



Mellanox ConnectX®-6 VPI Adapter Cards User Manual for Dell EMC PowerEdge Servers

OPNs: Y1T43, 7TKND, 1GK7G, CY7GD

Rev 1.1

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Table of Contents

1	Introduction	8
1.1	Product Overview	8
1.2	ConnectX-6 SNAPI (Single-slot) Configuration.....	8
1.2.1	ConnectX-6 Dual-slot Socket Direct Cards 2x PCIe x16	9
1.2.2	ConnectX-6 SNAPI (Single-slot) PCIe 2 x8 in a Row	10
1.3	Features and Benefits	11
1.3.1	Operating Systems/Distributions	12
1.3.2	Connectivity	12
1.3.3	Manageability	12
2	Interfaces	13
2.1	InfiniBand Interface	13
2.2	Ethernet QSFP56 Interface	13
2.3	PCI Express Interface	13
2.4	LED Interface	14
2.5	Heat Sink Interface.....	14
2.6	SMBus Interface.....	15
2.7	Voltage Regulators.....	15
3	Hardware Installation	16
3.1	Safety Warnings	16
3.2	Installation Procedure Overview	17
3.3	System Requirements	17
3.3.1	Hardware Requirements	17
3.3.2	Airflow Requirements	18
3.3.3	Software Requirements.....	18
3.4	Safety Precautions	18
3.5	Pre-Installation Checklist.....	18
3.6	Installation Instructions.....	19
3.6.1	Installation Instructions for R740 Server	20
3.6.2	Installation Instructions for C6400 Server	23
3.6.3	Installation Instructions for C4140 Server	26
3.6.4	Installation Instructions for HDR100 Card	30
3.7	Cables and Modules.....	31
3.7.1	Cable Installation.....	31
3.8	Identifying the Card in Your System.....	31
3.8.1	On Linux	31
3.8.2	On Windows	32

4	Driver Installation	33
4.1	Linux Driver Installation	33
4.1.1	Prerequisites.....	33
4.1.2	Downloading Mellanox OFED	33
4.1.3	Installing Mellanox OFED.....	34
4.1.4	Installing MLNX_OFED Using YUM	38
4.1.5	Installing MLNX_OFED Using apt-get Tool.....	41
4.1.6	Updating Firmware After Installation	42
4.1.7	UEFI Secure Boot.....	43
4.1.8	Performance Tuning	45
4.2	Windows Driver Installation.....	46
4.2.1	Software Requirements.....	46
4.2.2	Downloading Mellanox WinOF-2 Driver	46
4.2.3	Installing Mellanox WinOF-2 Driver.....	47
4.2.4	Uninstalling Mellanox WinOF-2 Driver	52
4.2.5	Extracting Files Without Running Installation.....	52
4.2.6	Firmware Upgrade.....	54
5	Updating Adapter Firmware	55
6	Troubleshooting	56
6.1	General Troubleshooting.....	56
6.2	Linux Troubleshooting	57
6.3	Windows Troubleshooting.....	58
7	Specifications	59
7.1	Y1T43 and 7TKND Specifications.....	59
7.2	1GK7G and CY7GD Specifications.....	60
7.3	Adapter Card and Bracket Mechanical Drawings and Dimensions	61
7.3.1	ConnectX-6 Adapter Card Mechanical Drawing and Dimensions	61
7.3.2	Auxiliary PCIe Connection Card.....	61
7.3.3	ConnectX-6 Brackets Mechanical Drawing and Dimensions.....	62
8	PCIe Express Pinouts Description for SNAPI.....	63
9	Finding the MAC on the Adapter Card	64

Document Revision History

Date	Revision	Comments/Changes
Feb. 2020	1.2	- Renamed “Single-slot Configuration” to “SNAPI (Single-slot) Configuration.” - Updated ConnectX-6 SNAPI (Single-slot) PCIe 2 x8 in a Row. - Renamed section title to Installation Instructions for HDR100 Card.
Aug. 2019	1.1	Added the following OPNs to relevant sections across the document: 1GK7G - CY7GD
May. 2019	1.0	First release

About This Manual

This User Manual describes Mellanox Technologies ConnectX®-6 InfiniBand/VPI adapter cards. It provides details as to the interfaces of the board, specifications, required software and firmware for operating the board, and relevant documentation.

Ordering Part Numbers

The table below provides the ordering part numbers (OPN) for the available ConnectX-6 InfiniBand/VPI adapter cards.



Initial release of ConnectX-6 cards is InfiniBand and PCIe Gen 3.0 only. VPI and PCIe Gen 4.0 functionality will be added in a future release.

OPN	Marketing Description
Y1T43	Mellanox ConnectX®-6 Single Port VPI HDR100 QSFP Adapter, Tall Bracket
7TKND	Mellanox ConnectX®-6 Single Port VPI HDR100 QSFP Adapter, Short Bracket
1GK7G	Mellanox ConnectX®-6 Single Port VPI HDR QSFP Adapter, Tall Bracket
CY7GD	Mellanox ConnectX®-6 Single Port VPI HDR QSFP Adapter, Short Bracket

Intended Audience

This manual is intended for the installer and user of these cards.

The manual assumes basic familiarity with InfiniBand and Ethernet network and architecture specifications.

Technical Support

Dell Support site: <http://www.dell.com/support>

Firmware Updates

The Mellanox support downloader contains software, firmware and knowledge database information for Mellanox products. Access the database from the Mellanox Support web page,

<http://www.mellanox.com> => Support

Or use the following link to go directly to the Mellanox Support Download Assistant page,

<http://www.mellanox.com/supportdownloader/>

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 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 3.0/4.0 Specifications</i>	Industry Standard PCI Express Base and Card Electromechanical Specifications at https://pcisig.com/specifications

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. IB is used in this document to mean InfiniBand. In this document PCIe is used to mean PCI Express.

1 Introduction

1.1 Product Overview

This is the user guide for Mellanox Technologies Virtual Protocol Interconnect® adapter cards based on the ConnectX®-6 integrated circuit device. ConnectX-6 connectivity provides the highest performing low latency and most flexible interconnect solution for PCI Express Gen 3.0/4.0 servers used in enterprise datacenters and high-performance computing environments.

ConnectX-6 VPI adapter cards provide up to two ports of 100Gb/s for InfiniBand and Ethernet connectivity, sub-600ns latency and 215 million messages per second, enabling the highest performance and most flexible solution for the most demanding High-Performance Computing (HPC), storage, and datacenter applications.

ConnectX-6 is a groundbreaking addition to the Mellanox ConnectX series of industry-leading adapter cards. In addition to all the existing innovative features of past ConnectX versions, ConnectX-6 offers several enhancements that further improve performance and scalability of datacenter applications.



Make sure to use a PCIe slot that can supply the required power and airflow to the ConnectX-6 as stated in [Specifications](#).

1.2 ConnectX-6 SNAPI (Single-slot) Configuration

Mellanox Socket Direct® technology offers improved performance to dual-socket servers by enabling direct access from each CPU in a dual-socket server to the network through its dedicated PCIe interface. Please note that ConnectX-6 Socket Direct cards do not support Multi-Host functionality (i.e. connectivity to two independent CPUs).

ConnectX-6 Socket Direct cards are available in two configurations: **Dual-slot Configuration** (2x PCIe x16) and **SNAPI (Single-slot) Configuration** (2x PCIe x8).

1.2.1 ConnectX-6 Dual-slot Socket Direct Cards 2x PCIe x16

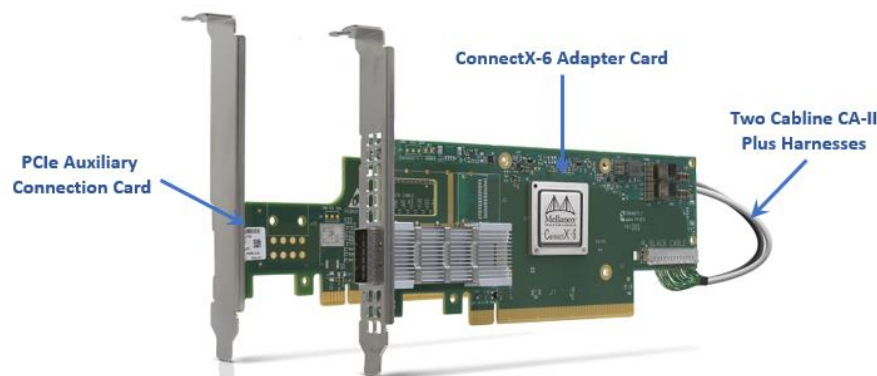


The PCIe Auxiliary Connection card and two Cabline CA-II Plus harnesses are ordered and shipped separately from Dell.

Silicom PCIe Auxiliary card and harness DPN: **2FR79**

PCIe Auxiliary Connection card DPN: **TFM86**

In order to obtain 200Gb/s speed, Mellanox offers ConnectX-6 Socket Direct that enable 200Gb/s connectivity on servers with PCIe Gen 3.0 capability. The adapter's 32-lane PCIe bus is split into two 16-lane buses, with one bus accessible through a PCIe x16 edge connector and the other bus through an x16 Auxiliary PCIe Connection card. The two cards should be installed into two PCIe x16 slots and connected using two Cabline SA-II Plus harnesses, as shown in the below figure.

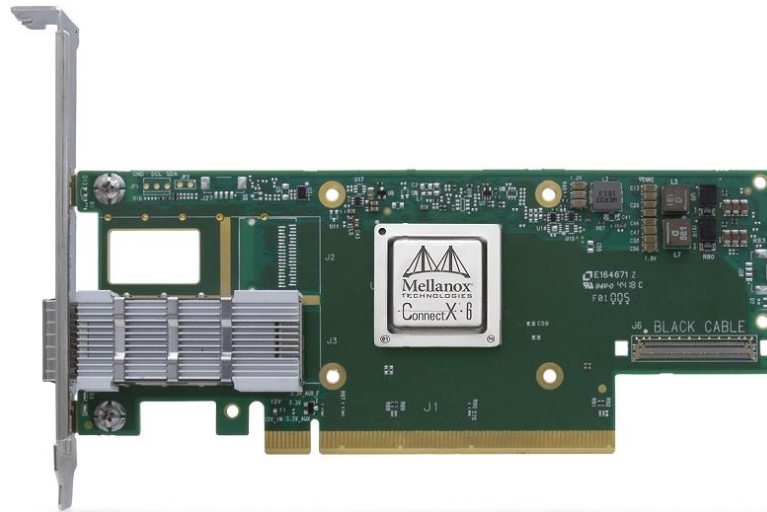


Part Number	1GK7G	CY7GD
Form Factor/Dimensions	Adapter Card: PCIe Half Height, Half Length / 167.65mm x 68.90mm Auxiliary PCIe Connection Card: 5.09 in. x 2.32 in. (129.30mm x 59.00mm) Harnesses: two 35cm Cabline CA-II Plus harnesses	
Data Transmission Rate	Ethernet: 10/25/40/50/100/200 Gb/s InfiniBand: SDR, DDR, QDR, FDR, EDR, HDR100, HDR	
Network Connector Type	Single-port QSFP56	
PCIe x16 through Edge Connector	PCIe Gen 3.0 / 4.0 SERDES @ 8.0GT/s / 16.0GT/s	
PCIe x16 through Auxiliary Card	PCIe Gen 3.0 SERDES@ 8.0GT/s	
Adapter Card Bracket	Tall Bracket	Short Bracket

1.2.2 ConnectX-6 SNAPI (Single-slot) PCIe 2 x8 in a Row

The PCIe x16 interface comprises two PCIe x8 in a row, such that each of the PCIe x8 lanes can be connected to a dedicated CPU in a dual-socket server. In such a configuration, Socket Direct brings lower latency and lower CPU utilization as the direct connection from each CPU to the network means the interconnect can bypass a QPI (UPI) and the other CPU, optimizing performance and improving latency. CPU utilization is improved as each CPU handles only its own traffic and not traffic from the other CPU.

