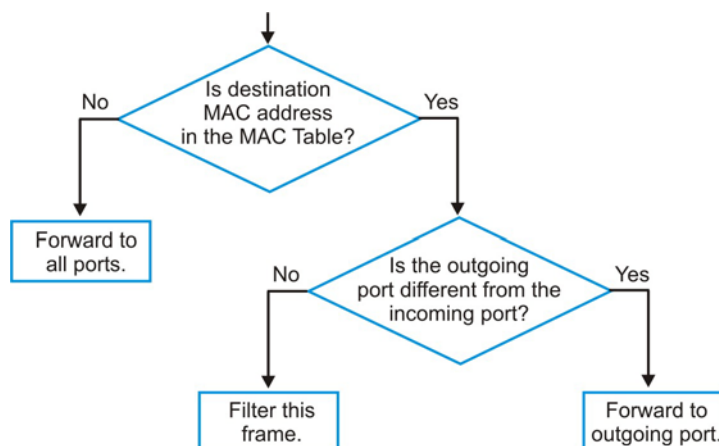
### 57.1 MAC Table Overview

The **MAC Table** screen (a MAC table is also known as a filtering database) shows how frames are forwarded or filtered across the Switch's ports. When a device (which may belong to a VLAN group) sends a packet which is forwarded to a port on the Switch, the MAC address of the device is shown on the Switch's **MAC Table**. It also shows whether the MAC address is dynamic (learned by the Switch) or static (manually entered in the **Static MAC Forwarding** screen).

The Switch uses the **MAC Table** to determine how to forward frames. See the following figure.

- 1 The Switch examines a received frame and learns the port from which this source MAC address came.
- 2 The Switch checks to see if the frame's destination MAC address matches a source MAC address already learned in the **MAC Table**.
  - If the Switch has already learned the port for this MAC address, then it forwards the frame to that port.
  - If the Switch has not already learned the port for this MAC address, then the frame is flooded to all ports. Too much port flooding leads to network congestion then the Switch sends an ARP to request the MAC address. The Switch then learns the port that replies with the MAC address.
  - If the Switch has already learned the port for this MAC address, but the destination port is the same as the port it came in on, then it filters the frame.

**Figure 341** MAC Table Flowchart



## 57.2 Viewing the MAC Table

Click **Management > MAC Table** in the navigation panel to display the following screen. Use this screen to search specific MAC addresses. You can also directly add dynamic MAC address(es) into the static MAC forwarding table or MAC filtering table from the MAC table using this screen.

**Figure 342** Management > MAC Table

| Index | MAC Address       | VID | Port | Type    |
|-------|-------------------|-----|------|---------|
| 1     | 00:03:21:10:be:00 | 1   | 26   | Dynamic |
| 2     | 00:03:21:10:f7:7c | 1   | 26   | Dynamic |
| 3     | 00:03:21:10:f7:7d | 1   | 26   | Dynamic |
| 4     | 00:03:21:11:02:a1 | 1   | 26   | Dynamic |
| 5     | 00:0e:e3:00:3d:0d | 1   | 26   | Dynamic |
| 6     | 00:0e:e3:00:3d:48 | 1   | 26   | Dynamic |
| 7     | 00:0e:e3:01:75:e2 | 1   | 26   | Dynamic |
| 8     | 00:0e:e3:03:e5:e6 | 1   | 26   | Dynamic |
| 9     | 00:0e:e3:04:2e:28 | 1   | 26   | Dynamic |
| 10    | 00:0e:e3:04:52:4a | 1   | 26   | Dynamic |
| 11    | 1c:74:0d:fe:f6:5e | 1   | CPU  | Static  |
| 12    | 1c:74:0d:fe:f6:5e | 11  | CPU  | Static  |
| 13    | 1c:74:0d:fe:f6:5e | 123 | CPU  | Static  |
| 14    | 30:65:ec:45:db:f3 | 1   | 26   | Dynamic |

The following table describes the labels in this screen.

Table 247 Management > MAC Table

| LABEL     | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|-----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Condition | <p>Select <b>All</b> to display all MAC addresses in the MAC table.</p> <p>Select <b>Static</b> to only display static MAC address(es) in this screen.</p> <p>Select <b>MAC</b> and enter a valid MAC address (six hexadecimal character pairs) to display the MAC address information in this screen.</p> <p>Select <b>VID</b> and type a VLAN identification number to display all MAC addresses in the VLAN.</p> <p>Select <b>Port</b> and type the number of a port to display all MAC addresses learned from the port.</p> |
| Sort by   | <p>Select this to display and arrange the data according to MAC address (<b>MAC</b>), VLAN group (<b>VID</b>) or port number (<b>Port</b>). The information is then displayed in the summary table below.</p>                                                                                                                                                                                                                                                                                                                   |

Table 247 Management &gt; MAC Table (continued)

| LABEL         | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|---------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Transfer Type | <p>Select <b>Dynamic to MAC forwarding</b> and click <b>Transfer</b> to add the relative dynamic MAC address(es) you select the criteria here into the static MAC forwarding table (see <a href="#">Section 10.2 on page 131</a>). The type of the MAC address(es) will be changed to "static".</p> <p>Select <b>Dynamic to MAC filtering</b> and click <b>Transfer</b> to add the relative dynamic MAC address(es) you make the search here into the static MAC filtering table (see <a href="#">Section 12.1 on page 137</a>). The MAC address(es) will be removed from the MAC table and all traffic sent from the MAC address(es) will be blocked by the Switch.</p> |
| Search        | Click this to search data in the MAC table according to your input criteria.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Transfer      | Click this to perform the MAC address transferring you selected in the <b>Transfer Type</b> field.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Cancel        | Click this to begin configuring the search criteria afresh.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Index         | This is the incoming frame index number.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| MAC Address   | This is the MAC address of the device from which this incoming frame came.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| VID           | This is the VLAN group to which this frame belongs.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Port          | This is the port from which the above MAC address was learned.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Type          | This shows whether the MAC address is <b>dynamic</b> (learned by the Switch) or <b>static</b> (manually entered in the <b>Static MAC Forwarding</b> screen).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |

# CHAPTER 58

## IP Table

This chapter introduces the IP table.

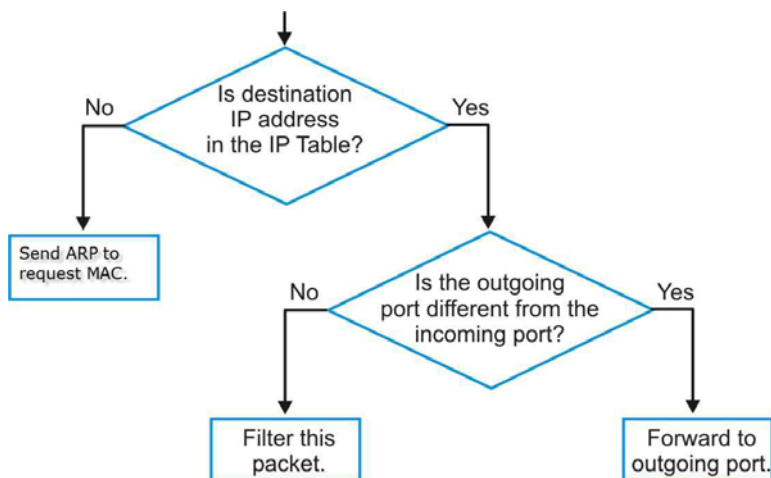
### 58.1 IP Table Overview

The **IP Table** screen shows how packets are forwarded or filtered across the Switch's ports. When a device (which may belong to a VLAN group) sends a packet which is forwarded to a port on the Switch, the IP address of the device is shown on the Switch's **IP Table**. The **IP Table** also shows whether the IP address is dynamic (learned by the Switch) or static (belonging to the Switch).

The Switch uses the **IP Table** to determine how to forward packets. See the following figure.

- 1 The Switch examines a received packet and learns the port from which this source IP address came.
- 2 The Switch checks to see if the packet's destination IP address matches a source IP address already learned in the **IP Table**.
  - If the Switch has already learned the port for this IP address, then it forwards the packet to that port.
  - If the Switch has not already learned the port for this IP address, then the packet is flooded to all ports. Too much port flooding leads to network congestion then the Switch sends an ARP to request the MAC address. The Switch then learns the port that replies with the MAC address.
  - If the Switch has already learned the port for this IP address, but the destination port is the same as the port it came in on, then it filters the packet.

**Figure 343** IP Table Flowchart



## 58.2 Viewing the IP Table

Click **Management > IP Table** in the navigation panel to display the following screen.

**Figure 344** Management > IP Table

| IP Table |              |     |      |         |
|----------|--------------|-----|------|---------|
| Sort by  | IP           | VID | Port |         |
| Index    | IP Address   | VID | Port | Type    |
| 1        | 172.21.10.7  | 1   | 26   | dynamic |
| 2        | 172.21.10.7  | 1   | CPU  | static  |
| 3        | 192.168.1.1  | 1   | CPU  | static  |
| 4        | 192.168.11.1 | 11  | CPU  | static  |
| 5        | 10.2.1.23    | 123 | CPU  | static  |

The following table describes the labels in this screen.

Table 248 Management > IP Table

| LABEL      | DESCRIPTION                                                                                                                                                     |
|------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Sort by    | Click one of the following buttons to display and arrange the data according to that button type. The information is then displayed in the summary table below. |
| IP         | Click this button to display and arrange the data according to IP address.                                                                                      |
| VID        | Click this button to display and arrange the data according to VLAN group.                                                                                      |
| Port       | Click this button to display and arrange the data according to port number.                                                                                     |
| Index      | This field displays the index number.                                                                                                                           |
| IP Address | This is the IP address of the device from which the incoming packets came.                                                                                      |
| VID        | This is the VLAN group to which the packet belongs.                                                                                                             |
| Port       | This is the port from which the above IP address was learned. This field displays <b>CPU</b> to indicate the IP address belongs to the Switch.                  |
| Type       | This shows whether the IP address is <b>dynamic</b> (learned by the Switch) or <b>static</b> (belonging to the Switch).                                         |



# CHAPTER 59

## ARP Table

This chapter introduces ARP Table.

### 59.1 ARP Table Overview

Address Resolution Protocol (ARP) is a protocol for mapping an Internet Protocol address (IP address) to a physical machine address, also known as a Media Access Control or MAC address, on the local area network.

An IP (version 4) address is 32 bits long. In an Ethernet LAN, MAC addresses are 48 bits long. The ARP Table maintains an association between each MAC address and its corresponding IP address.

#### 59.1.1 How ARP Works

When an incoming packet destined for a host device on a local area network arrives at the Switch, the Switch's ARP program looks in the ARP Table and if it finds the address, it sends it to the device.

If no entry is found for the IP address, ARP broadcasts the request to all the devices on the LAN. The Switch fills in its own MAC and IP address in the sender address fields, and puts the known IP address of the target in the target IP address field. In addition, the Switch puts all ones in the target MAC field (FF.FF.FF.FF.FF.FF is the Ethernet broadcast address). The replying device (which is either the IP address of the device being sought or the router that knows the way) replaces the broadcast address with the target's MAC address, swaps the sender and target pairs, and unicasts the answer directly back to the requesting machine. ARP updates the ARP Table for future reference and then sends the packet to the MAC address that replied.

### 59.2 The ARP Table Screen

Click **Management > ARP Table** in the navigation panel to open the following screen. Use the ARP table to view IP-to-MAC address mapping(s) and remove specific dynamic ARP entries.

**Figure 345** Management > ARP Table

| Index | IP Address   | MAC Address       | VID | Port | Age(s) | Type    |
|-------|--------------|-------------------|-----|------|--------|---------|
| 1     | 10.2.1.23    | 1c:74:0d:fe:f6:5e | 123 | CPU  | 0      | static  |
| 2     | 172.11.10.7  | c0:3f:d5:b6:78:44 | 1   | 26   | 190    | dynamic |
| 3     | 172.11.10.9  | 1c:74:0d:fe:f6:5e | 1   | CPU  | 0      | static  |
| 4     | 192.168.1.1  | 1c:74:0d:fe:f6:5e | 1   | CPU  | 0      | static  |
| 5     | 192.168.11.1 | 1c:74:0d:fe:f6:5e | 11  | CPU  | 0      | static  |

The following table describes the labels in this screen.

**Table 249** Management > ARP Table

| LABEL       | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                       |
|-------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Condition   | Specify how you want the Switch to remove ARP entries when you click <b>Flush</b> .<br><br>Select <b>All</b> to remove all of the dynamic entries from the ARP table.<br><br>Select <b>IP Address</b> and enter an IP address to remove the dynamic entries learned with the specified IP address.<br><br>Select <b>Port</b> and enter a port number to remove the dynamic entries learned on the specified port. |
| Flush       | Click <b>Flush</b> to remove the ARP entries according to the condition you specified.                                                                                                                                                                                                                                                                                                                            |
| Cancel      | Click <b>Cancel</b> to return the fields to the factory defaults.                                                                                                                                                                                                                                                                                                                                                 |
| Index       | This is the ARP table entry number.                                                                                                                                                                                                                                                                                                                                                                               |
| IP Address  | This is the IP address of a device connected to a Switch port with the corresponding MAC address below.                                                                                                                                                                                                                                                                                                           |
| MAC Address | This is the MAC address of the device with the corresponding IP address above.                                                                                                                                                                                                                                                                                                                                    |
| VID         | This field displays the VLAN to which the device belongs.                                                                                                                                                                                                                                                                                                                                                         |
| Port        | This field displays the port to which the device connects. <b>CPU</b> means this IP address is the Switch's management IP address.                                                                                                                                                                                                                                                                                |
| Age(s)      | This field displays how long (in seconds) an entry can still remain in the ARP table before it ages out and needs to be relearned. This shows <b>0</b> for a static entry.                                                                                                                                                                                                                                        |
| Type        | This shows whether the IP address is dynamic (learned by the Switch) or static (manually configured in the <b>Basic Setting &gt; IP Setup</b> or <b>IP Application &gt; ARP Setup &gt; Static ARP</b> screen).                                                                                                                                                                                                    |

# CHAPTER 60

## Routing Table

This chapter introduces the routing table.

