



NVIDIA ConnectX-4 Lx Ethernet Adapter Cards for OCP 3.0 User Manual

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About This Manual

This User Manual describes NVIDIA® ConnectX®-4 Lx Ethernet adapter cards for Open Compute Project, spec 3.0. It provides details as to the interfaces of the board, specifications, required software and firmware for operating the board, and relevant documentation.

EOL'd (End of Life) Ordering Part Numbers

The table below provides the ordering part numbers (OPN) for ConnectX-4 Lx Ethernet adapter cards for OCP Spec 3.0.

NVIDIA SKU	Legacy OPN	Marketing Description
900-9X422-0052-SB0	MCX4621A-XCAB	ConnectX®-4 Lx EN network interface card for OCP 3.0, with host management, 10GbE Dual-port SFP28, PCIe3.0 x8, Thumbscrew bracket, ROHS Compliant
900-9X422-0053-SB0	MCX4621A-ACAB	ConnectX®-4 Lx EN network interface card for OCP 3.0, with host management, 25GbE Dual-port SFP28, PCIe3.0 x8, Thumbscrew bracket, ROHS Compliant

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 NVIDIA products directly from NVIDIA are invited to contact us through the following methods:

- URL: <https://www.nvidia.com> > Support
- E-mail: enterprisesupport@nvidia.com

Customers who purchased NVIDIA Global Support Services, please see your contract for details regarding Technical Support.

Customers who purchased NVIDIA products through an NVIDIA-approved reseller should first seek assistance through their reseller.

Related Documentation

NVIDIA SKU	Legacy OPN	Marketing Description	NVIDIA MLNX_OFED for Linux User Manual and Release Notes	User Manual and Release Notes describing MLNX_OFED features, performance, band diagnostic, tools content and configuration. See NVIDIA MLNX_OFED for Linux Documentation .
900-9X422-0052-SB0	MCX4621A-XCAB	ConnectX®-4 Lx EN network interface card for OCP 3.0, with host management, 10GbE Dual-port SFP28, PCIe3.0 x8, Thumbscrew bracket, ROHS Compliant		
900-9X422-0053-SB0	MCX4621A-ACAB	ConnectX®-4 Lx EN network interface card for OCP 3.0, with host management,		

		25GbE Dual-port SFP28, PCIe3.0 x8, Thumbscrew bracket, ROHS Compliant
WinOF-2 for Windows User Manual and Release Notes	User Manual describing WinOF-2 features, performance, Ethernet diagnostic, tools content and configuration. See WinOF-2 for Windows Documentation .	
NVIDIA VMware for Ethernet User Manual and Release Notes	User Manual describing the various components of the NVIDIA ConnectX® NATIVE ESXi stack. See VMware® ESXi Documentation .	
NVIDIA Firmware Update	NVIDIA firmware update and query utility used to update the firmware. See NVIDIA Firmware Utility (mlxup) Documentation .	
NVIDIA Firmware Tools (MFT) User Manual	User Manual describing the set of MFT firmware management tools for a single	

	node. See MFT User Manual .
IEEE Std 802.3 Specification	IEEE Ethernet Specifications
PCI Express Specifications	Industry Standard PCI Express Base and Card Electromechanical Specifications .
Open Compute Project Specification 3.0	OCP Spec 3.0
LinkX Interconnect Solutions	LinkX Ethernet 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. NVIDIA offers one of the industry's broadest portfolio of 40GbE, 56GbE, 100GbE, 200GbE and 400GbE 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. In addition to meeting Ethernet standards, NVIDIA tests every product in an end-to-end environment ensuring a Bit Error Rate of less than $1E-15$. Read more at [LinkX Cables and Transceivers](#).

Document Conventions

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

Introduction

Product Overview

This is the User Guide for Ethernet adapter cards based on the ConnectX®-4 Lx integrated circuit device. These adapters connectivity provide the highest performing low latency and most flexible interconnect solution for PCI Express Gen 3.0 servers used in Enterprise Data Centers and High-Performance Computing environments.

Important Notes:

1. ConnectX-4 Lx OCP 3.0 cards were tested for Shock & Vibe in accordance with NVIDIA specifications and setups, as the OCP spec 3.0 available at that time did not contain any S&V definitions. A newer version of the OCP spec 3.0 has defined S&V specifications and NVIDIA is in the midst of retesting these cards to comply with OCP spec 3.0.
2. In some of the OCP 3.0 cards, 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. NVIDIA is updating the OCP 3.0 cards to ensure the proper insertion process.

Note

Please note the following OPN has a thumbscrew bracket. For other retention mechanisms brackets, please contact NVIDIA.