A system with a custom PCI Express x16 slot that includes special signals is required for installing the card. Please refer to [PCIe Express Pinouts Description for Single-Slot Socket Direct Card](#) for pinout definitions.



Part Number	Y1T43	7TKND
Form Factor/Dimensions	PCIe Half Height, Half Length / 167.65mm x 68.90mm	
Data Transmission Rate	Ethernet: 10/25/40/50/100 Gb/s InfiniBand: SDR, DDR, QDR, FDR, EDR, HDR100	
Network Connector Type	Single-port QSFP56	
PCIe x16 through Edge Connector	PCIe Gen 3.0 / 4.0 SERDES @ 8.0GT/s / 16.0GT/s SNAPI (Single-slot) PCIe 2x8 in a row	
Adapter Card Bracket	Tall Bracket	Short Bracket

1.3 Features and Benefits



NOTE: Make sure to use a PCIe slot that is capable of supplying the required power and airflow to the ConnectX-6 cards as stated in [Specifications](#).

PCI Express (PCIe)	Uses the following PCIe interfaces: PCIe x16 configurations: PCIe Gen 3.0 (8GT/s) and Gen 4.0 (16GT/s) through an x16 edge connector. 2x PCIe x16 configurations: PCIe Gen 3.0/4.0 SERDES @ 8.0/16.0 GT/s through Edge Connector PCIe Gen 3.0 SERDES @ 8.0GT/s through PCIe Auxiliary Connection Card
InfiniBand Architecture Specification v1.3 compliant	ConnectX-6 delivers low latency, high bandwidth, and computing efficiency for performance-driven server and storage clustering applications. ConnectX-6 is InfiniBand Architecture Specification v1.3 compliant.
Up to 100 Gigabit Ethernet	Mellanox adapters comply with the following IEEE 802.3 standards: 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 - 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)
InfiniBand HDR100	A standard InfiniBand data rate, where each lane of a 2X port runs a bit rate of 53.125Gb/s with a 64b/66b encoding, resulting in an effective bandwidth of 100Gb/s.
Memory Components	• SPI Quad - includes 256Mbit SPI Quad Flash device • FRU EEPROM - The EEPROM capacity is 128Kbit.
Overlay Networks	In order to better scale their networks, datacenter 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 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, utilizing IBTA RDMA (Remote Data Memory Access) and RoCE (RDMA over Converged Ethernet) technology, delivers low-latency and high-performance over InfiniBand and Ethernet networks. Leveraging datacenter bridging (DCB) capabilities as well as ConnectX-6 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 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. • Flexible match-action flow tables • Open VSwitch (OVS) offload using ASAP² - Accelerated Switch and Packet Processing® • 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 provides dedicated adapter resources and guaranteed isolation and protection for virtual machines within the server.
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 target machine • Erasure Coding • T10-DIF Signature Handover
SR-IOV	ConnectX-6 SR-IOV technology provides dedicated adapter resources and guaranteed isolation and protection for virtual machines (VM) within the server.
High-Performance Accelerations	• Tag Matching and Rendezvous Offloads • Adaptive Routing on Reliable Transport • Burst Buffer Offloads for Background Checkpointing

1.3.1 Operating Systems/Distributions



ConnectX-6 Socket Direct cards 2x PCIe x16 (OPNs 1GK7G and CY7GD) are not supported in Windows and WinOF-2.

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

1.3.2 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

1.3.3 Manageability

ConnectX-6 technology maintains support for manageability through a BMC. ConnectX-6 adapter card can be connected to a BMC using MCTP over SMBus or MCTP over PCIe protocols as if it is a standard Mellanox adapter card.

2 Interfaces

2.1 InfiniBand Interface

The network ports of the ConnectX®-6 adapter cards are compliant with *the InfiniBand Architecture Specification, Release 1.3 and Vol. 2, Release 1.4*. InfiniBand traffic is transmitted through the card's QSFP56 connector.

2.2 Ethernet QSFP56 Interface



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

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

2.3 PCI Express Interface



Initial release of ConnectX-6 cards is InfiniBand and PCIe Gen 3.0 only. VPI and PCIe Gen 4.0 functionality will be added in a future release.

ConnectX®-6 adapter cards support PCI Express Gen 3.0/4.0 (1.1 and 2.0 compatible) through x16 edge connectors. The device can be either a master initiating the PCI Express bus operations, or a slave responding to PCI bus operations.

The following lists PCIe interface features:

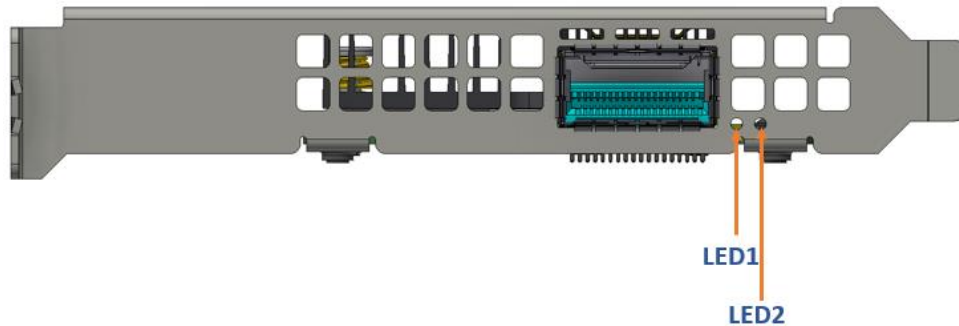
- PCIe Gen 3.0 and 4.0 compliant, 2.0 and 1.1 compatible
- 2.5, 5.0, 8.0, or 16.0 GT/s link rate x16
- Auto-negotiates to x16, x8, x4, x2, or x1
- Support for MSI/MSI-X mechanisms

2.4 LED Interface

There are two I/O LEDs per port:

LED 1: A bi-color I/O LED which indicates link status. LED behavior is described below for Ethernet and InfiniBand port configurations.

LED 2: Reserved for future use.



LED1 Link Status Indications (Physical and Logical) - Ethernet Protocol:

LED Color and State	Description
Off	A link has not been established
Blinking Amber ^a	1 Hz Blinking Amber occurs due to running a beacon command for locating the adapter card. 4 Hz blinking Amber indicates a problem with the link
Solid Green	Indicates a valid link with no active traffic
Blinking Green	Indicates a valid logical link with active traffic

^a 1 Hz Blinking Amber occurs due to running a beacon command for locating the adapter card.

LED2 Link Status Indications (Physical and Logical) - InfiniBand Protocol:

LED Color and State	Description
Off	A physical link has not been established
Solid Amber	Indicates an active physical link
Blinking Amber ^a	4 Hz blinking Amber indicates a problem with the physical link
Solid Green	Indicates a valid logical (data activity) link with no active traffic
Blinking Green	Indicates a valid logical link with active traffic

^a 1 Hz Blinking Amber occurs due to running a beacon command for locating the adapter card.

2.5 Heat Sink Interface

The heatsink is attached to the ConnectX-6 IC to dissipate the heat from the ConnectX-6 IC. It is attached either by using four spring-loaded push pins that insert into four mounting holes, or by screws.

ConnectX-6 IC has a thermal shutdown safety mechanism which automatically shuts down the ConnectX-6 card in cases of high-temperature event, improper thermal coupling or heatsink removal.

For the required airflow (LFM) per OPN, please refer to [Specifications](#).

2.6 SMBus Interface

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

2.7 Voltage Regulators

The voltage regulator power is derived from the PCI Express edge connector 12V supply pins. These voltage supply pins feed on-board regulators that provide the necessary power to the various components on the card.

3 Hardware Installation

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

3.1 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.

Please observe all safety warnings to avoid injury and prevent damage to system components.

	General Installation Instructions Read all installation instructions before connecting the equipment to the power source.
	Jewelry Removal Warning Before you install or remove equipment that is connected to power lines, remove jewelry such as bracelets, necklaces, rings, watches and so on. Metal objects heat up when connected to power and ground and can melt down, causing serious burns and/or welding the metal object to the terminals.
	Over-temperature This equipment should not be operated in an area with an ambient temperature exceeding the maximum recommended: 55°C (131°F). An air flow of 200LFM at this maximum ambient temperature is required for HCA cards and NICs. To guarantee proper airflow, allow at least 8cm (3 inches) of clearance around the ventilation openings.
	During Lightning - Electrical Hazard During periods of lightning activity, do not work on the equipment or connect or disconnect cables.
	Copper Cable Connecting/Disconnecting Some copper cables are heavy and not flexible, as such they should be carefully attached to or detached from the connectors. Refer to the cable manufacturer for special warnings and instructions.
	Equipment Installation This equipment should be installed, replaced, or serviced only by trained and qualified personnel.
	Equipment Disposal Disposal of this equipment should be in accordance to all national laws and regulations.
	Local and National Electrical Codes This equipment should be installed in compliance with local and national electrical codes.
	Hazardous Radiation Exposure - Caution – Use of controls or adjustment or performance of procedures other than those specified herein may result in hazardous radiation exposure for products with optical ports. - CLASS 1 LASER PRODUCT and reference to the most recent laser standards: IEC 60 825-1:1993 + A1:1997 + A2:2001 and EN 60825-1:1994+A1:1996+ A2:20

3.2 Installation Procedure Overview

The installation procedure of ConnectX-6 adapter cards involve the following steps:

Step	Procedure	Direct Link
1	Check the system's hardware and software requirements.	System Requirements
2	Pay attention to the airflow consideration within the host system	Airflow Requirements
3	Follow the safety precautions	Safety Precautions
4	Follow the pre-installation checklist	Pre-Installation Checklist
5	Install the ConnectX-6 adapter card in the system	ConnectX-6 Installation Instructions
6	Connect cables or modules to the card	Cables and Modules
7	Identify ConnectX-6 in the system	Identifying Your Card

3.3 System Requirements

3.3.1 Hardware 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 operation environment should meet severity level G1 as per ISA 71.04 for gaseous contamination and ISO 14644-1 class 8 for cleanliness level.



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.