### 60.1 Routing Table Overview

The routing table contains the route information to the network(s) that the Switch can reach.

### 60.2 The Routing Table Main Screen

Click **Management > Routing Table** in the navigation panel to display the main screen as shown. Click the link next to **IPv4 Routing Table** to open a screen where you can view the IPv4 routing table information. Click the link next to **IPv6 Routing Table** to open a screen where you can view the IPv6 routing table information.

**Figure 346** Management > Routing Table

| Routing Table      |                            |
|--------------------|----------------------------|
| IPv4 Routing Table | <a href="#">Click Here</a> |
| IPv6 Routing Table | <a href="#">Click Here</a> |

### 60.3 IPv4 Routing Table

Use this screen to view IPv4 routing table information. Click **Management > Routing Table > IPv4 Routing Table** in the navigation panel to display the screen as shown.

**Figure 347** Management > Routing Table > IPv4 Routing Table

| Routing Table Status |                 |               |              |        |        |         |
|----------------------|-----------------|---------------|--------------|--------|--------|---------|
| Index                | Destination     | Gateway       | Interface    | Metric | Type   | Uptime  |
| 1                    | 192.168.1.0/24  | 192.168.1.1   | 192.168.1.1  | 1      | LOCAL  | 7:24:42 |
| 2                    | 10.2.1.0/24     | 10.2.1.23     | 10.2.1.23    | 1      | LOCAL  | 7:24:42 |
| 3                    | 192.168.11.0/24 | 192.168.11.1  | 192.168.11.1 | 1      | LOCAL  | 7:24:42 |
| 4                    | 172.31.10.0/22  | 172.31.10.0   | 172.31.10.0  | 1      | LOCAL  | 7:24:06 |
| 5                    | 127.0.0.0/16    | 127.0.0.1     | 127.0.0.1    | 1      | LOCAL  | 7:24:45 |
| 6                    | default         | 172.31.10.254 | 172.31.10.0  | 2      | STATIC | 7:24:06 |

The following table describes the labels in this screen.

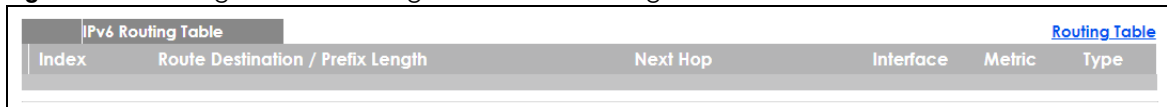
Table 250 Management > Routing Table > IPv4 Routing Table

| LABEL       | DESCRIPTION                                                                                                                                                     |
|-------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Index       | This field displays the index number.                                                                                                                           |
| Destination | This field displays the destination IP routing domain.                                                                                                          |
| Gateway     | This field displays the IP address of the gateway device.                                                                                                       |
| Interface   | This field displays the IP address of the IPv4 Interface.                                                                                                       |
| Metric      | This field displays the cost of the route.                                                                                                                      |
| Type        | This field displays the method used to learn the route.<br><br><b>STATIC</b> - added as a static entry.<br><br><b>LOCAL</b> - added as a local interface entry. |
| Uptime      | This field displays how long the route has been running since the Switch learned the route and added an entry in the routing table.                             |

## 60.4 IPv6 Routing Table

Use this screen to view IPv6 routing table information. Click **Management > Routing Table > IPv6 Routing Table** in the navigation panel to display the screen as shown.

Figure 348 Management > Routing Table > IPv6 Routing Table



| Index | Route Destination / Prefix Length | Next Hop | Interface | Metric | Type |
|-------|-----------------------------------|----------|-----------|--------|------|
|-------|-----------------------------------|----------|-----------|--------|------|

The following table describes the labels in this screen.

Table 251 Management > Routing Table > IPv6 Routing Table

| LABEL                            | DESCRIPTION                                                                                                                                                       |
|----------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Index                            | This field displays the index number.                                                                                                                             |
| Route Destination/ Prefix Length | This field displays the IPv6 subnet prefix and prefix length of the final destination.                                                                            |
| Next Hop                         | This field displays the IPv6 address of the gateway that helps forward the packet to the destination.                                                             |
| Interface                        | This field displays the descriptive name of the IPv6 interface that is used to forward the packets to the destination.                                            |
| Metric                           | This field displays the cost of the route.                                                                                                                        |
| Type                             | This field displays the method used to learn the route.<br><br><b>STATIC</b> - added as a static entry.<br><br><b>Connect</b> - added as a local interface entry. |

# CHAPTER 61

## Path MTU Table

This chapter introduces the IPv6 Path MTU table.

### 61.1 Path MTU Overview

The largest size (in bytes) of a packet that can be transferred over a data link is called the maximum transmission unit (MTU). The Switch uses Path MTU Discovery to discover Path MTU (PMTU), that is, the minimum link MTU of all the links in a path to the destination. If the Switch receives an ICMPv6 Packet Too Big error message after sending a packet, it fragments the next packet according to the suggested MTU in the error message.

### 61.2 Viewing the Path MTU Table

Use this screen to view IPv6 path MTU information on the Switch. Click **Management > Path MTU Table** in the navigation panel to display the screen as shown.

**Figure 349** Management > Path MTU Table

| Path MTU Table                   |                     |     |        |
|----------------------------------|---------------------|-----|--------|
| Path MTU aging time : 10 minutes |                     |     |        |
| Index                            | Destination Address | MTU | Expire |
|                                  |                     |     |        |

The following table describes the labels in this screen.

Table 252 Management > Path MTU Table

| LABEL               | DESCRIPTION                                                                                                                             |
|---------------------|-----------------------------------------------------------------------------------------------------------------------------------------|
| Path MTU aging time | This field displays how long an entry remains in the Path MTU table before it ages out and needs to be relearned.                       |
| Index               | This field displays the index number of each entry in the table.                                                                        |
| Destination Address | This field displays the destination IPv6 address of each path/entry.                                                                    |
| MTU                 | This field displays the maximum transmission unit of the links in the path.                                                             |
| Expire              | This field displays how long (in minutes) an entry can still remain in the Path MTU table before it ages out and needs to be relearned. |

# CHAPTER 62

## Configure Clone

This chapter shows you how you can copy the settings of one port onto other ports.

### 62.1 Configure Clone

Cloning allows you to copy the basic and advanced settings from a source port to a destination port or ports. Click **Management** > **Configure Clone** to open the following screen.

**Figure 350** Management > Configure Clone

| Configure Clone                       |             |  |  |
|---------------------------------------|-------------|--|--|
| Source                                | Destination |  |  |
| <input checked="" type="radio"/> Port |             |  |  |

**Port Features**

|                                                       |                                                                |
|-------------------------------------------------------|----------------------------------------------------------------|
| Basic Setting                                         | <input type="checkbox"/> Active                                |
|                                                       | <input type="checkbox"/> Name                                  |
|                                                       | <input type="checkbox"/> Speed / Duplex                        |
|                                                       | <input type="checkbox"/> BPDU Control                          |
|                                                       | <input type="checkbox"/> Flow Control                          |
| Advanced Application                                  | <input type="checkbox"/> VLAN1q                                |
|                                                       | <input type="checkbox"/> VLAN1q Member                         |
|                                                       | <input type="checkbox"/> Bandwidth Control                     |
|                                                       | <input type="checkbox"/> VLAN Stacking                         |
|                                                       | <input type="checkbox"/> Port Security                         |
|                                                       | <input type="checkbox"/> Broadcast Storm Control               |
|                                                       | <input type="checkbox"/> Mirroring                             |
|                                                       | <input type="checkbox"/> Port Authentication                   |
|                                                       | <input type="checkbox"/> Queuing Method                        |
|                                                       | <input type="checkbox"/> IGMP Filtering                        |
|                                                       | <input type="checkbox"/> Spanning Tree Protocol                |
|                                                       | <input type="checkbox"/> Multiple Rapid Spanning Tree Protocol |
|                                                       | <input type="checkbox"/> Protocol-based VLAN                   |
|                                                       | <input type="checkbox"/> Port-based VLAN                       |
|                                                       | <input type="checkbox"/> MAC Authentication                    |
|                                                       | <input type="checkbox"/> Ethernet OAM                          |
|                                                       | <input type="checkbox"/> Loop Guard                            |
|                                                       | <input type="checkbox"/> ARP Inspection                        |
|                                                       | <input type="checkbox"/> DHCP Snooping                         |
|                                                       | <input type="checkbox"/> VLAN Mapping                          |
|                                                       | <input type="checkbox"/> Layer 2 Protocol Tunneling            |
|                                                       | <input type="checkbox"/> LLDP                                  |
|                                                       | <input type="checkbox"/> sFlow                                 |
|                                                       | <input type="checkbox"/> PPPoE IA                              |
|                                                       | <input type="checkbox"/> ARP Learning                          |
|                                                       | <input type="checkbox"/> CPUProtection                         |
|                                                       | <input type="checkbox"/> Multiple Spanning Tree Protocol       |
|                                                       | <input type="checkbox"/> SNMP Trap                             |
|                                                       | <input type="checkbox"/> MAC Pinning                           |
|                                                       | <input type="checkbox"/> Green Ethernet                        |
| <input type="checkbox"/> Diffserv                     |                                                                |
| <input type="checkbox"/> MLD Snooping-Proxy Filtering |                                                                |
| <input type="checkbox"/> Anti-Arpscan                 |                                                                |
| <input type="checkbox"/> BPDU Guard                   |                                                                |
| <input type="checkbox"/> IPv6 DHCP Trust              |                                                                |
| <input type="checkbox"/> IPv6 Source Guard            |                                                                |
| <input type="checkbox"/> ZULD                         |                                                                |

The following table describes the labels in this screen.

Table 253 Management > Configure Clone

| LABEL                   | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|-------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Source/<br>Destination  | Select the source port under the <b>Source</b> label. This port's attributes are copied.<br><br>Enter the destination port or ports under the <b>Destination</b> label. These are the ports which are going to have the same attributes as the source port. You can enter individual ports separated by a comma or a range of ports by using a hyphen. For example, <b>2, 4, 6</b> indicates that ports 2, 4 and 6 are the destination ports. <b>2-6</b> indicates that ports 2 through 6 are the destination ports. |
| Basic Setting           | Select which port settings (configured in the <b>Basic Setting</b> menus) should be copied to the destination port(s).                                                                                                                                                                                                                                                                                                                                                                                               |
| Advanced<br>Application | Select which port settings (configured in the <b>Advanced Application</b> menus) should be copied to the destination ports.                                                                                                                                                                                                                                                                                                                                                                                          |
| Apply                   | Click <b>Apply</b> to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the <b>Save</b> link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.                                                                                                                                                                                                                                   |
| Cancel                  | Click <b>Cancel</b> to begin configuring this screen afresh.                                                                                                                                                                                                                                                                                                                                                                                                                                                         |



# CHAPTER 63

## IPv6 Neighbor Table

This chapter introduces the IPv6 neighbor table.

### 63.1 IPv6 Neighbor Table Overview

An IPv6 host is required to have a neighbor table. If there is an address to be resolved or verified, the Switch sends out a neighbor solicitation message. When the Switch receives a neighbor advertisement in response, it stores the neighbor's link-layer address in the neighbor table. You can also manually create a static IPv6 neighbor entry using the **Basic Setting > IPv6 > IPv6 Configuration > IPv6 Neighbor Setup** screen.

When the Switch needs to send a packet, it first consults other table to determine the next hop. Once the next hop IPv6 address is known, the Switch looks into the neighbor table to get the link-layer address and sends the packet when the neighbor is reachable. If the Switch cannot find an entry in the neighbor table or the state for the neighbor is not reachable, it starts the address resolution process. This helps reduce the number of IPv6 solicitation and advertisement messages.

### 63.2 Viewing the IPv6 Neighbor Table

Use this screen to view IPv6 neighbor information on the Switch. Click **Management > IPv6 Neighbor Table** in the navigation panel to display the screen as shown.

**Figure 351** Management > IPv6 Neighbor Table

| IPv6 Neighbor Table                                                   |         |     |        |      |           |
|-----------------------------------------------------------------------|---------|-----|--------|------|-----------|
| Sort by: <span>Address</span> <span>MAC</span> <span>Interface</span> |         |     |        |      |           |
| Index                                                                 | Address | MAC | Status | Type | Interface |
|                                                                       |         |     |        |      |           |

The following table describes the labels in this screen.

