



NVIDIA Mellanox ConnectX-6 Dx Ethernet Adapter Cards for OCP Spec 3.0 User Manual

Table of Contents

Table of Contents	2
Introduction	9
Products Overview.....	9
ConnectX-6 Dx 25GbE Adapter Cards for OCP 3.0	9
ConnectX-6 Dx 100GbE Adapter Cards for OCP 3.0	10
ConnectX-6 Dx 200GbE Adapter Cards for OCP 3.0	11
Features and Benefits.....	11
Operating Systems/Distributions	13
Connectivity	13
Interfaces	15
ConnectX-6 Dx IC	16
Encryption.....	16
Ethernet SFP28/SFP56/QSFP56 Interfaces	16
PCI Express Interface	16
Networking Ports LEDs Interface	17
SMBus Interface	18
Voltage Regulators	18
CPLD Interface	18
Heatsink.....	18
Hardware Installation	19
Safety Warnings.....	19
Installation Procedure Overview.....	19
System Requirements.....	20
Hardware Requirements	20
Airflow Requirements	20
Software Requirements	20
Safety Precautions	21
Pre-Installation Checklist.....	21
OCP 3.0 Bracket Replacement Instructions	22
OCP 3.0 Adapter Card Installation Instructions.....	22
Cards with Thumbscrew (Pull-tab) Bracket	22
Cards with Internal Lock Bracket	23

Cables and Modules	24
Identifying the Card in Your System	24
Extraction Instructions.....	25
Safety Precautions	21
Extraction Instructions.....	25
Driver Installation	27
Windows Driver Installation	27
Hardware and Software Requirements.....	27
Downloading Mellanox WinOF-2 Driver	27
Installing Mellanox WinOF-2 Driver	28
Attended Installation	28
Unattended Installation.....	32
Installation Results	33
Extracting Files Without Running Installation	33
Uninstalling Mellanox WinOF-2 Driver.....	35
Attended Uninstallation	35
Unattended Uninstallation	35
Firmware Upgrade	35
Deploying the Driver on a Nano Server	35
Offline Installation	35
Online Update	36
Linux Driver Installation.....	37
Prerequisites	37
Downloading Mellanox OFED	37
Installing Mellanox OFED	38
Installation Script	38
Installation Procedure	39
Installation Results	41
Installation Logs.....	41
openibd Script.....	41
Driver Load Upon System Boot	42
mlnxofedinstall Return Codes	42
Uninstalling MLNX_OFED	43
Installing MLNX_OFED Using YUM	43

Setting up MLNX_OFED YUM Repository	43
Installing MLNX_OFED Using the YUM Tool	44
Uninstalling MLNX_OFED Using the YUM Tool	45
Installing MLNX_OFED Using apt-get Tool.....	45
Setting up MLNX_OFED apt-get Repository	45
Installing MLNX_OFED Using the apt-get Tool.....	45
Uninstalling MLNX_OFED Using the apt-get Tool.....	46
Updating Firmware After Installation.....	46
Updating the Device Online.....	46
Updating the Device Manually	47
Updating the Device Firmware Automatically upon System Boot	47
UEFI Secure Boot	48
Enrolling Mellanox's x.509 Public Key on Your Systems.....	48
Removing Signature from kernel Modules	48
Performance Tuning	49
VMware Driver Installation	49
Hardware and Software Requirements.....	49
Installing Mellanox NATIVE ESXi Driver for VMware vSphere.....	50
Removing Earlier Mellanox Drivers.....	50
Firmware Programming	51
Updating Adapter Firmware	52
Troubleshooting	53
General Troubleshooting	53
Linux Troubleshooting	53
Windows Troubleshooting.....	54
Specifications	55
MCX623432A[E/N/C]-ADAB Specifications	55
MCX623432A[N/C]-GDAB/MCX623432AS-GDAI Specifications.....	56
MCX623435MN-CDAB Specifications	57
MCX623436A[N/C]-CDAB/MCX623436AS-CDAI Specifications.....	59
Board Mechanical Drawing and Dimensions.....	61
Bracket Mechanical Drawings and Dimensions	63
Dual-port SFP28/SFP56 Thumbscrew Bracket	63
Dual-port QSFP56 Thumbscrew Bracket	63

Single-port QSFP56 Thumbscrew Bracket	63
Finding the MAC and Serial Number on the Adapter Card	64
Document Revision History	66

About This Manual

This is the User Guide for NVIDIA® Mellanox® Ethernet ConnectX®-6 Dx adapter cards for Open Compute Project Spec 3.0. These adapters connectivity provide the highest performing low latency and most flexible interconnect solution for servers supporting OCP spec 3.0 adapter cards used in Enterprise Data Centers and High-Performance Computing environments.

Important Note:

In some of the OCP 3.0 prototype samples, the insertion force that is required to install the card into a particular PCI connector may exceed the maximum insertion force that is allowed by the connector's spec. Mellanox is updating the OCP 3.0 cards to ensure the proper insertion process.

Ordering Part Numbers

The table below provides the ordering part numbers (OPN) for the available ConnectX-6 Dx Ethernet adapter cards for OCP Spec 3.0.

OPN	Marketing Description
MCX623432A C-ADAB	ConnectX®-6 Dx EN adapter card, 25GbE OCP3.0, With Host Management, Dual-port SFP28 , PCIe 4.0 x16, Crypto and Secure Boot, Thumbscrew (Pull Tab) Bracket
MCX623432A E-ADAB	ConnectX®-6 Dx EN adapter card, 25GbE OCP3.0, With Host Management, Dual-port SFP28 , PCIe 4.0 x16, Crypto , No Secure Boot, Thumbscrew (Pull Tab) Bracket
MCX623432A N-ADAB	ConnectX®-6 Dx EN adapter card, 25GbE OCP3.0, With Host management, Dual-port SFP28 , PCIe 4.0 x16 , No Crypto, Thumbscrew (Pull Tab) Bracket
MCX623432A N-GDAB	ConnectX®-6 Dx EN adapter card, 50GbE OCP3.0, With Host Management, Dual-port SFP56 , PCIe 4.0 x16 , No Crypto, Thumbscrew (Pull Tab) Bracket
MCX623432A C-GDAB	ConnectX®-6 Dx EN adapter card, 50GbE OCP3.0, With Host Management, Dual-port SFP56 , PCIe 4.0 x16, Crypto and Secure Boot, Thumbscrew (Pull Tab) Bracket
MCX623432A S-GDAI	ConnectX®-6 Dx EN adapter card, 50GbE OCP3.0, With Host Management, Dual-port SFP56 , PCIe 4.0 x16 , Secure Boot, No Crypto, Internal Lock Bracket
MCX623435M N-CDAB	ConnectX®-6 Dx EN adapter card, 100GbE , OCP3.0, With Host Management, Single-port QSFP56, Multi-Host or Socket Direct , PCIe 4.0 x16, No Crypto, Thumbscrew (Pull Tab) Bracket
MCX623436A C-CDAB	ConnectX®-6 Dx EN adapter card, 100GbE , OCP3.0, With Host Management, Dual-port QSFP56 , PCIe 4.0 x16, Crypto and Secure Boot, Thumbscrew (Pull Tab) Bracket
MCX623436A N-CDAB	ConnectX®-6 Dx EN adapter card, 100GbE , OCP3.0, With Host Management, Dual-port QSFP56 , PCIe 4.0 x16 , No Crypto, Thumbscrew (Pull Tab) Bracket
MCX623436A S-CDAI	ConnectX®-6 Dx EN adapter card, 100GbE OCP3.0, With Host Management, Dual-port QSFP56 , PCIe 4.0 x16 , Secure Boot, No Crypto, Internal Lock Bracket
MCX623435A C-VDAB	ConnectX®-6 Dx EN adapter card, 200GbE , OCP3.0, With Host Management, Single-port QSFP56 , PCIe 4.0 x16, Crypto and Secure Boot, Thumbscrew (Pull Tab) Bracket
MCX623435A N-VDAB	ConnectX®-6 Dx EN adapter card, 200GbE , OCP3.0, With Host Management, Single-port QSFP56 , PCIe 4.0 x16 , No Crypto, Thumbscrew (Pull Tab) Bracket
MCX623435A S-VDAI	ConnectX®-6 Dx EN adapter card, 200GbE , OCP3.0, With Host Management, Single-port QSFP56 , PCIe 4.0 x16 , Secure Boot, No Crypto, Internal Lock Bracket

Intended Audience

This manual is intended for the installer and user of these cards. The manual assumes basic familiarity with Ethernet network and architecture specifications.

Technical Support

Customers who purchased Mellanox products directly from Mellanox are invited to contact us through the following methods:

- URL: <http://www.mellanox.com> > Support
- E-mail: support@mellanox.com
- Tel: +1.408.916.0055

Customers who purchased Mellanox M-1 Global Support Services, please see your contract for details regarding Technical Support.

Customers who purchased Mellanox products through a Mellanox approved reseller should first seek assistance through their reseller.

Related Documentation

<i>Mellanox OFED for Linux User Manual and Release Notes</i>	User Manual describing OFED features, performance, band diagnostic, tools content and configuration. See Mellanox OFED for Linux Documentation .
<i>WinOF-2 for Windows User Manual and Release Notes</i>	User Manual describing WinOF-2 features, performance, Ethernet diagnostic, tools content and configuration. See WinOF-2 for Windows Documentation .
<i>Mellanox VMware for Ethernet User Manual and Release Notes</i>	User Manual describing the various components of the Mellanox ConnectX® NATIVE ESXi stack. See http://www.mellanox.com Products > Software > Ethernet Drivers > VMware Driver
<i>Mellanox Firmware Utility (mlxup) User Manual and Release Notes</i>	Mellanox firmware update and query utility used to update the firmware. See http://www.mellanox.com > Products > Software > Firmware Tools > mlxup Firmware Utility
<i>Mellanox Firmware Tools (MFT) User Manual</i>	User Manual describing the set of MFT firmware management tools for a single node. See MFT User Manual .
<i>IEEE Std 802.3 Specification</i>	IEEE Ethernet specification at http://standards.ieee.org/
<i>PCI Express Specifications</i>	Industry Standard PCI Express Base and Card Electromechanical Specifications at https://pcisig.com/specifications
<i>Open Compute Project 3.0 Specification</i>	https://www.opencompute.org/

Mellanox LinkX Interconnect Solutions	Mellanox LinkX cables and transceivers are designed to maximize the performance of High-Performance Computing networks, requiring high-bandwidth, low-latency connections between compute nodes and switch nodes. Mellanox offers one of industry's broadest portfolio of 40Gb/s, 56Gb/s, 100Gb/s and 200Gb/s cables, including Direct Attach Copper cables (DACs), copper splitter cables, Active Optical Cables (AOCs) and transceivers in a wide range of lengths from 0.5m to 10km. Mellanox tests every product in an end-to-end environment ensuring a Bit Error Rate of less than 1E-15. Read more at https://www.mellanox.com/products/interconnect/infiniband-overview.php
---------------------------------------	--

Document Conventions

When discussing memory sizes, MB and MBytes are used in this document to mean size in mega Bytes. The use of Mb or Mbits (small b) indicates size in mega bits. In this document PCIe is used to mean PCI Express.

Introduction

This is the *User Guide* for Mellanox Technologies Ethernet adapter cards based on the ConnectX®-6 Dx integrated circuit device for OCP Spec 3.0. These adapters connectivity provide the highest performing low latency and most flexible interconnect solution for servers supporting OCP 3.0 used in Enterprise Data Centers and High-Performance Computing environments.

Important Note:

In some of the OCP 3.0 prototype samples, the insertion force that is required to install the card into a particular PCI connector may exceed the maximum insertion force that is allowed by the connector's spec. Mellanox is updating the OCP 3.0 cards to ensure the proper insertion process.

The following table provides the ordering part number, port speed, number of ports, and PCI Express speed.

 Please note the following OPNs include a thumbscrew (pull tab) bracket. For other retention mechanism brackets, please contact Mellanox.

Products Overview

ConnectX-6 Dx 25GbE Adapter Cards for OCP 3.0

OPN	MCX623432AN-ADAB	MCX623432AC-ADAB	MCX623432AE-ADAB
Network Connector Type	Dual-port SFP28	Dual-port SFP28	Dual-port SFP28
Ethernet Data Rate	10/25 Gb/s		
PCI Express Connectors	PCIe Gen 3.0 / 4.0 x16 SERDES @ 8.0GT/s / 16.0GT/s		
Dimensions	Small Form Factor (SFF) OCP 3.0 4.52 in. x 2.99 in (115.00mm x 76.00mm)		
Retention Mechanism	Thumbscrew (Pull Tab) Bracket		
RoHS	RoHS Compliant	RoHS Compliant	RoHS Compliant
IC Part Number	MT28928A0-XCCF-CE	MT28928A0-XCCF-CE	MT28928A0-XCCF-CE
Host Management	√	√	√
Crypto	-	√	√
Secure Boot	√	√	-
Device ID	4125 for Physical Function (PF) 4126 for Virtual Function (VF)		

ConnectX-6 Dx 50GbE Adapter Cards for OCP 3.0

OPN	MCX623432AN-GDAB	MCX623432AC-GDAB	MCX623432AS-GDAI
Network Connector Type	Dual-port SFP56	Dual-port SFP56	Dual-port SFP56
Ethernet Data Rate	10/25/40/50 Gb/s		
PCI Express Connectors	PCIe Gen 3.0 / 4.0 x16 SERDES @ 8.0GT/s / 16.0GT/s		
Dimensions	Small Form Factor (SFF) OCP 3.0 4.52 in. x 2.99 in (115.00mm x 76.00mm)		
Retention Mechanism	Thumbscrew (Pull Tab) Bracket	Thumbscrew (Pull Tab) Bracket	Internal Lock Bracket
RoHS	RoHS Compliant	RoHS Compliant	RoHS Compliant
IC Part Number	MT28928A0-XCCF-CE	MT28928A0-XCCF-CE	MT28928A0-XCCF-CE
Host Management	√	√	√
Crypto	-	√	-
Secure Boot	-	√	√
Device ID	4125 for Physical Function (PF) 4126 for Virtual Function (VF)		

ConnectX-6 Dx 100GbE Adapter Cards for OCP 3.0

OPN	MCX623436AN-CDAB	MCX623436AC-CDAB	MCX623435MN-CDAB	MCX623436AS-CDAI
Network Connector Type	Dual-port QSFP56	Dual-port QSFP56	Single-port QSFP56	Dual-port QSFP56
Ethernet Data Rate	10/25/40/50/100 Gb/s			
PCI Express Connectors	PCIe Gen 3.0 / 4.0 x16 SERDES @ 8.0GT/s / 16.0GT/s			
Dimensions	Small Form Factor (SFF) OCP 3.0 4.52 in. x 2.99 in (115.00mm x 76.00mm)			
Retention Mechanism	Thumbscrew (Pull Tab) Bracket	Thumbscrew (Pull Tab) Bracket	Thumbscrew (Pull Tab) Bracket	Internal Lock Bracket
RoHS	RoHS Compliant	RoHS Compliant	RoHS Compliant	RoHS Compliant
IC Part Number	MT28928A0-XCCF-CE	MT28928A0-XCCF-CE	MT28928A0-XCCF-CE	MT28928A0-XCCF-CE
Host Management	√	√	√	√
Crypto	-	√	-	-
Secure Boot	-	√	-	√
Mutli-Host or Socket Direct	-	-	√	-

OPN	MCX623436AN-CDAB	MCX623436AC-CDAB	MCX623435MN-CDAB	MCX623436AS-CDAI
Device ID	4125 for Physical Function (PF) 4126 for Virtual Function (VF)			

ConnectX-6 Dx 200GbE Adapter Cards for OCP 3.0

OPN	MCX623435AN-VDAB	MCX623435AC-VDAB	MCX623435AS-VDAI
Network Connector Type	Single-port QSFP56	Single-port QSFP56	Single-port QSFP56
Ethernet Data Rate	10/25/40/50/100/200 Gb/s		
PCI Express Connectors	PCIe Gen 3.0 / 4.0 x16 SERDES @ 8.0GT/s / 16.0GT/s		
Dimensions	Small Form Factor (SFF) OCP 3.0 4.52 in. x 2.99 in (115.00mm x 76.00mm)		
Retention Mechanism	Thumbscrew (Pull Tab) Bracket	Thumbscrew (Pull Tab) Bracket	Internal Lock Bracket
RoHS	RoHS Compliant	RoHS Compliant	RoHS Compliant
IC Part Number	MT28928A0-XCCF-CE	MT28928A0-XCCF-CE	MT28928A0-XCCF-CE
Host Management	√	√	√
Crypto	-	√	-
Secure Boot	-	√	√
Device ID	4125 for Physical Function (PF) 4126 for Virtual Function (VF)		

For more detailed information see [Specifications](#).

Features and Benefits



This section describes hardware features and capabilities. Please refer to the relevant driver and/or firmware release notes for feature availability.

Feature	Description
PCI Express (PCIe)	Uses PCIe Gen 3.0 (8GT/s) or Gen 4.0 (16GT/s) through x16 edge connector.