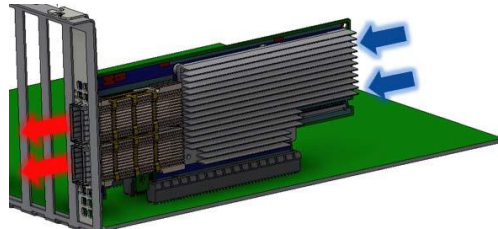
ConnectX-6 Configuration	Hardware Requirements
SNAPI (Single-slot) PCIe 2x8 in a row	A system with a custom PCI Express x16 slot (four special pins) is required for installing the card. Please refer to PCIe Express Pinouts Description for SNAPI for pinout definitions.
Socket Direct 2x PCIe x16 (dual slot)	A system with two PCIe x16 slots is required for installing the cards.

3.3.2 Airflow Requirements

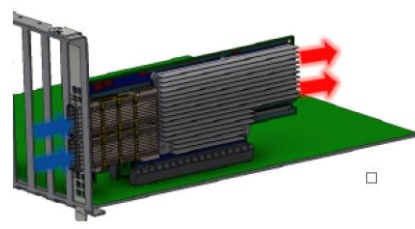
ConnectX-6 adapter cards are offered with two airflow patterns: from the heatsink to the network ports, and vice versa, as shown below.

Please refer to the [Specifications](#) section for airflow numbers for each specific card model.

Airflow from the heatsink to the network ports



Airflow from the network ports to the heatsink



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

3.3.3 Software Requirements

- See [Operating Systems/Distributions](#) section under the Introduction section.
- Software Stacks - Mellanox OpenFabric software package MLNX_OFED for Linux and WinOF-2 for Windows. See the [Driver Installation](#) section.

3.4 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.

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

3.5 Pre-Installation Checklist

1. Unpack the ConnectX-6 Card; Unpack and remove the ConnectX-6 card. Check against the package contents list that all the parts have been sent. 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 card, make sure that the system is disconnected from power.

3.6 Installation Instructions

This section provides detailed instructions on how to install your adapter card. Choose the installation instructions according to the card OPN, PCIe auxiliary card and server.

OPNs	Server	PCIe Auxiliary Card and cable	Installation Instructions
IGK7G	R740	FTR4J (Mellanox PCIe Auxiliary card and cable)	Error! Reference source not found.
CY7GD	C6400	2FR79 (Silicom PCIe Auxiliary card and cable)	Installation Instructions for C6400 Server
CY7GD	C4140	TFM86 (Mellanox PCIe Auxiliary card and cable)	Installation Instructions for C4140 Server
Y1T43, 7TKND	NA	NA	Installation Instructions for HDR100 Card



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



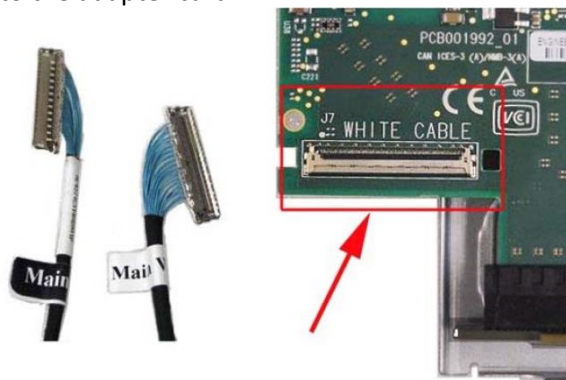
Please make sure to install the ConnectX-6 cards in a PCIe slot that can supply the required power and airflow as stated in [Specifications](#).

3.6.1 Installation Instructions for R740 Server



Applies to R740 only.

1. Connect the adapter card with the Auxiliary connection card using the supplied Cabline CA-II Plus harnesses. The cable and card connectors are labeled for easier installation. Cables labeled “Main White” and “Main Black” should be connected to the adapter card.

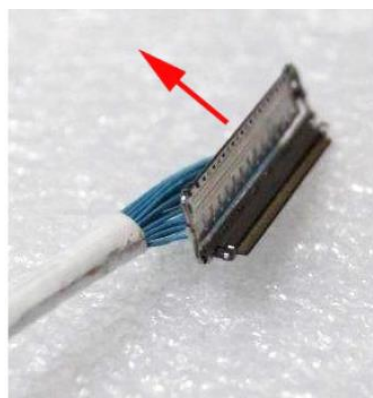


1. Open the plastic connector lock and insert both main and secondary cable through the slot. Repeat the step to install a second connector lock to other ends of the cable.

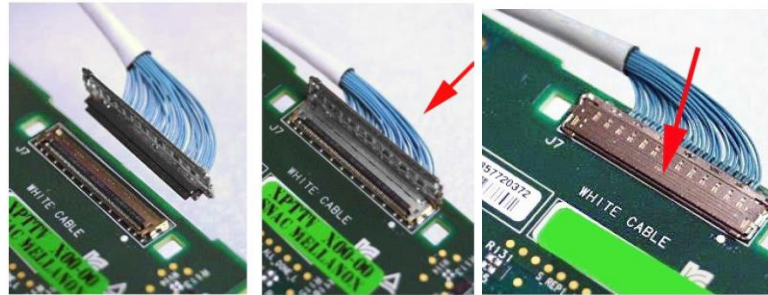


WARNING: Orientation of cable and connector lock is important.

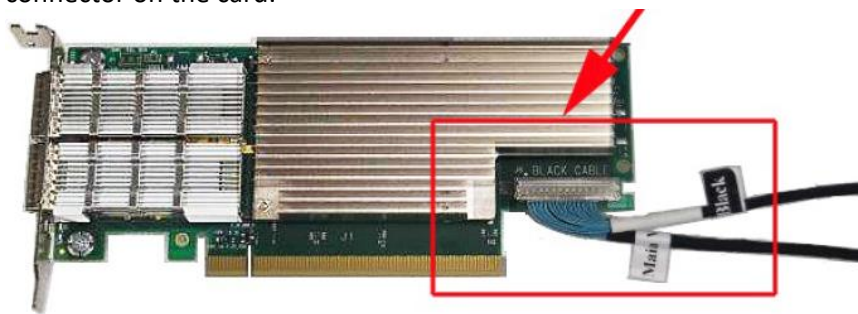
2. Carefully, open the connector cover on the “Main Cable” connector (White cable connector), as seen in the below figure.



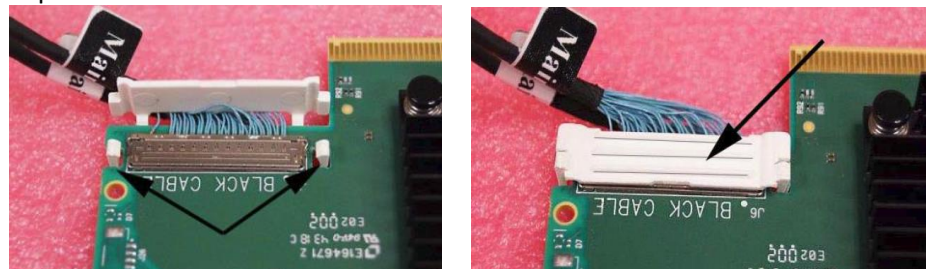
3. Align and insert the cable connector into the "White Cable" connector on the card. Close the connector lock, as seen in the below figure.



4. Repeat steps 1-3 to connect the Main Black cable to the "Black Cable" connector on the card.



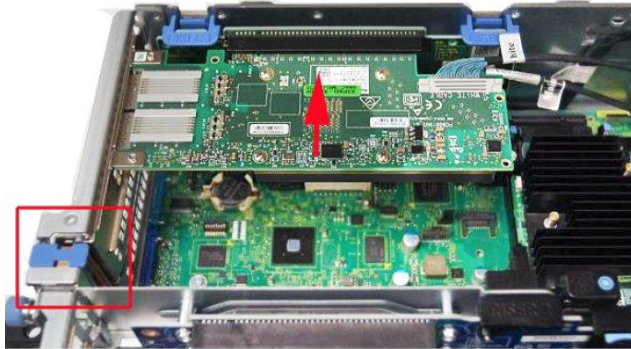
5. Slide the connector lock until the BOTTOM side is "under card", and tabs are through card slots. Press the top section of the connector lock down and lock in place.



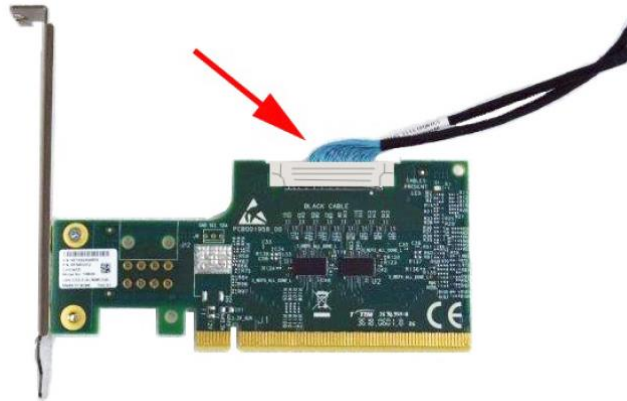
6. Physically touch and verify that both connector lock tabs are completely seated.



2. Install the Mellanox adapter card into the riser per slot matrix. Close and lock the blue card latch.



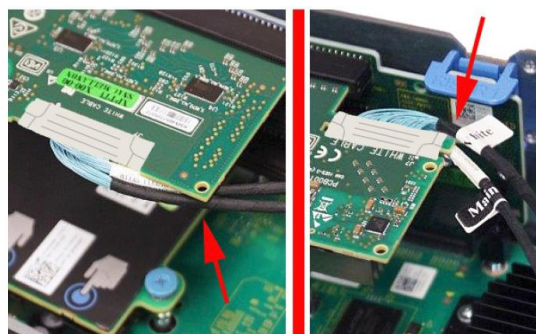
3. Connect the cables and connector lock to the PCIe Auxiliary card as specified in the above steps.



4. Install the PCIe Auxiliary card into the riser per riser installation instructions and slot matrix. Close and lock the blue card latch.



5. Pay attention to the cable routing for both cards.

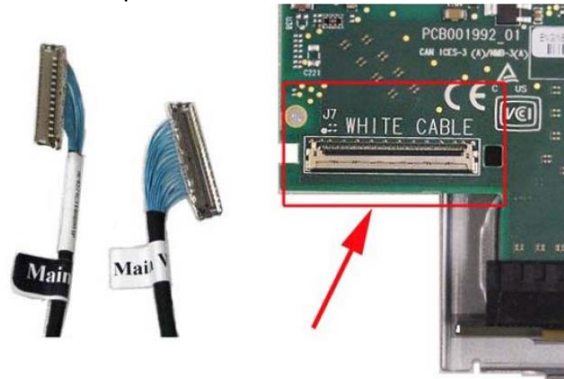


3.6.2 Installation Instructions for C6400 Server



Applies to CY7GD only.

1. Connect the adapter card with the Auxiliary connection card using the supplied Cabline CA-II Plus harnesses. The cable and card connectors are labeled for easier installation. Cables labeled “Main White” and “Main Black” should be connected to the adapter card.