Table 254 Management > IPv6 Neighbor Table

| LABEL   | DESCRIPTION                                                                                                                                                                                                                |
|---------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Sort by | Select this to display and arrange the data according to IPv6 address ( <b>Address</b> ), MAC address ( <b>MAC</b> ) or IPv6 interface ( <b>Interface</b> ). The information is then displayed in the summary table below. |
| Index   | This field displays the index number of each entry in the table.                                                                                                                                                           |
| Address | This field displays the IPv6 address of the Switch or a neighboring device.                                                                                                                                                |

Table 254 Management &gt; IPv6 Neighbor Table (continued)

| LABEL     | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|-----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| MAC       | This field displays the MAC address of the IPv6 interface on which the IPv6 address is configured or the MAC address of the neighboring device.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Status    | <p>This field displays whether the neighbor IPv6 interface is reachable. In IPv6, "reachable" means an IPv6 packet can be correctly forwarded to a neighbor node (host or router) and the neighbor can successfully receive and handle the packet. The available options in this field are:</p> <ul style="list-style-type: none"> <li>• reachable (R): The interface of the neighboring device is reachable. (The Switch has received a response to the initial request.)</li> <li>• stale (S): The last reachable time has expired and the Switch is waiting for a response to another initial request. The field displays this also when the Switch receives an unrequested response from the neighbor's interface.</li> <li>• delay (D): The neighboring interface is no longer known to be reachable, and traffic has been sent to the neighbor recently. The Switch delays sending request packets for a short to give upper-layer protocols a chance to determine reachability.</li> <li>• probe (P): The Switch is sending request packets and waiting for the neighbor's response.</li> <li>• invalid (IV): The neighbor address is with an invalid IPv6 address.</li> <li>• unknown (?): The status of the neighboring interface can not be determined for some reason.</li> <li>• incomplete (I): Address resolution is in progress and the link-layer address of the neighbor has not yet been determined. The interface of the neighboring device did not give a complete response.</li> </ul> |
| Type      | <p>This field displays the type of an address mapping to a neighbor interface. The available options in this field are:</p> <ul style="list-style-type: none"> <li>• other (O): none of the following type.</li> <li>• local (L): A Switch interface is using the address.</li> <li>• dynamic (D): The IP address to MAC address can be successfully resolved using IPv6 Neighbor Discovery protocol. Is it similar as IPv4 ARP (Address Resolution protocol).</li> <li>• static (S): The interface address is statically configured.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Interface | This field displays the ID number of the IPv6 interface on which the IPv6 address is created or through which the neighboring device can be reached.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |

# CHAPTER 64

## Port Status

### 64.1 Overview

This chapter introduces the port status screens.

### 64.2 Port Status

This screen displays a port statistical summary with links to each port showing statistical details. To view the port statistics, click **Status** in all web configurator screens and then the **Port Status** link in the **Quick Links** section of the **Status** screen to display the **Port Status** screen as shown next. You can also click **Management > Port Status** to see the following screen.

**Figure 352** Port Status

| Port Status        |      |            |            |          |         |         |        |         |         | DDMI Utilization |
|--------------------|------|------------|------------|----------|---------|---------|--------|---------|---------|------------------|
| Port               | Name | Link       | State      | LACP     | TxPkts  | RxPkts  | Errors | Tx kB/s | Rx kB/s | Up Time          |
| <a href="#">1</a>  |      | Down       | STOP       | Disabled | 0       | 0       | 0      | 0.0     | 0.0     | 0:00:00          |
| <a href="#">2</a>  |      | Down       | STOP       | Disabled | 0       | 0       | 0      | 0.0     | 0.0     | 0:00:00          |
| <a href="#">3</a>  |      | Down       | STOP       | Disabled | 0       | 0       | 0      | 0.0     | 0.0     | 0:00:00          |
| <a href="#">4</a>  |      | Down       | STOP       | Disabled | 0       | 0       | 0      | 0.0     | 0.0     | 0:00:00          |
| <a href="#">5</a>  |      | Down       | STOP       | Disabled | 0       | 0       | 0      | 0.0     | 0.0     | 0:00:00          |
| <a href="#">6</a>  |      | Down       | STOP       | Disabled | 0       | 0       | 0      | 0.0     | 0.0     | 0:00:00          |
| <a href="#">7</a>  |      | Down       | STOP       | Disabled | 0       | 0       | 0      | 0.0     | 0.0     | 0:00:00          |
| <a href="#">8</a>  |      | Down       | STOP       | Disabled | 0       | 0       | 0      | 0.0     | 0.0     | 0:00:00          |
| <a href="#">9</a>  |      | Down       | STOP       | Disabled | 0       | 0       | 0      | 0.0     | 0.0     | 0:00:00          |
| <a href="#">10</a> |      | Down       | STOP       | Disabled | 0       | 0       | 0      | 0.0     | 0.0     | 0:00:00          |
| <a href="#">11</a> |      | Down       | STOP       | Disabled | 0       | 0       | 0      | 0.0     | 0.0     | 0:00:00          |
| <a href="#">12</a> |      | Down       | STOP       | Disabled | 0       | 0       | 0      | 0.0     | 0.0     | 0:00:00          |
| <a href="#">13</a> |      | Down       | STOP       | Disabled | 0       | 0       | 0      | 0.0     | 0.0     | 0:00:00          |
| <a href="#">14</a> |      | Down       | STOP       | Disabled | 0       | 0       | 0      | 0.0     | 0.0     | 0:00:00          |
| <a href="#">15</a> |      | Down       | STOP       | Disabled | 0       | 0       | 0      | 0.0     | 0.0     | 0:00:00          |
| <a href="#">16</a> |      | Down       | STOP       | Disabled | 0       | 0       | 0      | 0.0     | 0.0     | 0:00:00          |
| <a href="#">17</a> |      | Down       | STOP       | Disabled | 10016   | 1034    | 0      | 0.0     | 0.0     | 0:00:00          |
| <a href="#">18</a> | 1G/F | FORWARDING | FORWARDING | Disabled | 576243  | 2588514 | 0      | 20.166  | 1.89    | 2:26:41          |
| <a href="#">19</a> |      | Down       | STOP       | Disabled | 0       | 0       | 0      | 0.0     | 0.0     | 0:00:00          |
| <a href="#">20</a> | 1G/F | FORWARDING | FORWARDING | Disabled | 502313  | 388930  | 0      | 0.104   | 0.243   | 2:26:44          |
| <a href="#">21</a> |      | Down       | STOP       | Disabled | 0       | 0       | 0      | 0.0     | 0.0     | 0:00:00          |
| <a href="#">22</a> |      | Down       | STOP       | Disabled | 2093900 | 204188  | 0      | 0.0     | 0.0     | 0:00:00          |
| <a href="#">23</a> |      | Down       | STOP       | Disabled | 0       | 0       | 0      | 0.0     | 0.0     | 0:00:00          |

☒ Any
 ☐ Port

The following table describes the labels in this screen.

Table 255 Port Status

| LABEL         | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                    |
|---------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Port          | This identifies the Ethernet port. Click a port number to display the <b>Port Details</b> screen (refer to <a href="#">Figure 353 on page 489</a> ).                                                                                                                                                                                                                                                           |
| Name          | This is the name you assigned to this port in the <b>Basic Setting &gt; Port Setup</b> screen.                                                                                                                                                                                                                                                                                                                 |
| Link          | This field displays the speed (either <b>100M</b> for 100Mbps, <b>1G</b> for 1 Gbps, <b>2.5G</b> for 2.5 Gbps, <b>5G</b> for 5 Gbps, or <b>10G</b> for 10 Gbps) and the duplex ( <b>F</b> for full duplex or <b>H</b> for half). It also shows the cable type ( <b>Copper</b> or <b>Fiber</b> ) for the combo ports. This field displays <b>Down</b> if the port is not connected to any device.               |
| State         | If STP (Spanning Tree Protocol) is enabled, this field displays the STP state of the port. See <a href="#">Chapter 13 on page 139</a> for more information.<br><br>If STP is disabled, this field displays <b>FORWARDING</b> if the link is up, otherwise, it displays <b>STOP</b> .<br><br>When LACP (Link Aggregation Control Protocol), STP, and dot1x are in blocking state, it displays <b>Blocking</b> . |
| LACP          | This field displays whether LACP (Link Aggregation Control Protocol) has been enabled on the port.                                                                                                                                                                                                                                                                                                             |
| TxPkts        | This field shows the number of transmitted frames on this port.                                                                                                                                                                                                                                                                                                                                                |
| RxPkts        | This field shows the number of received frames on this port.                                                                                                                                                                                                                                                                                                                                                   |
| Errors        | This field shows the number of received errors on this port.                                                                                                                                                                                                                                                                                                                                                   |
| Tx KB/s       | This field shows the number of kilobytes per second transmitted on this port.                                                                                                                                                                                                                                                                                                                                  |
| Rx KB/s       | This field shows the number of kilobytes per second received on this port.                                                                                                                                                                                                                                                                                                                                     |
| Up Time       | This field shows the total amount of time in hours, minutes and seconds the port has been up.                                                                                                                                                                                                                                                                                                                  |
| Clear Counter | Select <b>Port</b> , enter a port number and then click <b>Clear Counter</b> to erase the recorded statistical information for that port, or select <b>Any</b> to clear statistics for all ports.                                                                                                                                                                                                              |

## 64.2.1 Port Details

Click a number in the **Port** column in the **Port Status** screen to display individual port statistics. Use this screen to check status and detailed performance data about an individual port on the Switch.

**Figure 353** Port Status > Port Details

| Port Details |                 |          | <a href="#">Port Status</a> |
|--------------|-----------------|----------|-----------------------------|
| Port Info    | Port NO.        | 1        |                             |
|              | Name            |          |                             |
|              | Link            | Down     |                             |
|              | State           | STOP     |                             |
|              | LACP            | Disabled |                             |
|              | TxPkts          | 0        |                             |
|              | RxPkts          | 0        |                             |
|              | Errors          | 0        |                             |
|              | Tx kB/s         | 0.0      |                             |
|              | Tx Utilization% | 0.0      |                             |
|              | Rx kB/s         | 0.0      |                             |
|              | Rx Utilization% | 0.0      |                             |
|              | Up Time         | 0:00:00  |                             |
| TX Packet    | Unicast         | 0        |                             |
|              | Multicast       | 0        |                             |
|              | Broadcast       | 0        |                             |
|              | Pause           | 0        |                             |
|              | Tagged          | 0        |                             |
| RX Packet    | Unicast         | 0        |                             |
|              | Multicast       | 0        |                             |
|              | Broadcast       | 0        |                             |
|              | Pause           | 0        |                             |
|              | Control         | 0        |                             |
| TX Collision | Single          | 0        |                             |
|              | Multiple        | 0        |                             |
|              | Excessive       | 0        |                             |
|              | Late            | 0        |                             |
| Error Packet | RX CRC          | 0        |                             |
|              | Length          | 0        |                             |
|              | Runt            | 0        |                             |
| Distribution | 64              | 0        |                             |
|              | 65 to 127       | 0        |                             |
|              | 128 to 255      | 0        |                             |
|              | 256 to 511      | 0        |                             |
|              | 512 to 1023     | 0        |                             |
|              | 1024 to 1518    | 0        |                             |
|              | Giant           | 0        |                             |

The following table describes the labels in this screen.

**Table 256** Port Status: Port Details

| LABEL     | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                         |
|-----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Port Info |                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Port NO.  | This field displays the port number you are viewing.                                                                                                                                                                                                                                                                                                                                                                |
| Name      | This field displays the name of the port.                                                                                                                                                                                                                                                                                                                                                                           |
| Link      | This field displays the speed (either <b>100M</b> for 100Mbps, <b>1G</b> for 1 Gbps, <b>2.5G</b> for 2.5 Gbps, <b>5G</b> for 5 Gbps, or <b>10G</b> for 10 Gbps) and the duplex ( <b>F</b> for full duplex or <b>H</b> for half). It also shows the cable type ( <b>Copper</b> or <b>Fiber</b> ) for the combo ports. This field displays <b>Down</b> if the port is not connected to any device.                    |
| State     | <p>If STP (Spanning Tree Protocol) is enabled, this field displays the STP state of the port. See <a href="#">Chapter 13 on page 139</a> for more information.</p> <p>If STP is disabled, this field displays <b>FORWARDING</b> if the link is up, otherwise, it displays <b>STOP</b>.</p> <p>When LACP (Link Aggregation Control Protocol), STP, and dot1x are in blocking state, it displays <b>Blocking</b>.</p> |
| LACP      | This field shows if LACP is enabled on this port or not.                                                                                                                                                                                                                                                                                                                                                            |