Feature	Description
Up to 200 Gigabit Ethernet	Mellanox adapters comply with the following IEEE 802.3 standards: • 200GbE / 100GbE / 50GbE / 40GbE / 25GbE / 10GbE / 1GbE • IEEE 802.3bj, 802.3bm 100 Gigabit Ethernet • IEEE 802.3by, Ethernet Consortium25, 50 Gigabit Ethernet, supporting all FEC modes • IEEE 802.3ba 40 Gigabit Ethernet • IEEE 802.3by 25 Gigabit Ethernet • IEEE 802.3ae 10 Gigabit Ethernet • IEEE 802.3ap based auto-negotiation and KR startup • Proprietary Ethernet protocols (20/40GBASE-R2, 50GBASE-R4) • IEEE 802.3ad, 802.1AX Link Aggregation • IEEE 802.1Q, 802.1P VLAN tags and priority • IEEE 802.1Qau (QCN) • Congestion Notification • IEEE 802.1Qaz (ETS) • IEEE 802.1Qbb (PFC) • IEEE 802.1Qbg • IEEE 1588v2 • Jumbo frame support (9.6KB)
Memory Components	• EEPROM - The EEPROM capacity is 32Kbit • SPI Quad - includes 256Mbit SPI Quad Flash device (MX25L25645GXDI-08G device by Macronix)
Overlay Networks	In order to better scale their networks, data center operators often create overlay networks that carry traffic from individual virtual machines over logical tunnels in encapsulated formats such as NVGRE and VXLAN. While this solves network scalability issues, it hides the TCP packet from the hardware offloading engines, placing higher loads on the host CPU. ConnectX®-6 Dx effectively addresses this by providing advanced NVGRE and VXLAN hardware offloading engines that encapsulate and de-capsulate the overlay protocol.
RDMA and RDMA over Converged Ethernet (RoCE)	ConnectX®-6 Dx, utilizing RDMA (Remote Data Memory Access) and RoCE (RDMA over Converged Ethernet) technology, delivers low-latency and high-performance over Band and Ethernet networks. Leveraging data center bridging (DCB) capabilities as well as ConnectX®-6 Dx advanced congestion control hardware mechanisms, RoCE provides efficient low-latency RDMA services over Layer 2 and Layer 3 networks.
Mellanox PeerDirect®	PeerDirect® communication provides high-efficiency RDMA access by eliminating unnecessary internal data copies between components on the PCIe bus (for example, from GPU to CPU), and therefore significantly reduces application run time. ConnectX®-6 Dx advanced acceleration technology enables higher cluster efficiency and scalability to tens of thousands of nodes.
CPU Offload	Adapter functionality enabling reduced CPU overhead allowing more available CPU for computation tasks. Open vSwitch (OVS) offload using ASAP² - Accelerated Switch and Packet Processing® • Flexible match-action flow tables • Tunneling encapsulation/decapsulation
Quality of Service (QoS)	Support for port-based Quality of Service enabling various application requirements for latency and SLA.
Hardware-based I/O Virtualization	ConnectX®-6 Dx provides dedicated adapter resources and guaranteed isolation and protection for virtual machines within the server.

Feature	Description
Storage Acceleration	A consolidated compute and storage network achieves significant cost-performance advantages over multi-fabric networks. Standard block and file access protocols can leverage RDMA for high-performance storage access. • NVMe over Fabric offloads for the target machine • Erasure Coding • T10-DIF Signature Handover
SR-IOV	ConnectX®-6 Dx SR-IOV technology provides dedicated adapter resources and guaranteed isolation and protection for virtual machines (VM) within the server.
NC-SI	The adapter supports a Network Controller Sideband Interface (NC-SI), MCTP over SMBus and MCTP over PCIe - Baseboard Management Controller interface.
High-Performance Accelerations	• Tag Matching and Rendezvous Offloads • Adaptive Routing on Reliable Transport • Burst Buffer Offloads for Background Checkpointing
Host Management	Mellanox host management sideband implementations enable remote monitor and control capabilities using RBT, MCTP over SMBus, and MCTP over PCIe - Baseboard Management Controller (BMC) interface, supporting both NC-SI and PLDM management protocols using these interfaces. Mellanox OCP 3.0 adapters support these protocols to offer numerous Host Management features such as PLDM for Firmware Update, network boot in UEFI driver, UEFI secure boot, and more.
Multi-Host or Socket Direct	TBD: Arnon
Secure Boot	Hardware Root-of-Trust (RoT) Secure Boot and secure firmware update using RSA cryptography, and cloning-protection, via a device-unique secret key.
Crypto	Crypto – IPsec and TLS data-in-motion inline encryption and decryption offload and AES-XTS block-level data-at-rest encryption and decryption offload.
Wake-on-LAN (WoL)	The adapter supported Wake-on-LAN (WoL), a computer networking standard that allows an adapter to be turned on or awakened by a network message. In STBY mode, only port0 is available.
Reset-on-LAN (RoL)	Supported

Operating Systems/Distributions

- RHEL/CentOS
- Windows
- FreeBSD
- VMware
- OpenFabrics Enterprise Distribution (OFED)
- OpenFabrics Windows Distribution (WinOF-2)

Connectivity

- Interoperable with 1/10/25/40/50/100/200 Gb/s Ethernet switches
- Passive copper cable with ESD protection
- Powered connectors for optical and active cable support

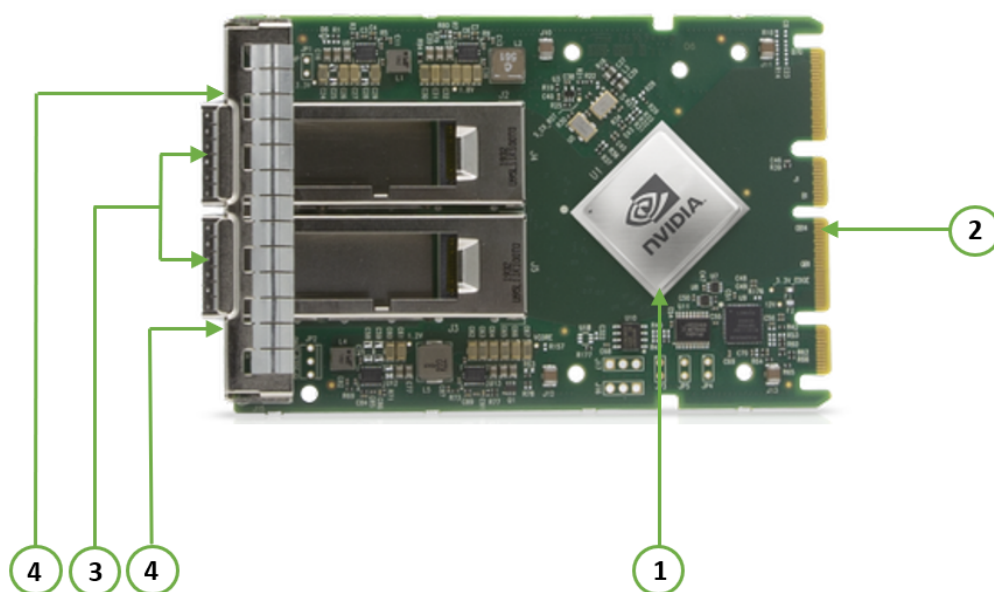
Interfaces

The below figures show the component side of the Mellanox ConnectX-6 Dx adapter card. Each numbered interface that is referenced in the figures is described in the following table with a link to detailed information.

⚠ The ConnectX-6 Dx adapter card includes special circuits to protect from ESD shocks to the card/server when plugging copper cables

⚠ The below figures are for illustration purposes only and might not reflect the current revision of the adapter card.

Mellanox ConenctX-6 Dx for OCP 3.0 Adapter Card Interfaces - Component Side



Cal lou t	Item	Description
1	"ConnectX-6 Dx IC"	Mellanox ConnectX-6 Dx IC on the board.
2	"PCI Express Interface"	PCIe Gen 3.0/4.0 through an x16 edge connector.
3	"Ethernet SFP28/SFP56/QSFP56 Interface"	Ethernet traffic is transmitted through the adapter's SFP28/SFP56/QSFP56 connectors. The networking connectors allow for the use of modules, optical and passive cable interconnect solutions.
4	"Networking Ports LEDs Interface"	There are two I/O LEDs, LED0 and LED1, per port to indicate speed and link status.
	"FRU EEPROM"	FRU EEPROM capacity 4Kb

Cal lou t	Item	Description
	"SMBus Interface"	Allows BMC connectivity using MCTP over SMBus or MCTP over PCIe protocols.
	"Voltage Regulators"	Voltage supply pins that feed onboard regulators.
	"CPLD Interface"	Controls the networking port LEDs.

ConnectX-6 Dx IC

The ConnectX®-6 Dx EN family of adapter IC devices delivers two ports of 10/25/40/50/100Gb/s or a single-port of 200Gb/s Ethernet connectivity paired with best-in-class hardware capabilities that accelerate and secure cloud and data-center workloads.

Encryption

 Applies to Crypto-enabled OPNs.

ConnectX-6 Dx brings security to every end-point, including:

- Purpose-built inline acceleration engines that offload IPsec and TLS data-in-motion and XTS-AES data-at-rest cryptographic operations.
- Stateful firewall solution acceleration, powered by Open vSwitch connection tracking and Mellanox's ASAP2 technology.
- Embedded hardware root-of-trust and support for RSA-based secure firmware update and secure boot, providing guaranteed integrity of the network adapter.

Ethernet SFP28/SFP56/QSFP56 Interfaces

The network ports of the ConnectX®-6 Dx adapter card are compliant with the IEEE 802.3 Ethernet standards listed in [Features and Benefits](#). Ethernet traffic is transmitted through the QSFP56 connectors on the adapter card.

 The adapter card includes special circuits to protect from ESD shocks to the card/server when plugging copper cables.

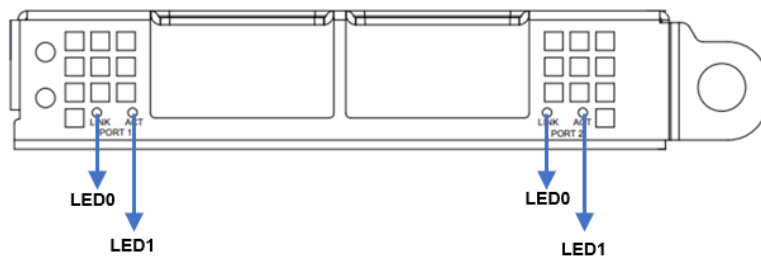
PCI Express Interface

The table below describes the supported PCIe interface in ConnectX®-6 Dx adapter cards.

Supported PCIe Interface	Features
PCIe Gen 3.0/4.0 (1.1 and 2.0 compatible) through x16 edge connectors	Link Rates: 2.5, 5.0, 8.0 or 16GT/s. Auto Negotiation to: x16, x8, x4, x2 or x1. Support for MSI/MSI-X mechanisms.

Networking Ports LEDs Interface

There are two I/O LEDs, LED0 and LED1, per port to indicate speed and link status. LED0 is bicolor (yellow and green) LED and LED1 is a single color (green) LED.



Link Indications

LED and State	Description									
1Hz blinking Yellow	Beacon command for locating the adapter card									
4Hz blinking Yellow	Indicates an error with the link. The error can be one of the following: <table><tr><th>Error Type</th><th>Description</th><th>LED Behavior</th></tr><tr><td>I²C</td><td>I²C access to the networking ports fails</td><td>Blinks until the error is fixed</td></tr><tr><td>Over-current</td><td>Over-current condition of the networking ports</td><td>Blinks until the error is fixed</td></tr></table>	Error Type	Description	LED Behavior	I ² C	I ² C access to the networking ports fails	Blinks until the error is fixed	Over-current	Over-current condition of the networking ports	Blinks until the error is fixed
Error Type	Description	LED Behavior								
I ² C	I ² C access to the networking ports fails	Blinks until the error is fixed								
Over-current	Over-current condition of the networking ports	Blinks until the error is fixed								
LED0 - Link Speed	• A constant Green indicates a link with the maximum networking speed. • A constant Yellow indicates a link with less than the maximum networking speed • If LED0 is off, then the link has not been established.									
LED1 - Activity	• A blinking Green indicates a valid link with data transfer. • If LED1 is off, then there is no activity									

FRU EEPROM

FRU EEPROM allows the baseboard to identify different types of Mezzanine cards. FRU EEPROM is accessible through SMCLK and SMDATA. FRU EEPROM address is defined according to SLOT_ID0 and SLOT_ID1 and its capacity is 4Kb.

SMBus Interface

ConnectX®-6 Dx technology maintains support for manageability through a BMC. ConnectX®-6 Dx OCP 3.0 adapter can be connected to a BMC using MCTP over SMBus or MCTP over PCIe protocols as if it is a standard Mellanox OCP 3.0 adapter. For configuring the adapter for the specific manageability solution in use by the server, please contact Mellanox Support.

Voltage Regulators

The voltage regulator power is derived from the OCP 3.0 edge connector 12V and 3.3V supply pins. These voltage supply pins feed onboard regulators that provide the necessary power to the various components on the card.

CPLD Interface

The adapter card incorporates a CPLD device that controls the networking port LEDs and the scan chain. It draws its power supply from 3.3V_EDGE.

Heatsink

A heatsink is attached to the ConnectX®-6 Dx IC in order to dissipate the heat. It is attached either by using four spring-loaded push pins that insert into four mounting holes. ConnectX®-6 Dx IC has a thermal shutdown safety mechanism that automatically shuts down the ConnectX®-6 Dx card in case of a high-temperature event, improper thermal coupling or heatsink removal.

Hardware Installation

Installation and initialization of ConnectX-6 Dx adapter cards for OCP Spec 3.0 require attention to the mechanical attributes, power specification, and precautions for electronic equipment.

Safety Warnings

 Safety warnings are provided here in the English language. For safety warnings in other languages, refer to the [Adapter Installation Safety Instructions](#) document available on mellanox.com.

Unable to render include or excerpt-include. Could not retrieve page.

Installation Procedure Overview

The installation procedure of ConnectX-6 Dx adapter cards for OCP Spec 3.0 involves the following steps:

Step	Procedure	Direct Link
1	Check the system's hardware and software requirements.	Refer to System Requirements
2	Pay attention to the airflow consideration within the host system	Refer to Airflow Requirements
3	Follow the safety precautions	Refer to Safety Precautions
4	Follow the pre-installation checklist	Refer to Pre-Installation Checklist
5	(Optional) Replace the assembled OCP 3.0 bracket with the desired form factor bracket	Refer to OCP 3.0 Bracket Replacement Instructions
6	Install ConnectX-6 Dx adapter card for OCP spec 3.0 in the system	Refer to Cards with Internal Lock Bracket Installation
		Refer to Cards with Internal Lock Bracket Installation
7	Connect cables or modules to the card	Refer to Cables and Modules
8	Identify ConnectX-6 Dx adapter card in the system	Refer to Identify the Card in Your System

System Requirements

- ⚠ Unless otherwise specified, Mellanox products are designed to work in an environmentally controlled data center with low levels of gaseous and dust (particulate) contamination. The operating environment should meet severity level G1 as per ISA 71.04 for gaseous contamination and ISO 14644-1 class 8 for cleanliness level.

Hardware Requirements

- ⚠ For proper operation and performance, please make sure to use a PCIe slot with a corresponding bus width and that can supply sufficient power to your card. Refer to the Specifications section of the manual for more power requirements.

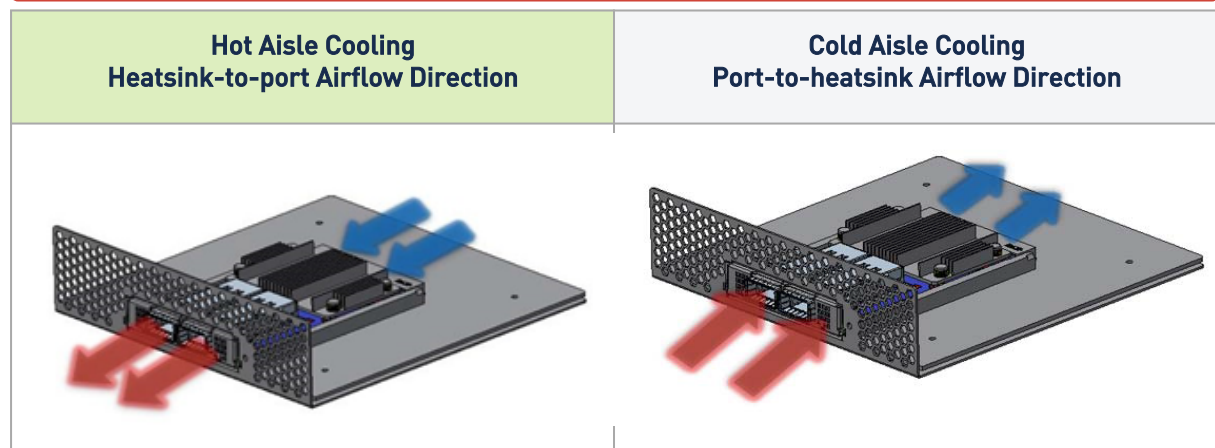
A system with a PCI Express x16 slot for OCP spec 3.0 is required for installing the card.

Airflow Requirements

ConnectX-6 Dx adapter cards are offered with two airflow patterns: from the heatsink to the network ports, and vice versa, as shown below.

Please refer to the "Specifications" chapter for airflow numbers for each specific card model.

- ⚠ All cards in the system should be planned with the same airflow direction.



Software Requirements

- See Operating Systems/Distributions section under the Introduction section.

- Software Stacks - Mellanox OpenFabric software package MLNX_OFED for Linux, WinOF-2 for Windows, and VMware. See the Driver Installation section.