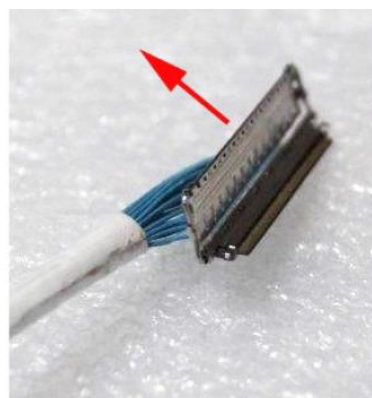


2. Open the plastic connector lock and insert both main and secondary cable through the slot. Repeat the step to install a second connector lock to other ends of the cable.

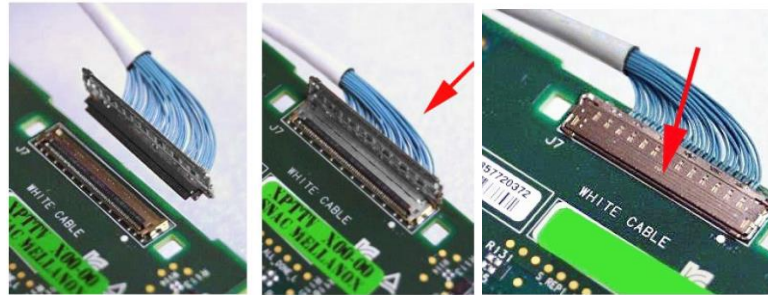


WARNING: Orientation of cable and connector lock is important.

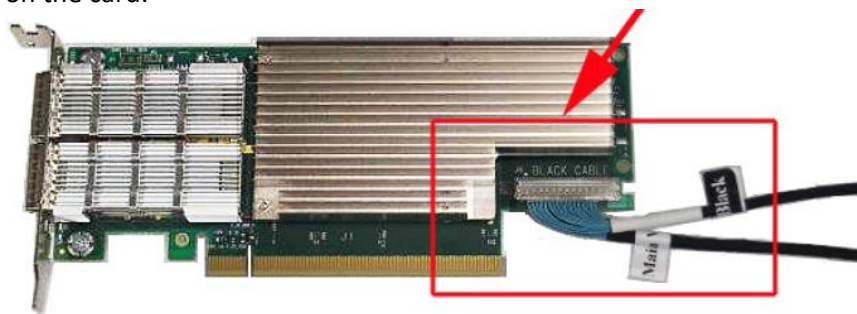
3. Carefully, open the connector cover on the “Main Cable” connector (White cable connector), as seen in the below figure.



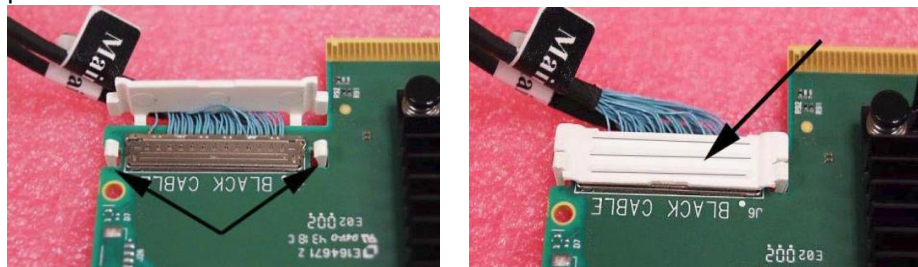
4. Align and insert the cable connector into the "White Cable" connector on the card. Close the connector lock, as seen in the below figure.



5. Repeat steps 1-3 to connect the Main Black cable to the "Black Cable" connector on the card.



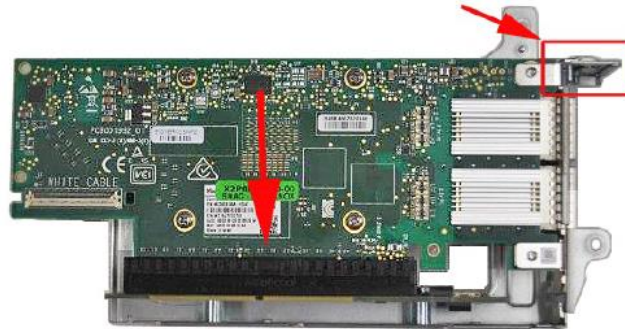
6. Slide the connector lock until the BOTTOM side is "under card", and tabs are through card slots. Press the top section of the connector lock down and lock in place.



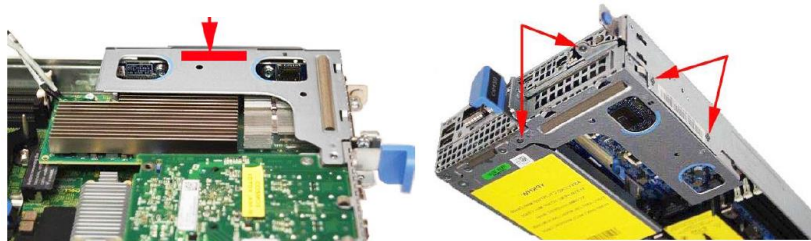
7. Physically touch and verify that both connector lock tabs are completely seated.



8. Install the card into the riser per card installation instructions. Use a 4 in-lb. torque tool on screw PN 94682 to secure the card to the bracket.



9. Align and press down to seat the riser. Use a 4 in-lb. torque tool to tighten 4 screws PN 267JK to secure the riser.



10. Insert and press down to seat the PCIe Auxiliary card. Use a 4 in-lb. torque tool to tighten the screw to secure the card.

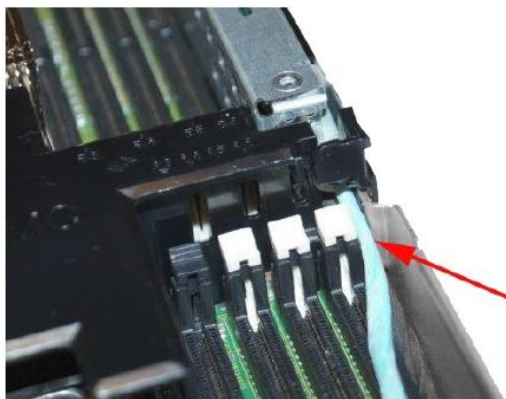


11. Make sure the cable is routed between the DIMM Slot and the chassis side.





12. Air baffle should seat over the cable when installed correctly.

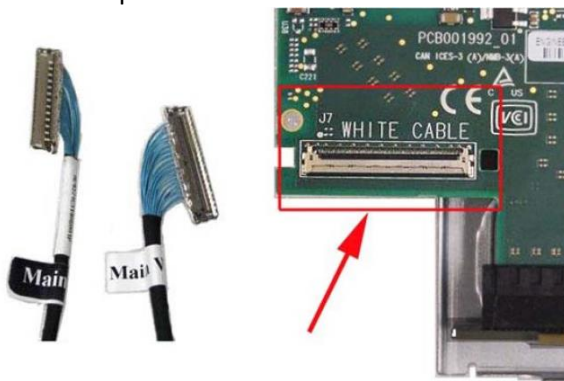


3.6.3 Installation Instructions for C4140 Server



Applies to CY7GD only

1. Connect the adapter card with the Auxiliary connection card using the supplied Cabline CA-II Plus harnesses. The cable and card connectors are labeled for easier installation. Cables labeled “Main White” and “Main Black” should be connected to the adapter card.



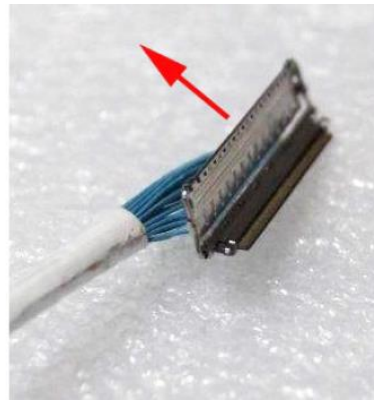
2. Open the plastic connector lock and insert both main and secondary cable through the slot. Repeat the step to install a second connector lock to other ends

of the cable.

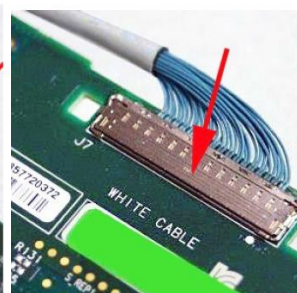


WARNING: Orientation of cable and connector lock is important.

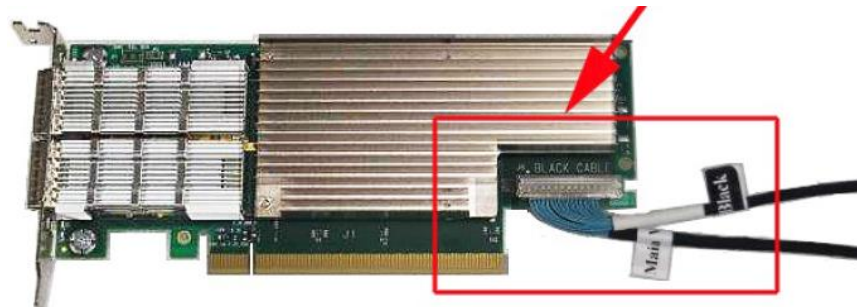
3. Carefully, open the connector cover on the “Main Cable” connector (White cable connector), as seen in the below figure.



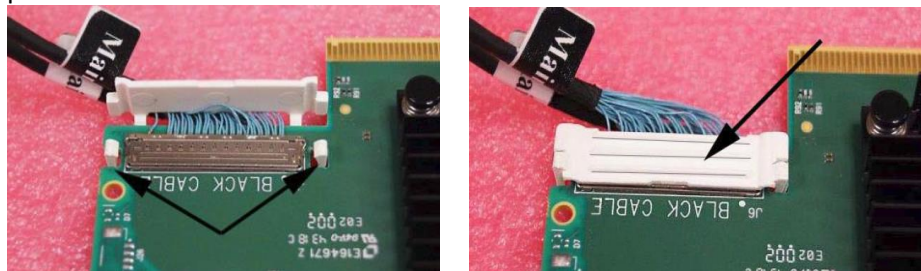
4. Align and insert the cable connector into the "White Cable" connector on the card. Close the connector lock, as seen in the below figure.



5. Repeat steps 1-3 to connect the Main Black cable to the “Black Cable” connector on the card.



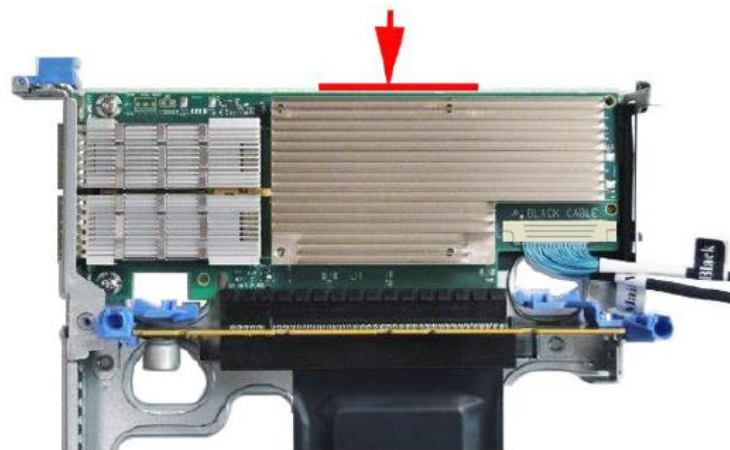
6. Slide the connector lock until the BOTTOM side is "under card", and tabs are through card slots. Press the top section of the connector lock down and lock in place.