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

ConnectX-4 Lx for OCP 3.0 Adapter Card Overview

Part Number	MCX4621A-XCAB	MCX4621A-ACAB
Form Factor /	Small Form Factor (SFF) / 4.52in. x 2.99in. (115mm x 76mm)	

Part Number	MCX4621A-XCAB	MCX4621A-ACAB
Dimensions		
Network Connector Type	Dual-port SFP28	
Ethernet Data Rate	10Gb/s	10/25 Gb/s
PCI Express Connectors	PCIe Gen 3.0 SERDES @ 8.0GT/s x8 lanes	
Bracket	Thumbscrew Bracket	
Host Management	□	□
RoHS	RoHS Compliant	

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

Features and Benefits

Note

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) through an x8 edge connector. Gen 1.1 and 3.0 compatible.
Up to 25 Gigabit Ethernet	NVIDIA adapters comply with the following IEEE 802.3 standards: • 25GbE / 10GbE / 1GbE • IEEE 802.3by, Ethernet Consortium25 • 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)

Feature	Description
	• 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	• SPI - includes one 16MB SPI Flash device (W25Q128FVSIQ device by WINBOND-NUVOTON).
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-4 Lx 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-4 Lx, utilizing IBTA 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-4 Lx, advanced congestion control hardware mechanisms, RoCE provides efficient low-latency RDMA services over Layer 2 and Layer 3 networks.
NVIDIA 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-4 Lx

Feature	Description
	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.
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-4 Lx 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
SR-IOV	ConnectX-4 Lx 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.
Wake-on-LAN (WoL)	Supported
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 Gb/s Ethernet switches
- Passive copper cable with ESD protection
- Powered connectors for optical and active cable support

Interfaces

Ethernet SFP28 Interface

The network ports of the ConnectX®-4 Lx adapter card for OCP Spec 3.0 are compliant with the IEEE 802.3 Ethernet standards listed in [Features and Benefits](#). Ethernet traffic is transmitted through the SFP28 connectors on the adapter card.

Note

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

PCI Express Interface

The ConnectX®-4 Lx adapter card supports PCI Express Gen 3.0 (1.1 and 2.0 compatible) through an x8 edge connector. The device can be either a master initiating the PCI Express bus operations, or a subordinate responding to PCI bus operations. The following lists PCIe interface features:

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

LED Interface

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

Link Indications

LED and State	Description		
1 Hz blinking Yellow	Beacon command for locating the adapter card		
4 Hz blinking Yellow	Indicates an error with the link. The error can be one of the following:		
	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		

Heatsink Interface

A heatsink is attached to the ConnectX-4 Lx IC in order to dissipate the heat from the ConnectX-4 Lx IC. It is attached either by using four spring-loaded push pins that insert into four mounting holes or by screws.

ConnectX-4 Lx IC has a thermal shutdown safety mechanism that automatically shuts down the ConnectX-4 Lx card in cases of a high-temperature event, improper thermal coupling or heatsink removal.

SMBus Interface

ConnectX-4 Lx technology maintains support for manageability through a BMC. ConnectX-4 Lx 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 PCIe stand-up adapter. For configuring the adapter for the specific manageability solution in use by the server, please contact NVIDIA Support.

Voltage Regulators

The voltage regulator power is derived from the PCI Express edge connector 12V 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.

Hardware Installation

Installation and initialization of ConnectX-4 Lx adapter cards for OCP Spec 3.0 require attention to the mechanical attributes, power specification, and precautions for electronic equipment.

Safety Warnings



Info

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

Note that not all warnings are relevant to all models.

	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 meltdown, 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 airflow 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 The 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

Installation Procedure Overview

The installation procedure of ConnectX-4 Lx 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 the ConnectX-4 Lx adapter card in the system	Refer to Installation Instructions
7	Connect cables or modules to the card	Refer to Cables and Modules
8	Identify ConnectX-4 Lx adapter card in the system	Refer to Identify the Card in Your System

System Requirements

Warning

Unless otherwise specified, NVIDIA 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



Warning

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 x8 slot for OCP spec 3.0 is required for installing the card.

Airflow Requirements

ConnectX-4 Lx 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.



Warning

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

Safety Precautions

Warning

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.

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-4 Lx adapter card.**

Unpack and remove the ConnectX-4 Lx 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.

Warning

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-4 Lx card, make sure that the system is disconnected from power.

OCP 3.0 Bracket Replacement Instructions

The OCP 3.0 adapter card is shipped assembled either with a thumbscrew (pull-tab) bracket, an internal-lock bracket, or an ejector-latch bracket. If this form factor is suitable for your requirements, you can skip the remainder of this section and move to Installation Instructions. If you need to replace the assembled OCP 3.0 bracket with a different form-factor bracket, please follow the instructions in this section.

Warning

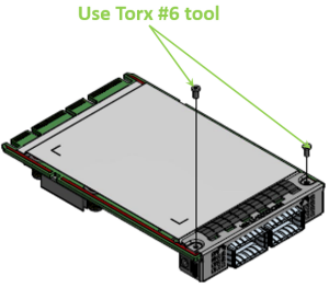
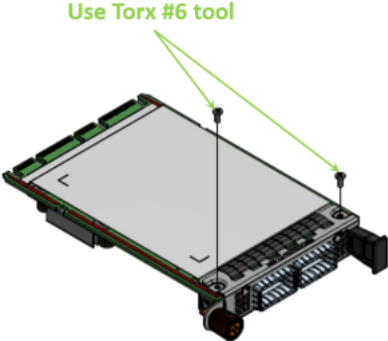
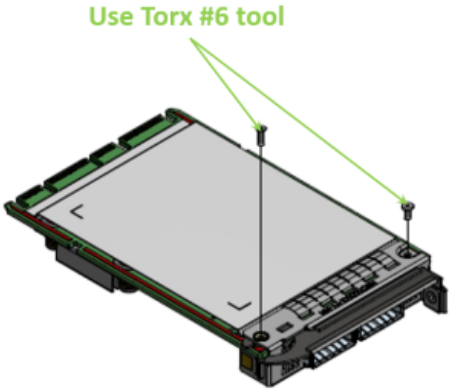
Due to risk of damaging the EMI gasket, it is not recommended to replace the bracket more than three times.