Safety Precautions

⚠ The adapter is being installed in a system that operates with voltages that can be lethal. Before opening the case of the system, observe the following precautions to avoid injury and prevent damage to system components.

1. Remove any metallic objects from your hands and wrists.
2. Make sure to use only insulated tools.
3. Verify that the system is powered off and is unplugged.
4. It is strongly recommended to use an ESD strap or other antistatic devices.

Pre-Installation Checklist

1. **Unpack the ConnectX-6 Dx adapter card.**

Unpack and remove the ConnectX-6 Dx card. Check the parts for visible damage that may have occurred during shipping. Please note that the cards must be placed on an antistatic surface.

⚠ Please note that if the card is removed hastily from the antistatic bag, the plastic ziplock may harm the EMI fingers on the networking connector. Carefully remove the card from the antistatic bag to avoid damaging the EMI fingers.



2. **Shut down your system if active:**

Turn off the power to the system, and disconnect the power cord. Refer to the system documentation for instructions. Before you install the ConnectX-6 Dx card, make sure that the system is disconnected from power.

OCP 3.0 Bracket Replacement Instructions

Unable to render include or excerpt-include. Could not retrieve page.

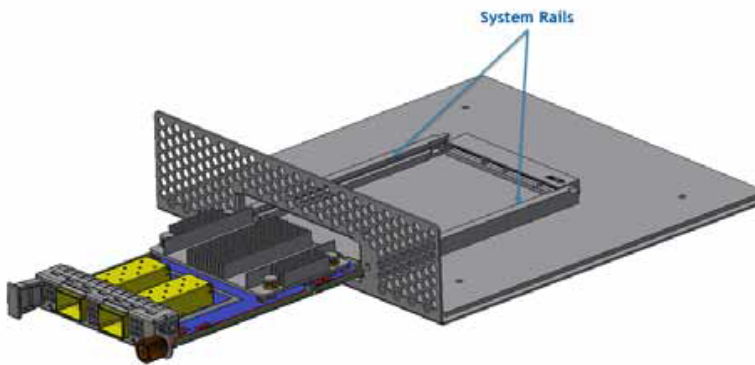
OCP 3.0 Adapter Card Installation Instructions

This section provides detailed instructions on how to install your adapter card in a system.

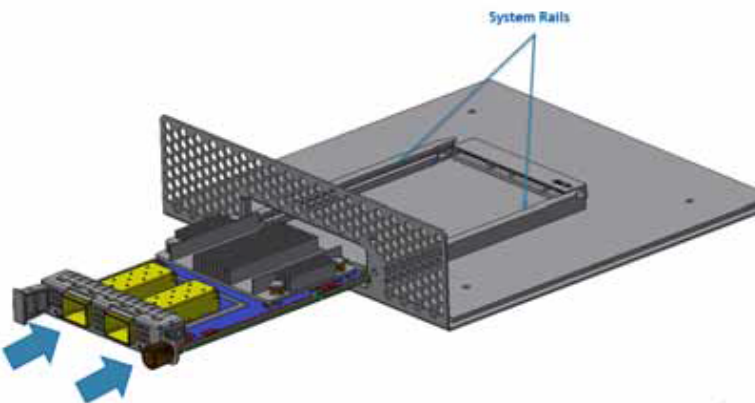
⚠ Please note that the following figures are for illustration purposes only.

Cards with Thumbscrew (Pull-tab) Bracket

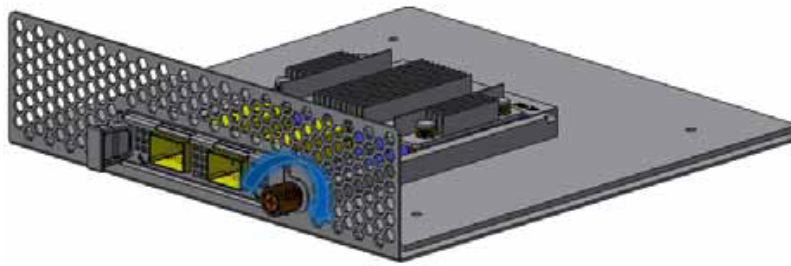
1. Before installing the card, make sure that the system is off and the power cord is not connected to the server. Please follow proper electrical grounding procedures.
2. Open the system case.
3. Align the card with the system rails.



4. Push the card until connectors are in full mate.

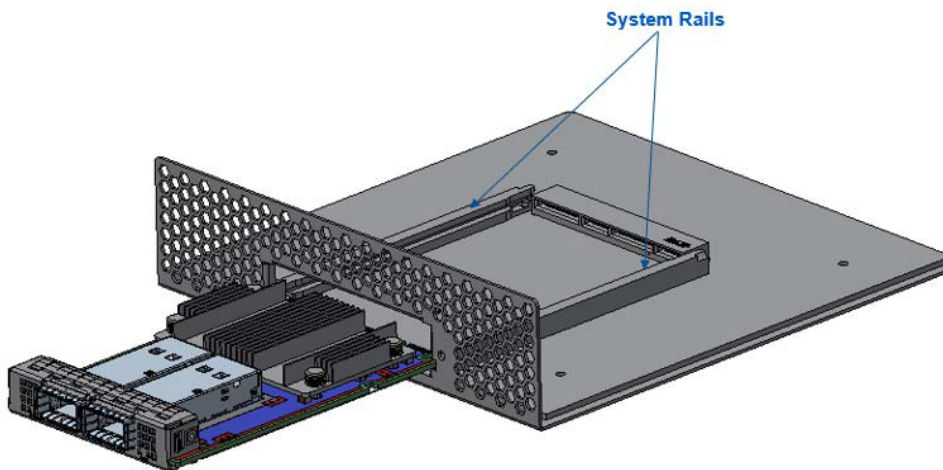


5. Turn the captive screw clockwise until firmly locked.

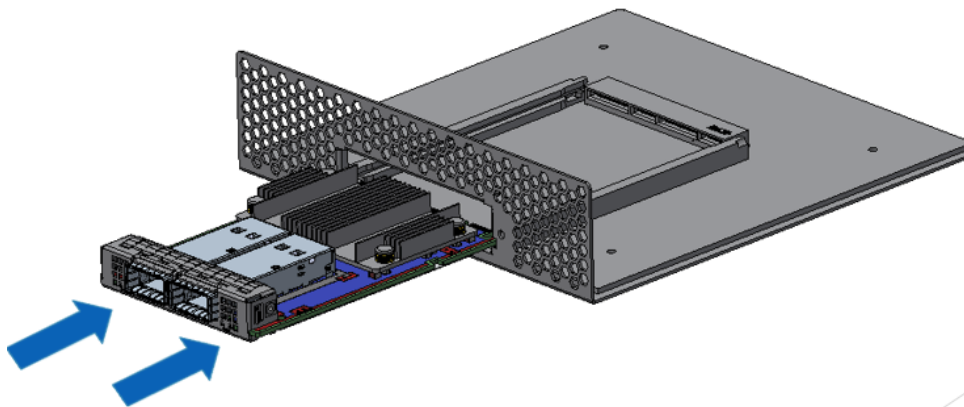


Cards with Internal Lock Bracket

1. Before installing the card, make sure that the system is off and the power cord is not connected to the server. Please follow proper electrical grounding procedures.
2. Open the system case.
3. Align the card with the system rails.



4. Push the card until connectors are in full mate and a clicking sound is heard.



Cables and Modules

To obtain the list of supported Mellanox cables for your adapter, please refer to the Cables Reference Table at <http://www.mellanox.com/products/interconnect/cables-configurator.php>.

Cable Installation

1. All cables can be inserted or removed with the unit powered on.
2. To insert a cable, press the connector into the port receptacle until the connector is firmly seated.
 - a. Support the weight of the cable before connecting the cable to the adapter card. Do this by using a cable holder or tying the cable to the rack.
 - b. Determine the correct orientation of the connector to the card before inserting the connector. Do not try and insert the connector upside down. This may damage the adapter card.
 - c. Insert the connector into the adapter card. Be careful to insert the connector straight into the cage. Do not apply any torque, up or down, to the connector cage in the adapter card.
 - d. Make sure that the connector locks in place.

 When installing cables make sure that the latches engage.

 Always install and remove cables by pushing or pulling the cable and connector in a straight line with the card.

3. After inserting a cable into a port, the Yellow or Green LED0 indicator will light when the physical connection is established (that is, when the unit is powered on and a cable is plugged into the port with the other end of the connector plugged into a functioning port). See [Adapter Card LED Operations](#).
4. After plugging in a cable, lock the connector using the latching mechanism particular to the cable vendor. When a logical connection is made, Green LED1 will light. When data is being transferred, Green LED1 will blink.
5. Care should be taken as not to impede the air exhaust flow through the ventilation holes. Use cable lengths which allow for routing horizontally around to the side of the chassis before bending upward or downward in the rack.
6. To remove a cable, disengage the locks and slowly pull the connector away from the port receptacle. LED indicator will turn off when the cable is unseated.

To uninstall the adapter card, see [Uninstalling the Card](#).

Identifying the Card in Your System

On Linux

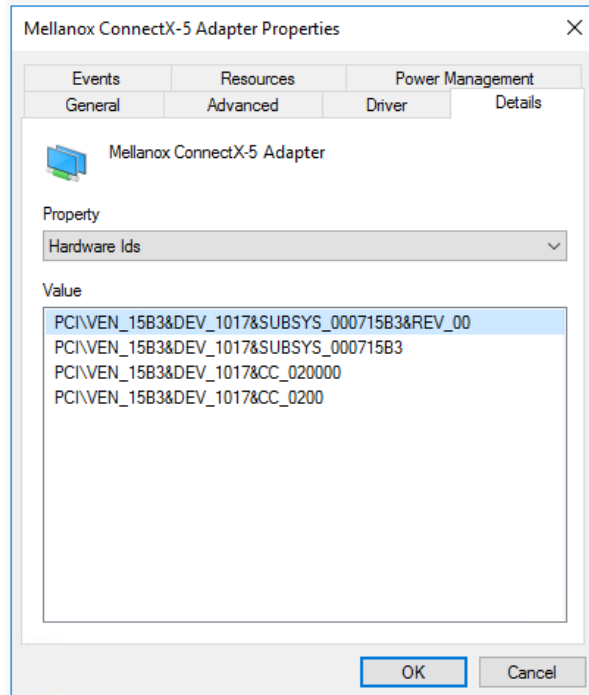
Get the device location on the PCI bus by running `lspci` and locating lines with the string “Mellanox Technologies”:

```
lspci |grep -i Mellanox
Network controller: Mellanox Technologies MT28800 Family [ConnectX-6 Dx]
```

On Windows

1. Open Device Manager on the server. Click **Start** => **Run**, and then enter **devmgmt.msc**.
2. Expand **System Devices** and locate your Mellanox ConnectX-6 Dx adapter card.
3. Right click the mouse on your adapter's row and select **Properties** to display the adapter card properties window.
4. Click the **Details** tab and select **Hardware Ids** (Windows 2012/R2/2016) from the **Property** pull-down menu.

PCI Device (Example)



5. In the **Value** display box, check the fields VEN and DEV (fields are separated by '&'). In the display example above, notice the sub-string "PCI\VEN_15B3&DEV_1003": VEN is equal to 0x15B3 – this is the Vendor ID of Mellanox Technologies; and DEV is equal to 1018 (for ConnectX-6 Dx) – this is a valid Mellanox Technologies PCI Device ID.



If the PCI device does not have a Mellanox adapter ID, return to Step 2 to check another device.



The list of Mellanox Technologies PCI Device IDs can be found in the PCI ID repository at <http://pci-ids.ucw.cz/read/PC/15b3>.

Extraction Instructions

Safety Precautions

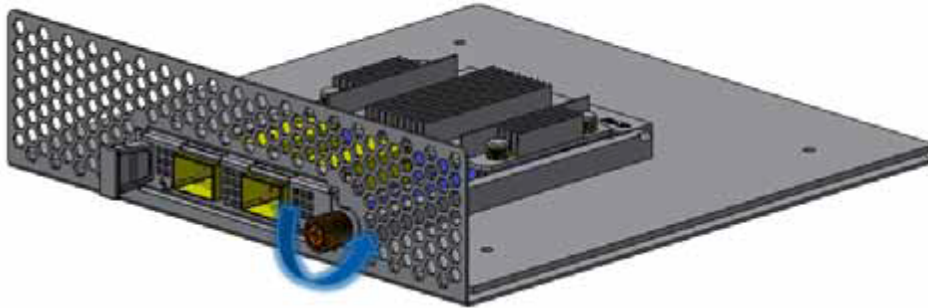
The adapter is installed in a system that operates with voltages that can be lethal. Before uninstalling the adapter card, please observe the following precautions to avoid injury and prevent damage to system components.

1. Remove any metallic objects from your hands and wrists.
2. It is strongly recommended to use an ESD strap or other antistatic devices.
3. Turn off the system and disconnect the power cord from the server.

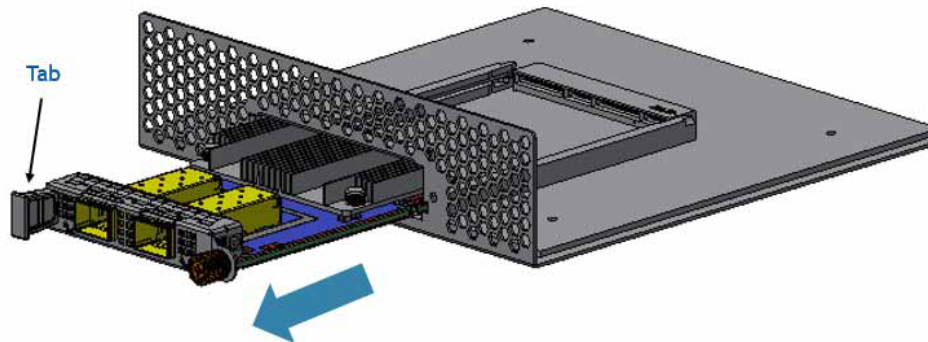
Extraction Instructions

 Please note that the following images are for illustration purposes only.

1. Verify that the system is powered off and unplugged.
2. Wait 30 seconds.
3. Rotate the captive screw counterclockwise.



4. While holding the tab, carefully pull out the adapter card.



Driver Installation

Please use the relevant driver installation section.

- [Windows Driver Installation](#)
- [Linux Driver Installation](#)
- [VMware Driver Installation](#)

Windows Driver Installation

For Windows, download and install the latest Mellanox WinOF-2 for Windows software package available via the Mellanox web site at: <http://www.mellanox.com> > Products > Software > Ethernet Drivers > Download. Follow the installation instructions included in the download package (also available from the download page).

 The snapshots in the following sections are presented for illustration purposes only. The installation interface may slightly vary, depending on the operating system in use.

Hardware and Software Requirements

Description	Package
Windows Server 2012 R2	MLNX_WinOF2-1_10_All_x64.exe TBD
Windows Server 2012	
Windows Server 2016	
Windows 8.1 Client (64 bit only)	
Windows 10 Client (64 bit only)	

Note: The Operating System listed above must run with administrator privileges.

Downloading Mellanox WinOF-2 Driver

To download the executable file according to your operating system, please follow the steps below:

1. Obtain the machine architecture.
 - a. To go to the **Start** menu, position your mouse in the bottom-right corner of the Remote Desktop of your screen.
 - b. Open a CMD console. (Click **Task Manager** > **File** > **Run** new task, and enter **CMD**.)
 - c. Enter the following command.

```
echo %PROCESSOR_ARCHITECTURE%
```

On an x64 (64-bit) machine, the output will be "AMD64".

2. Go to the Mellanox WinOF-2 web page at <http://www.mellanox.com> > Products > InfiniBand/VPI Drivers > Windows SW/Drivers.
3. Download the exe image according to the architecture of your machine (see Step 1). The name of the .exe is in the following format: MLNX_WinOF2-<version>_x<arch>.exe.

 Installing the incorrect exe file is prohibited. If you do so, an error message will be displayed. For example, if you try to install a 64-bit executable file on a 32-bit machine, the wizard will display the following (or a similar) error message: "The installation package is not supported by this processor type. Contact your vendor."

Installing Mellanox WinOF-2 Driver

This section provides instructions for two types of installation procedures:

- Attended Installation - An installation procedure that requires frequent user intervention.
- [Unattended Installation](#) - An automated installation procedure that requires no user intervention.

 Both Attended and Unattended installations require administrator privileges.

 WinOF-2 supports adapter cards based on the Mellanox ConnectX®-4 and above family of adapter IC devices only. If you have ConnectX-3 and ConnectX-3 Pro on your server, you will need to install WinOF driver. For details on how to install WinOF driver, please refer to *WinOF User Manual*.

Attended Installation

The following is an example of an installation session.