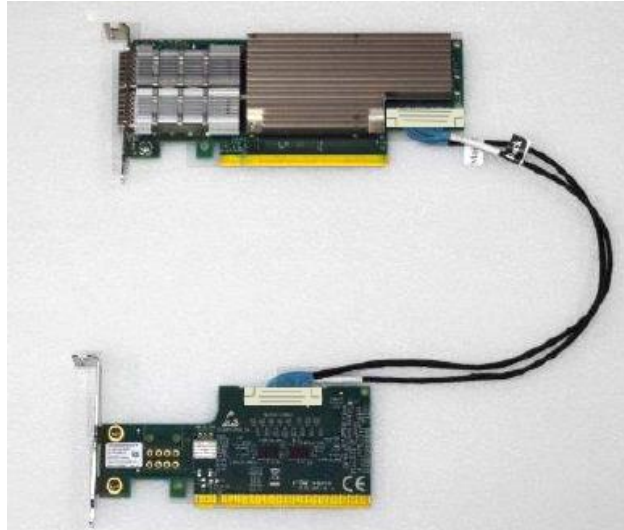
7. Physically touch and verify that both connector lock tabs are completely seated.



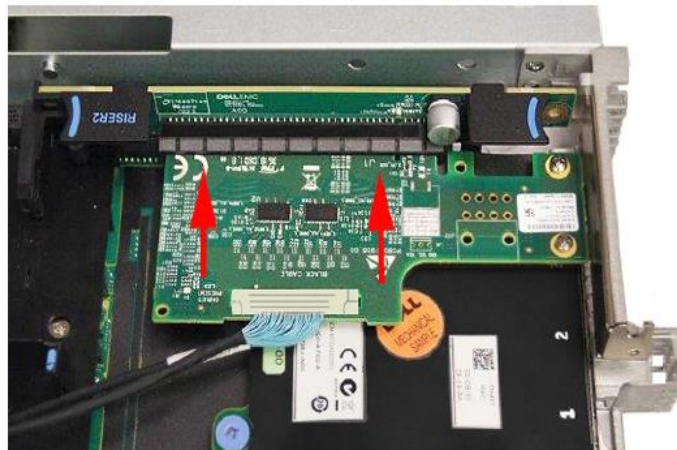
8. Install the Mellanox card into the riser per riser installation instructions and slot matrix. Close and lock the blue card latch.



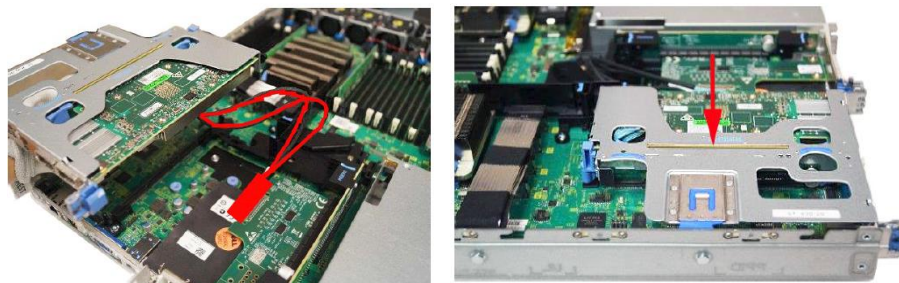
9. Repeat the above-mentioned steps to install other ends of cables to the Mellanox Auxiliary Card.



10. Install the Mellanox Auxiliary card into the riser per slot Matrix and card installation instructions.



11. With cables routed under the riser; install the riser per riser installation instructions.



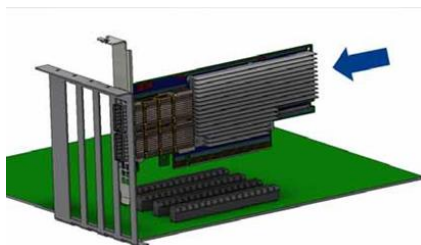
12. Make sure cable is routed as shown in the below figure.

3.6.4 Installation Instructions for HDR100 Card

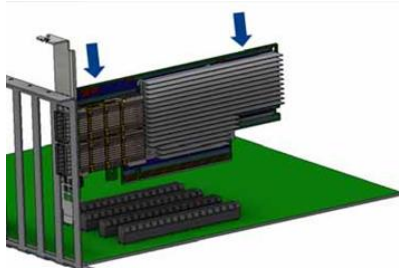


Applies to Y1T43 and 7TKND.

- **Connect the adapter Card in an available PCIe x16 slot in the chassis.**
Step 1: Locate an available PCI Express x16 slot and insert the adapter card to the chassis.



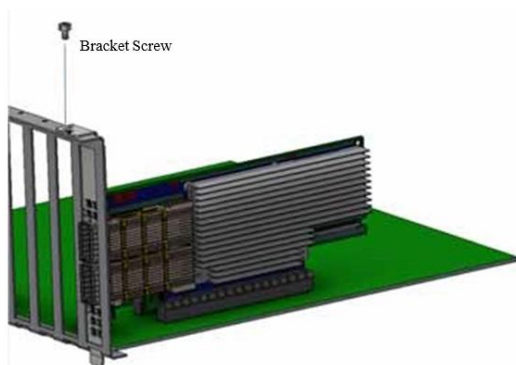
Step 2: Applying even pressure at both corners of the card, insert the adapter card in a PCI Express slot until firmly seated.



Do not use excessive force when seating the card, as this may damage the chassis.

- Secure the adapter card to the chassis.

Step 1: Secure the bracket to the chassis with the bracket screw.



3.7 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>.

3.7.1 Cable Installation

- All cables can be inserted or removed with the unit powered on.
- 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.



NOTE: When installing cables make sure that the latches engage.



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

- After inserting a cable into a port, the Green LED 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 [LED Interface](#) under the Interfaces section.
- After plugging in a cable, lock the connector using the latching mechanism particular to the cable vendor. When data is being transferred the Green LED will blink. See [LED Interface](#) under the Interfaces section.
- 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.
- 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.

3.8 Identifying the Card in Your System

3.8.1 On Linux

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

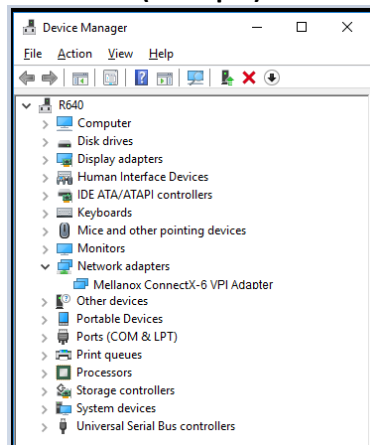

```
lspci | grep -i Mellanox
```

Network controller: Mellanox Technologies MT28908 Family [ConnectX-6]

3.8.2 On Windows

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

PCI Device (Example)



- 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_1018": VEN is equal to 0x15B3 – this is the Vendor ID of Mellanox Technologies; and DEV is equal to 1018 (for ConnectX-6) – this is a valid Mellanox Technologies PCI Device ID.



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



NOTE: 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>.

4 Driver Installation

Please use the relevant driver installation section.

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

4.1 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 adapter card installed.

4.1.1 Prerequisites

Requirements	Description
Platforms	A server platform with a ConnectX-6 InfiniBand/VPI adapter card installed.
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.

4.1.2 Downloading Mellanox OFED

- 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
af:00.0 Infiniband controller: Mellanox Technologies MT28908 Family [ConnectX-6]
Subsystem: Mellanox Technologies Device 0018
```

- 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..
 - Scroll down to the Download wizard, and click the Download tab.
 - Choose your relevant package depending on your host operating system.
 - Click the desired ISO/tgz package.
 - To obtain the download link, accept the End User License Agreement (EULA).

- 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
```

4.1.3 Installing Mellanox OFED

4.1.3.1 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 InfiniBand and 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 user space application to unlimited. If desired, tune the value unlimited to a specific amount of RAM.

For your machine to be part of the InfiniBand/VPI 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`

4.1.3.2 Installation Procedure

- Login to the installation machine as root.

- Mount the ISO image on your machine.

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

- 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 chroot 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 installation a message similar to the following:

```
Device #1:
-----
Device Type:      ConnectX-6
Part Number:      7TKND
Description:      Mellanox ConnectX®-6 Single Port VPI HDR100 QSFP Adapter
PSID:             DEL0000000013
PCI Device Name:  0b:00.0
Base MAC:         0000e41d2d5cf810
Versions:         Current      Available
FW               20.24.xxxx    20.25.xxxx
Status:          Up to date
```

- 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 Socket Direct - perform a cold reboot (power cycle)
 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.

4.1.3.3 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: DEL0000000013) To obtain firmware for this device, please contact your HW vendor.

4.1.3.4 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
```

4.1.3.5 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.

4.1.3.6 Driver Load Upon System Boot

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

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

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

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

- Set "ONBOOT=no" in the "/etc/infiniband/openib.conf" file.
- 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.

4.1.3.7 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

4.1.3.8 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.

4.1.4 Installing MLNX_OFED Using YUM

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

4.1.4.1 Setting up MLNX_OFED YUM Repository

- Log into the installation machine as root.

- 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
```

- 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]
```

- 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]:
```

- 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>)
```

- 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
```

- 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
```

4.1.4.2 Installing MLNX_OFED Using the YUM Tool

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

- 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.

- 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.rhel7u1 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
sdpnetsat.x86_64 0:1.60-26
srptools.x86_64 0:1.0.2-12

Complete!
```

4.1.4.3 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.

4.1.5 Installing MLNX_OFED Using apt-get Tool

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

4.1.5.1 Setting up MLNX_OFED apt-get Repository

- Log into the installation machine as root.
- 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.
- 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 ./
```

- Download and install Mellanox Technologies GPG-KEY.

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

- 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
```

- Update the apt-get cache.

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

4.1.5.2 Installing MLNX_OFED Using the apt-get Tool

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

- 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.

- 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](#).

4.1.5.3 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.

4.1.6 Updating Firmware After Installation

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

4.1.6.1 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
Part Number:
Description:
PSID:             DEL0000000013
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.

4.1.6.2 Updating the Device Manually

To update the device manually, please refer to the [OEM Firmware Download page](#) 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).

- Get the device's PSID.

```
mlxfwmanager_pci | grep PSID
PSID: DEL0000000013
```

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

```
mlxfwmanager_pci -i <fw_file.bin>
```

- Reboot your machine after the firmware burning is completed.