To replace the bracket you will need the following parts:

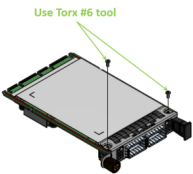
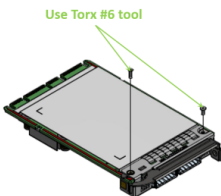
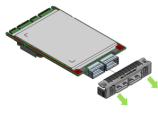
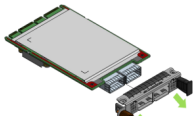
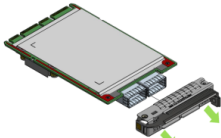
- The new bracket of the desired form factor.
- The screws supplied with the new bracket kit.
- The required torx tool type as specified in the instructions.

Removing the Existing Bracket

1. Using the torx tool type listed in the below table, remove the screws according to the instructions per OCP 3.0 bracket type.

Internal Lock Bracket	Pull-tab (Thumbscrew) Bracket	Ejector-Latch Bracket
		

2. Gently separate the bracket from the OCP 3.0 card.

Internal Lock Bracket	Pull-tab (Thumbscrew) Bracket	Ejector-Latch Bracket	Internal Lock Bracket	Pull-tab Bracket	Ejector-Latch Bracket
					
					



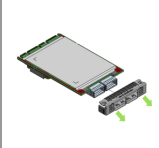
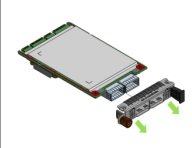
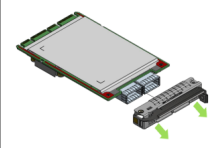
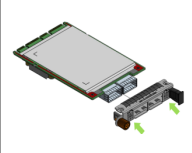
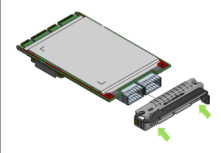
Warning

Be careful not to put stress on the LEDs on the adapter card.

3. Save the two screws.

Installing the New Bracket

1. Assemble the new bracket onto the card.

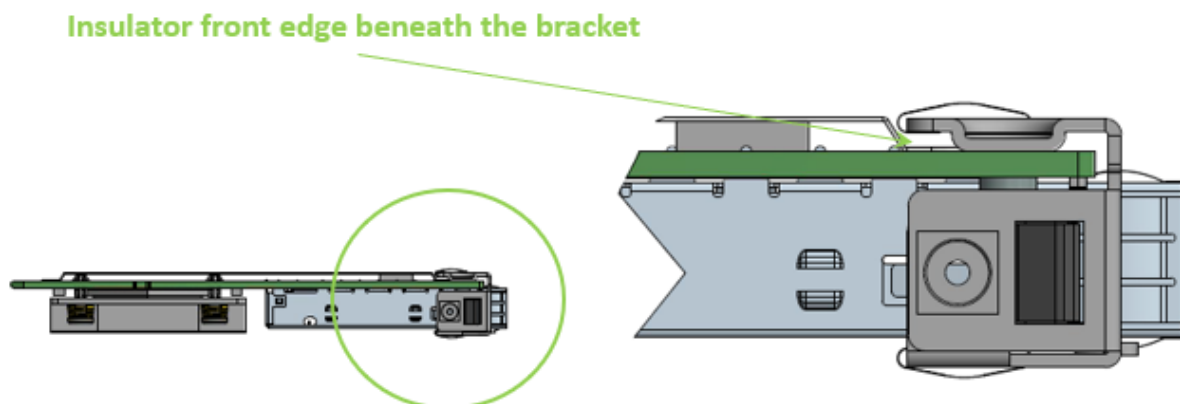
Internal Lock Bracket			Pull-tab Bracket			Ejector-Latch Bracket		
Internal Lock Bracket			Pull-tab Bracket			Ejector-Latch Bracket		
								
								
								



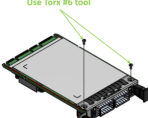
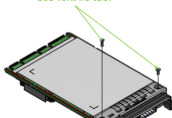
Warning

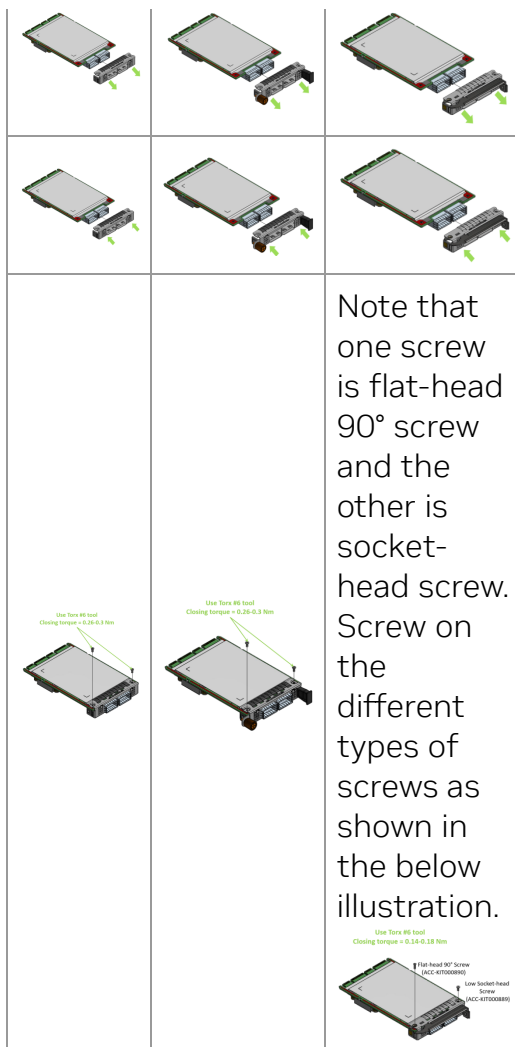
Do not force the bracket onto the adapter card.