Table 256 Port Status: Port Details (continued)

| <b>LABEL</b>                                                                                 | <b>DESCRIPTION</b>                                                                                                                                                                                 |
|----------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| TxPkts                                                                                       | This field shows the number of transmitted frames on this port                                                                                                                                     |
| RxPkts                                                                                       | This field shows the number of received frames on this port                                                                                                                                        |
| Errors                                                                                       | This field shows the number of received errors on this port.                                                                                                                                       |
| Tx KB/s                                                                                      | This field shows the number of kilobytes per second transmitted on this port.                                                                                                                      |
| Tx Utilization%                                                                              | This field shows the percentage of actual transmitted frames on this port as a percentage of the <b>Link</b> speed.                                                                                |
| Rx KB/s                                                                                      | This field shows the number of kilobytes per second received on this port.                                                                                                                         |
| Rx Utilization%                                                                              | This field shows the percentage of actual received frames on this port as a percentage of the <b>Link</b> speed.                                                                                   |
| Up Time                                                                                      | This field shows the total amount of time the connection has been up.                                                                                                                              |
| Tx Packet                                                                                    |                                                                                                                                                                                                    |
| The following fields display detailed information about packets transmitted.                 |                                                                                                                                                                                                    |
| Unicast                                                                                      | This field shows the number of good unicast packets transmitted.                                                                                                                                   |
| Multicast                                                                                    | This field shows the number of good multicast packets transmitted.                                                                                                                                 |
| Broadcast                                                                                    | This field shows the number of good broadcast packets transmitted.                                                                                                                                 |
| Pause                                                                                        | This field shows the number of 802.3x Pause packets transmitted.                                                                                                                                   |
| Tagged                                                                                       | This field shows the number of packets with VLAN tags transmitted.                                                                                                                                 |
| Rx Packet                                                                                    |                                                                                                                                                                                                    |
| The following fields display detailed information about packets received.                    |                                                                                                                                                                                                    |
| Unicast                                                                                      | This field shows the number of good unicast packets received.                                                                                                                                      |
| Multicast                                                                                    | This field shows the number of good multicast packets received.                                                                                                                                    |
| Broadcast                                                                                    | This field shows the number of good broadcast packets received.                                                                                                                                    |
| Pause                                                                                        | This field shows the number of 802.3x Pause packets received.                                                                                                                                      |
| Control                                                                                      | This field shows the number of control packets received (including those with CRC error) but it does not include the 802.3x Pause packets.                                                         |
| TX Collision                                                                                 |                                                                                                                                                                                                    |
| The following fields display information on collisions while transmitting.                   |                                                                                                                                                                                                    |
| Single                                                                                       | This is a count of successfully transmitted packets for which transmission is inhibited by exactly one collision.                                                                                  |
| Multiple                                                                                     | This is a count of successfully transmitted packets for which transmission was inhibited by more than one collision.                                                                               |
| Excessive                                                                                    | This is a count of packets for which transmission failed due to excessive collisions. Excessive collision is defined as the number of maximum collisions before the retransmission count is reset. |
| Late                                                                                         | This is the number of times a late collision is detected, that is, after 512 bits of the packets have already been transmitted.                                                                    |
| Error Packet                                                                                 |                                                                                                                                                                                                    |
| The following fields display detailed information about packets received that were in error. |                                                                                                                                                                                                    |
| RX CRC                                                                                       | This field shows the number of packets received with CRC (Cyclic Redundant Check) error(s).                                                                                                        |
| Length                                                                                       | This field shows the number of packets received with a length that was out of range.                                                                                                               |
| Runt                                                                                         | This field shows the number of packets received that were too short (shorter than 64 octets), including the ones with CRC errors.                                                                  |
| Distribution                                                                                 |                                                                                                                                                                                                    |
| 64                                                                                           | This field shows the number of packets (including bad packets) received that were 64 octets in length.                                                                                             |

Table 256 Port Status: Port Details (continued)

| LABEL     | DESCRIPTION                                                                                                                                                                                            |
|-----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 65-127    | This field shows the number of packets (including bad packets) received that were between 65 and 127 octets in length.                                                                                 |
| 128-255   | This field shows the number of packets (including bad packets) received that were between 128 and 255 octets in length.                                                                                |
| 256-511   | This field shows the number of packets (including bad packets) received that were between 256 and 511 octets in length.                                                                                |
| 512-1023  | This field shows the number of packets (including bad packets) received that were between 512 and 1023 octets in length.                                                                               |
| 1024-1518 | This field shows the number of packets (including bad packets) received that were between 1024 and 1518 octets in length.                                                                              |
| Giant     | This field shows the number of packets (including bad packets) received that were between 1519 octets and the maximum frame size.<br><br>The maximum frame size varies depending on your switch model. |

## 64.2.2 DDMI

Use this screen to view the SFP (Small Form Factor Pluggable) transceiver information. Click **Management > Port Status > DDMI** to see the following screen.

Figure 354 Management &gt; Port Status &gt; DDMI

| DDMI               |        |             |               |          |           |             | <a href="#">Port Status</a> |
|--------------------|--------|-------------|---------------|----------|-----------|-------------|-----------------------------|
| Port               | Vendor | Part Number | Serial Number | Revision | Date Code | Transceiver |                             |
| <a href="#">1</a>  | -      | -           | -             | -        | -         | -           |                             |
| <a href="#">2</a>  | -      | -           | -             | -        | -         | -           |                             |
| <a href="#">3</a>  | -      | -           | -             | -        | -         | -           |                             |
| <a href="#">4</a>  | -      | -           | -             | -        | -         | -           |                             |
| <a href="#">5</a>  | -      | -           | -             | -        | -         | -           |                             |
| <a href="#">6</a>  | -      | -           | -             | -        | -         | -           |                             |
| <a href="#">7</a>  | -      | -           | -             | -        | -         | -           |                             |
| <a href="#">8</a>  | -      | -           | -             | -        | -         | -           |                             |
| <a href="#">9</a>  | -      | -           | -             | -        | -         | -           |                             |
| <a href="#">10</a> | -      | -           | -             | -        | -         | -           |                             |
| <a href="#">11</a> | -      | -           | -             | -        | -         | -           |                             |
| <a href="#">12</a> | -      | -           | -             | -        | -         | -           |                             |
| <a href="#">13</a> | -      | -           | -             | -        | -         | -           |                             |
| <a href="#">14</a> | -      | -           | -             | -        | -         | -           |                             |
| <a href="#">15</a> | -      | -           | -             | -        | -         | -           |                             |
| <a href="#">16</a> | -      | -           | -             | -        | -         | -           |                             |
| <a href="#">21</a> | -      | -           | -             | -        | -         | -           |                             |
| <a href="#">22</a> | -      | -           | -             | -        | -         | -           |                             |
| <a href="#">23</a> | -      | -           | -             | -        | -         | -           |                             |
| <a href="#">24</a> | -      | -           | -             | -        | -         | -           |                             |
| <a href="#">25</a> | -      | -           | -             | -        | -         | -           |                             |
| <a href="#">26</a> | -      | -           | -             | -        | -         | -           |                             |
| <a href="#">27</a> | -      | -           | -             | -        | -         | -           |                             |
| <a href="#">28</a> | -      | -           | -             | -        | -         | -           |                             |

The following table describes the labels in this screen.

Table 257 Management &gt; Port Status &gt; DDMI

| LABEL  | DESCRIPTION                                               |
|--------|-----------------------------------------------------------|
| Port   | This identifies the SFP port.                             |
| Vendor | This displays the vendor name of the optical transceiver. |

Table 257 Management &gt; Port Status &gt; DDMI (continued)

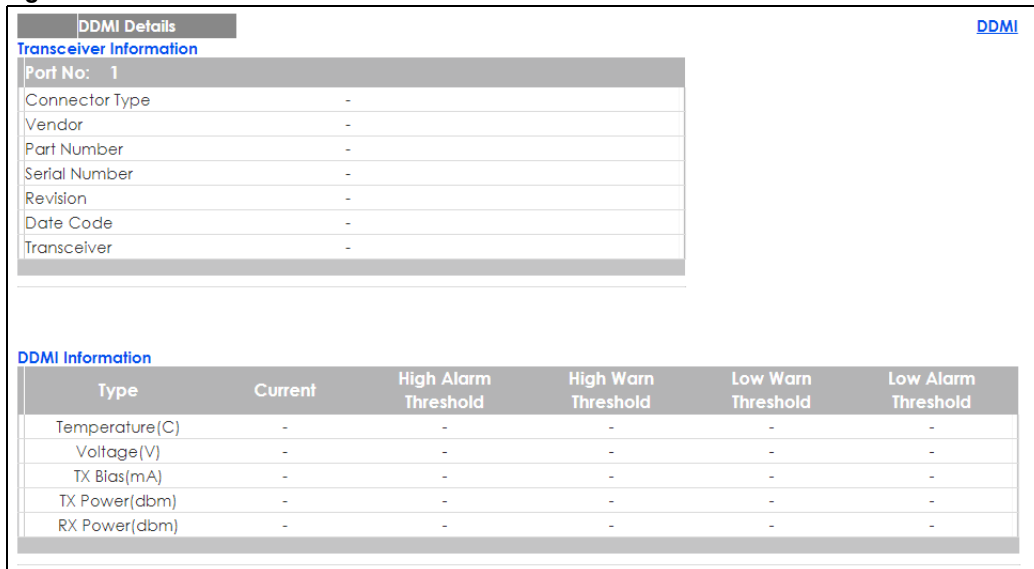
| LABEL         | DESCRIPTION                                                                |
|---------------|----------------------------------------------------------------------------|
| Part Number   | This displays the part number of the optical transceiver.                  |
| Serial Number | This displays the serial number of the optical transceiver.                |
| Revision      | This displays the revision number of the optical transceiver.              |
| Date Code     | This displays the date when the optical transceiver was manufactured.      |
| Transceiver   | This displays whether the connection to the optical network is up or down. |

### 64.2.3 DDMI Details

Use this screen to view the real-time SFP (Small Form Factor Pluggable) transceiver information and operating parameters on the SFP port. The parameters include, for example, transmitting and receiving power, and module temperature.

Click a number in the **Port** column in the **DDMI** screen to view current transceivers' status.

Figure 355 DDMI Details



The screenshot shows the 'DDMI Details' screen. At the top, there is a 'Transceiver Information' table for Port No. 1. Below it is a 'DDMI Information' table with columns for Type, Current, High Alarm Threshold, High Warn Threshold, Low Warn Threshold, and Low Alarm Threshold. The data in the tables is as follows:

| Transceiver Information |   |
|-------------------------|---|
| Port No.                | 1 |
| Connector Type          | - |
| Vendor                  | - |
| Part Number             | - |
| Serial Number           | - |
| Revision                | - |
| Date Code               | - |
| Transceiver             | - |

| Type           | Current | High Alarm Threshold | High Warn Threshold | Low Warn Threshold | Low Alarm Threshold |
|----------------|---------|----------------------|---------------------|--------------------|---------------------|
| Temperature(C) | -       | -                    | -                   | -                  | -                   |
| Voltage(V)     | -       | -                    | -                   | -                  | -                   |
| TX Bias(mA)    | -       | -                    | -                   | -                  | -                   |
| TX Power(dbm)  | -       | -                    | -                   | -                  | -                   |
| RX Power(dbm)  | -       | -                    | -                   | -                  | -                   |

The following table describes the labels in this screen.

Table 258 DDMI Details

| LABEL                   | DESCRIPTION                                                                |
|-------------------------|----------------------------------------------------------------------------|
| Transceiver Information |                                                                            |
| Port No                 | This identifies the SFP port.                                              |
| Connector Type          | This displays the connector type of the optical transceiver.               |
| Vendor                  | This displays the vendor name of the optical transceiver.                  |
| Part Number             | This displays the part number of the optical transceiver.                  |
| Serial Number           | This displays the serial number of the optical transceiver.                |
| Revision                | This displays the revision number of the optical transceiver.              |
| Date Code               | This displays the date when the optical transceiver was manufactured.      |
| Transceiver             | This displays whether the connection to the optical network is up or down. |



Table 258 DDMI Details (continued)

| LABEL                | DESCRIPTION                                                                                                                                                                      |
|----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| DDMI Information     |                                                                                                                                                                                  |
| Type                 | This displays the DDMI parameter.                                                                                                                                                |
| Current              | This displays the current status for each monitored DDMI parameter.                                                                                                              |
| High Alarm Threshold | This displays the high value alarm threshold for each monitored DDMI parameter. An alarm signal is reported to the Switch if the monitored DDMI parameter reaches this value.    |
| High Warn Threshold  | This displays the high value warning threshold for each monitored DDMI parameter. A warning signal is reported to the Switch if the monitored DDMI parameter reaches this value. |
| Low Warn Threshold   | This displays the low value warning threshold for each monitored DDMI parameter. A warning signal is reported to the Switch if the monitored DDMI parameter reaches this value.  |
| Low Alarm Threshold  | This displays the low value alarm threshold for each monitored DDMI parameter. An alarm signal is reported to the Switch if the monitored DDMI parameter reaches this value.     |

## 64.2.4 Port Utilization

This screen displays the percentage of actual transmitted or received frames on a port as a percentage of the **Link** speed. To view port utilization, click **Management > Port Status > Port Utilization** to see the following screen. Alternatively, click **Status** from any Web Configurator screen and then the **Port Status** link in the **Quick Links** section of the **Status** screen to display the **Port Status** screen and then click the **Utilization** link tab.

Figure 356 Management &gt; Port Status &gt; Utilization

| Port Utilization |      |         |                 |         |                 | <a href="#">Port Status</a> |
|------------------|------|---------|-----------------|---------|-----------------|-----------------------------|
| Port             | Link | Tx kB/s | Tx Utilization% | Rx kB/s | Rx Utilization% |                             |
| 1                | Down | 0.0     | 0.0             | 0.0     | 0.0             |                             |
| 2                | Down | 0.0     | 0.0             | 0.0     | 0.0             |                             |
| 3                | Down | 0.0     | 0.0             | 0.0     | 0.0             |                             |
| 4                | Down | 0.0     | 0.0             | 0.0     | 0.0             |                             |
| 5                | Down | 0.0     | 0.0             | 0.0     | 0.0             |                             |
| 6                | Down | 0.0     | 0.0             | 0.0     | 0.0             |                             |
| 7                | Down | 0.0     | 0.0             | 0.0     | 0.0             |                             |
| 8                | Down | 0.0     | 0.0             | 0.0     | 0.0             |                             |
| 9                | Down | 0.0     | 0.0             | 0.0     | 0.0             |                             |
| 10               | Down | 0.0     | 0.0             | 0.0     | 0.0             |                             |
| 11               | Down | 0.0     | 0.0             | 0.0     | 0.0             |                             |
| 12               | Down | 0.0     | 0.0             | 0.0     | 0.0             |                             |
| 13               | Down | 0.0     | 0.0             | 0.0     | 0.0             |                             |
| 14               | Down | 0.0     | 0.0             | 0.0     | 0.0             |                             |
| 15               | Down | 0.0     | 0.0             | 0.0     | 0.0             |                             |
| 16               | Down | 0.0     | 0.0             | 0.0     | 0.0             |                             |
| 17               | Down | 0.0     | 0.0             | 0.0     | 0.0             |                             |
| 18               | 1G/F | 0.55    | 0.0             | 0.164   | 0.0             |                             |
| 19               | Down | 0.0     | 0.0             | 0.0     | 0.0             |                             |
| 20               | 1G/F | 0.164   | 0.0             | 0.55    | 0.0             |                             |
| 21               | Down | 0.0     | 0.0             | 0.0     | 0.0             |                             |
| 22               | Down | 0.0     | 0.0             | 0.0     | 0.0             |                             |
| 23               | Down | 0.0     | 0.0             | 0.0     | 0.0             |                             |
| 24               | Down | 0.0     | 0.0             | 0.0     | 0.0             |                             |
| 25               | Down | 0.0     | 0.0             | 0.0     | 0.0             |                             |
| 26               | Down | 0.0     | 0.0             | 0.0     | 0.0             |                             |
| 27               | Down | 0.0     | 0.0             | 0.0     | 0.0             |                             |
| 28               | Down | 0.0     | 0.0             | 0.0     | 0.0             |                             |

The following table describes the labels in this screen.