4.1.6.3 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"
```

4.1.7 UEFI Secure Boot

All kernel modules included in MLNX_OFED for RHEL7, RHEL8 and SLES15 are signed with x.509 key to support loading the modules when Secure Boot is enabled.

4.1.7.1 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.

- Download the x.509 public key.

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

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

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

- 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#`

4.1.7.2 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:

- 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.)

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

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


4.1.8 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 at <https://community.mellanox.com/docs/DOC-2489>.

4.2 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.

4.2.1 Software Requirements

Description	Package
Windows Server 2016	MLNX_WinOF2-2_10_All_x64.exe
Windows Server 2019	

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

4.2.2 Downloading Mellanox WinOF-2 Driver

➤ To download the .exe file according to your Operating System, please follow the steps below:

- 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".

- Go to the Mellanox WinOF-2 web page at: <http://www.mellanox.com> > Products > InfiniBand/VPI Drivers => Windows SW/Drivers.
- 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>_<arch>.exe.



Installing the incorrect .exe file is prohibited. If you do so, an error message will be displayed. For example, if you install a 64-bit .exe 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".

4.2.3 Installing Mellanox WinOF-2 Driver



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

This section provides instructions for two types of installation procedures, and both require administrator privileges:

- [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.

4.2.3.1 Attended Installation

The following is an example of an installation session.

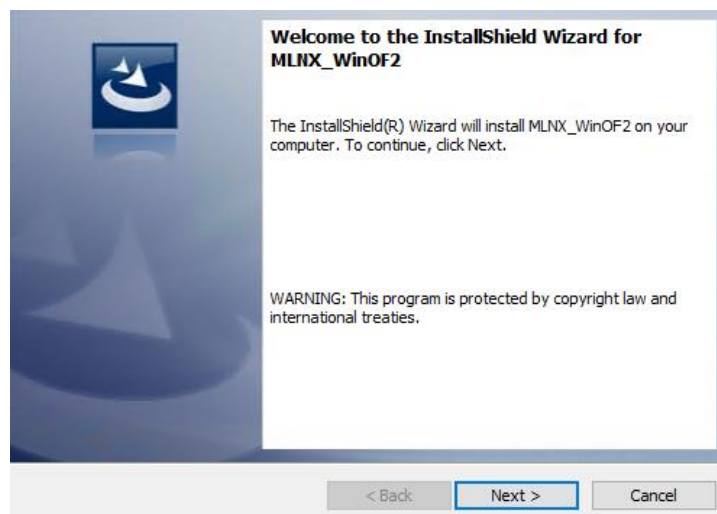
- Double click the .exe and follow the GUI instructions to install MLNX_WinOF2.
- **[Optional]** Manually configure your setup to contain the logs option (replace "LogFile" with the relevant directory):

```
MLNX_WinOF2-[Driver/Version]_<revision_version>_All_Arch.exe /v"/l*vx [LogFile]"
```

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

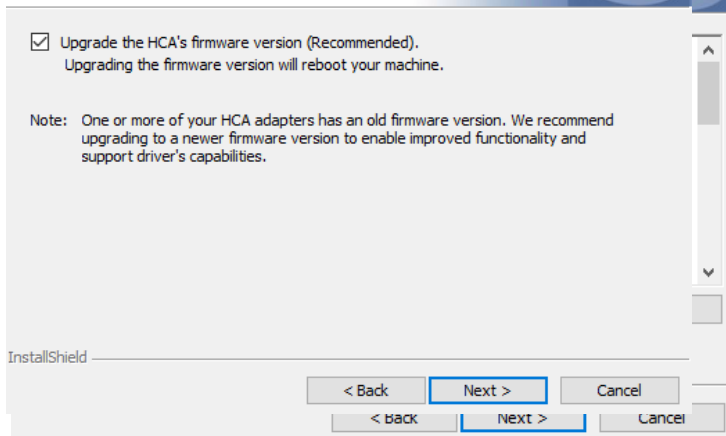
```
MLNX_WinOF2-2_10_50000_All_x64.exe /v"/l*vx MyLog.txt=1"
```

- Click Next in the Welcome screen.

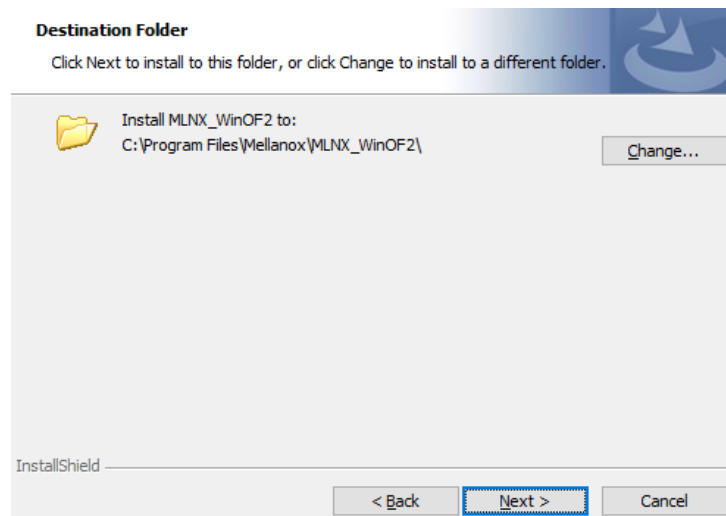


- Read and accept the license agreement and click Next.

Firmware Upgrade

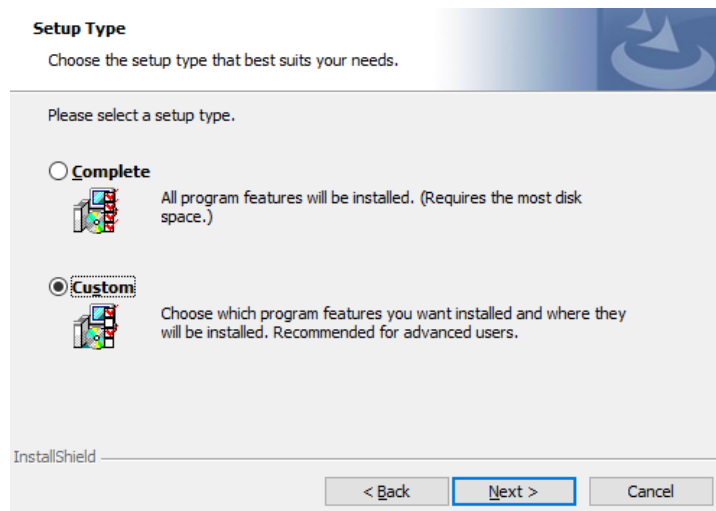


- Select the target folder for the installation.



- The firmware upgrade screen will be displayed in the following cases:
- If the user has an OEM card. In this case, the firmware will not be displayed.
- 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.

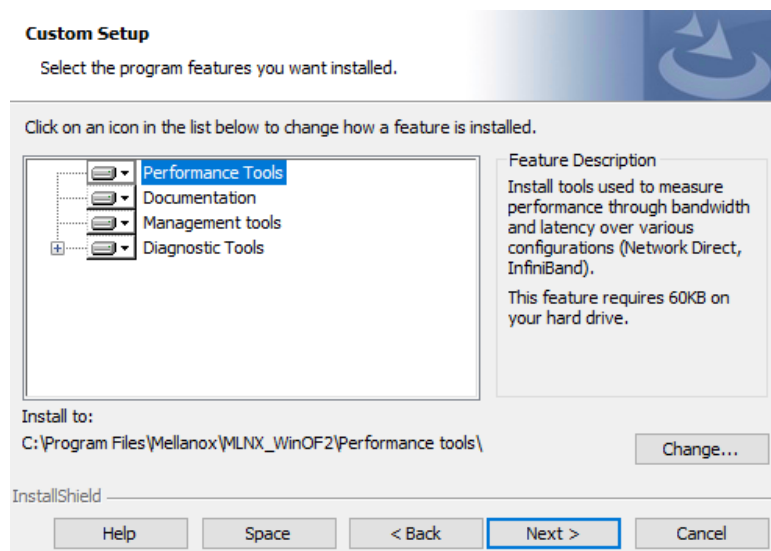
- Select a Complete or Custom installation, follow [Step a](#) onward.



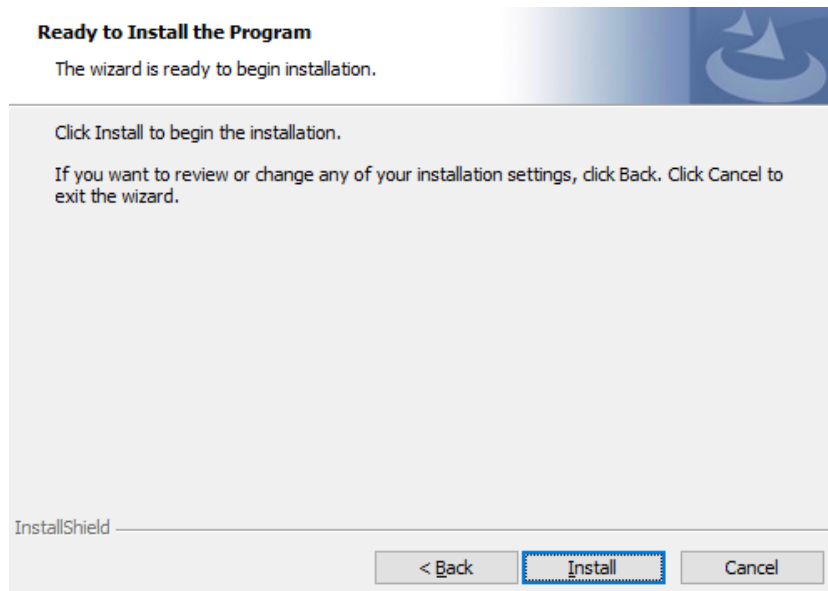
a) Select the desired feature to install:

- Performance tools - install the performance tools that are used to measure performance in user environment
- Documentation - contains the User Manual and Release Notes
- Management tools - installation tools used for management, such as mlxstat
- Diagnostic Tools - installation tools used for diagnostics, such as mlx5cmd

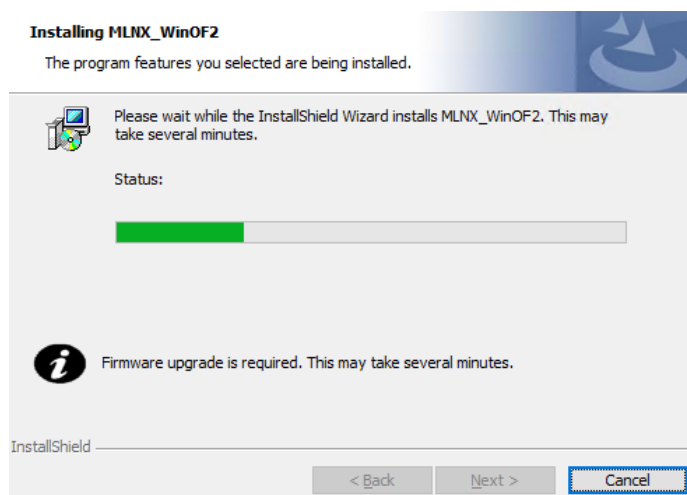
b) Click Next to install the desired tools.



- Click Install to start the installation.



- In case firmware upgrade option was checked in [Step 7](#), you will be notified if a firmware upgrade is required (see ).



- Click Finish to complete the installation.

4.2.3.2 Unattended Installation



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

The following is an example of an unattended installation session.

- Open a CMD console-> Click Start-> Task Manager File-> Run new task-> and enter CMD.

- Install the driver. Run:

```
MLNX_WinOF2-[Driver/Version]_<revision_version>_All_Arch.exe /S /v/qn
```

- **[Optional]** Manually configure your setup to contain the logs option:

```
_All_Arch.exe /S /v/qn /v"/I*vx [Log- File]" v:shapes="_x0000_s1026">
```

- **[Optional]** if you wish to control whether to install ND provider or not (i.e., *MT_NDPROPERTY default value is True*).