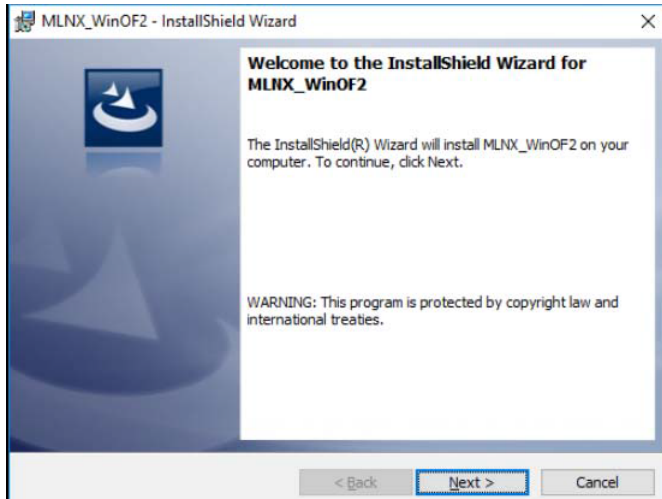
1. Double click the .exe and follow the GUI instructions to install MLNX_WinOF2.
2. [Optional] Manually configure your setup to contain the logs option (replace "LogFile" with the relevant directory):

```
MLNX_WinOF2-1_10_<revision_version>_All_x64.exe /v"/1*vx [LogFile]"
```

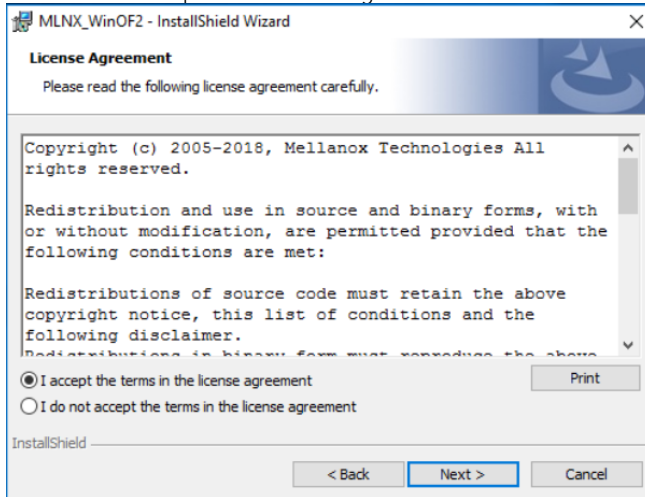
3. [Optional] If you do not want to upgrade your firmware version. (Note: MT_SKIPFWUPGRD default value is False.)

```
MLNX_WinOF2-1_10_<revision_version>_All_x64.exe /v" MT_SKIPFWUPGRD=1"
```

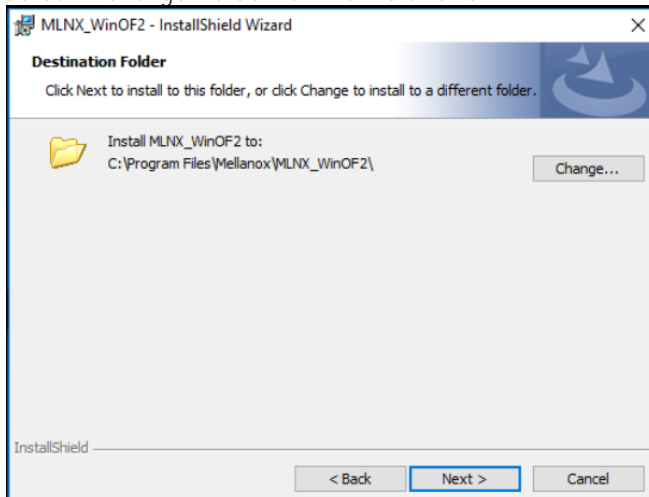
4. Click **Next** in the Welcome screen.



5. Read then accept the license agreement and click **Next**.

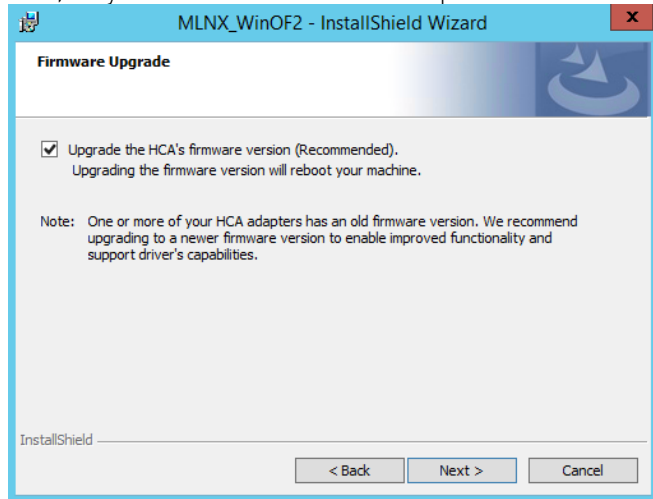


6. Select the target folder for the installation.

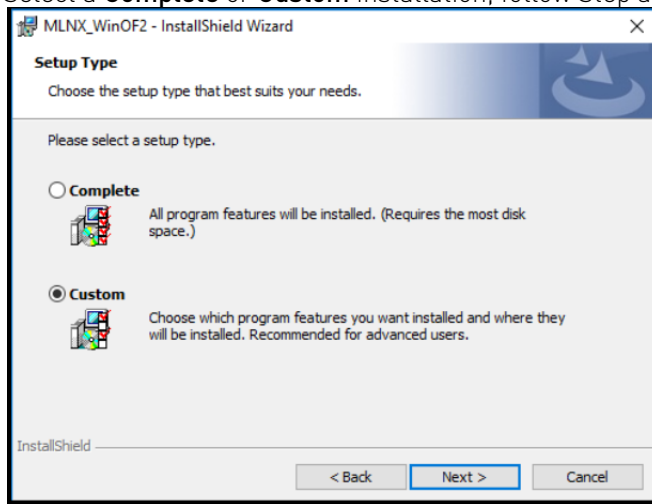


7. The firmware upgrade screen will be displayed in the following cases:
- a. If the user has an OEM card. In this case, the firmware will not be displayed.
 - b. If the user has a standard Mellanox card with an older firmware version, the firmware will be updated accordingly. However, if the user has both an OEM card and a Mellanox

card, only the Mellanox card will be updated.

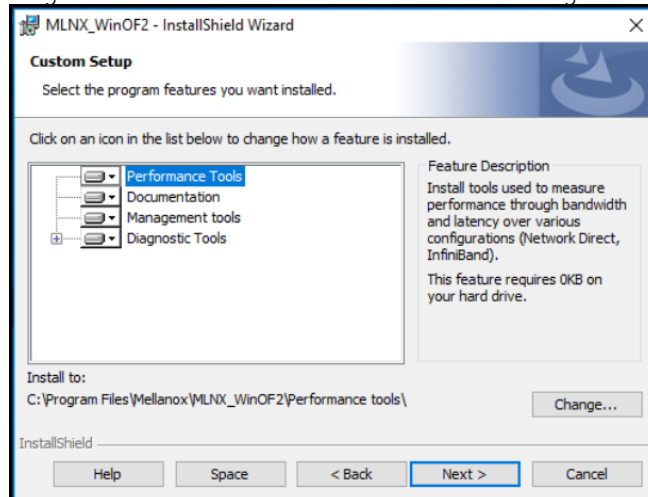


8. Select a **Complete** or **Custom** installation, follow Step a and on.

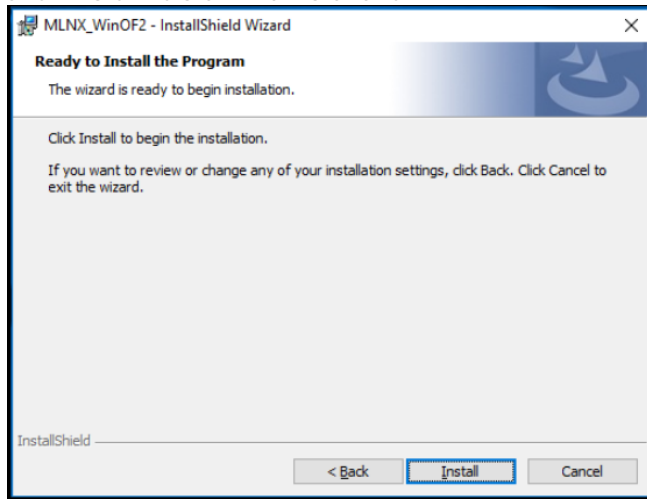


- a. Select the desired feature to install:
- i. Performance tools - install the performance tools that are used to measure performance in user environment
 - ii. Documentation - contains the User Manual and Release Notes
 - iii. Management tools - installation tools used for management, such as mlxstat

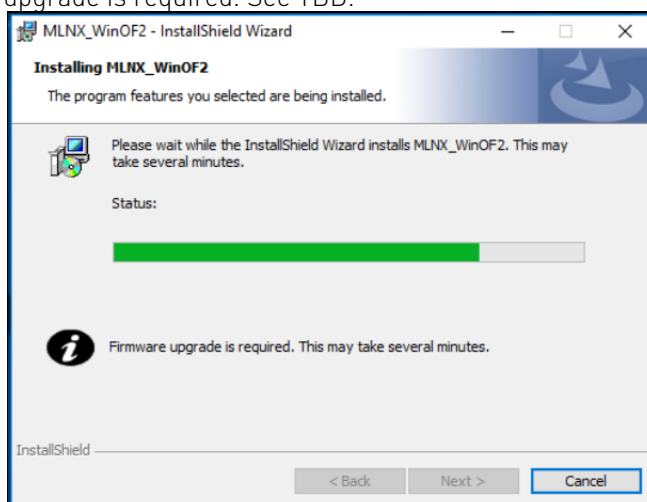
- iv. Diagnostic Tools - installation tools used for diagnostics, such as mlx5cmd



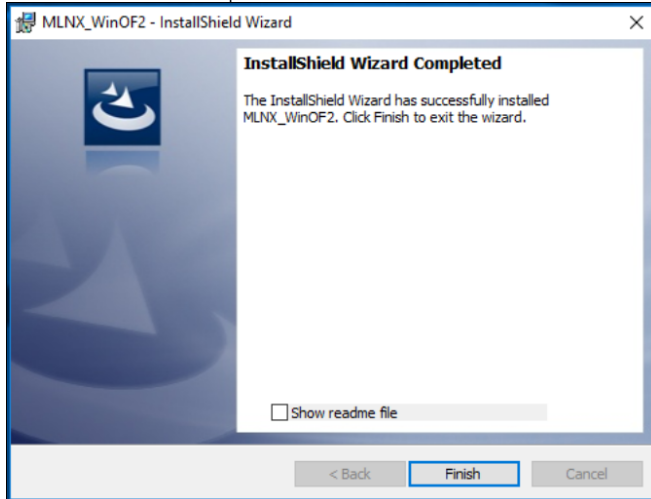
- b. Click **Next** to install the desired tools.
9. Click **Install** to start the installation.



10. In case that firmware upgrade option was checked in Step 7, you will be notified if a firmware upgrade is required. See TBD.



11. Click **Finish** to complete the installation.



Unattended Installation

- !** If no reboot options are specified, the installer restarts the computer whenever necessary without displaying any prompt or warning to the user. Use the /norestart or /forcerestart standard command-line options to control reboots.

The following is an example of an unattended installation session.

1. Open a CMD console. (Click **Task Manager** > **File** > **Run** new task, and enter **CMD**.)
2. Install the driver. Run:

```
MLNX_WinOF2-1_10_<revision_version>_All_x64.exe /S /v/qn
```

3. [Optional] Manually configure your setup to contain the logs option:

```
MLNX_WinOF2-1_10_All_x64.exe /S /v/qn /v"/l*v [LogFile]"
```

4. [Optional] if you want to control whether to install ND provider or not. (Note: MT_NDPROPERTY default value is True.)

```
MLNX_WinOF2-1_10_All_x64.exe /vMT_NDPROPERTY=1
```

5. [Optional] If you do not wish to upgrade your firmware version. (Note: MT_SKIPFWUPGRD default value is False.)

```
MLNX_WinOF2-1_10_All_x64.exe /vMT_SKIPFWUPGRD=1
```

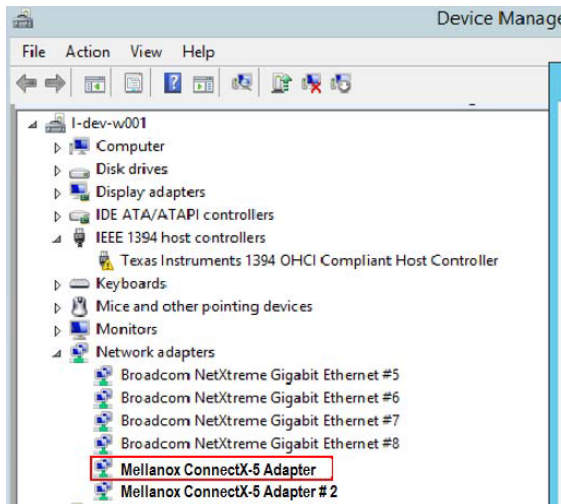
- !** Applications that hold the driver files (such as ND applications) will be closed during the unattended installation.

Installation Results

Upon installation completion, you can verify the successful addition of the network card(s) through the Device Manager.

Upon installation completion, the inf files can be located at: %ProgramFiles%\Mellanox\MLNX_WinOF2\Drivers\<OS>

To see the Mellanox network adapters, display the **Device Manager** and pull down the **Network adapters** menu.



Extracting Files Without Running Installation

To extract the files without running installation, perform the following steps.

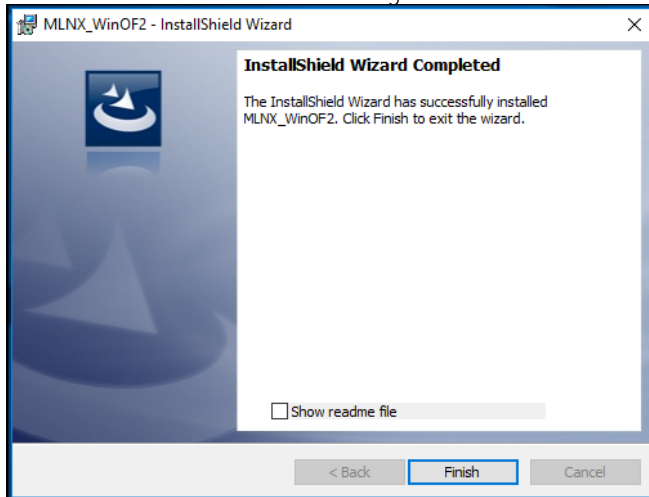
1. Open a CMD console. (Click **Task Manager** > **File** > **Run** new task, and enter **CMD**.)
2. Extract the driver and the tools:

```
MLNX_WinOF2-1_10_All_x64 /a
```

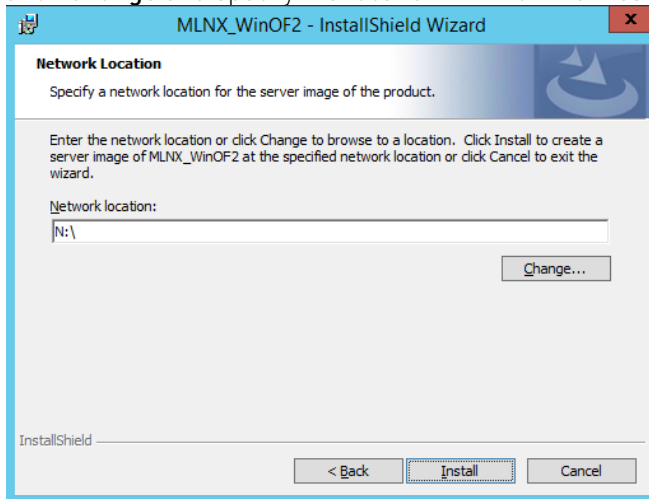
To extract only the driver files.

```
MLNX_WinOF2-1_10_All_x64 /a /vMT_DRIVERS_ONLY=1
```

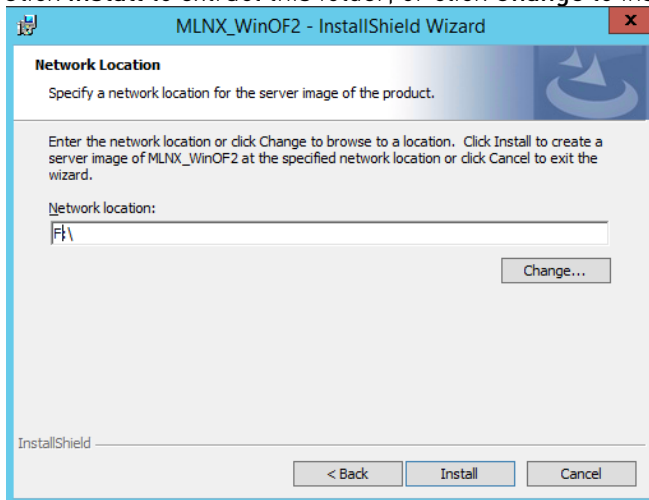
3. Click **Next** to create a server image.



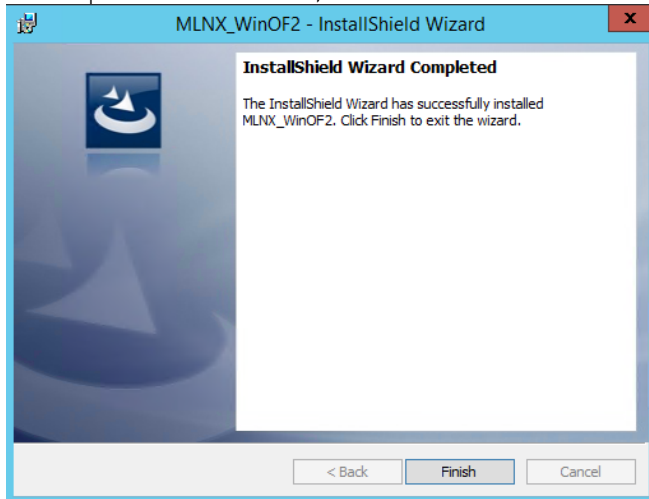
4. Click **Change** and specify the location in which the files are extracted to.