2. Ensure that the insulator's front edge is beneath the bracket, as shown in the below figure.



3. Screw on the OCP 3.0 bracket with the supplied screws that came with the new bracket kit. Use the specified torx tool type and apply the specified torque on the screws per bracket form factor.

Internal Lock Bracket	Pull-tab (Thumb screw) Bracket	Ejector-Latch Bracket	Internal Lock Bracket	Pull-tab Bracket	Ejector-Latch Bracket	Internal Lock Bracket	Pull-tab Bracket	Ejector-Latch Bracket	Internal Lock Bracket	Pull-tab Bracket	Ejector-Latch Bracket
											



OCP 3.0 Adapter Card Installation Instructions

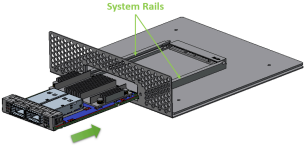
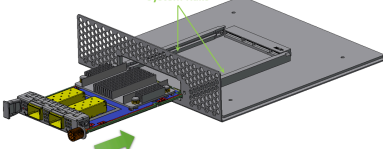
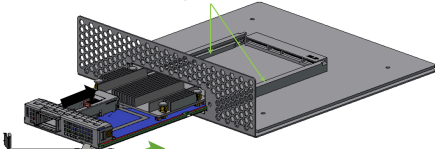
This section provides detailed instructions on how to install your adapter card in a system. The OCP 3.0 adapter card is shipped assembled either with an internal-lock, a pull-tab (thumbscrew), or an ejector-latch bracket. Follow the below instructions depending on the card you have purchased.

Note

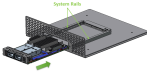
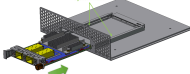
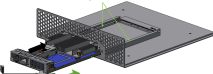
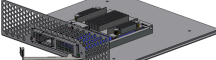
The following figures are for illustration purposes only.

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.

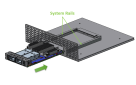
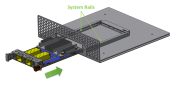
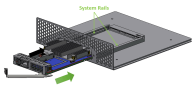
2. Open the system case.
3. Align the card with the system rails.

Internal Lock Bracket	Pull-tab (Thumbscrew) Bracket	Ejector-Latch Bracket
		

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

Internal Lock Bracket	Pull-tab (Thumbscrew) Bracket	Ejector-Latch Bracket	Internal Lock Bracket	Pull-tab (Thumbscrew) Bracket	Ejector-Latch Bracket
					
					

5. Secure the card.

Internal Lock Bracket			Pull-tab (Thumb screw) Bracket			Ejector-Latch Bracket			Internal Lock Bracket			Pull-tab (Thumb screw) Bracket			Ejector-Latch Bracket			Internal Lock Bracket			Pull-tab (Thumb screw) Bracket			Ejector-Latch Bracket		
																										
A clicking sound is heard once the connectors are in a full mate. 			Turn the captive screw clockwise until firmly locked. 			Close the ejector. 																				

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

Cables and Modules

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.
 1. 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.
 2. 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.
 3. 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.
 4. 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.

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.

Identifying the Card in Your System

On Linux

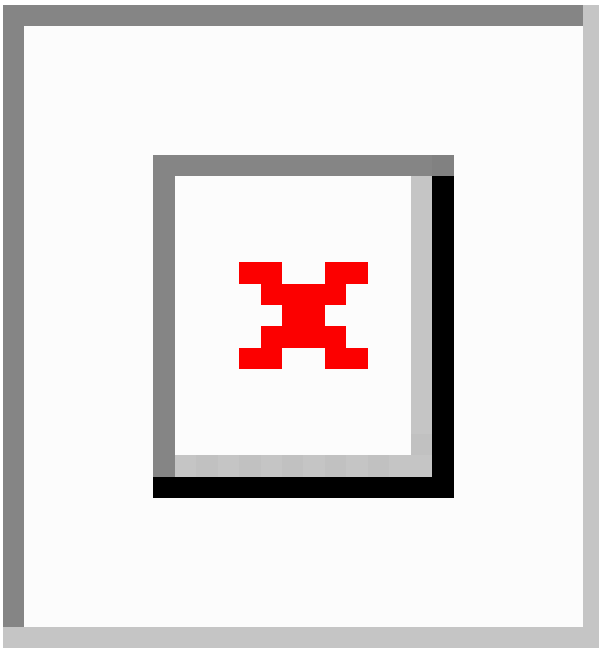
Get the device location on the PCI bus by running `lspci` and locating lines with the string “Mellanox Technologies”:

```
lspci |grep -i Mellanox
Network controller: Mellanox Technologies MT28800 Family
[ConnectX-4 Lx]
```

On Windows

1. Open Device Manager on the server. Click **Start** => **Run**, and then enter **devmgmt.msc**.
2. Expand **System Devices** and locate your NVIDIA ConnectX-4 Lx 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 NVIDIA; and DEV is equal to 1018 (for ConnectX-4 Lx) – this is a valid NVIDIA PCI Device ID.