```
MLNX_WinOF2-[Driver/Version]_<revision_version>_All_Arch.exe /vMT_NDPROPERTY=1
```

- **[Optional]** If you do not wish to upgrade your firmware version (i.e., *MT_SKIPFWUPGRD default value is False*).

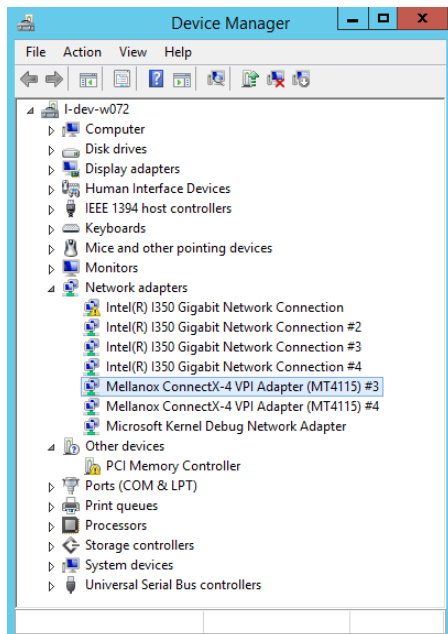
```
MLNX_WinOF2-[Driver/Version]_<revision_version>_All_Arch.exe /vMT_SKIPFWUPGRD=1
```

4.2.3.3 Installation Results

Upon installation completion, you can verify the successful addition of the network card(s) through the Device Manager. The inf files can be located at:

%ProgramFiles%\Mellanox\MLNX_WinOF2\Drivers\

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



4.2.4 Uninstalling Mellanox WinOF-2 Driver

4.2.4.1 Attended Uninstallation

To uninstall MLNX_WinOF2 on a single node:

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

4.2.4.2 Unattended Uninstallation

To uninstall MLNX_WinOF2 in unattended mode:

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

```
MLNX_WinOF2-2_0_All_x64.exe /S /x /v"/qn"
```

4.2.5 Extracting Files Without Running Installation

➤ **To extract the files without running installation, perform the following steps:**

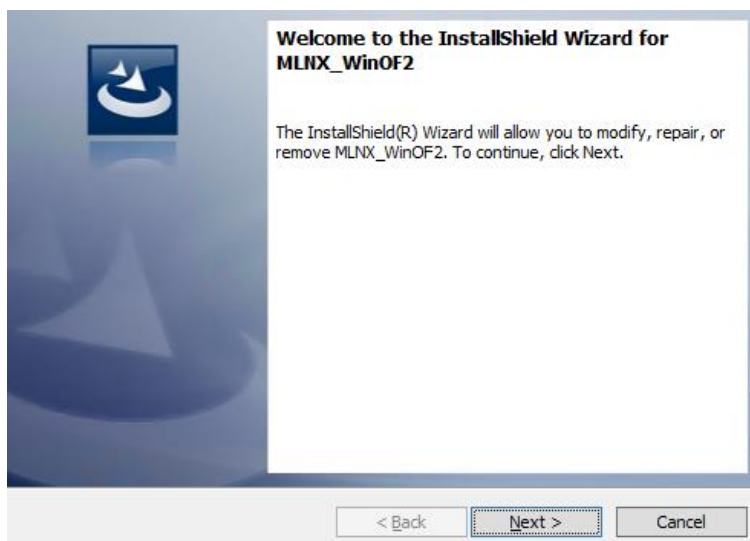
- Open a CMD console-> Click Start-> Task Manager-> File-> Run new task-> and enter CMD.
- Extract the driver and the tools:

```
MLNX_WinOF2-2_0_<revision_version>_All_x64 /a
```

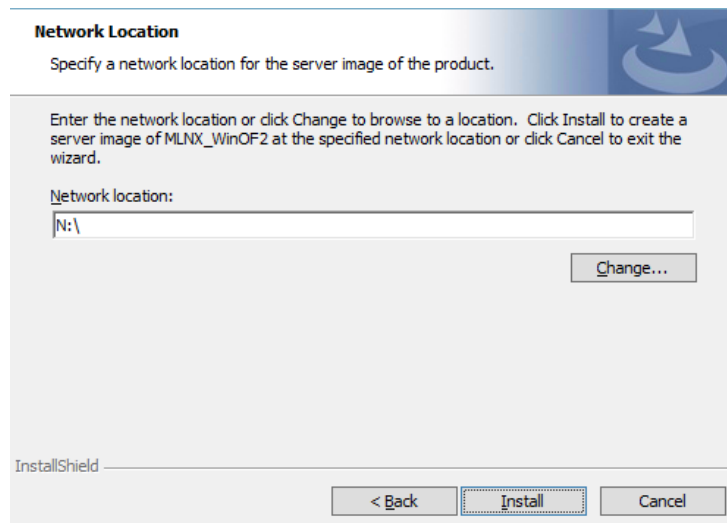
To extract only the driver file

```
MLNX_WinOF2-2_0_<revision_version>_All_x64 /a /vMT_DRIVERS_ONLY=1
```

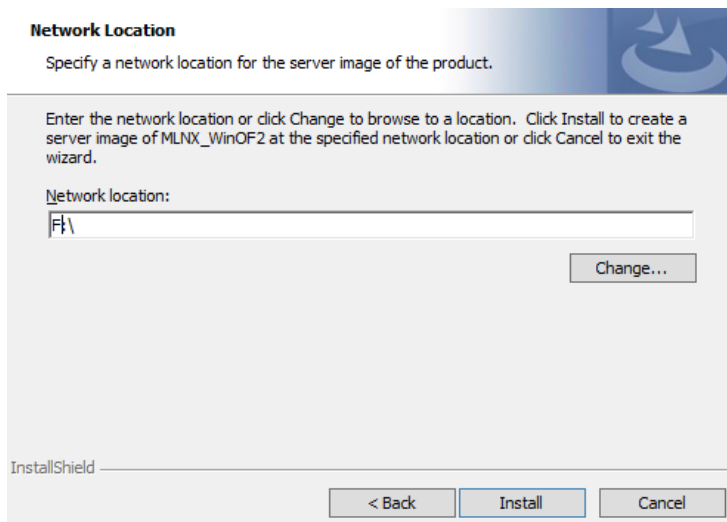
- Click Next to create a server image.



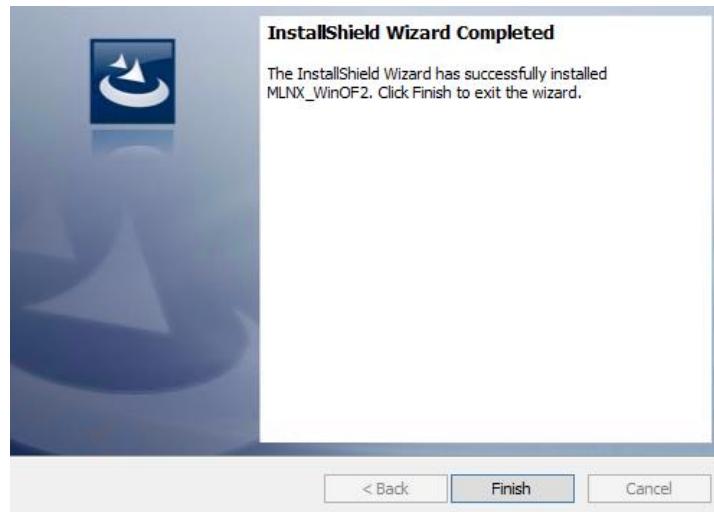
- Click Change and specify the location in which the files are extracted to.



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



- To complete the extraction, click Finish.



4.2.6 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.

5 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
Part Number:      Y1T43
Description:      Mellanox ConnectX®-6 Single Port VPI HDR100 QSFP Adapter
PSID:             DEL0000000013
PCI Device Name:  0000:06:00.0
Base GUID:        e41d2d0300fd8b8a
Versions:         Current      Available
                  FW 20.24.xxxx  20.25.xxxx

Status:           Update required

Device Type:      ConnectX-6
Part Number:      Y1T43
Description:      Mellanox ConnectX®-6 Single Port VPI HDR100 QSFP Adapter
PSID:             DEL0000000013
PCI Device Name:  0000:07:00.0
Base MAC:         0000e41d2da206d4
Versions:         Current      Available
                  FW 20.24.xxxx  20.25.xxxx

Status:           Up to date

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
```

6 Troubleshooting

6.1 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

6.2 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	<pre>ibstat ibv_devinfo</pre>
Firmware Version Upgrade	To download the latest firmware version refer to http://www.mellanox.com/supportdownloader
Collect Log File	<pre>cat /var/log/messages dmesg >> system.log journalctl (Applicable on new operating systems) cat /var/log/syslog</pre>

6.3 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: <pre>WinMFT mst start mst status flint -d <mst_device> q</pre>
Ports Information	vstat
Firmware Version Upgrade	Download the latest firmware version using the PSID/board ID: http://www.mellanox.com/supportdownloader/ <pre>flint -d <mst_device> -i <firmware_bin_file> b</pre>
Collect Log File	• Event log viewer • MST device logs: ▪ mst start ▪ mst status • <code>flint -d <mst_device> dc > dump_configuration.log</code> • <code>mstdump <mst_device> dc > mstdump.log</code>

7 Specifications

7.1 Y1T43 and 7TKND Specifications



Please make sure to install the ConnectX-6 card in a PCIe slot that is capable of supplying the required power and airflow as stated in the below table.

Physical	Adapter Card Size: 6.6 in. x 2.71 in. (167.65mm x 68.90mm)		
	Connector: Single QSFP56 InfiniBand and Ethernet (copper and optical)		
Protocol Support	InfiniBand: IBTA v1.3 and v1.4 ^a Auto-Negotiation: 1X/2X/4X SDR (2.5Gb/s per lane), DDR (5Gb/s per lane), QDR (10Gb/s per lane), FDR (14.0625Gb/s per lane), EDR (25Gb/s per lane) port, HDR100 (2 lane x 50Gb/s per lane) port		
	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-KX4, 10GBASE-CR, 10GBASE-KR, SGMII, 1000BASE-CX, 1000BASE-KX, 10GBASE-SR		
	Data Rate	InfiniBand	SDR/DDR/QDR/FDR/EDR/HDR100
		Ethernet	1/10/25/40/50/100 Gb/s
	Gen3.0/4.0: SERDES @ 8.0GT/s/16GT/s, x16 lanes, SNAP! (Single-slot) PCIe 2x8 in a row (2.0 and 1.1 compatible)		
Adapter Card Power	Voltage: 12V, 3.3VAUX		
	Power	Cable Type	
	Typical Power^b	Passive Cables	19.4W
	Maximum Power	Passive Cables	22.4W
		3.5 Active Cables	22.4W
	Maximum power available through QSFP56 port: 3.5W		
Environmental	Temperature	Operational	0°C to 55°C
		Non-operational	-40°C to 70°C
	Humidity: 90% relative humidity ^c		
	Airflow (LFM) / Ambient Temperature	Cable Type	Airflow Direction
			Heatsink to Port Port to Heatsink
		Passive Cables	300 / 55°C 200 / 35°C
Regulatory	Safety: CB / cTUVus / CE		
	EMC: CE / FCC / VCCI / ICES / RCM / KC		
	RoHS: RoHS Compliant		

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

b. Typical power for ATIS traffic load.

c. For both operational and non-operational states.