5. Click **Install** to extract this folder, or click **Change** to install to a different folder.



6. To complete the extraction, click **Finish**.



Uninstalling Mellanox WinOF-2 Driver

Attended Uninstallation

To uninstall MLNX_WinOF2 on a single node:

1. Click **Start > Control Panel > Programs and Features > MLNX_WinOF2 > Uninstall**.
(NOTE: This requires elevated administrator privileges)

Unattended Uninstallation

To uninstall MLNX_WinOF2 in unattended mode:

1. Open a CMD console. (Click **Task Manager > File > Run** new task, and enter **CMD**.)
2. To uninstall the driver, run:

```
MLNX_WinOF2-1_10_All_x64.exe /S /x /v"/qn"
```

Firmware Upgrade

If the machine has a standard Mellanox card with an older firmware version, the firmware will be automatically updated as part of the WinOF-2 package installation.

For information on how to upgrade firmware manually, please refer to the MFT User Manual at www.mellanox.com >Products > Ethernet Drivers > Firmware Tools.

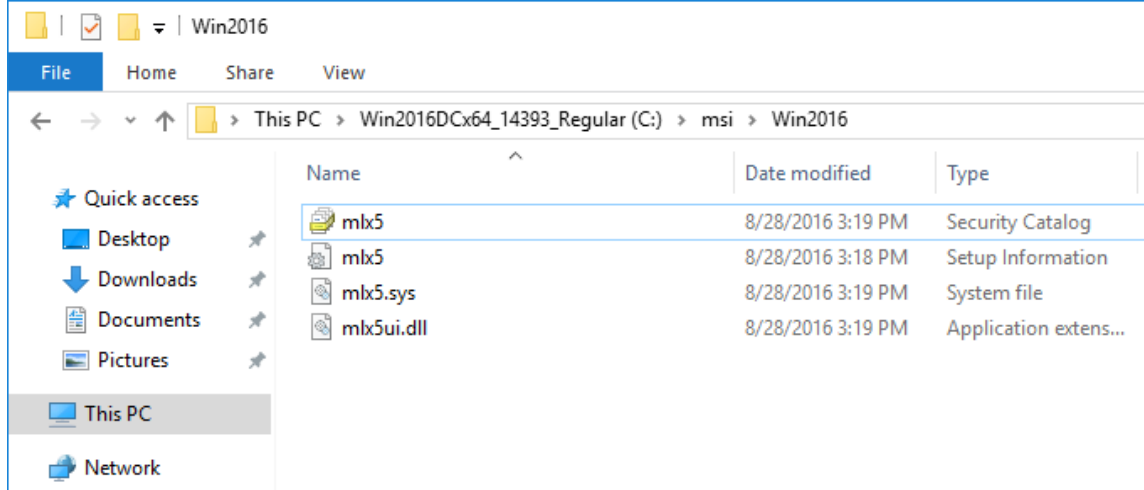
Deploying the Driver on a Nano Server

Offline Installation

To deploy the Driver on a Nano Server:

1. Go to the Mellanox WinOF web page at <http://www.mellanox.com> > Products > Ethernet Drivers > Windows SW/Drivers.
2. Download the driver (MLNX_WinOF2_MLNX_WinOF2-1_64_mlx5_All_win2016_x64_fre_1_64_15407.exe).
3. Extract the driver to a local directory (see [Extracting Files Without Running Installation](#)).
4. Copy the contents of this directory to C:\WS2016TP5_Drivers.

The directory contents should appear as follows:



This location should be specified for DriversPath property when injecting driver into the Nano server image:

```
New-NanoServerImage -MediaPath \\Path\To\Media\en_us -BasePath .\Base -TargetPath .\InjectingDrivers.vhdx
-DriversPath C:\WS2016TP5_Drivers
```

5. Create the Nano server image. Follow the instructions in the TechNet article for "[Getting Started with Nano Server](#)".

Online Update

1. Go to the Mellanox WinOF web page at <http://www.mellanox.com> > Products > Ethernet Drivers > Windows SW/Drivers.
2. Download the driver package.
3. Extract the Mellanox drivers to a local directory (see [Extracting Files Without Running Installation](#)).
4. Open a remote connection to the Nano server.
5. Copy all the driver files to the Nano server
6. Install the driver:

```
pnputil -I -a <Driver_Folder>\mlx5.inf
```

⚠ When upgrading the driver on a server where the remote connection was done over Mellanox device, there will be a loss of connectivity. To upgrade, it is recommended to run a script that will execute all the required upgrade commands.

Linux Driver Installation

This section describes how to install and test the Mellanox OFED for Linux package on a single server with a Mellanox ConnectX-6 Dx adapter card installed.

Prerequisites

Requirements	Description
Platforms	A server platform with ConnectX®-6 Dx (EN) (firmware: fw-ConnectX6 Dx)
Required Disk Space for Installation	1GB
Device ID	For the latest list of device IDs, please visit the Mellanox website at http://www.mellanox.com/page/firmware_HCA_FW_identification .
Operating System	Linux operating system. For the list of supported operating system distributions and kernels, please refer to the <i>Mellanox OFED Release Notes</i> file.
Installer Privileges	The installation requires administrator (root) privileges on the target machine.

Downloading Mellanox OFED

1. Verify that the system has a Mellanox network adapter installed.
The following example shows a system with an installed Mellanox adapter card:

```
# lspci -v | grep Mellanox
86:00.0 Network controller [0207]: Mellanox Technologies Family
      Subsystem: Mellanox Technologies Device 0014
86:00.1 Network controller [0207]: Mellanox Technologies Family
      Subsystem: Mellanox Technologies Device 0014
```

2. Download the ISO image to your host.
The image's name has the format `MLNX_OFED_LINUX-<ver>-<OS label><CPU arch>.iso`. You can download and install the latest OpenFabrics Enterprise Distribution (OFED) software package available via the Mellanox web site at <http://www.mellanox.com> > Products > Software > Ethernet Drivers > Linux SW/Drivers > Download..
 - a. Scroll down to the Download wizard, and click the Download tab.
 - b. Choose your relevant package depending on your host operating system.
 - c. Click the desired ISO/tgz package.
 - d. To obtain the download link, accept the End User License Agreement (EULA).
3. Use the md5sum utility to confirm the file integrity of your ISO image. Run the following command and compare the result to the value provided on the download page.

```
md5sum MLNX_OFED_LINUX-<ver>-<OS label>.iso
```

Installing Mellanox OFED

Installation Script

The installation script, `mlnxofedinstall`, performs the following:

- Discovers the currently installed kernel
- Uninstalls any software stacks that are part of the standard operating system distribution or another vendor's commercial stack
- Installs the MLNX_OFED_LINUX binary RPMs (if they are available for the current kernel)
- Identifies the currently installed Mellanox Ethernet network adapters and automatically upgrades the firmware.

Note: The firmware will not be updated if you run the install script with the '`--without-fw-update`' option.

Note: If you wish to perform a firmware upgrade using customized FW binaries, you can provide a path to the folder that contains the FW binary files, by running `--fw-image-dir`. Using this option, the FW version embedded in the MLNX_OFED package will be ignored. Example:

```
./mlnxofedinstall --fw-image-dir /tmp/my_fw_bin_files
```

Usage

```
./mnt/mlnxofedinstall [OPTIONS]
```

 Pre-existing configuration files will be saved with the extension ".conf.rpmsave".

The installation script removes all previously installed Mellanox OFED packages and re-installs from scratch. You will be prompted to acknowledge the deletion of the old packages.

- If you need to install Mellanox OFED on an entire (homogeneous) cluster, a common strategy is to mount the ISO image on one of the cluster nodes and then copy it to a shared file system such as NFS. To install on all the cluster nodes, use cluster-aware tools (such as `pdsh`).
- If your kernel version does not match with any of the offered pre-built RPMs, you can add your kernel version by using the "`mlnx_add_kernel_support.sh`" script located inside the MLNX_OFED package.

 On Redhat and SLES distributions with errata kernel installed there is no need to use the `mlnx_add_kernel_support.sh` script. The regular installation can be performed and weak updates mechanism will create symbolic links to the MLNX_OFED kernel modules.

The "`mlnx_add_kernel_support.sh`" script can be executed directly from the `mlnxofedinstall` script. For further information, please see '`--add-kernel-support`' option below.

 On Ubuntu and Debian distributions drivers installation use Dynamic Kernel Module Support (DKMS) framework. Thus, the drivers' compilation will take place on the host during MLNX_OFED installation. Therefore, using "`mlnx_add_kernel_support.sh`" is irrelevant on Ubuntu and Debian distributions.

Example

The following command will create a MLNX_OFED_LINUX ISO image for RedHat 6.3 under the /tmp directory.

```
# ./MLNX_OFED_LINUX-x.x-x-rhel6.3-x86_64/mlnx_add_kernel_support.sh -m /tmp/MLNX_OFED_LINUX-x.x-x-rhel6.3-x86_64/ --make-tgz
Note: This program will create MLNX_OFED_LINUX TGZ for rhel6.3 under /tmp directory.
All Mellanox, OEM, OFED, or Distribution IB packages will be removed.
Do you want to continue?[y/N]:y
See log file /tmp/mlnx_ofed_iso.21642.log

Building OFED RPMs. Please wait...
Removing OFED RPMs...
Created /tmp/MLNX_OFED_LINUX-x.x-x-rhel6.3-x86_64-ext.tgz
```

- The script adds the following lines to /etc/security/limits.conf for the userspace components such as MPI:
 - * soft memlock unlimited
 - * hard memlock unlimited
 - These settings set the amount of memory that can be pinned by a userspace application to unlimited. If desired, tune the value unlimited to a specific amount of RAM.

For your machine to be part of the Ethernet fabric, a Subnet Manager must be running on one of the fabric nodes. At this point, Mellanox OFED for Linux has already installed the OpenSM Subnet Manager on your machine.

For the list of installation options, run:

```
./mlnxofedinstall --h
```

 The DKMS (on Debian based OS) and the weak-modules (RedHat OS) mechanisms rebuild the initrd/initramfs for the respective kernel in order to add the MLNX_OFED drivers. When installing MLNX_OFED without DKMS support on Debian based OS, or without KMP support on RedHat or any other distribution, the initramfs will not be changed. Therefore, the inbox drivers may be loaded on boot. In this case, openibd service script will automatically unload them and load the new drivers that come with MLNX_OFED.

Installation Procedure

1. Login to the installation machine as root.
2. Mount the ISO image on your machine.

```
# mount -o ro,loop MLNX_OFED_LINUX-<ver>-<OS label>-<CPU arch>.iso /mnt
```

3. Run the installation script.

```
/mnt/mlnxofedinstall
Logs dir: /tmp/MLNX_OFED_LINUX-x.x-x.logs
This program will install the MLNX_OFED_LINUX package on your machine.
Note that all other Mellanox, OEM, OFED, RDMA or Distribution IB packages will be removed.
Those packages are removed due to conflicts with MLNX_OFED_LINUX, do not reinstall them.
Starting MLNX_OFED_LINUX-x.x.x installation ...
.....
Installation finished successfully.

Attempting to perform Firmware update...
Querying Mellanox devices firmware ...
```

 For unattended installation, use the --force installation option while running the MLNX_OFED installation script:

```
/mnt/mlnxofedinstall --force
```

 MLNX_OFED for Ubuntu should be installed with the following flags in the root environment:

```
./mlnxofedinstall --without-dkms --add-kernel-support --kernel <kernel version in chroot> --without-fw-update --force
```

For example:

```
./mlnxofedinstall --without-dkms --add-kernel-support --kernel 3.13.0-85-generic --without-fw-update --force
```

Note that the path to kernel sources (--kernel-sources) should be added if the sources are not in their default location.

 In case your machine has the latest firmware, no firmware update will occur and the installation script will print at the end of the installation a message similar to the following:

```
Device #1:
-----
```

```
Device Type:    ConnectX-6 Dx
Part Number:    MCX623436AC-CDAB
Description:    ConnectX@-6 Dx EN adapter card, 100GbE, OCP3.0, With Host Management,
Dual-port QSFP56, PCIe 4.0 x16, Crypto and Secure Boot, Thumbscrew (Pull Tab) Bracket
```

```
PSID: MT_2190110032
```

```
PCI Device Name: 0b:00.0
```

```
Base MAC: 0000e41d2d5cf810
```

```
Versions:      Current      Available
FW             16.22.0228    16.22.0228
Status:        Up to date
```

 In case your machine has an unsupported network adapter device, no firmware update will occur and one of the following error messages below will be printed. Please contact your hardware vendor for help on firmware updates.

Error message 1:

```
Device #1:
-----
```

```
Device Type:    ConnectX-6 Dx
Part Number:    MCX623436AC-CDAB
Description:    ConnectX@-6 Dx EN adapter card, 100GbE, OCP3.0, With Host Management,
Dual-port QSFP56, PCIe 4.0 x16, Crypto and Secure Boot, Thumbscrew (Pull Tab) Bracket
```

```
PSID: MT_2190110032
```

```
PCI Device Name: 0b:00.0
```

```
Base MAC: 0000e41d2d5cf810
```

```
Versions:      Current      Available
FW             16.22.0228    N/A
```

```
Status: No matching image found
```

Error message 2:

```
The firmware for this device is not distributed inside Mellanox driver: 0000:01:00.0 (PSID:
IBM2150110033)
To obtain firmware for this device, please contact your HW vendor.
```

4. If the installation script has performed a firmware update on your network adapter, complete the step relevant to your adapter card type to load the firmware:

- ConnectX-6 Dx/ConnectX-6 Dx Ex - perform a standard reboot
- Otherwise, restart the driver by running: `/etc/init.d/openibd restart`

After installation completion, information about the Mellanox OFED installation, such as prefix, kernel version, and installation parameters can be retrieved by running the command `/etc/infiniband/info`.

Most of the Mellanox OFED components can be configured or reconfigured after the installation, by modifying the relevant configuration files. See the relevant chapters in this manual for details.

The list of the modules that will be loaded automatically upon boot can be found in the `/etc/infiniband/openib.conf` file.

Installation Results

Software	• Most of MLNX_OFED packages are installed under the <code>/usr</code> directory except for the following packages which are installed under the <code>/opt</code> directory: • <code>fca</code> and <code>ibutils</code> • The kernel modules are installed under • <code>/lib/modules/`uname -r`/updates</code> on SLES and Fedora Distributions • <code>/lib/modules/`uname -r`/extra/mlnx-ofa_kernel</code> on RHEL and other Red Hat like Distributions
Firmware	• The firmware of existing network adapter devices will be updated if the following two conditions are fulfilled: • The installation script is run in default mode; that is, without the option <code>--without-fw-update</code> • The firmware version of the adapter device is older than the firmware version included with the Mellanox OFED ISO image Note: If an adapter's flash was originally programmed with an Expansion ROM image, the automatic firmware update will also burn an Expansion ROM image. • In case that your machine has an unsupported network adapter device, no firmware update will occur and the error message below will be printed. The firmware for this device is not distributed inside Mellanox driver: 0000:01:00.0 (PSID: IBM2150110033) To obtain firmware for this device, please contact your HW vendor.

Installation Logs

While installing MLNX_OFED, the install log for each selected package will be saved in a separate log file. The path to the directory containing the log files will be displayed after running the installation script in the following format: `"Logs dir: /tmp/MLNX_OFED_LINUX-<version>.<PD>.logs"`.

Example:

```
Logs dir: /tmp/MLNX_OFED_LINUX-4.4-1.0.0.0.63414.logs
```

openibd Script

As of MLNX_OFED v2.2-1.0.0 the `openibd` script supports pre/post start/stop scripts: This can be controlled by setting the variables below in the `/etc/infiniband/openibd.conf` file.

```
OPENIBD_PRE_START
OPENIBD_POST_START
OPENIBD_PRE_STOP
OPENIBD_POST_STOP
```

Example:

```
OPENIBD_POST_START=/sbin/openibd_post_start.sh
```

 An example of OPENIBD_POST_START script for activating all interfaces is provided in the MLNX_OFED package under the docs/scripts/openibd-post-start-configure-interfaces/ folder.

Driver Load Upon System Boot

Upon system boot, the Mellanox drivers will be loaded automatically.

To prevent the automatic load of the Mellanox drivers upon system boot:

1. Add the following lines to the "/etc/modprobe.d/mlnx.conf" file.

```
blacklist mlx4_core
blacklist mlx4_en
blacklist mlx5_core
blacklist mlx5_ib
```

2. Set "ONBOOT=no" in the "/etc/infiniband/openib.conf" file.
3. If the modules exist in the initramfs file, they can automatically be loaded by the kernel. To prevent this behavior, update the initramfs using the operating systems' standard tools.
Note: The process of updating the initramfs will add the blacklists from step 1, and will prevent the kernel from loading the modules automatically.

mlnxofedinstall Return Codes

The table below lists the mlnxofedinstall script return codes and their meanings.

Return Code	Meaning
0	The installation ended successfully
1	The installation failed
2	No firmware was found for the adapter device
22	Invalid parameter
28	Not enough free space
171	Not applicable to this system configuration. This can occur when the required hardware is not present on the system.
172	Prerequisites are not met. For example, missing the required software installed or the hardware is not configured correctly.
173	Failed to start the mst driver

Uninstalling MLNX_OFED

Use the script `/usr/sbin/ofed_uninstall.sh` to uninstall the Mellanox OFED package. The script is part of the `ofed-scripts` RPM.