Note

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

Note

The list of NVIDIA PCI Device IDs can be found at the [PCI ID repository](#).

Adapter Card Extraction Instructions

Follow the below instructions depending on the card form-factor you have purchased.

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.

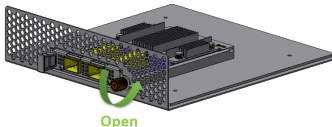
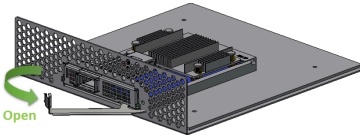
- 1. Remove any metallic objects from your hands and wrists.
- 2. It is strongly recommended to use an ESD strap or other antistatic devices.
- 3. Turn off the system and disconnect the power cord from the server.

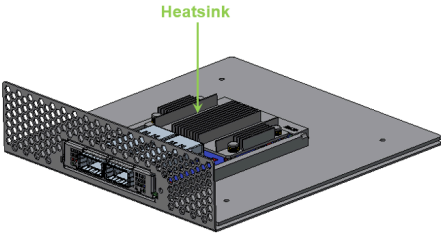
Instructions

Note

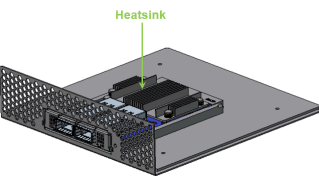
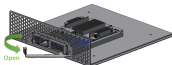
Please note that the following images are for illustration purposes only.

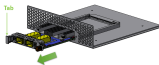
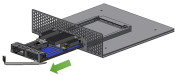
- 1. Verify that the system is powered off and unplugged.
- 2. Wait 30 seconds.
- 3. Unsecure the card.

Internal Lock Bracket	Pull-tab (Thumbscrew) Bracket	Ejector-Latch Bracket
While holding the heatsink, gently push the card out of the server.	Rotate the captive screw counterclockwise. 	Open the ejector latch. 

Internal Lock Bracket	Pull-tab (Thumbscrew) Bracket	Ejector-Latch Bracket
 Warning Careful, the heatsink might be hot.		

4. Gently pull out the adapter card.

Internal Lock Bracket	Pull-tab (Thumbscrew) Bracket	Ejector-Latch Bracket	Internal Lock Bracket	Pull-tab (Thumbscrew) Bracket	Ejector-Latch Bracket
While holding the heatsink, gently push the card out of the server.  Warning	Rotate the captive screw counterclockwise. 	Open the ejector latch. 			

Internal Lock Bracket	Pull-tab (Thumb screw) Bracket	Ejector-Latch Bracket	Internal Lock Bracket	Pull-tab (Thumb screw) Bracket	Ejector-Latch Bracket
Warning Careful, the heat sink might be hot.					
	Gently pull out the adapter card from the server. 	While holding the tab, pull out the adapter card. 	Open the ejector latch. 		

Internal Lock Bracket	Pull-tab (Thumb screw) Bracket	Ejector- Latch Bracket	Internal Lock Bracket	Pull- tab (Thumb screw) Bracket	Ejector- Latch Bracket
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Driver Installation

Linux Driver Installation

This section describes how to install and test the MLNX_OFED for Linux package on a single server with ConnectX-5 adapter card installed.

Prerequisites

Requirements	Description
Platforms	A server platform with a ConnectX-4 Lx adapter card installed • MT27710 ConnectX®-4 Lx (firmware: fw-ConnectX4-Lx)
Required Disk Space for Installation	1GB
Operating System	Linux operating system. For the list of supported operating system distributions and kernels, please refer to the <i>MLNX_OFED Release Notes</i>
Installer Privileges	The installation requires administrator (root) privileges on the target machine.

Downloading NVIDIA OFED

1. Verify that the system has a network adapter installed.

The following example shows a system with an installed adapter card:

```
# lspci -v | grep Mellanox
86:00.0 Network controller [0207]: Mellanox Technologies
MT27710 Family
        Subsystem: Mellanox Technologies Device 0014
```

```
86:00.1 Network controller [0207]: Mellanox Technologies
MT27710 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 NVIDIA web site at nvidia.com/en-us/networking → Products → Software → InfiniBand Drivers → [NVIDIA MLNX_OFED](#)

1.

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

3. Use the Hash 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.

```
SHA256 MLNX_OFED_LINUX-<ver>--<OS label>.iso
```

Installing MLNX_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 InfiniBand and Ethernet network adapters and automatically upgrades the firmware

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

Example:

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

Note

If the driver detects unsupported cards on the system, it will abort the installation procedure. To avoid this, make sure to add `--skip-unsupported-devices-check` flag during installation.

Usage

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

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

Note

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

- If you need to install 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.

Note

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.

Note

If you regenerate kernel modules for a custom kernel (using `--add-kernel-support`), the packages installation will not involve automatic regeneration of the initramfs. In some cases, such as a system with a root filesystem mounted over a ConnectX card, not regenerating the initramfs may even cause the system to fail to reboot.

In such cases, the installer will recommend running the following command to update the initramfs:

```
dracut -f
```

On some OSs, `dracut -f` might result in the following error message which can be safely ignore.