Table 259 Port Status: Utilization

| LABEL           | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                      |
|-----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Port            | This identifies the Ethernet port.                                                                                                                                                                                                                                                                                                                                                               |
| Link            | This field displays the speed (either <b>100M</b> for 100Mbps, <b>1G</b> for 1 Gbps, <b>2.5G</b> for 2.5 Gbps, <b>5G</b> for 5 Gbps, or <b>10G</b> for 10 Gbps) and the duplex ( <b>F</b> for full duplex or <b>H</b> for half). It also shows the cable type ( <b>Copper</b> or <b>Fiber</b> ) for the combo ports. This field displays <b>Down</b> if the port is not connected to any device. |
| Tx kB/s         | This field shows the transmission speed of data sent on this port in kilobytes per second.                                                                                                                                                                                                                                                                                                       |
| Tx Utilization% | This field shows the percentage of actual transmitted frames on this port as a percentage of the Link speed.                                                                                                                                                                                                                                                                                     |
| Rx KB/s         | This field shows the transmission speed of data received on this port in kilobytes per second.                                                                                                                                                                                                                                                                                                   |
| Rx Utilization% | This field shows the percentage of actual received frames on this port as a percentage of the <b>Link</b> speed.                                                                                                                                                                                                                                                                                 |

# CHAPTER 65

## Troubleshooting

This chapter offers some suggestions to solve problems you might encounter. The potential problems are divided into the following categories.

- [Power, Hardware Connections, and LEDs](#)
- [Switch Access and Login](#)
- [Switch Configuration](#)

### 65.1 Power, Hardware Connections, and LEDs

---

[The Switch does not turn on. None of the LEDs turn on.](#)

---

- 1 Make sure the Switch is turned on.
- 2 Make sure you are using the power adaptor or cord included with the Switch.
- 3 Make sure the power adaptor or cord is connected to the Switch and plugged in to an appropriate power source. Make sure the power source is turned on.
- 4 Turn the Switch off and on.
- 5 Disconnect and re-connect the power adaptor or cord to the Switch.
- 6 If the problem continues, contact the vendor.

---

[One of the LEDs does not behave as expected.](#)

---

- 1 Make sure you understand the normal behavior of the LED. See [Section 3.3 on page 39](#).
- 2 Check the hardware connections. See [Section 3.1 on page 34](#).
- 3 Inspect your cables for damage. Contact the vendor to replace any damaged cables.
- 4 Turn the Switch off and on.
- 5 Disconnect and re-connect the power adaptor or cord to the Switch.
- 6 If the problem continues, contact the vendor.

## 65.2 Switch Access and Login

---

I forgot the IP address for the Switch.

---

- 1 The default in-band IP address in standalone mode is **http://DHCP-assigned IP** (when connecting to a DHCP server) or **192.168.1.1**.
- 2 Use the console port to log in to the Switch.
- 3 Use the **MGMT** port to log in to the Switch, the default IP address of the **MGMT** port is **192.168.0.1**.
- 4 If this does not work, you have to reset the device to its factory defaults. See [Section 4.6 on page 51](#).

---

I forgot the username and/or password.

---

- 1 The default username is **admin** and the default password is **1234**.
- 2 If this does not work, you have to reset the device to its factory defaults. See [Section 4.6 on page 51](#).

---

I cannot see or access the **Login** screen in the web configurator.

---

- 1 Make sure you are using the correct IP address.
  - The default in-band IP address in standalone mode is [http://DHCP-assigned IP](#) (when connecting to a DHCP server) or [192.168.1.1](#).
  - If you changed the IP address, use the new IP address.
  - If you changed the IP address and have forgotten it, see the troubleshooting suggestions for [I forgot the IP address for the Switch](#).
- 2 Check the hardware connections, and make sure the LEDs are behaving as expected. See [Section 3.3 on page 39](#).
- 3 Make sure your Internet browser does not block pop-up windows and has JavaScripts and Java enabled.
- 4 Make sure your computer is in the same subnet as the Switch. (If you know that there are routers between your computer and the Switch, skip this step.)
- 5 Reset the device to its factory defaults, and try to access the Switch with the default IP address. See [Section 4.6 on page 51](#).
- 6 If the problem continues, contact the vendor, or try one of the advanced suggestions.

### Advanced Suggestions

- Try to access the Switch using another service, such as Telnet. If you can access the Switch, check the remote management settings to find out why the Switch does not respond to HTTP.

---

I can see the **Login** screen, but I cannot log in to the Switch.

---

- 1 Make sure you have entered the user name and password correctly. The default user name is **admin**, and the default password is **1234**. These fields are case-sensitive, so make sure [Caps Lock] is not on.
- 2 You may have exceeded the maximum number of concurrent Telnet sessions. Close other Telnet session(s) or try connecting again later.  
  
Check that you have enabled logins for HTTP or Telnet. If you have configured a secured client IP address, your computer's IP address must match it. Refer to the chapter on access control for details.
- 3 Disconnect and re-connect the cord to the Switch.
- 4 If this does not work, you have to reset the device to its factory defaults. See [Section 4.6 on page 51](#).

---

Pop-up Windows, JavaScripts and Java Permissions

---

In order to use the web configurator you need to allow:

- Web browser pop-up windows from your device.
- JavaScripts (enabled by default).
- Java permissions (enabled by default).

---

There is unauthorized access to my Switch via telnet, HTTP and SSH.

---

To avoid unauthorized access, configure the secured client setting in the **Management > Access Control > Remote Management** screen for telnet, HTTP and SSH (see [Section 52.11 on page 458](#)). Computers not belonging to the secured client set cannot get permission to access the Switch.

## 65.3 Switch Configuration

---

I lost my configuration settings after I restart the Switch.

---

Make sure you save your configuration into the Switch's nonvolatile memory each time you make changes. Click

**Save** at the top right corner of the web configurator to save the configuration permanently. See also [Section 51.3 on page 426](#) for more information about how to save your configuration.



# APPENDIX A

## Customer Support

In the event of problems that cannot be solved by using this manual, you should contact your vendor. If you cannot contact your vendor, then contact a Zyxel office for the region in which you bought the device.

See <http://www.zyxel.com/homepage.shtml> and also [http://www.zyxel.com/about\\_zyxel/zyxel\\_worldwide.shtml](http://www.zyxel.com/about_zyxel/zyxel_worldwide.shtml) for the latest information.

Please have the following information ready when you contact an office.

### Required Information

- Product model and serial number.
- Warranty Information.
- Date that you received your device.
- Brief description of the problem and the steps you took to solve it.

### Corporate Headquarters (Worldwide)

#### Taiwan

- Zyxel Communications Corporation
- <http://www.zyxel.com>

### Asia

#### China

- Zyxel Communications (Shanghai) Corp.
- Zyxel Communications (Beijing) Corp.
- Zyxel Communications (Tianjin) Corp.
- <http://www.zyxel.cn>

#### India

- Zyxel Technology India Pvt Ltd
- <http://www.zyxel.in>

#### Kazakhstan

- Zyxel Kazakhstan
- <http://www.zyxel.kz>

## **Korea**

- Zyxel Korea Corp.
- <http://www.zyxel.kr>

## **Malaysia**

- Zyxel Malaysia Sdn Bhd.
- <http://www.zyxel.com.my>

## **Pakistan**

- Zyxel Pakistan (Pvt.) Ltd.
- <http://www.zyxel.com.pk>

## **Philippines**

- Zyxel Philippines
- <http://www.zyxel.com.ph>

## **Singapore**

- Zyxel Singapore Pte Ltd.
- <http://www.zyxel.com.sg>

## **Taiwan**

- Zyxel Communications Corporation
- <http://www.zyxel.com/tw/zh/>

## **Thailand**

- Zyxel Thailand Co., Ltd
- <http://www.zyxel.co.th>

## **Vietnam**

- Zyxel Communications Corporation-Vietnam Office
- <http://www.zyxel.com/vn/vi>

## **Europe**

### **Austria**

- Zyxel Deutschland GmbH
- <http://www.zyxel.de>

### **Belarus**

- Zyxel BY
- <http://www.zyxel.by>

## **Belgium**

- Zyxel Communications B.V.
- <http://www.zyxel.com/be/nl/>
- <http://www.zyxel.com/be/fr/>

## **Bulgaria**

- Zyxel България
- <http://www.zyxel.com/bg/bg/>

## **Czech Republic**

- Zyxel Communications Czech s.r.o
- <http://www.zyxel.cz>

## **Denmark**

- Zyxel Communications A/S
- <http://www.zyxel.dk>

## **Estonia**

- Zyxel Estonia
- <http://www.zyxel.com/ee/et/>

## **Finland**

- Zyxel Communications
- <http://www.zyxel.fi>

## **France**

- Zyxel France
- <http://www.zyxel.fr>

## **Germany**

- Zyxel Deutschland GmbH
- <http://www.zyxel.de>

## **Hungary**

- Zyxel Hungary & SEE
- <http://www.zyxel.hu>

## **Italy**

- Zyxel Communications Italy
- <http://www.zyxel.it/>



## **Latvia**

- Zyxel Latvia
- <http://www.zyxel.com/lv/lv/homepage.shtml>

## **Lithuania**

- Zyxel Lithuania
- <http://www.zyxel.com/lt/lt/homepage.shtml>

## **Netherlands**

- Zyxel Benelux
- <http://www.zyxel.nl>

## **Norway**

- Zyxel Communications
- <http://www.zyxel.no>

## **Poland**

- Zyxel Communications Poland
- <http://www.zyxel.pl>

## **Romania**

- Zyxel Romania
- <http://www.zyxel.com/ro/ro>

## **Russia**

- Zyxel Russia
- <http://www.zyxel.ru>

## **Slovakia**

- Zyxel Communications Czech s.r.o. organizacna zlozka
- <http://www.zyxel.sk>

## **Spain**

- Zyxel Communications ES Ltd
- <http://www.zyxel.es>

## **Sweden**

- Zyxel Communications
- <http://www.zyxel.se>

## **Switzerland**

- Studerus AG

- <http://www.zyxel.ch/>

## **Turkey**

- Zyxel Turkey A.S.
- <http://www.zyxel.com.tr>

## **UK**

- Zyxel Communications UK Ltd.
- <http://www.zyxel.co.uk>

## **Ukraine**

- Zyxel Ukraine
- <http://www.ua.zyxel.com>

## **Latin America**

### **Argentina**

- Zyxel Communication Corporation
- <http://www.zyxel.com/ec/es/>

### **Brazil**

- Zyxel Communications Brasil Ltda.
- <https://www.zyxel.com/br/pt/>

### **Ecuador**

- Zyxel Communication Corporation
- <http://www.zyxel.com/ec/es/>

## **Middle East**

### **Israel**

- Zyxel Communication Corporation
- <http://il.zyxel.com/homepage.shtml>

### **Middle East**

- Zyxel Communication Corporation
- <http://www.zyxel.com/me/en/>

## **North America**

### **USA**

- Zyxel Communications, Inc. - North America Headquarters
- <http://www.zyxel.com/us/en/>

## **Oceania**

### **Australia**

- Zyxel Communications Corporation
- <http://www.zyxel.com/au/en/>

## **Africa**

### **South Africa**

- Nology (Pty) Ltd.
- <http://www.zyxel.co.za>

# APPENDIX B

## Common Services

The following table lists some commonly-used services and their associated protocols and port numbers. For a comprehensive list of port numbers, ICMP type/code numbers and services, visit the IANA (Internet Assigned Number Authority) web site.

- **Name:** This is a short, descriptive name for the service. You can use this one or create a different one, if you like.
- **Protocol:** This is the type of IP protocol used by the service. If this is **TCP/UDP**, then the service uses the same port number with TCP and UDP. If this is **User-Defined**, the **Port(s)** is the IP protocol number, not the port number.
- **Port(s):** This value depends on the **Protocol**. Please refer to RFC 1700 for further information about port numbers.
  - If the **Protocol** is **TCP**, **UDP**, or **TCP/UDP**, this is the IP port number.
  - If the **Protocol** is **USER**, this is the IP protocol number.
- **Description:** This is a brief explanation of the applications that use this service or the situations in which this service is used.