Installing MLNX_OFED Using YUM

This type of installation is applicable to RedHat/OL, Fedora, XenServer Operating Systems.

Setting up MLNX_OFED YUM Repository

1. Log into the installation machine as root.
2. Mount the ISO image on your machine and copy its content to a shared location in your network.

```
# mount -o ro,loop MLNX_OFED_LINUX-<ver>-<OS label>-<CPU arch>.iso /mnt
```

3. Download and install Mellanox Technologies GPG-KEY:
The key can be downloaded via the following link: <http://www.mellanox.com/downloads/ofed/RPM-GPG-KEY-Mellanox>

```
# wget http://www.mellanox.com/downloads/ofed/RPM-GPG-KEY-Mellanox
--2014-04-20 13:52:30-- http://www.mellanox.com/downloads/ofed/RPM-GPG-KEY-Mellanox
Resolving www.mellanox.com... 72.3.194.0
Connecting to www.mellanox.com[72.3.194.0]:80... connected.
HTTP request sent, awaiting response... 200 OK
Length: 1354 (1.3K) [text/plain]
Saving to: ?RPM-GPG-KEY-Mellanox?

100%[=====] 1,354 --K/s in 0s
2014-04-20 13:52:30 (247 MB/s) - ?RPM-GPG-KEY-Mellanox? saved [1354/1354]
```

4. Install the key.

```
# sudo rpm --import RPM-GPG-KEY-Mellanox
warning: rpmts_HdrFromFdno: Header V3 DSA/SHA1 Signature, key ID 6224c050: NOKEY
Retrieving key from file:///repos/MLNX_OFED/<MLNX_OFED file>/RPM-GPG-KEY-Mellanox
Importing GPG key 0x6224C050:
Userid: "Mellanox Technologies (Mellanox Technologies - Signing Key v2) <support@mellanox.com>"
From : /repos/MLNX_OFED/<MLNX_OFED file>/RPM-GPG-KEY-Mellanox
Is this ok [y/N]:
```

5. Check that the key was successfully imported.

```
# rpm -q gpg-pubkey --qf '%{NAME}-%{VERSION}-%{RELEASE}\t%{SUMMARY}\n' | grep Mellanox
gpg-pubkey-a9e4b643-520791ba gpg (Mellanox Technologies <support@mellanox.com>)
```

6. Create a yum repository configuration file called `"/etc/yum.repos.d/mlnx_ofed.repo"` with the following content:

```
[mlnx_ofed]
name=MLNX_OFED Repository
baseurl=file:///<path to extracted MLNX_OFED package>/RPMs
enabled=1
gpgkey=file:///<path to the downloaded key RPM-GPG-KEY-Mellanox>
gpgcheck=1
```

7. Check that the repository was successfully added.

```
# yum repolist
Loaded plugins: product-id, security, subscription-manager
This system is not registered to Red Hat Subscription Management. You can use subscription-manager to
register.
repo id      repo name      status
mlnx_ofed    MLNX_OFED Repository    108
rpmforge     RHEL 6Server - RPMforge.net - dag    4,597
repolist: 8,351
```

Installing MLNX_OFED Using the YUM Tool

After setting up the YUM repository for MLNX_OFED package, perform the following:

1. View the available package groups by invoking:

```
# yum search mlnx-ofed-
mlnx-ofed-all.noarch : MLNX_OFED all installer package (with KMP support)
mlnx-ofed-basic.noarch : MLNX_OFED basic installer package (with KMP support)
mlnx-ofed-guest.noarch : MLNX_OFED guest installer package (with KMP support)
mlnx-ofed-hpc.noarch : MLNX_OFED hpc installer package (with KMP support)
mlnx-ofed-hypervisor.noarch : MLNX_OFED hypervisor installer package (with KMP support)
mlnx-ofed-vma.noarch : MLNX_OFED vma installer package (with KMP support)
mlnx-ofed-vma-eth.noarch : MLNX_OFED vma-eth installer package (with KMP support)
mlnx-ofed-vma-vpi.noarch : MLNX_OFED vma-vpi installer package (with KMP support)
```

Where:

mlnx-ofed-all	Installs all available packages in MLNX_OFED.
mlnx-ofed-basic	Installs basic packages required for running Mellanox cards.
mlnx-ofed-guest	Installs packages required by guest OS.
mlnx-ofed-hpc	Installs packages required for HPC.
mlnx-ofed-hypervisor	Installs packages required by hypervisor OS.
mlnx-ofed-vma	Installs packages required by VMA.
mlnx-ofed-vma-eth	Installs packages required by VMA to work over Ethernet.
mlnx-ofed-vma-vpi	Installs packages required by VMA to support VPI.

Note: MLNX_OFED provides kernel module RPM packages with KMP support for RHEL and SLES. For other operating systems, kernel module RPM packages are provided only for the operating systems' default kernel. In this case, the group RPM packages have the supported kernel version in their package's name.

Example:

```
mlnx-ofed-all-3.17.4-301.fc21.x86_64.noarch : MLNX_OFED all installer package for kernel 3.17.4-301.fc21.x86_64 (without KMP support)
mlnx-ofed-basic-3.17.4-301.fc21.x86_64.noarch : MLNX_OFED basic installer package for kernel 3.17.4-301.fc21.x86_64 (without KMP support)
mlnx-ofed-guest-3.17.4-301.fc21.x86_64.noarch : MLNX_OFED guest installer package for kernel 3.17.4-301.fc21.x86_64 (without KMP support)
mlnx-ofed-hpc-3.17.4-301.fc21.x86_64.noarch : MLNX_OFED hpc installer package for kernel 3.17.4-301.fc21.x86_64 (without KMP support)
mlnx-ofed-hypervisor-3.17.4-301.fc21.x86_64.noarch : MLNX_OFED hypervisor installer package for kernel 3.17.4-301.fc21.x86_64 (without KMP support)
mlnx-ofed-vma-3.17.4-301.fc21.x86_64.noarch : MLNX_OFED vma installer package for kernel 3.17.4-301.fc21.x86_64 (without KMP support)
mlnx-ofed-vma-eth-3.17.4-301.fc21.x86_64.noarch : MLNX_OFED vma-eth installer package for kernel 3.17.4-301.fc21.x86_64 (without KMP support)
mlnx-ofed-vma-vpi-3.17.4-301.fc21.x86_64.noarch : MLNX_OFED vma-vpi installer package for kernel 3.17.4-301.fc21.x86_64 (without KMP support)
```

If you have an operating system different than RHEL or SLES, or you have installed a kernel that is not supported by default in MLNX_OFED, you can use the `mlnx_add_kernel_support.sh` script to build MLNX_OFED for your kernel.

The script will automatically build the matching group RPM packages for your kernel so that you can still install MLNX_OFED via yum.

Please note that the resulting MLNX_OFED repository will contain unsigned RPMs, therefore, you should set 'gpgcheck=0' in the repository configuration file.

2. Install the desired group.

```
# yum install mlnx-ofed-all
Loaded plugins: langpacks, product-id, subscription-manager
Resolving Dependencies
--> Running transaction check
--> Package mlnx-ofed-all.noarch 0:3.1-0.1.2 will be installed
--> Processing Dependency: kmod-iser = 1.0-OFED.3.1.0.1.2.1.g832a737.rhel7ul for package:
mlnx-ofed-all-3.1-0.1.2.noarch
.....
qperf.x86_64 0:0.4.9-9
rds-devel.x86_64 0:2.0.7-1.12
rds-tools.x86_64 0:2.0.7-1.12
sdpnetstat.x86_64 0:1.60-26
srptools.x86_64 0:1.0.2-12

Complete!
```

Uninstalling MLNX_OFED Using the YUM Tool

Use the script `/usr/sbin/ofed_uninstall.sh` to uninstall the Mellanox OFED package. The script is part of the `ofed-scripts RPM`.

Installing MLNX_OFED Using apt-get Tool

This type of installation is applicable to Debian and Ubuntu operating systems.

Setting up MLNX_OFED apt-get Repository

1. Log into the installation machine as root.
2. Extract the MLNX_OFED package on a shared location in your network.
You can download it from <http://www.mellanox.com> > Products > Software > Ethernet Drivers.
3. Create an apt-get repository configuration file called `"/etc/apt/sources.list.d/mlnx_ofed.list"` with the following content:

```
# deb file:/<path to extracted MLNX_OFED package>/DEBS ./
```

4. Download and install Mellanox Technologies GPG-KEY.

```
# wget -qO - http://www.mellanox.com/downloads/ofed/RPM-GPG-KEY-Mellanox | sudo apt-key add -
```

5. Check that the key was successfully imported.

```
# apt-key list
pub 1024D/A9E4B643 2013-08-11
uid Mellanox Technologies <support@mellanox.com>
sub 1024g/09FCC269 2013-08-11
```

6. Update the apt-get cache.

```
# sudo apt-get update
```

Installing MLNX_OFED Using the apt-get Tool

After setting up the apt-get repository for MLNX_OFED package, perform the following:

1. View the available package groups by invoking:

```
<pre># apt-cache search mlnx-ofed-
mlnx-ofed-vma-eth - MLNX_OFED vma-eth installer package (with DKMS support)
mlnx-ofed-hpc - MLNX_OFED hpc installer package (with DKMS support)
mlnx-ofed-vma-vpi - MLNX_OFED vma-vpi installer package (with DKMS support)
mlnx-ofed-basic - MLNX_OFED basic installer package (with DKMS support)
mlnx-ofed-vma - MLNX_OFED vma installer package (with DKMS support)
mlnx-ofed-all - MLNX_OFED all installer package (with DKMS support)
```

Where:

```
mlnx-ofed-all      MLNX_OFED all installer package.
mlnx-ofed-basic    MLNX_OFED basic installer package.
mlnx-ofed-vma      MLNX_OFED vma installer package.
mlnx-ofed-hpc      MLNX_OFED HPC installer package.
mlnx-ofed-vma-eth  MLNX_OFED vma-eth installer package.
mlnx-ofed-vma-vpi  MLNX_OFED vma-vpi installer package.
```

2. Install the desired group.

```
# apt-get install '<group name>'
```

Example:

```
# apt-get install mlnx-ofed-all
```

 Installing MLNX_OFED using the “apt-get” tool does not automatically update the firmware. To update the firmware to the version included in MLNX_OFED package, run:
apt-get install mlnx-fw-updater
Or, update the firmware to the latest version available on Mellanox Technologies’ Web site as described in [Updating Adapter Firmware](#).

Uninstalling MLNX_OFED Using the apt-get Tool

Use the script `/usr/sbin/ofed_uninstall.sh` to uninstall the Mellanox OFED package. The script is part of the `ofed-scripts` package.

Updating Firmware After Installation

The firmware can be updated either manually or automatically (upon system boot), as described in the sections below.

Updating the Device Online

To update the device online on the machine from the Mellanox site, use the following command line:

```
mlxfwmanager --online -u -d <device>
```

Example:

```

mlxfwmanager --online -u -d 0000:09:00.0
Querying Mellanox devices firmware ...
Device #1:
-----
Device Type:      ConnectX-6 Dx
Part Number:      MCX623436AC-CDAB
Description:      ConnectX@-6 Dx EN adapter card, 100GbE, OCP3.0, With Host Management, Dual-port QSFP56, PCIe 4.0
x16, Crypto and Secure Boot, Thumbscrew (Pull Tab) Bracket
PSID:             MT_1020120019
PCI Device Name:  0000:09:00.0
Port1 GUID:       0002c9000100d051
Port2 MAC:        0002c9000002
Versions:         Current          Available
                  FW 2.32.5000      2.33.5000
Status:           Update required
-----
Found 1 device(s) requiring firmware update. Please use -u flag to perform the update.

```

Updating the Device Manually

To update the device manually, please refer to the [OEM Firmware Download page](http://www.mellanox.com/page/firmware_table_dell?mtag=oem_firmware_download) at http://www.mellanox.com/page/firmware_table_dell?mtag=oem_firmware_download.

In case that you ran the `mlnxofedinstall` script with the `'--without-fw-update'` option or you are using an OEM card and now you wish to (manually) update firmware on your adapter card(s), you need to perform the steps below. The following steps are also appropriate in case that you wish to burn newer firmware that you have downloaded from Mellanox Technologies' Web site (<http://www.mellanox.com> > Support > Firmware Download).

1. Get the device's PSID.

```

mlxfwmanager_pci | grep PSID
PSID: MT_1210110019

```

2. Download the firmware BIN file from the Mellanox website or the OEM website.
3. Burn the firmware.

```

mlxfwmanager_pci -i <fw_file.bin>

```

4. Reboot your machine after the firmware burning is completed.

Updating the Device Firmware Automatically upon System Boot

As of MLNX_OFED v3.1-x.x.x, firmware can be automatically updated upon system boot. The firmware update package (`mlnx-fw-updater`) is installed in the `"/opt/mellanox/mlnx-fw-updater"` folder, and `openibd` service script can invoke the firmware update process if requested on boot.

If the firmware is updated, the following message is printed to the system's standard logging file:

```

fw_updater: Firmware was updated. Please reboot your system for the changes to take effect.

```

Otherwise, the following message is printed:

```

fw_updater: Didn't detect new devices with old firmware.

```

Please note, this feature is disabled by default. To enable the automatic firmware update upon system boot, set the following parameter to "yes" `"RUN_FW_UPDATER_ONBOOT=yes"` in the `openibd` service configuration file `"/etc/infiniband/openib.conf"`.

You can opt to exclude a list of devices from the automatic firmware update procedure. To do so, edit the configurations file `"/opt/mellanox/mlnx-fw-updater/mlnx-fw-updater.conf"` and provide a comma

separated list of PCI devices to exclude from the firmware update.
Example:

```
MLNX_EXCLUDE_DEVICES="00:05.0,00:07.0"
```

UEFI Secure Boot

All kernel modules included in MLNX_OFED for RHEL7 and SLES12 are signed with x.509 key to support loading the modules when Secure Boot is enabled.

Enrolling Mellanox's x.509 Public Key on Your Systems

In order to support loading MLNX_OFED drivers when an OS supporting Secure Boot boots on a UEFI-based system with Secure Boot enabled, the Mellanox x.509 public key should be added to the UEFI Secure Boot key database and loaded onto the system key ring by the kernel.
Follow these steps below to add the Mellanox's x.509 public key to your system:

 Prior to adding the Mellanox's x.509 public key to your system, please make sure that (1) The 'mokutil' package is installed on your system, and (2) The system is booted in UEFI mode.

1. Download the x.509 public key.

```
# wget http://www.mellanox.com/downloads/ofed/mlnx_signing_key_pub.der
```

2. Add the public key to the MOK list using the mokutil utility.

```
# mokutil --import mlnx_signing_key_pub.der
```

3. Reboot the system.

The pending MOK key enrollment request will be noticed by shim.efi and it will launch MokManager.efi to allow you to complete the enrollment from the UEFI console. You will need to enter the password you previously associated with this request and confirm the enrollment. Once done, the public key is added to the MOK list, which is persistent. Once a key is in the MOK list, it will be automatically propagated to the system key ring and subsequent will be booted when the UEFI Secure Boot is enabled.

 To see what keys have been added to the system key ring on the current boot, install the 'keyutils' package and run: `#keyctl list %::system_keyring#`

Removing Signature from kernel Modules

The signature can be removed from a signed kernel module using the 'strip' utility which is provided by the 'binutils' package. The strip utility will change the given file without saving a backup. The operation can be undo only by resigning the kernel module. Hence, we recommend backing up a copy prior to removing the signature.

To remove the signature from the MLNX_OFED kernel modules:

1. Remove the signature.

```
# rpm -qa | grep -E "kernel-ib|mlnx-ofa_kernel|iser|srp|knem|mlnx-rds|mlnx-nfsrdma|mlnx-nvme|mlnx-rdma-rxe"
| xargs rpm -ql | grep "\.ko$" | xargs strip -g
```

After the signature has been removed, a message as the below will no longer be presented upon module loading:

```
"Request for unknown module key 'Mellanox Technologies signing key:
61feb074fc7292f958419386ffdd9d5ca999e403' err -11"
```

However, please note that a similar message as the following will still be presented:

```
"my_module: module verification failed: signature and/or required key missing - tainting kernel"
```

This message is only presented once, upon first module boot that either has no signature or whose key is not in the kernel key ring. Therefore, this message may go unnoticed. Once the system is rebooted after unloading and reloading a kernel module, the message will appear. (Note that this message cannot be eliminated.)

2. Update the initramfs on RHEL systems with the stripped modules.

```
mkinitrd /boot/initramfs-$(uname -r).img $(uname -r) --force
```

Performance Tuning

Depending on the application of the user's system, it may be necessary to modify the default configuration of network adapters based on the ConnectX® adapters. In case that tuning is required, please refer to the [Performance Tuning Guide for Mellanox Network Adapters](https://community.mellanox.com/docs/DOC-2489) at <https://community.mellanox.com/docs/DOC-2489>.

VMware Driver Installation

This section describes VMware Driver Installation.

Hardware and Software Requirements

Requirement	Description
Platforms	A server platform with an adapter card based on one of the following Mellanox Technologies' devices: • ConnectX®-6 Dx (EN) (firmware: fw-ConnectX6 Dx)
Device ID	For the latest list of device IDs, please visit Mellanox's website.
Operating System	ESXi 6.5
Installer Privileges	The installation requires administrator privileges on the target machine.