```
libkmod: kmod_module_new_from_path:  
kmod_module 'mdev' already exists with  
different path
```

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.

Note

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 7.3 under the `/tmp` directory.

```
# ./MLNX_OFED_LINUX-x.x-x-rhel7.3-  
x86_64/mlnx_add_kernel_support.sh -m  
/tmp/MLNX_OFED_LINUX-x.x-x-rhel7.3-x86_64/ --make-tgz  
Note: This program will create MLNX_OFED_LINUX TGZ for  
rhel7.3 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-rhel7.3-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 InfiniBand/VPI fabric, a Subnet Manager must be running on one of the fabric nodes. At this point, OFED for Linux has already installed the OpenSM Subnet Manager on your machine.

For the list of installation options, run:

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

Installation Procedure

This section describes the installation procedure of MLNX_OFED on NVIDIA adapter cards.

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

```
host1# 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 ...
```

Note

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

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

Note

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

```
./mlnxofedinstall --without-dkms --add-kernel-support --  
kernel --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.

Note

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-X

Part Number: MCXXXX-XXX

PSID: MT_

PCI Device Name: 0b:00.0

Base MAC: 0000e41d2d5cf810

Versions: Current Available

FW XX.XX.XXXX

Status: Up to date

Note

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

Error message #1:

Device #1:

Device Type: ConnectX-X

Part Number: MCXXXX-XXX

PSID: MT_

PCI Device Name: 0b:00.0

Base MAC: 0000e41d2d5cf810

Versions: Current Available

FW XX.XX.XXXX

Status: No matching image found

Error message #2:

The firmware for this device is not distributed inside
NVIDIA driver: 0000:01:00.0 (PSID: IBM2150110033)

To obtain firmware for this device, please contact your HW
vendor.

4. **Case A:** If the installation script has performed a firmware update on your network adapter, you need to either restart the driver or reboot your system

before the firmware update can take effect. Refer to the table below to find the appropriate action for your specific card.

Action \ Adapter	Driver Restart	Standard Reboot (Soft Reset)	Cold Reboot (Hard Reset)
Standard ConnectX-4/ConnectX-4 Lx or higher	-	+	-
Adapters with Multi-Host Support	-	-	+
Socket Direct Cards	-	-	+

Case B: If the installations script has not performed a firmware upgrade on your network adapter, restart the driver by running: “/etc/init.d/openibd restart”.

5. (InfiniBand only) Run the `hca_self_test.ofed` utility to verify whether or not the InfiniBand link is up. The utility also checks for and displays additional information such as:
 - HCA firmware version
 - Kernel architecture
 - Driver version
 - Number of active HCA ports along with their states
 - Node GUID

For more details on `hca_self_test.ofed`, see the file `docs/readme_and_user_manual/hca_self_test.readme`.

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

Note

Installing OFED will replace the RDMA stack and remove existing 3rd party RDMA connectors.

Installation Results

Action \ Adapter	Driver Restart	Standard Reboot (Soft Reset)	Cold Reboot (Hard Reset)
Standard ConnectX-4/ConnectX-4 Lx or higher	-	+	-
Adapters with Multi-Host Support	-	-	+
Socket Direct Cards	-	-	+
Software	- Most of MLNX_OFED packages are installed under the “/usr” directory except for the following packages which are installed under the “/opt” directory: - fca and ibutils		

Action \ Adapter	Driver Restart	Standard Reboot (Soft Reset)	Cold Reboot (Hard Reset)
	▪ iproute2 (rdma tool) - installed under /opt/Mellanox/iproute2/sbin/rdma ◦ The kernel modules are installed under ▪ /lib/modules/`uname -r`/updates on SLES and Fedora Distributions ▪ /lib/modules/`uname -r`/extra/mlnx-ofa_kernel on RHEL and other RedHat like Distributions ▪ /lib/modules/`uname -r`/updates		

Action \ Adapter	Driver Restart	Standard Reboot (Soft Reset)	Cold Reboot (Hard Reset)
	es/dkms / on Ubuntu		
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 '-without-fw-update' ▪ The firmware version of the adapter device is older than the firmware version included with the		

Action \ Adapter	Driver Restart	Standard Reboot (Soft Reset)	Cold Reboot (Hard Reset)
	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 your machine has an unsupported network adapter device, no firmware update will occur and the error message below will be printed.		

Action \ Adapter	Driver Restart	Standard Reboot (Soft Reset)	Cold Reboot (Hard Reset)
	"The firmware for this device is not distributed inside NVIDIA driver: 0000:01:00.0 (PSID: IBM2150110033) To obtain firmware for this device, please contact your HW vendor."		

Installation Logging

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:

Example:

```
Logs dir: /tmp/MLNX_OFED_LINUX-4.4-1.0.0.0.IBMM2150110033.logs
```

Driver Load Upon System Boot

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

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



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

```
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.