Table 260 Commonly Used Services

| NAME               | PROTOCOL     | PORT(S)       | DESCRIPTION                                                                                                                         |
|--------------------|--------------|---------------|-------------------------------------------------------------------------------------------------------------------------------------|
| AH (IPSEC_TUNNEL)  | User-Defined | 51            | The IPSEC AH (Authentication Header) tunneling protocol uses this service.                                                          |
| AIM/New-ICQ        | TCP          | 5190          | AOL's Internet Messenger service. It is also used as a listening port by ICQ.                                                       |
| AUTH               | TCP          | 113           | Authentication protocol used by some servers.                                                                                       |
| BGP                | TCP          | 179           | Border Gateway Protocol.                                                                                                            |
| BOOTP_CLIENT       | UDP          | 68            | DHCP Client.                                                                                                                        |
| BOOTP_SERVER       | UDP          | 67            | DHCP Server.                                                                                                                        |
| CU-SEEME           | TCP<br>UDP   | 7648<br>24032 | A popular videoconferencing solution from White Pines Software.                                                                     |
| DNS                | TCP/UDP      | 53            | Domain Name Server, a service that matches web names (for example <a href="http://www.zyxel.com">www.zyxel.com</a> ) to IP numbers. |
| ESP (IPSEC_TUNNEL) | User-Defined | 50            | The IPSEC ESP (Encapsulation Security Protocol) tunneling protocol uses this service.                                               |
| FINGER             | TCP          | 79            | Finger is a UNIX or Internet related command that can be used to find out if a user is logged on.                                   |
| FTP                | TCP<br>TCP   | 20<br>21      | File Transfer Program, a program to enable fast transfer of files, including large files that may not be possible by e-mail.        |
| H.323              | TCP          | 1720          | NetMeeting uses this protocol.                                                                                                      |
| HTTP               | TCP          | 80            | Hyper Text Transfer Protocol - a client/server protocol for the world wide web.                                                     |
| HTTPS              | TCP          | 443           | HTTPS is a secured http session often used in e-commerce.                                                                           |

Table 260 Commonly Used Services (continued)

| NAME              | PROTOCOL     | PORT(S) | DESCRIPTION                                                                                                                                                                     |
|-------------------|--------------|---------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| ICMP              | User-Defined | 1       | Internet Control Message Protocol is often used for diagnostic or routing purposes.                                                                                             |
| ICQ               | UDP          | 4000    | This is a popular Internet chat program.                                                                                                                                        |
| IGMP (MULTICAST)  | User-Defined | 2       | Internet Group Multicast Protocol is used when sending packets to a specific group of hosts.                                                                                    |
| IKE               | UDP          | 500     | The Internet Key Exchange algorithm is used for key distribution and management.                                                                                                |
| IRC               | TCP/UDP      | 6667    | This is another popular Internet chat program.                                                                                                                                  |
| MSN Messenger     | TCP          | 1863    | Microsoft Networks' messenger service uses this protocol.                                                                                                                       |
| NEW-ICQ           | TCP          | 5190    | An Internet chat program.                                                                                                                                                       |
| NEWS              | TCP          | 144     | A protocol for news groups.                                                                                                                                                     |
| NFS               | UDP          | 2049    | Network File System - NFS is a client/server distributed file service that provides transparent file sharing for network environments.                                          |
| NNTP              | TCP          | 119     | Network News Transport Protocol is the delivery mechanism for the USENET newsgroup service.                                                                                     |
| PING              | User-Defined | 1       | Packet Internet Groper is a protocol that sends out ICMP echo requests to test whether or not a remote host is reachable.                                                       |
| POP3              | TCP          | 110     | Post Office Protocol version 3 lets a client computer get e-mail from a POP3 server through a temporary connection (TCP/IP or other).                                           |
| PPTP              | TCP          | 1723    | Point-to-Point Tunneling Protocol enables secure transfer of data over public networks. This is the control channel.                                                            |
| PPTP_TUNNEL (GRE) | User-Defined | 47      | PPTP (Point-to-Point Tunneling Protocol) enables secure transfer of data over public networks. This is the data channel.                                                        |
| RCMD              | TCP          | 512     | Remote Command Service.                                                                                                                                                         |
| REAL_AUDIO        | TCP          | 7070    | A streaming audio service that enables real time sound over the web.                                                                                                            |
| REXEC             | TCP          | 514     | Remote Execution Daemon.                                                                                                                                                        |
| RLOGIN            | TCP          | 513     | Remote Login.                                                                                                                                                                   |
| RTELNET           | TCP          | 107     | Remote Telnet.                                                                                                                                                                  |
| RTSP              | TCP/UDP      | 554     | The Real Time Streaming (media control) Protocol (RTSP) is a remote control for multimedia on the Internet.                                                                     |
| SFTP              | TCP          | 115     | Simple File Transfer Protocol.                                                                                                                                                  |
| SMTP              | TCP          | 25      | Simple Mail Transfer Protocol is the message-exchange standard for the Internet. SMTP enables you to move messages from one e-mail server to another.                           |
| SNMP              | TCP/UDP      | 161     | Simple Network Management Program.                                                                                                                                              |
| SNMP-TRAPS        | TCP/UDP      | 162     | Traps for use with the SNMP (RFC:1215).                                                                                                                                         |
| SQL-NET           | TCP          | 1521    | Structured Query Language is an interface to access data on many different types of database systems, including mainframes, midrange systems, UNIX systems and network servers. |

Table 260 Commonly Used Services (continued)

| NAME       | PROTOCOL | PORT(S) | DESCRIPTION                                                                                                                                                                                                    |
|------------|----------|---------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| SSH        | TCP/UDP  | 22      | Secure Shell Remote Login Program.                                                                                                                                                                             |
| STRM WORKS | UDP      | 1558    | Stream Works Protocol.                                                                                                                                                                                         |
| SYSLOG     | UDP      | 514     | Syslog allows you to send system logs to a UNIX server.                                                                                                                                                        |
| TACACS     | UDP      | 49      | Login Host Protocol used for (Terminal Access Controller Access Control System).                                                                                                                               |
| TELNET     | TCP      | 23      | Telnet is the login and terminal emulation protocol common on the Internet and in UNIX environments. It operates over TCP/IP networks. Its primary function is to allow users to log into remote host systems. |
| TFTP       | UDP      | 69      | Trivial File Transfer Protocol is an Internet file transfer protocol similar to FTP, but uses the UDP (User Datagram Protocol) rather than TCP (Transmission Control Protocol).                                |
| VDOLIVE    | TCP      | 7000    | Another videoconferencing solution.                                                                                                                                                                            |

# APPENDIX C

## IPv6

### Overview

IPv6 (Internet Protocol version 6), is designed to enhance IP address size and features. The increase in IPv6 address size to 128 bits (from the 32-bit IPv4 address) allows up to  $3.4 \times 10^{38}$  IP addresses.

### IPv6 Addressing

The 128-bit IPv6 address is written as eight 16-bit hexadecimal blocks separated by colons (:). This is an example IPv6 address `2001:0db8:1a2b:0015:0000:0000:1a2f:0000`.

IPv6 addresses can be abbreviated in two ways:

- Leading zeros in a block can be omitted. So `2001:0db8:1a2b:0015:0000:0000:1a2f:0000` can be written as `2001:db8:1a2b:15:0:0:1a2f:0`.
- Any number of consecutive blocks of zeros can be replaced by a double colon. A double colon can only appear once in an IPv6 address. So `2001:0db8:0000:0000:1a2f:0000:0000:0015` can be written as `2001:0db8::1a2f:0000:0000:0015`, `2001:0db8:0000:0000:1a2f::0015`, `2001:db8::1a2f:0:0:15` or `2001:db8:0:0:1a2f::15`.

### Prefix and Prefix Length

Similar to an IPv4 subnet mask, IPv6 uses an address prefix to represent the network address. An IPv6 prefix length specifies how many most significant bits (start from the left) in the address compose the network address. The prefix length is written as "/x" where x is a number. For example,

`2001:db8:1a2b:15::1a2f:0/32`

means that the first 32 bits (`2001:db8`) is the subnet prefix.

### Link-local Address

A link-local address uniquely identifies a device on the local network (the LAN). It is similar to a "private IP address" in IPv4. You can have the same link-local address on multiple interfaces on a device. A link-local unicast address has a predefined prefix of `fe80::/10`. The link-local unicast address format is as follows.

Table 261 Link-local Unicast Address Format

|              |         |              |
|--------------|---------|--------------|
| 1111 1110 10 | 0       | Interface ID |
| 10 bits      | 54 bits | 64 bits      |

### Global Address

A global address uniquely identifies a device on the Internet. It is similar to a "public IP address" in IPv4. A global unicast address starts with a 2 or 3.

## Unspecified Address

An unspecified address (0:0:0:0:0:0 or ::) is used as the source address when a device does not have its own address. It is similar to "0.0.0.0" in IPv4.

## Loopback Address

A loopback address (0:0:0:0:0:1 or ::1) allows a host to send packets to itself. It is similar to "127.0.0.1" in IPv4.

## Multicast Address

In IPv6, multicast addresses provide the same functionality as IPv4 broadcast addresses. Broadcasting is not supported in IPv6. A multicast address allows a host to send packets to all hosts in a multicast group.

Multicast scope allows you to determine the size of the multicast group. A multicast address has a predefined prefix of ff00::/8. The following table describes some of the predefined multicast addresses.

Table 262 Predefined Multicast Address

| MULTICAST ADDRESS  | DESCRIPTION                            |
|--------------------|----------------------------------------|
| FF01:0:0:0:0:0:0:1 | All hosts on a local node.             |
| FF01:0:0:0:0:0:0:2 | All routers on a local node.           |
| FF02:0:0:0:0:0:0:1 | All hosts on a local connected link.   |
| FF02:0:0:0:0:0:0:2 | All routers on a local connected link. |
| FF05:0:0:0:0:0:0:2 | All routers on a local site.           |
| FF05:0:0:0:0:0:1:3 | All DHCP servers on a local site.      |

The following table describes the multicast addresses which are reserved and can not be assigned to a multicast group.

Table 263 Reserved Multicast Address

| MULTICAST ADDRESS  |
|--------------------|
| FF00:0:0:0:0:0:0:0 |
| FF01:0:0:0:0:0:0:0 |
| FF02:0:0:0:0:0:0:0 |
| FF03:0:0:0:0:0:0:0 |
| FF04:0:0:0:0:0:0:0 |
| FF05:0:0:0:0:0:0:0 |
| FF06:0:0:0:0:0:0:0 |
| FF07:0:0:0:0:0:0:0 |
| FF08:0:0:0:0:0:0:0 |
| FF09:0:0:0:0:0:0:0 |
| FF0A:0:0:0:0:0:0:0 |
| FF0B:0:0:0:0:0:0:0 |
| FF0C:0:0:0:0:0:0:0 |
| FF0D:0:0:0:0:0:0:0 |
| FF0E:0:0:0:0:0:0:0 |
| FF0F:0:0:0:0:0:0:0 |



## Subnet Masking

Both an IPv6 address and IPv6 subnet mask compose of 128-bit binary digits, which are divided into eight 16-bit blocks and written in hexadecimal notation. Hexadecimal uses four bits for each character (1 ~ 10, A ~ F). Each block's 16 bits are then represented by four hexadecimal characters. For example, FFFF:FFFF:FFFF:FFFF:FC00:0000:0000:0000.

## Interface ID

In IPv6, an interface ID is a 64-bit identifier. It identifies a physical interface (for example, an Ethernet port) or a virtual interface (for example, the management IP address for a VLAN). One interface should have a unique interface ID.

## EUI-64

The EUI-64 (Extended Unique Identifier) defined by the IEEE (Institute of Electrical and Electronics Engineers) is an interface ID format designed to adapt with IPv6. It is derived from the 48-bit (6-byte) Ethernet MAC address as shown next. EUI-64 inserts the hex digits ffe between the third and fourth bytes of the MAC address and complements the seventh bit of the first byte of the MAC address. See the following example.

Table 264

|            |    |   |    |   |    |   |    |   |    |   |    |
|------------|----|---|----|---|----|---|----|---|----|---|----|
| <b>MAC</b> | 00 | : | 13 | : | 49 | : | 12 | : | 34 | : | 56 |
|------------|----|---|----|---|----|---|----|---|----|---|----|

Table 265

|               |    |   |    |   |    |   |    |   |    |   |    |   |    |   |    |
|---------------|----|---|----|---|----|---|----|---|----|---|----|---|----|---|----|
| <b>EUI-64</b> | 02 | : | 13 | : | 49 | : | FF | : | FE | : | 12 | : | 34 | : | 56 |
|---------------|----|---|----|---|----|---|----|---|----|---|----|---|----|---|----|

## Stateless Autoconfiguration

With stateless autoconfiguration in IPv6, addresses can be uniquely and automatically generated. Unlike DHCPv6 (Dynamic Host Configuration Protocol version six) which is used in IPv6 stateful autoconfiguration, the owner and status of addresses don't need to be maintained by a DHCP server. Every IPv6 device is able to generate its own and unique IP address automatically when IPv6 is initiated on its interface. It combines the prefix and the interface ID (generated from its own Ethernet MAC address, see [Interface ID](#) and [EUI-64](#)) to form a complete IPv6 address.

When IPv6 is enabled on a device, its interface automatically generates a link-local address (beginning with fe80).

When the interface is connected to a network with a router and the Switch is set to automatically obtain an IPv6 network prefix from the router for the interface, it generates <sup>1</sup>another address which combines its interface ID and global and subnet information advertised from the router. This is a routable global IP address.

## DHCPv6

The Dynamic Host Configuration Protocol for IPv6 (DHCPv6, RFC 3315) is a server-client protocol that allows a DHCP server to assign and pass IPv6 network addresses, prefixes and other configuration information to DHCP clients. DHCPv6 servers and clients exchange DHCP messages using UDP.