7.2 1GK7G and CY7GD Specifications



Please make sure to install the ConnectX-6 card in a PCIe slot that is capable of supplying the required power and airflow as stated in the below table.

Physical	Adapter Card Size: 6.6 in. x 2.71 in. (167.65mm x 68.90mm)		
	PCIe Auxiliary Connection Card Size: 5.09 in. x 2.32 in. (129.30mm x 59.00mm) Two Cabline CA-II Plus harnesses (white and black) Length: 35cm		
Protocol Support	Connector: Single QSFP56 InfiniBand and Ethernet (copper and optical)		
	InfiniBand: IBTA v1.3 and v1.4 ^a Auto-Negotiation: 1X/2X/4X SDR (2.5Gb/s per lane), DDR (5Gb/s per lane), QDR (10Gb/s per lane), FDR (14.0625Gb/s per lane), EDR (25Gb/s per lane) port, HDR100 (2 lane x 50Gb/s per lane) port, HDR (50Gb/s per lane) port		
	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-KX4, 10GBASE-CR, 10GBASE-KR, SGMII, 1000BASE-CX, 1000BASE-KX, 10GBASE-SR		
	Data Rate	InfiniBand	SDR/DDR/QDR/FDR/EDR/HDR100/HDR
		Ethernet	1/10/25/40/50/100/200 Gb/s
Adapter Card Power	ConnectX-6 Card: Gen 3.0/4.0 SERDES @ 8.0GT/s / 16 GT/s Auxiliary PCIe Connection Card: Gen3.0 SERDES @ 8.0GT/s x16 lanes		
	Voltage: 12V, 3.3VAUX		
	Power	Cable Type	
	Typical Power^b	Passive Cables	28.1W
	Maximum Power	Passive Cables	32.8W
		5W Active Cables	38.3W
Active PCIe Auxiliary Connection Card Power	Maximum power available through QSFP56 port: 5W		
	Typical Power	3.0W	
	Maximum Power	4.0W	
Environmental	Temperature	Operational	0°C to 55°C
		Non-operational	-40°C to 70°C
	Humidity: 90% relative humidity ^c		
	Airflow (LFM) / Ambient Temperature	Cable Type	Airflow Direction
		Passive Cables	Heatsink to Port 300 / 55°C Port to Heatsink 200 / 35°C
		Mellanox Active 2.75W Cables	300 / 55°C 200 / 35°C
Regulatory	Safety: CB / cTUVus / CE		
	EMC: CE / FCC / VCCI / ICES / RCM / KC		
	RoHS: RoHS Compliant		

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

b. Typical power for ATIS traffic load.

c. For both operational and non-operational states.

7.3 Adapter Card and Bracket Mechanical Drawings and Dimensions

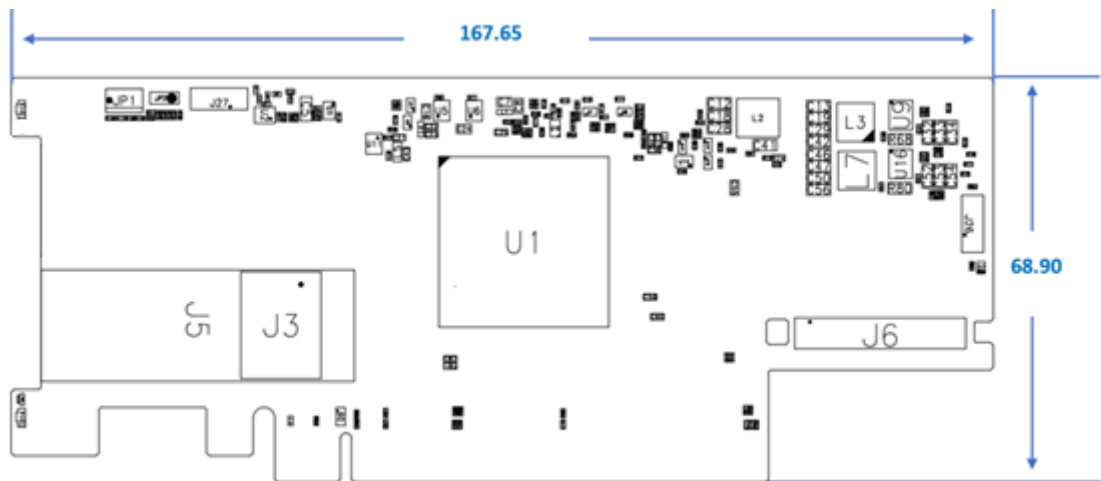


All dimensions are in millimeters. The PCB mechanical tolerance is $\pm 0.13\text{mm}$.

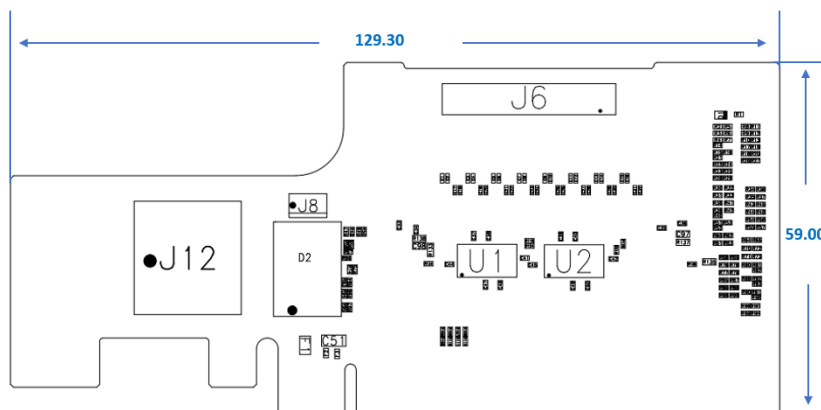


For the 3D Model of the card, please refer to http://www.mellanox.com/page/3d_models..

7.3.1 ConnectX-6 Adapter Card Mechanical Drawing and Dimensions



7.3.2 Auxiliary PCIe Connection Card

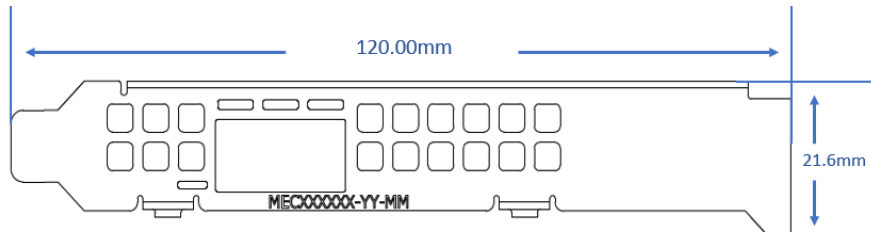


7.3.3 ConnectX-6 Brackets Mechanical Drawing and Dimensions

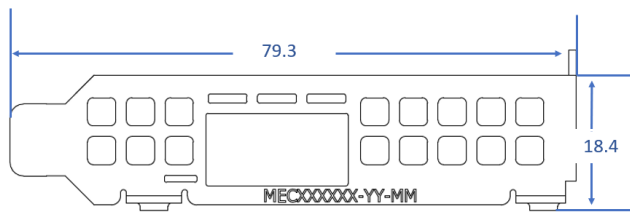


All dimensions are in millimeters. The bracket mechanical tolerance is +/- 0.25mm.

7.3.3.1 Tall Bracket



7.3.3.2 Short Bracket



8 PCIe Express Pinouts Description for SNAPI

ConnectX-6 SNAPI cards offer improved performance to dual-socket servers by enabling direct access from each CPU in a dual-socket server to the network through its dedicated PCIe interface. The PCIe x16 interface is split into two PCIe x8 in a row, such that each of the PCIe x8 lanes can be connected to a dedicated CPU in a dual-socket server. In such a configuration, Socket Direct brings lower latency and lower CPU utilization as the direct connection from each CPU to the network means the Interconnect can bypass a QPI (UPI) and the other CPU, optimizing performance and improving latency. CPU utilization is improved as each CPU handles only its own traffic and not traffic from the other CPU.

In order to allow this capability, a system with a special PCI Express x16 slot is required. The below table provides the pin definitions of the required four special PCIe pins.

PCIe pin#	Server Connection for 2x PCIe x8 mode	Server Connection for 1x PCIe x16 mode	Comments
B82	1Kohm pull up to 3.3VAUX	Either leave unconnected or pulled to GND	Configure the card to work at 2x PCIe x8 or 1x PCIe x16 modes
A32	P signal of differential PCIe clock (100MHz nominally) of the CPU which connects to PCIe lanes 15-8 of the PCIe connector	Not Connected	PCIe clock for ConnectX-6 PCIe bus lanes [15:8]
A33	N signal of differential PCIe clock (100MHz nominally) of the CPU which connects to PCIe lanes 15-8 of the PCIe connector	Not Connected	
A15	PERST signal from the CPU which connects to PCIe lanes 15-8 of the PCIe connector	Not Connected	PERST (PCIe Reset) for ConnectX-6 PCIe bus lanes [15:8]

9 Finding the MAC 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.

Y1T43 Board Label  Made in Israel DP/N 0Y1T43 IL-0Y1T43-74031 YMD-ZSSS-A00  Model No: CX653105A ConnectX-6 P/N: 0Y1T43 REV: E1 GUID: EC0D9A0300224CFD S/N: IL0Y1T4374031YMDZSSS	7TKND Board Label  Made in Israel DP/N 07TKND IL-07TKND-74031 YMD-ZSSS-A00  Model No: CX653105A ConnectX-6 P/N: 07TKND REV: E1 GUID: EC0D9A0300224CFD S/N: IL07TKND74031YMDZSSS
1GK7G Board Label  Made in Israel DP/N 01GK7G IL-01GK7G-74031 YMD-ZSSS-A00  Model No: CX654105A ConnectX-6 P/N: 01GK7G REV: E1 GUID: EC0D9A0300224CFD S/N: IL01GK7G74031YMDZSSS	CY7GD Board Label  Made in Israel DP/N 0CY7GD IL-0CY7GD-74031 YMD-ZSSS-A00  Model No: CX653105A ConnectX-6 P/N: 0CY7GD REV: E1 GUID: EC0D9A0300224CFD S/N: IL0CY7GD74031YMDZSSS