Action \ Adapter	Driver Restart	Standard Reboot (Soft Reset)	Cold Reboot (Hard Reset)	Return Code	Meaning
Standard ConnectX-4/ConnectX-4 Lx or higher	-	+	-		
Adapters with Multi-Host Support	-	-	+		
Socket Direct Cards	-	-	+		
Software	Most of MLNX_OFED packages are installed under				

Action \ Adapter	Driver Restart	Standard Reboot (Soft Reset)	Cold Reboot (Hard Reset)	Return Code	Meaning
	the “/usr” directory except for the following packages which are installed under the “/opt” directory: ▪ fc a a n d i b u t i l s ▪ i p r o u t e 2 (r d m a t o l) - i n s t a l l				

Action \ Adapter	Driver Restart	Standard Reboot (Soft Reset)	Cold Reboot (Hard Reset)	Return Code	Meaning
	<p>edunder/opt/Mellanox/lib/modules/`uname</p> <ul style="list-style-type: none"> <li>◦ The kernel modules are installed under <ul style="list-style-type: none"> <li>▪ /lib/modules/`uname				

Action \ Adapter	Driver Restart	Standard Reboot (Soft Reset)	Cold Reboot (Hard Reset)	Return Code	Meaning
		n a m e - r` /u p d a t e s o n S L E S a n d F e d o r a D i s t r i b u t i o n s /l i b/ m o d u l e s /` u n			

Action \ Adapter	Driver Restart	Standard Reboot (Soft Reset)	Cold Reboot (Hard Reset)	Return Code	Meaning
		a m e - r` /e xt ra / m ln x- of a_ ke rn el o n R H EL a n d ot h er R e d H at lik e Di st ri b ut			

Action \ Adapter	Driver Restart	Standard Reboot (Soft Reset)	Cold Reboot (Hard Reset)	Return Code	Meaning
	- ions ▪ /lib/modules/ /`uname -r`/updates/ dkms/ on Ubuntu				
Firmware	◦ The firmware of existing network adapter devices				

Action \ Adapter	Driver Restart	Standard Reboot (Soft Reset)	Cold Reboot (Hard Reset)	Return Code	Meaning
	will be updated if the following two conditions are fulfilled: ▪ The installation script is run in default mode; that is, without				

Action \ Adapter	Driver Restart	Standard Reboot (Soft Reset)	Cold Reboot (Hard Reset)	Return Code	Meaning
	option '— without - firmware - update'. ▪ The firmware version of the adapter device				

Action \ Adapter	Driver Restart	Standard Reboot (Soft Reset)	Cold Reboot (Hard Reset)	Return Code	Meaning
		ic e is ol d er th a n th e fir m w ar e ve rsi o n in cl u d e d wi th th e O F E D IS O i m a g e			

Action \ Adapter	Driver Restart	Standard Reboot (Soft Reset)	Cold Reboot (Hard Reset)	Return Code	Meaning
		Note: If a network adapter's Flash was originally programmed with an Expansion ROM			

Action \ Adapter	Driver Restart	Standard Reboot (Soft Reset)	Cold Reboot (Hard Reset)	Return Code	Meaning
		OM image, the automatic firmware update will also burn an Expansion ROM			

Action \ Adapter	Driver Restart	Standard Reboot (Soft Reset)	Cold Reboot (Hard Reset)	Return Code	Meaning
	M i m a g e. ◦ In case 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 NVIDIA driver: 0000:0				

Action \ Adapter	Driver Restart	Standard Reboot (Soft Reset)	Cold Reboot (Hard Reset)	Return Code	Meaning
	1:00.0 (PSID: IBM215 011003 3) To obtain firmwar e for this device, please contact your HW vendor."				
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				

Action \ Adapter	Driver Restart	Standard Reboot (Soft Reset)	Cold Reboot (Hard Reset)	Return Code	Meaning
	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				

Action \ Adapter	Driver Restart	Standard Reboot (Soft Reset)	Cold Reboot (Hard Reset)	Return Code	Meaning
Standard ConnectX-4/ConnectX-4 Lx or higher	-	+	-		
Adapters with Multi-Host Support	-	-	+		
Socket Direct Cards	-	-	+		

Action \ Adapter	Driver Restart	Standard Reboot (Soft Reset)	Cold Reboot (Hard Reset)	Return Code	Meaning
Software	◦ Most of MLNX_OFED packages are installed under the “/usr” directory except for the following packages which are installed under the “/opt” directory: ▪ fc a a n d i b u t i l s ▪ i p r o u t e 2 (r d				

Action \ Adapter	Driver Restart	Standard Reboot (Soft Reset)	Cold Reboot (Hard Reset)	Return Code	Meaning
	m a to ol) - in st all e d u n d er /o pt / M ell a n ox /i pr o ut e 2/ sb in /r d m a ◦ The kernel module s are installed under				

Action \ Adapter	Driver Restart	Standard Reboot (Soft Reset)	Cold Reboot (Hard Reset)	Return Code	Meaning
	▪ /lib/modules/ uname -r /updates on SLES and Fedora Distributions				

Action \ Adapter	Driver Restart	Standard Reboot (Soft Reset)	Cold Reboot (Hard Reset)	Return Code	Meaning
	▪ /lib/modules/ uname -r /extra/m lnx-of a_ke rn el o n R H EL a n d o t h e r R e d				

Action \ Adapter	Driver Restart	Standard Reboot (Soft Reset)	Cold Reboot (Hard Reset)	Return Code	Meaning
	H at lik e Di st ri b ut io ns ▪ /li b/ m o d ul es /`</div> <div>u</div> <div>n</div> <div>a</div> <div>m</div> <div>e</div> <div>-</div> <div>r` /u p d at es /d k m s/ o n U b u				