---

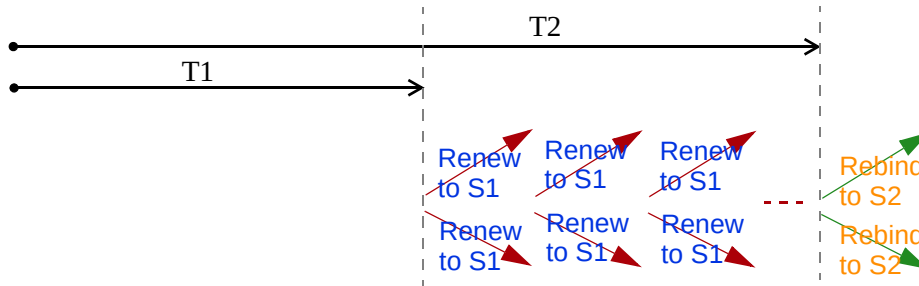
1. In IPv6, all network interfaces can be associated with several addresses.

Each DHCP client and server has a unique DHCP Unique Identifier (DUID), which is used for identification when they are exchanging DHCPv6 messages. The DUID is generated from the MAC address, time, vendor assigned ID and/or the vendor's private enterprise number registered with the IANA. It should not change over time even after you reboot the device.

## Identity Association

An Identity Association (IA) is a collection of addresses assigned to a DHCP client, through which the server and client can manage a set of related IP addresses. Each IA must be associated with exactly one interface. The DHCP client uses the IA assigned to an interface to obtain configuration from a DHCP server for that interface. Each IA consists of a unique IAID and associated IP information.

The IA type is the type of address in the IA. Each IA holds one type of address. IA\_NA means an identity association for non-temporary addresses and IA\_TA is an identity association for temporary addresses. An IA\_NA option contains the T1 and T2 fields, but an IA\_TA option does not. The DHCPv6 server uses T1 and T2 to control the time at which the client contacts with the server to extend the lifetimes on any addresses in the IA\_NA before the lifetimes expire. After T1, the client sends the server (**S1**) (from which the addresses in the IA\_NA were obtained) a Renew message. If the time T2 is reached and the server does not respond, the client sends a Rebind message to any available server (**S2**). For an IA\_TA, the client may send a Renew or Rebind message at the client's discretion.



## DHCP Relay Agent

A DHCP relay agent is on the same network as the DHCP clients and helps forward messages between the DHCP server and clients. When a client cannot use its link-local address and a well-known multicast address to locate a DHCP server on its network, it then needs a DHCP relay agent to send a message to a DHCP server that is not attached to the same network.

The DHCP relay agent can add the remote identification (remote-ID) option and the interface-ID option to the Relay-Forward DHCPv6 messages. The remote-ID option carries a user-defined string, such as the system name. The interface-ID option provides slot number, port information and the VLAN ID to the DHCPv6 server. The remote-ID option (if any) is stripped from the Relay-Reply messages before the relay agent sends the packets to the clients. The DHCP server copies the interface-ID option from the Relay-Forward message into the Relay-Reply message and sends it to the relay agent. The interface-ID should not change even after the relay agent restarts.

## Prefix Delegation

Prefix delegation enables an IPv6 router to use the IPv6 prefix (network address) received from the ISP (or a connected uplink router) for its LAN. The Switch uses the received IPv6 prefix (for example, 2001:db2::/48) to generate its LAN IP address. Through sending Router Advertisements (RAs) regularly by multicast, the Switch passes the IPv6 prefix information to its LAN hosts. The hosts then can use the prefix to generate their IPv6 addresses.

## ICMPv6

Internet Control Message Protocol for IPv6 (ICMPv6 or ICMP for IPv6) is defined in RFC 4443. ICMPv6 has a preceding Next Header value of 58, which is different from the value used to identify ICMP for IPv4. ICMPv6 is an integral part of IPv6. IPv6 nodes use ICMPv6 to report errors encountered in packet processing and perform other diagnostic functions, such as "ping".

## Neighbor Discovery Protocol (NDP)

The Neighbor Discovery Protocol (NDP) is a protocol used to discover other IPv6 devices and track neighbor's reachability in a network. An IPv6 device uses the following ICMPv6 message types:

- Neighbor solicitation: A request from a host to determine a neighbor's link-layer address (MAC address) and detect if the neighbor is still reachable. A neighbor being "reachable" means it responds to a neighbor solicitation message (from the host) with a neighbor advertisement message.
- Neighbor advertisement: A response from a node to announce its link-layer address.
- Router solicitation: A request from a host to locate a router that can act as the default router and forward packets.
- Router advertisement: A response to a router solicitation or a periodical multicast advertisement from a router to advertise its presence and other parameters.

## IPv6 Cache

An IPv6 host is required to have a neighbor cache, destination cache, prefix list and default router list. The Switch maintains and updates its IPv6 caches constantly using the information from response messages. In IPv6, the Switch configures a link-local address automatically, and then sends a neighbor solicitation message to check if the address is unique. If there is an address to be resolved or verified, the Switch also sends out a neighbor solicitation message. When the Switch receives a neighbor advertisement in response, it stores the neighbor's link-layer address in the neighbor cache. When the Switch uses a router solicitation message to query for a router and receives a router advertisement message, it adds the router's information to the neighbor cache, prefix list and destination cache. The Switch creates an entry in the default router list cache if the router can be used as a default router.

When the Switch needs to send a packet, it first consults the destination cache to determine the next hop. If there is no matching entry in the destination cache, the Switch uses the prefix list to determine whether the destination address is on-link and can be reached directly without passing through a router. If the address is onlink, the address is considered as the next hop. Otherwise, the Switch determines the next-hop from the default router list or routing table. Once the next hop IP address is known, the Switch looks into the neighbor cache to get the link-layer address and sends the packet when the neighbor is reachable. If the Switch cannot find an entry in the neighbor cache or the state for the neighbor is not reachable, it starts the address resolution process. This helps reduce the number of IPv6 solicitation and advertisement messages.

## Multicast Listener Discovery

The Multicast Listener Discovery (MLD) protocol (defined in RFC 2710) is derived from IPv4's Internet Group Management Protocol version 2 (IGMPv2). MLD uses ICMPv6 message types, rather than IGMP message types. MLDv1 is equivalent to IGMPv2 and MLDv2 is equivalent to IGMPv3.

MLD allows an IPv6 switch or router to discover the presence of MLD listeners who wish to receive multicast packets and the IP addresses of multicast groups the hosts want to join on its network.

MLD snooping and MLD proxy are analogous to IGMP snooping and IGMP proxy in IPv4.

MLD filtering controls which multicast groups a port can join.

## MLD Messages

A multicast router or switch periodically sends general queries to MLD hosts to update the multicast forwarding table. When an MLD host wants to join a multicast group, it sends an MLD Report message for that address.

An MLD Done message is equivalent to an IGMP Leave message. When an MLD host wants to leave a multicast group, it can send a Done message to the router or switch. The router or switch then sends a group-specific query to the port on which the Done message is received to determine if other devices connected to this port should remain in the group.

## Example - Enabling IPv6 on Windows XP/2003/Vista

By default, Windows XP and Windows 2003 support IPv6. This example shows you how to use the `ipv6 install` command on Windows XP/2003 to enable IPv6. This also displays how to use the `ipconfig` command to see auto-generated IP addresses.

```
C:\>ipv6 install
Installing...
Succeeded.

C:\>ipconfig

Windows IP Configuration

Ethernet adapter Local Area Connection:

    Connection-specific DNS Suffix  . : 
    IP Address. . . . . : 10.1.1.46
    Subnet Mask . . . . . : 255.255.255.0
    IP Address. . . . . : fe80::2d0:59ff:feb8:103c%4
    Default Gateway . . . . . : 10.1.1.254
```

IPv6 is installed and enabled by default in Windows Vista. Use the `ipconfig` command to check your automatic configured IPv6 address as well. You should see at least one IPv6 address available for the interface on your computer.

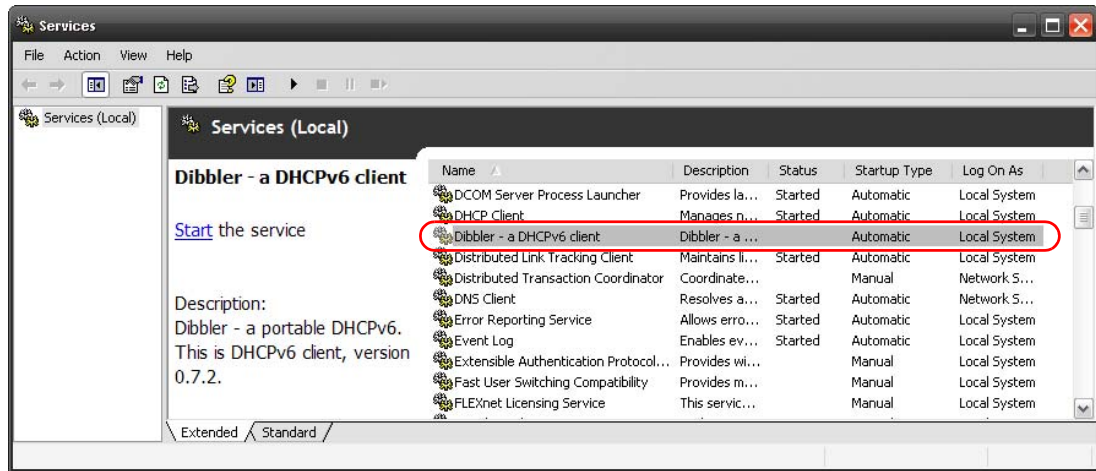
## Example - Enabling DHCPv6 on Windows XP

Windows XP does not support DHCPv6. If your network uses DHCPv6 for IP address assignment, you have to additionally install a DHCPv6 client software on your Windows XP. (Note: If you use static IP addresses or Router Advertisement for IPv6 address assignment in your network, ignore this section.)

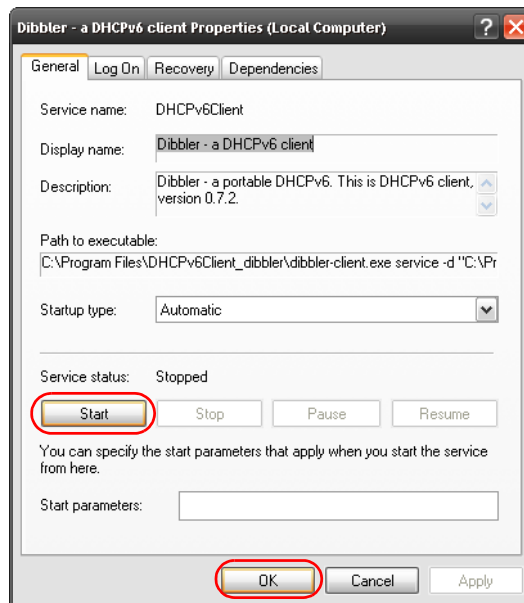
This example uses Dibbler as the DHCPv6 client. To enable DHCPv6 client on your computer:

1. Install Dibbler and select the DHCPv6 client option on your computer.

- 2 After the installation is complete, select **Start > All Programs > Dibbler-DHCPv6 > Client Install as service**.
- 3 Select **Start > Control Panel > Administrative Tools > Services**.
- 4 Double click **Dibbler - a DHCPv6 client**.



- 5 Click **Start** and then **OK**.



- 6 Now your computer can obtain an IPv6 address from a DHCPv6 server.

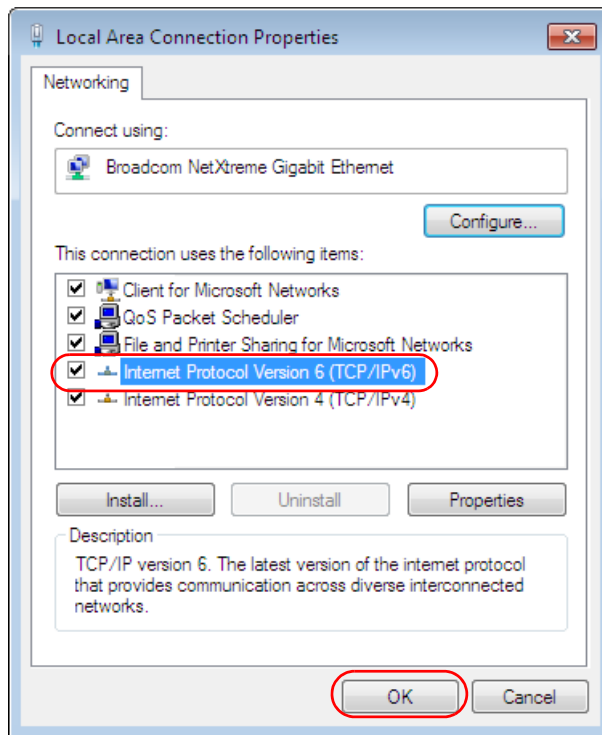
## Example - Enabling IPv6 on Windows 7

Windows 7 supports IPv6 by default. DHCPv6 is also enabled when you enable IPv6 on a Windows 7 computer.

To enable IPv6 in Windows 7:

- 1 Select **Control Panel > Network and Sharing Center > Local Area Connection**.

- 2 Select the **Internet Protocol Version 6 (TCP/IPv6)** checkbox to enable it.
- 3 Click **OK** to save the change.