Installing Mellanox NATIVE ESXi Driver for VMware vSphere

 Please uninstall all previous Mellanox driver packages prior to installing the new version. See [Removing Earlier Mellanox Drivers](#) for further information.

To install the driver:

1. Log into the ESXi server with root permissions.
2. Install the driver.

```
#> esxcli software vib install -d <path>/<bundle_file>
```

Example:

```
#> esxcli software vib install -d /tmp/MLNX-NATIVE-ESX-ConnectX-4-5_4.16.8.8-10EM-650.0.0.4240417.zip
```

3. Reboot the machine.
4. Verify the driver was installed successfully.

```
esxcli software vib list | grep nmlx  
nmlx5-core      4.16.8.8-10EM.650.0.0.4240417  MEL  PartnerSupported 2017-01-31  
nmlx5-rdma      4.16.8.8-10EM.650.0.0.4240417  MEL  PartnerSupported 2017-01-31
```

 After the installation process, all kernel modules are loaded automatically upon boot.

Removing Earlier Mellanox Drivers

 Please unload the previously installed drivers before removing them.

To remove all the drivers:

1. Log into the ESXi server with root permissions.
2. List all the existing NATIVE ESXi driver modules. (See Step 4 in [Installing Mellanox NATIVE ESXi Driver for VMware vSphere.](#))
3. Remove each module:

```
#> esxcli software vib remove -n nmlx5-rdma  
#> esxcli software vib remove -n nmlx5-core
```

 To remove the modules, you must run the command in the same order as shown in the example above.

4. Reboot the server.

Firmware Programming

- a. Download the VMware bootable binary images from the [Mellanox Firmware Tools \(MFT\) site](#).
- b. Install the image according to the steps described in the [MFT User Manual](#).



The following procedure requires custom boot image downloading, mounting and booting from a USB device.

Updating Adapter Firmware

Each adapter card is shipped with the latest version of qualified firmware at the time of manufacturing. However, Mellanox issues firmware updates occasionally that provide new features and bug fixes. To check that your card is programmed with the latest available firmware version, download the mlxup firmware update and query utility. The utility can query for available Mellanox adapters and indicate which adapters require a firmware update. If the user confirms, mlxup upgrades the firmware using embedded images. The latest mlxup executable and documentation are available from <http://www.mellanox.com> > Products > Software > Firmware Tools.

Firmware Update Example

```
[server1]# ./mlxup
Querying Mellanox devices firmware ...
Device Type:      ConnectX-6 Dx
Part Number:      MCX623436AC-CDAB
Description:      ConnectX@-6 Dx EN adapter card, 100GbE, OCP3.0, With Host Management, Dual-port QSFP56, PCIe 4.0
x16, Crypto and Secure Boot, Thumbscrew (Pull Tab) Bracket
PSID:             MT_2190110032
PCI Device Name:  0000:06:00.0
Base GUID:        e41d2d0300fd8b8a
Versions:         Current      Available
                  FW 16.00.0000 16.00.0000

Status:           Up to date
Device Type:      ConnectX-6 Dx
Part Number:      MCX623436AC-CDAB
Description:      ConnectX@-6 Dx EN adapter card, 100GbE, OCP3.0, With Host Management, Dual-port QSFP56, PCIe 4.0
x16, Crypto and Secure Boot, Thumbscrew (Pull Tab) Bracket
PCI Device Name:  0000:07:00.0
Base MAC:         0000e41d2da206d4
Versions:         Current      Available
                  FW 16.20.1000 16.24.1000

Status:           Update required

Perform FW update? [y/N]: y
Device #1: Up to date
Device #2: Updating FW ... Done

Restart needed for updates to take effect.
Log File: /var/log/mlxup/mlxup-yyyymmdd.log
```

Troubleshooting

General Troubleshooting

Server unable to find the adapter	• Ensure that the adapter is placed correctly • Make sure the adapter slot and the adapter are compatible Install the adapter in a different PCI Express slot • Use the drivers that came with the adapter or download the latest • Make sure your motherboard has the latest BIOS • Try to reboot the server
The adapter no longer works	• Reseat the adapter in its slot or a different slot, if necessary • Try using another cable • Reinstall the drivers for the network driver files may be damaged or deleted • Reboot the server
Adapters stopped working after installing another adapter	• Try removing and re-installing all adapters • Check that cables are connected properly • Make sure your motherboard has the latest BIOS
Link indicator light is off	• Try another port on the switch • Make sure the cable is securely attached • Check you are using the proper cables that do not exceed the recommended lengths • Verify that your switch and adapter port are compatible
Link light is on, but with no communication established	• Check that the latest driver is loaded • Check that both the adapter and its link are set to the same speed and duplex settings

Linux Troubleshooting

Environment Information	<pre>cat /etc/issue uname -a cat /proc/cupinfo grep 'model name' uniq ofed_info -s ifconfig -a ip link show ethtool <interface> ethtool -i <interface_of_Mellanox_port_num> ibdev2netdev</pre>
Card Detection	<pre>lspci grep -i Mellanox</pre>

Mellanox Firmware Tool (MFT)	Download and install MFT: http://www.mellanox.com/content/pages.php?pg=management_tools&menu_section=34 Refer to the User Manual for installation instructions. Once installed, run: mst start mst status flint -d <mst_device> q
Ports Information	ibstat ibv_devinfo
Firmware Version Upgrade	To download the latest firmware version refer to http://www.mellanox.com/supportdownloader
Collect Log File	cat /var/log/messages dmesg >> system.log journalctl (Applicable on new operating systems) cat /var/log/syslog

Windows Troubleshooting

Environment Information	From the Windows desktop choose the Start menu and run: msinfo32 To export system information to a text file, choose the Export option from the File menu. Assign a file name and save.
Mellanox Firmware Tool (MFT)	Download and install MFT: http://www.mellanox.com/content/pages.php?pg=management_tools&menu_section=34 Refer to the User Manual for installation instructions. Once installed, open a CMD window and run: WinMFT mst start mst status flint -d <mst_device> q
Ports Information	vstat
Firmware Version Upgrade	Download the latest firmware version using the PSID/board ID: http://www.mellanox.com/supportdownloader/ flint -d <mst_device> -i <firmware_bin_file> b
Collect Log File	• Event log viewer • MST device logs: • mst start • mst status • flint -d <mst_device> dc > dump_configuration.log • mstdump <mst_device> dc > mstdump.log

Specifications

⚠ Install the ConnectX-6 Dx OCP 3.0 card in a PCIe slot that is capable of supplying the power levels mentioned below for the appropriate use case

⚠ In Standby mode only port0 is available.

MCX623432A[E/N/C]-ADAB Specifications

Physical	Form Factor: Small Form Factor (SFF) OCP 3.0 Size: 4.52 in. x 2.99 in (115.00mm x 76.00mm)			
	Connector: Dual SFP28 Ethernet (copper and optical)			
	Retention Mechanism: Thumbscrew (Pull Tab) Bracket			
Protocol Support	Ethernet: 25GBASE-R, 20GBASE-KR2, 10GBASE-LR,10GBASE-ER, 10GBASE-CX4, 10GBASE-KX4, 10GBASE-CR, 10GBASE-KR, SGMII, 1000BASE-CX, 1000BASE-KX, 10GBASE-SR			
	Data Rate:	Ethernet	1/10/25 Gb/s	
	PCI Express Gen 4.0: SERDES @ 16.0GT/s, 16 lanes (2.0 and 1.1 compatible)			
Power and Environmental	Voltage: 3.3VAUX, 12V			
	Power	Cable Type	Active Mode	Standby Mode
	Typical Power ^(b)	Passive Cables	15.7W	3.8W
	Maximum Power	Passive Cables	19.74W	7.95W
		1.5W Active Cables	23.1W	9.5W
	Maximum power available through SFP28 port: 1.5W			
	Temperature	Operational	0°C to 55°C	
		Non-operational	-40°C to 70°C	
	Humidity	90% relative humidity ^(c)		
	Altitude (Operational)	3050m		
Environmental	Airflow	Cable Type	Hot Aisle HSK to Port	Cold Aisle @35C Port to HSK

			Active Mode @55C	Standby Mode @45C	Active Mode	Standby Mode
		Passive Cable	400LFM	100LFM	TBD	TBD
		Active 0.8W Cable	400LFM	100LFM	TBD	TBD
		Active 1.5W Cable	500LFM	150LFM	TBD	TBD
Regulatory	Safety	CB / cTUVus / CE				
	EMC	CE / FCC / VCCI / ICES / RCM				
	RoHS	RoHS compliant				

- a. ConnectX-6 Dx adapters supplement the auto-negotiation specification to get better bit error rates and longer cable reaches. This supplemental feature only initiates when connected to another Mellanox Ethernet product.
- b. Typical power for ATIS traffic load.
- c. For both operational and non-operational states.

MCX623432A[N/C]-GDAB/MCX623432AS-GDAI Specifications

Physical	Form Factor: Small Form Factor (SFF) OCP 3.0 Size: 4.52 in. x 2.99 in (115.00mm x 76.00mm)		
	Connector: Dual SFP56 Ethernet (copper and optical)		
	Retention Mechanism:	MCX623432A[N/C]-GDAB: Thumbscrew (Pull Tab) Bracket	
		MCX623432AS-GDAI: Internal Lock	
Protocol Support	Ethernet: 50GBASE-R2, 50GBASE-R4, 40GBASE-CR4, 40GBASE-KR4, 40GBASE-SR4, 40GBASE-LR4, 40GBASE-ER4, 40GBASE-R2, 25GBASE-R, 20GBASE-KR2, 10GBASE-LR, 10GBASE-ER, 10GBASE-CX4, 10GBASE-CR, 10GBASE-KR, SGMII, 1000BASE-CX, 1000BASE-KX, 10GBASE-SR		
	Data Rate	Ethernet	1/10/25/40/50 Gb/s
	PCI Express Gen 4.0: SERDES @ 16.0GT/s, 16 lanes (2.0 and 1.1 compatible)		

Power and Environmental	Voltage: 3.3VAUX, 12V					
	Power	Cable Type	Active Mode		Standby Mode	
	Typical Power ^(b)	Passive Cables	16.9W		4.54W	
	Maximum Power	Passive Cables	21.4W		8.75W	
		2W Active Cables	25.94W		11W	
	Maximum power available through SFP56 port: 2W					
	Temperature	Operational	0°C to 55°C			
		Non-operational	-40°C to 70°C			
	Humidity	90% relative humidity ^(c)				
	Altitude (Operational)	3050m				
Environmental	Airflow	Cable Type	Hot Aisle HSK to Port		Cold Aisle @35C Port to HSK	
			Active Mode @ 55C	Standby Mode @45C	Active Mode	Standby Mode
		Passive Cable	400LFM	100LFM	TBD	TBD
		Active 2W Cable	800LFM	200LFM	TBD	TBD
Regulatory	Safety	CB / cTUVus / CE				
	EMC	CE / FCC / VCCI / ICES / RCM				
	RoHS	RoHS compliant				

- a. ConnectX-6 Dx adapters supplement the auto-negotiation specification to get better bit error rates and longer cable reaches. This supplemental feature only initiates when connected to another Mellanox Ethernet product.
- b. Typical power for ATIS traffic load.
- c. For both operational and non-operational states.

MCX623435MN-CDAB Specifications

Physical	Form Factor: Small Form Factor (SFF) OCP 3.0 Size: 4.52 in. x 2.99 in (115.00mm x 76.00mm)
----------	---

Protocol Support	Connector: Single QSFP56 Ethernet (copper and optical)					
	Retention Mechanism: Thumbscrew (Pull Tab) Bracket					
	Ethernet: 100GBASE-CR4, 100GBASE-KR4, 100GBASE-SR4, 50GBASE-R2, 50GBASE-R4, 40GBASE-CR4, 40GBASE-KR4, 40GBASE-SR4, 40GBASE-LR4, 40GBASE-ER4, 40GBASE-R2, 25GBASE-R, 20GBASE-KR2, 10GBASE-LR,10GBASE-ER, 10GBASE-CX4, 10GBASE-CR, 10GBASE-KR, SGMII, 1000BASE-CX, 1000BASE-KX, 10GBASE-SR					
	Data Rate:	Ethernet	1/10/25/40/50/100 Gb/s			
Power and Environmental	PCI Express Gen 4.0: SERDES @ 16.0GT/s, 16 lanes (2.0 and 1.1 compatible)					
	Voltage: 3.3VAUX, 12V					
	Power	Cable Type	Active Mode		Standby Mode	
	Typical Power ^(b)	Passive Cables	18W		5.7W	
	Maximum Power	Passive Cables	23.4W		10W	
		3.5W Active Cables	27.4W		14W	
	Maximum power available through QSFP56 port: 3.5W					
	Temperature	Operational	0°C to 55°C			
		Non-operational	-40°C to 70°C			
	Humidity	90% relative humidity ^(c)				
	Altitude (Operational)	3050m				
Environmental	Airflow	Cable Type	Hot Aisle HSK to Port		Cold Aisle @35C Port to HSK	
			Active Mode @55C	Standby Mode @50C	Active Mode	Standby Mode
		Passive Cable	500LFM	100LFM	300LFM	100LFM
		Active 2.5W Mellanox Cable	700LFM	200LFM	300LFM	100LFM
		Active 3.5W Cable	700LFM @50C	300LFM	300LFM	100LFM
Regulatory	Safety	CB / cTUVus / CE				
	EMC	CE / FCC / VCCI / ICES / RCM				
	RoHS	RoHS compliant				

a. ConnectX-6 Dx adapters supplement the auto-negotiation specification to get better bit error rates and longer cable reaches. This supplemental feature only initiates when connected to another Mellanox Ethernet product.

b. Typical power for ATIS traffic load.

c. For both operational and non-operational states.

MCX623436A[N/C]-CDAB/MCX623436AS- CDAI Specifications

Physical	Form Factor: Small Form Factor (SFF) OCP 3.0 Size: 4.52 in. x 2.99 in (115.00mm x 76.00mm)					
	Connector: Dual QSFP56 Ethernet (copper and optical)					
	Retention Mechanism:	MCX623436A[N/C]-CDAB: Thumbscrew (Pull Tab) Bracket				
		MCX623436AS-CDAI: Internal Lock Bracket				
Protocol Support	Ethernet: 100GBASE-CR4, 100GBASE-KR4, 100GBASE-SR4, 50GBASE-R2, 50GBASE-R4, 40GBASE-CR4, 40GBASE-KR4, 40GBASE-SR4, 40GBASE-LR4, 40GBASE-ER4, 40GBASE-R2, 25GBASE-R, 20GBASE-KR2, 10GBASE-LR,10GBASE-ER, 10GBASE-CX4, 10GBASE-CR, 10GBASE-KR, SGMII, 1000BASE-CX, 1000BASE-KX, 10GBASE-SR					
	Data Rate:	Ethernet	1/10/25/40/50/100 Gb/s			
	PCI Express Gen 4.0: SERDES @ 16.0GT/s, 16 lanes (2.0 and 1.1 compatible)					
Power and Environmental	Voltage: 3.3VAUX, 12V					
	Power	Cable Type	Active Mode		Standby Mode	
	Typical Power ^(b)	Passive Cables	19W		5.7W	
	Maximum Power	Passive Cables	26.6W		10W	
		3.5W Active Cables	34.5W		14W	
	Maximum power available through QSFP56 port: 3.5W					
	Temperature	Operational	0°C to 55°C			
		Non-operational	-40°C to 70°C			
	Humidity	90% relative humidity ^(c)				
	Altitude (Operational)	3050m				
Environmental	Airflow	Cable Type	Hot Aisle HSK to Port		Cold Aisle @35C Port to HSK	
			Normal Mode @55C	Standby Mode @45C	Normal Mode	Standby Mode
		Passive Cable	600LFM	100LFM	Not Supported	Not Supported
		Active 2.5W Mellanox Cable	1000LFM	300LFM	Not Supported	Not Supported
		Active 3.5W Cable	800LFM (@45C)	500LFM	Not Supported	Not Supported

Regulatory	Safety	CB / cTUVus / CE
	EMC	CE / FCC / VCCI / ICES / RCM
	RoHS	RoHS compliant

- a. ConnectX-6 Dx adapters supplement the auto-negotiation specification to get better bit error rates and longer cable reaches. This supplemental feature only initiates when connected to another Mellanox Ethernet product.
- b. Typical power for ATIS traffic load.
- c. For both operational and non-operational states.