- 4 Click **Close** to exit the **Local Area Connection Status** screen.
- 5 Select **Start > All Programs > Accessories > Command Prompt**.
- 6 Use the `ipconfig` command to check your dynamic IPv6 address. This example shows a global address (2001:b021:2d::1000) obtained from a DHCP server.

```
C:\>ipconfig

Windows IP Configuration

Ethernet adapter Local Area Connection:

    Connection-specific DNS Suffix  . : 
    IPv6 Address. . . . . : 2001:b021:2d::1000
    Link-local IPv6 Address . . . . . : fe80::25d8:dcab:c80a:5189%11
    IPv4 Address. . . . . : 172.16.100.61
    Subnet Mask . . . . . : 255.255.255.0
    Default Gateway . . . . . : fe80::213:49ff:feaa:7125%11
                                172.16.100.254
```

# APPENDIX D

## Legal Information

### Copyright

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### Regulatory Notice and Statement

#### United States of America



The following information applies if you use the product within USA area.

#### Federal Communications Commission (FCC) EMC Statement

- This device complies with Part 15 of FCC rules. Operation is subject to the following two conditions:
  - (1) This device may not cause harmful interference.
  - (2) This device must accept any interference received, including interference that may cause undesired operations.
- Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.
- This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

#### Canada

The following information applies if you use the product within Canada area

#### Innovation, Science, and Economic Development Canada ICES Statement

CAN ICES-3 (A)/NMB-3(A)

#### European Union



The following information applies if you use the product within the European Union.

#### CE EMC statement

WARNING: This equipment is compliant with Class A of EN55032. In a residential environment this equipment may cause radio interference.

## List of National Codes

| COUNTRY        | ISO 3166 2 LETTER CODE | COUNTRY        | ISO 3166 2 LETTER CODE |
|----------------|------------------------|----------------|------------------------|
| Austria        | AT                     | Liechtenstein  | LI                     |
| Belgium        | BE                     | Lithuania      | LT                     |
| Bulgaria       | BG                     | Luxembourg     | LU                     |
| Croatia        | HR                     | Malta          | MT                     |
| Cyprus         | CY                     | Netherlands    | NL                     |
| Czech Republic | CR                     | Norway         | NO                     |
| Denmark        | DK                     | Poland         | PL                     |
| Estonia        | EE                     | Portugal       | PT                     |
| Finland        | FI                     | Romania        | RO                     |
| France         | FR                     | Serbia         | RS                     |
| Germany        | DE                     | Slovakia       | SK                     |
| Greece         | GR                     | Slovenia       | SI                     |
| Hungary        | HU                     | Spain          | ES                     |
| Iceland        | IS                     | Sweden         | SE                     |
| Ireland        | IE                     | Switzerland    | CH                     |
| Italy          | IT                     | Turkey         | TR                     |
| Latvia         | LV                     | United Kingdom | GB                     |

## Safety Warnings

- Do NOT use this product near water, for example, in a wet basement or near a swimming pool.
- Do NOT expose your device to dampness, dust or corrosive liquids.
- Do NOT store things on the device.
- Do not obstruct the device ventilation slots as insufficient airflow may harm your device. For example, do not place the device in an enclosed space such as a box or on a very soft surface such as a bed or sofa.
- Do NOT install, use, or service this device during a thunderstorm. There is a remote risk of electric shock from lightning.
- Connect ONLY suitable accessories to the device.
- Do NOT open the device or unit. Opening or removing covers can expose you to dangerous high voltage points or other risks. ONLY qualified service personnel should service or disassemble this device. Please contact your vendor for further information.
- Make sure to connect the cables to the correct ports.
- Place connecting cables carefully so that no one will step on them or stumble over them.
- Always disconnect all cables from this device before servicing or disassembling.
- Use ONLY an appropriate power adaptor or cord for your device. Connect it to the right supply voltage (for example, 110V AC in North America or 230V AC in Europe).
- DO NOT remove the plug and connect it to a power outlet by itself; always attach the plug to the power adaptor first before connecting it to a power outlet.
- Do NOT allow anything to rest on the power adaptor or cord and do NOT place the product where anyone can walk on the power adaptor or cord.
- Do NOT use the device if the power adaptor or cord is damaged as it might cause electrocution.
- If the power adaptor or cord is damaged, remove it from the device and the power source.
- Do NOT attempt to repair the power adaptor or cord. Contact your local vendor to order a new one.
- DO NOT use the device outside, and make sure all the connections are indoors. There is a remote risk of electric shock from lightning.
- CAUTION: RISK OF EXPLOSION IF BATTERY (on the motherboard) IS REPLACED BY AN INCORRECT TYPE. DISPOSE OF USED BATTERIES ACCORDING TO THE INSTRUCTIONS. Dispose them at the applicable collection point for the recycling of electrical and electronic equipment. For detailed information about recycling of this product, please contact your local city office, your household waste disposal service or the store where you purchased the product.
- Use ONLY power wires of the appropriate wire gauge for your device. Connect it to a power supply of the correct voltage.
- Fuse Warning! Replace a fuse only with a fuse of the same type and rating.
- The POE (Power over Ethernet) devices that supply or receive power and their connected Ethernet cables must all be completely indoors.
- This equipment must be grounded. Never defeat the ground conductor or operate the equipment in the absence of a suitably installed ground conductor. Contact the appropriate electrical inspection authority or an electrician if you are uncertain that suitable grounding is available.
- When connecting or disconnecting power to hot-pluggable power supplies, if offered with your system, observe the following guidelines:
  - Install the power supply before connecting the power cable to the power supply.
  - Unplug the power cable before removing the power supply.
  - If the system has multiple sources of power, disconnect power from the system by unplugging all power cables from the power supply.
- The following warning statements apply, where the disconnect device is not incorporated in the equipment or where the plug on the power supply cord is intended to serve as the disconnect device,
  - For PERMANENTLY CONNECTED EQUIPMENT, a readily accessible disconnect device shall be incorporated external to the equipment;
  - For PLUGGABLE EQUIPMENT, the socket-outlet shall be installed near the equipment and shall be easily accessible.
- CLASS 1 LASER PRODUCT
- APPAREIL À LASER DE CLASS 1
- PRODUCT COMPLIES WITH 21 CFR 1040.10 AND 1040.11.
- PRODUIT CONFORME SELON 21 CFR 1040.10 ET 1040.11.



## Important Safety Instructions

- 1 Warning! Energy Hazard. Remove all metal jewelry, watches, and so on from your hands and wrists before serving this device.

- 2 Caution! The RJ-45 jacks are not used for telephone line connection.

- 3  Hazardous Moving Parts. Keep body parts away from fan blades.

- 4  Hot Surface. Do not touch.

- 1 Avertissement: Risque de choc électrique. Retirer tout bijoux en métal et votre montre de vos mains et poignets avant de manipuler cet appareil.

- 2 Attention: Les câbles RJ-45 ne doivent pas être utilisés pour les connections téléphoniques.

- 3  Mobilité des pièces détachées. S'assurer que les pièces détachées ne sont pas en contact avec les pales du ventilateur.

- 4  Surface brûlante. Ne pas toucher.

## Environment Statement

### European Union - Disposal and Recycling Information

The symbol below means that according to local regulations your product and/or its battery shall be disposed of separately from domestic waste. If this product is end of life, take it to a recycling station designated by local authorities. At the time of disposal, the separate collection of your product and/or its battery will help save natural resources and ensure that the environment is sustainable development.

Die folgende Symbol bedeutet, dass Ihr Produkt und/oder seine Batterie gemäß den örtlichen Bestimmungen getrennt vom Hausmüll entsorgt werden muss. Wenden Sie sich an eine Recyclingstation, wenn dieses Produkt das Ende seiner Lebensdauer erreicht hat. Zum Zeitpunkt der Entsorgung wird die getrennte Sammlung von Produkt und/oder seiner Batterie dazu beitragen, natürliche Ressourcen zu sparen und die Umwelt und die menschliche Gesundheit zu schützen.

El símbolo de abajo indica que según las regulaciones locales, su producto y/o su batería deberán depositarse como basura separada de la doméstica. Cuando este producto alcance el final de su vida útil, llévelo a un punto limpio. Cuando llegue el momento de desechar el producto, la recogida por separado éste y/o su batería ayudará a salvar los recursos naturales y a proteger la salud humana y medioambiental.

Le symbole ci-dessous signifie que selon les réglementations locales votre produit et/ou sa batterie doivent être éliminés séparément des ordures ménagères. Lorsque ce produit atteint sa fin de vie, amenez-le à un centre de recyclage. Au moment de la mise au rebut, la collecte séparée de votre produit et/ou de sa batterie aidera à économiser les ressources naturelles et protéger l'environnement et la santé humaine.

Il simbolo sotto significa che secondo i regolamenti locali il vostro prodotto e/o batteria deve essere smaltito separatamente dai rifiuti domestici. Quando questo prodotto raggiunge la fine della vita di servizio portarlo a una stazione di riciclaggio. Al momento dello smaltimento, la raccolta separata del vostro prodotto e/o della sua batteria aiuta a risparmiare risorse naturali e a proteggere l'ambiente e la salute umana.

Symbolen innebär att enligt lokal lagstiftning ska produkten och/eller dess batteri kastas separat från hushållsavfallet. När den här produkten når slutet av sin livslängd ska du ta den till en återvinningsstation. Vid tiden för kasseringen bidrar du till en bättre miljö och mänsklig hälsa genom att göra dig av med den på ett återvinningsställe.



## 台灣



以下訊息僅適用於產品銷售至台灣地區

- 這是甲類的資訊產品，在居住的環境中使用時，可能會造成射頻干擾，在這種情況下，使用者會被要求採取某些適當的對策。

### 安全警告

為了您的安全，請先閱讀以下警告及指示：

- 請勿將此產品接近水、火焰或放置在高溫的環境。
- 避免設備接觸
  - 任何液體 - 切勿讓設備接觸水、雨水、高濕度、污水腐蝕性的液體或其他水份。
  - 灰塵及污物 - 切勿接觸灰塵、污物、沙土、食物或其他不合適的材料。
- 雷雨天氣時，不要安裝，使用或維修此設備。有遭受電擊的風險。
- 切勿重摔或撞擊設備，並勿使用不正確的電源變壓器。
- 若接上不正確的電源變壓器會有爆炸的風險。
- 請勿隨意更換產品內的電池。
- 如果更換不正確之電池型式，會有爆炸的風險，請依製造商說明書處理使用過之電池。
- 請將廢電池丟棄在適當的電器或電子設備回收處。
- 請勿將設備解體。
- 請勿阻礙設備的散熱孔，空氣對流不足將會造成設備損害。
- 請插在正確的電壓供給插座（如：北美 / 台灣電壓 110V AC，歐洲是 230V AC）。
- 假若電源變壓器或電源變壓器的纜線損壞，請從插座拔除，若您還繼續插電使用，會有觸電死亡的風險。
- 請勿試圖修理電源變壓器或電源變壓器的纜線，若有毀損，請直接聯絡您購買的店家，購買一個新的電源變壓器。
- 請勿將此設備安裝於室外，此設備僅適合放置於室內。
- 請勿隨一般垃圾丟棄。
- 請參閱產品背貼上的設備額定功率。
- 請參考產品型錄或是彩盒上的作業溫度。
- 設備必須接地，接地導線不允許被破壞或沒有適當安裝接地導線，如果不確定接地方式是否符合要求可聯繫相應的電氣檢驗機構檢驗。
- 如果您提供的系統中有提供熱插拔電源，連接或斷開電源請遵循以下指導原則
  - 先連接電源線至設備連，再連接電源。
  - 先斷開電源再拔除連接至設備的電源線。
  - 如果系統有多個電源，需拔除所有連接至電源的電源線再關閉設備電源。
- 產品沒有斷電裝置或者採用電源線的插頭視為斷電裝置的一部分，以下警語將適用：
  - 對永久連接之設備，在設備外部須安裝可觸及之斷電裝置；
  - 對插接式之設備，插座必須接近安裝之地點而且是易於觸及的。

## About the Symbols

Various symbols are used in this product to ensure correct usage, to prevent danger to the user and others, and to prevent property damage. The meaning of these symbols are described below. It is important that you read these descriptions thoroughly and fully understand the contents.

### Explanation of the Symbols

| SYMBOL                                                                            | EXPLANATION                                                                                                                                                    |
|-----------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | Alternating current (AC):<br>AC is an electric current in which the flow of electric charge periodically reverses direction.                                   |
|  | Direct current (DC):<br>DC is the unidirectional flow or movement of electric charge carriers.                                                                 |
|  | Earth; ground:<br>A wiring terminal intended for connection of a Protective Earthing Conductor.                                                                |
|  | Class II equipment:<br>The method of protection against electric shock in the case of class II equipment is either double insulation or reinforced insulation. |

### Viewing Certifications

Go to <http://www.zyxel.com> to view this product's documentation and certifications.

### Zyxel Limited Warranty

Zyxel warrants to the original end user (purchaser) that this product is free from any defects in material or workmanship for a specific period (the Warranty Period) from the date of purchase. The Warranty Period varies by region. Check with your vendor and/or the authorized Zyxel local distributor for details about the Warranty Period of this product. During the warranty period, and upon proof of purchase, should the product have indications of failure due to faulty workmanship and/or materials, Zyxel will, at its discretion, repair or replace the defective products or components without charge for either parts or labor, and to whatever extent it shall deem necessary to restore the product or components to proper operating condition. Any replacement will consist of a new or re-manufactured functionally equivalent product of equal or higher value, and will be solely at the discretion of Zyxel. This warranty shall not apply if the product has been modified, misused, tampered with, damaged by an act of God, or subjected to abnormal working conditions.

#### Note

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To obtain the services of this warranty, contact your vendor. You may also refer to the warranty policy for the region in which you bought the device at [http://www.zyxel.com/web/support\\_warranty\\_info.php](http://www.zyxel.com/web/support_warranty_info.php).

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