MCX623435A[N/C]-VDAB/MCX623435AS-VDAI Specifications

Physical	Form Factor: Small Form Factor (SFF) OCP 3.0 Size: 4.52 in. x 2.99 in (115.00mm x 76.00mm)			
	Connector: Single QSFP56 Ethernet (copper and optical)			
	Retention Mechanism:	MCX623435A[N/C]-VDAB: Thumbscrew (Pull Tab) Bracket MCX623435AS-VDAl: Internal Lock		
Protocol Support	Ethernet: 200GBASE-CR4, 200GBASE-KR4, 200GBASE-SR4, 100GBASE-CR4, 100GBASE-KR4, 100GBASE-SR4, 50GBASE-R2, 50GBASE-R4, 40GBASE-CR4, 40GBASE-KR4, 40GBASE-SR4, 40GBASE-LR4, 40GBASE-ER4, 40GBASE-R2, 25GBASE-R, 20GBASE-KR2, 10GBASE-LR, 10GBASE-ER, 10GBASE-CX4, 10GBASE-CR, 10GBASE-KR, SGMII, 1000BASE-CX, 1000BASE-KX, 10GBASE-SR			
	Data Rate:	Ethernet	1/10/25/40/50/100/200 Gb/s	
	PCI Express Gen 4.0: SERDES @ 16.0GT/s, 16 lanes (2.0 and 1.1 compatible)			
Power and Environmental	Voltage: 3.3VAUX, 12V			
	Power	Cable Type	Active Mode	Standby Mode
	Typical Power ^(b)	Passive Cables	16.9W	5.6W
	Maximum Power	Passive Cables	24W	11.4W
		4.5W Active Cables	29.1W	16.5W
	Maximum power available through QSFP56 port: 5W			
	Temperature	Operational	0°C to 55°C	
		Non-operational	-40°C to 70°C	
Humidity	90% relative humidity ^(c)			

	Altitude (Operational)	3050m				
Environmental	Airflow	Cable Type	Hot Aisle Heatsink to Port		Cold Aisle @35C Port to Heatsink	
			Active Mode @ 55C	Standby Mode @45C	Active Mode	Standby Mode
		Passive Cable	500LFM	100LFM	300LFM	100LFM
		Active 4.55W Cable	800LFM @45C	600LFM @45C	300LFM	100LFM
Regulatory	Safety	CB / cTUVus / CE				
	EMC	CE / FCC / VCCI / ICES / RCM				
	RoHS	RoHS compliant				

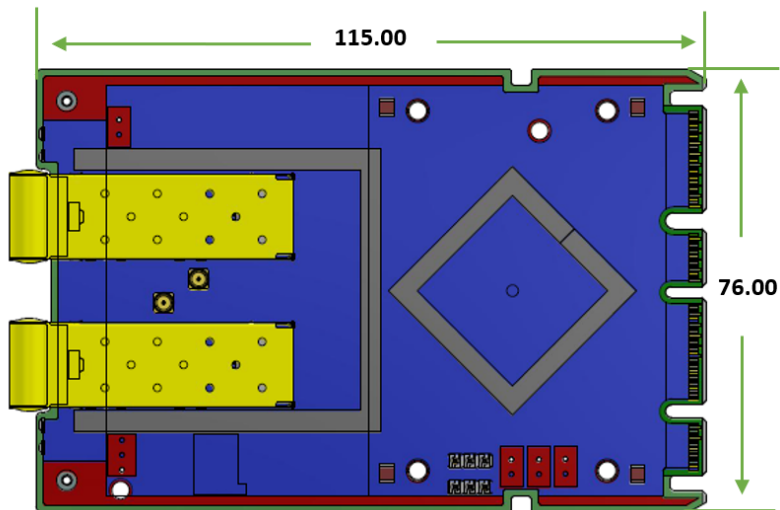
- a. ConnectX-6 Dx adapters supplement the auto-negotiation specification to get better bit error rates and longer cable reaches. This supplemental feature only initiates when connected to another Mellanox Ethernet product.
- b. Typical power for ATIS traffic load.
- c. For both operational and non-operational states.

Board Mechanical Drawing and Dimensions

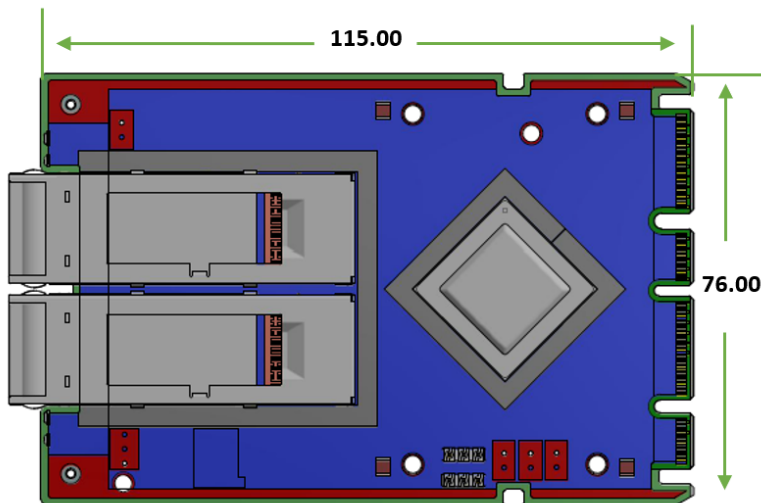
 For the 3D Model of the card, please refer to 3D Models at http://www.mellanox.com/page/3d_models.

 All dimensions are in millimeters. The PCB mechanical tolerance is +/- 0.13mm.

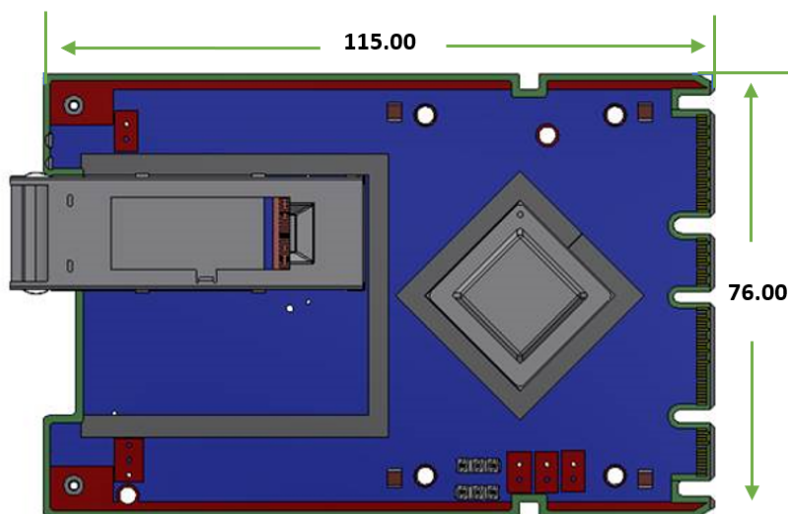
ConnectX-6 Dx SFP28/SFP56 OCP 3.0 Mechanical Drawing and Dimensions



ConnectX-6 Dx Dual-Port QSFP56 OCP 3.0 Mechanical Drawing and Dimensions



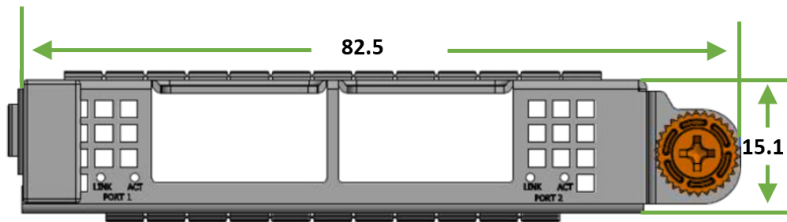
ConnectX-6 Dx Single-Port QSFP56 OCP 3.0 Mechanical Drawing and Dimensions



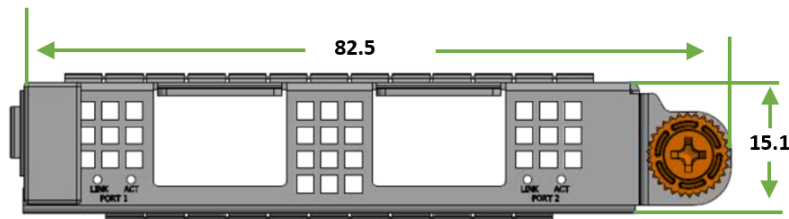
Bracket Mechanical Drawings and Dimensions

⚠ All dimensions are in millimeters. The bracket's mechanical tolerance is $\pm 0.25\text{mm}$.

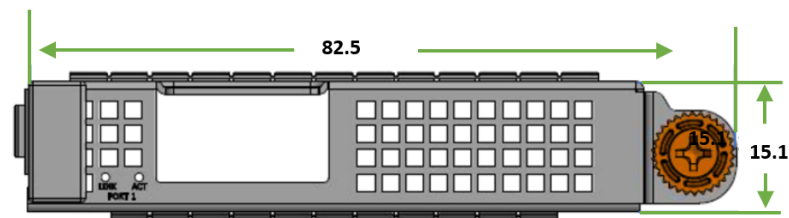
Dual-port SFP28/SFP56 Thumbscrew Bracket



Dual-port QSFP56 Thumbscrew Bracket



Single-port QSFP56 Thumbscrew Bracket



Finding the MAC and Serial Number on the Adapter Card

Each Mellanox adapter card has a different identifier printed on the label: serial number and the card MAC for the Ethernet protocol.

 The product revisions indicated on the labels in the following figures do not necessarily represent the latest revisions of the cards.

MCX623432AN-ADAB Board Label Example  P/N: MCX623432AN-ADAB S/N: MT0806X01504 Made in Israel 	MCX623432AC-ADAB Board Label Example  P/N: MCX623432AC-ADAB S/N: MT0806X01504 Made in Israel 
ConnectX-6DX 25GbE Model: CX623432A P/N: MCX623432AN-ADAB S/N: MT0806X01504 2019-10-15 Rev: A1  H1 P1:F45214992300 H1 P2: F45214992301 H2 P1 F45214992306 H2 P2: F45214992307 H3 P1:F4521499230C H3 P2: F4521499230D H4 P1:F45214992312 H4 P2: F45214992313 	ConnectX-6DX 25GbE Model: CX623432A P/N: MCX623432AC-ADAB S/N: MT0806X01504 2019-11-05 Rev: A1  H1 P1:F45214992300 H1 P2: F45214992301 H2 P1 F45214992306 H2 P2: F45214992307 H3 P1:F4521499230C H3 P2: F4521499230D H4 P1:F45214992312 H4 P2: F45214992313 
MCX623432AN-GDAB Board Label Example  P/N: MCX623432AN-GDAB S/N: MT0806X01504 Made in Israel 	MCX623432AC-GDAB Board Label Example  P/N: MCX623432AC-GDAB S/N: MT0806X01504 Made in Israel 
ConnectX-6DX 50GbE Model: CX623432A P/N: MCX623432AN-GDAB S/N: MT0806X01504 2019-11-05 Rev: A1  H1 P1:F45214992300 H1 P2: F45214992301 H2 P1 F45214992306 H2 P2: F45214992307 H3 P1:F4521499230C H3 P2: F4521499230D H4 P1:F45214992312 H4 P2: F45214992313 	ConnectX-6DX 50GbE Model: CX623432A P/N: MCX623432AC-GDAB S/N: MT0806X01504 2019-10-15 Rev: A1  H1 P1:F45214992300 H1 P2: F45214992301 H2 P1 F45214992306 H2 P2: F45214992307 H3 P1:F4521499230C H3 P2: F4521499230D H4 P1:F45214992312 H4 P2: F45214992313 

MCX623436AN-CDAB Board Label Example  P/N: MCX623436AN-CDAB  S/N: MT1210X00011 Made in Israel  ConnectX-6DX 100GbE Model: CX623436A P/N: MCX623436AN-CDAB Rev: A1  S/N: MT0806X01504 P1: F45214992300 P2: F45214992301 ME P1: F45214992302 ME P2: F45214992303 	MCX623436AC-CDAB Board Label Example  P/N: MCX623436AC-CDAB  S/N: MT1210X00011 Made in Israel  ConnectX-6DX 100GbE Model: CX623436A P/N: MCX623436AC-CDAB Rev: A1  S/N: MT0806X01504 P1: F45214992300 P2: F45214992301 ME P1: F45214992302 ME P2: F45214992303 
MCX623435AN-VDAB Board Label Example  P/N: MCX623435AN-VDAB  S/N: MT0806X01504 Made in Israel  ConnectX-6DX 200GbE Model: CX623435A P/N: MCX623435AN-VDAB Rev: A1  S/N: MT0806X01504 H1: F45214992300 H2: F45214992303 H3: F45214992306 H4: F45214992309 	MCX623435AC-VDAB Board Label Example  P/N: MCX623435AC-VDAB  S/N: MT0806X01504 Made in Israel  ConnectX-6DX 200GbE Model: CX623435A P/N: MCX623435AC-VDAB Rev: A1  S/N: MT0806X01504 H1: F45214992300 H2: F45214992303 H3: F45214992306 H4: F45214992309 

Document Revision History

Date	Revision	Description of Changes
Oct. 2020	1.6	• Updated airflow numbers in "Specifications". • Updated networking ports LEDs indications.
Sep. 2020	1.5	Added OCP 3.0 bracket replacement instructions.
Jul. 2020	1.4	Updated airflow numbers in "Specifications".
Jul. 2020	1.3	Updated all power and airflow numbers in "Specifications".
Jul. 2020	1.2	Added support for MCX623435MN-CDAB.
Feb. 2020	1.1	Updated "Specifications" with power numbers.
Nov. 2019	1.0	First release

Notice

This document is provided for information purposes only and shall not be regarded as a warranty of a certain functionality, condition, or quality of a product. Neither NVIDIA Corporation nor any of its direct or indirect subsidiaries (collectively: "NVIDIA") make any representations or warranties, expressed or implied, as to the accuracy or completeness of the information contained in this document and assumes no responsibility for any errors contained herein. NVIDIA shall have no liability for the consequences or use of such information or for any infringement of patents or other rights of third parties that may result from its use. This document is not a commitment to develop, release, or deliver any Material (defined below), code, or functionality.

NVIDIA reserves the right to make corrections, modifications, enhancements, improvements, and any other changes to this document, at any time without notice.

Customer should obtain the latest relevant information before placing orders and should verify that such information is current and complete.

NVIDIA products are sold subject to the NVIDIA standard terms and conditions of sale supplied at the time of order acknowledgement, unless otherwise agreed in an individual sales agreement signed by authorized representatives of NVIDIA and customer ("Terms of Sale"). NVIDIA hereby expressly objects to applying any customer general terms and conditions with regards to the purchase of the NVIDIA product referenced in this document. No contractual obligations are formed either directly or indirectly by this document.

NVIDIA products are not designed, authorized, or warranted to be suitable for use in medical, military, aircraft, space, or life support equipment, nor in applications where failure or malfunction of the NVIDIA product can reasonably be expected to result in personal injury, death, or property or environmental damage. NVIDIA accepts no liability for inclusion and/or use of NVIDIA products in such equipment or applications and therefore such inclusion and/or use is at customer's own risk.

NVIDIA makes no representation or warranty that products based on this document will be suitable for any specified use. Testing of all parameters of each product is not necessarily performed by NVIDIA. It is customer's sole responsibility to evaluate and determine the applicability of any information contained in this document, ensure the product is suitable and fit for the application planned by customer, and perform the necessary testing for the application in order to avoid a default of the application or the product. Weaknesses in customer's product designs may affect the quality and reliability of the NVIDIA product and may result in additional or different conditions and/or requirements beyond those contained in this document. NVIDIA accepts no liability related to any default, damage, costs, or problem which may be based on or attributable to: (i) the use of the NVIDIA product in any manner that is contrary to this document or (ii) customer product designs.

No license, either expressed or implied, is granted under any NVIDIA patent right, copyright, or other NVIDIA intellectual property right under this document. Information published by NVIDIA regarding third-party products or services does not constitute a license from NVIDIA to use such products or services or a warranty or endorsement thereof. Use of such information may require a license from a third party under the patents or other intellectual property rights of the third party, or a license from NVIDIA under the patents or other intellectual property rights of NVIDIA.

Reproduction of information in this document is permissible only if approved in advance by NVIDIA in writing, reproduced without alteration and in full compliance with all applicable export laws and regulations, and accompanied by all associated conditions, limitations, and notices.

THIS DOCUMENT AND ALL NVIDIA DESIGN SPECIFICATIONS, REFERENCE BOARDS, FILES, DRAWINGS, DIAGNOSTICS, LISTS, AND OTHER DOCUMENTS (TOGETHER AND SEPARATELY, "MATERIALS") ARE BEING PROVIDED "AS IS." NVIDIA MAKES NO WARRANTIES, EXPRESSED, IMPLIED, STATUTORY, OR OTHERWISE WITH RESPECT TO THE MATERIALS, AND EXPRESSLY DISCLAIMS ALL IMPLIED WARRANTIES OF NONINFRINGEMENT, MERCHANTABILITY, AND FITNESS FOR A PARTICULAR PURPOSE. TO THE EXTENT NOT PROHIBITED BY LAW, IN NO EVENT WILL NVIDIA BE LIABLE FOR ANY DAMAGES, INCLUDING WITHOUT LIMITATION ANY DIRECT, INDIRECT, SPECIAL, INCIDENTAL, PUNITIVE, OR CONSEQUENTIAL DAMAGES, HOWEVER CAUSED AND REGARDLESS OF THE THEORY OF LIABILITY, ARISING OUT OF ANY USE OF THIS DOCUMENT, EVEN IF NVIDIA HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES. Notwithstanding any damages that customer might incur for any reason whatsoever, NVIDIA's aggregate and cumulative

liability towards customer for the products described herein shall be limited in accordance with the Terms of Sale for the product.

Trademarks

NVIDIA, the NVIDIA logo, and Mellanox are trademarks and/or registered trademarks of Mellanox Technologies Ltd. and/or NVIDIA Corporation in the U.S. and in other countries. Other company and product names may be trademarks of the respective companies with which they are associated. For the complete and most updated list of Mellanox trademarks, visit <http://www.mellanox.com/page/trademarks>

Copyright

© 2020 Mellanox Technologies Ltd. All rights reserved.