Action \ Adapter	Driver Restart	Standard Reboot (Soft Reset)	Cold Reboot (Hard Reset)	Return Code	Meaning
	nt u				
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				

Action \ Adapter	Driver Restart	Standard Reboot (Soft Reset)	Cold Reboot (Hard Reset)	Return Code	Meaning
	de; that is, without the option '-- without -fw -update'. ▪ The firmware version				

Action \ Adapter	Driver Restart	Standard Reboot (Soft Reset)	Cold Reboot (Hard Reset)	Return Code	Meaning
		of the adapter device is older than the firmware version included with the O			

Action \ Adapter	Driver Restart	Standard Reboot (Soft Reset)	Cold Reboot (Hard Reset)	Return Code	Meaning
		FE D IS O i m a g e Note: If a n a d a p t e r 's F l a s h w a s o r i g i n a l l y p r o g r a m m e d w i t h			

Action \ Adapter	Driver Restart	Standard Reboot (Soft Reset)	Cold Reboot (Hard Reset)	Return Code	Meaning
		a n Ex p a ns io n R O M i m a g e, th e au to m at ic fir m w ar e u p d at e wi ll al so b ur n a			

Action \ Adapter	Driver Restart	Standard Reboot (Soft Reset)	Cold Reboot (Hard Reset)	Return Code	Meaning
	n Ex p a ns io n R O M i m a g e. ◦ In case your machine has an unsupported network adapter device, no firmware update will occur and the error message below will be printed. "The firmware for				

Action \ Adapter	Driver Restart	Standard Reboot (Soft Reset)	Cold Reboot (Hard Reset)	Return Code	Meaning
	this device is not distributed inside NVIDIA driver: 0000:01:00.0 (PSID: IBM215 0110033) To obtain firmware for this device, please contact your HW vendor."				
0	The Installation ended successfully				
1	The installation failed				
2	No firmware was found for the adapter device				
22	Invalid parameter				

Action \ Adapter	Driver Restart	Standard Reboot (Soft Reset)	Cold Reboot (Hard Reset)	Return Code	Meaning
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				
Software	Most of MLNX_OFED packages are installed under the "/usr" directory				

Action \ Adapter	Driver Restart	Standard Reboot (Soft Reset)	Cold Reboot (Hard Reset)	Return Code	Meaning
	except for the following packages which are installed under the “/opt” directory: ▪ fc a a n d i b u t i l s ▪ i p r o u t e 2 (r d m a t o l) - i n s t a l l e d u n				

Action \ Adapter	Driver Restart	Standard Reboot (Soft Reset)	Cold Reboot (Hard Reset)	Return Code	Meaning
	der /o pt / M ell a n ox /i pr o ut e 2/ sb in /r d m a ◦ The kernel modules are installed under ▪ /lib/modules/ uname				

Action \ Adapter	Driver Restart	Standard Reboot (Soft Reset)	Cold Reboot (Hard Reset)	Return Code	Meaning
	- r` /u p d at es o n S L E S a n d Fe d or a Di st ri b ut io ns</li> <li>▪ /li b/ m o d ul es /` u n a m e -				

Action \ Adapter	Driver Restart	Standard Reboot (Soft Reset)	Cold Reboot (Hard Reset)	Return Code	Meaning
		r` /e xt ra / m In x- of a_ ke rn el o n R H EL a n d ot h er R e d H at lik e Di st ri b ut io ns ▪ /li b/ m			

Action \ Adapter	Driver Restart	Standard Reboot (Soft Reset)	Cold Reboot (Hard Reset)	Return Code	Meaning
	o d ul es /' u n a m e - r' /u p d at es /d k m s/ o n U b u nt u				
Firmware	o The firmwar e of existing networ k adapter devices will be update d if the followin g two				

Action \ Adapter	Driver Restart	Standard Reboot (Soft Reset)	Cold Reboot (Hard Reset)	Return Code	Meaning
	conditions are fulfilled : ▪ The installation script is run in default mode; that is, without the option				

Action \ Adapter	Driver Restart	Standard Reboot (Soft Reset)	Cold Reboot (Hard Reset)	Return Code	Meaning
		'-- without --' ▪ The firm ware version of the adapter device is old			

Action \ Adapter	Driver Restart	Standard Reboot (Soft Reset)	Cold Reboot (Hard Reset)	Return Code	Meaning
		er th a n th e fir m w ar e ve rsi o n in cl u d e d wi th th e O FE D IS O i m a g e Note: If a n			

Action \ Adapter	Driver Restart	Standard Reboot (Soft Reset)	Cold Reboot (Hard Reset)	Return Code	Meaning
		adapter's Flash was originally programmed with an Expansion ROM image			

Action \ Adapter	Driver Restart	Standard Reboot (Soft Reset)	Cold Reboot (Hard Reset)	Return Code	Meaning
		e, the automatic firmware update will also burn an Expansion ROM image.			

Action \ Adapter	Driver Restart	Standard Reboot (Soft Reset)	Cold Reboot (Hard Reset)	Return Code	Meaning
	In case 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 NVIDIA driver: 0000:01:00.0 (PSID: IBM215 011003 3)				

Action \ Adapter	Driver Restart	Standard Reboot (Soft Reset)	Cold Reboot (Hard Reset)	Return Code	Meaning
	To obtain firmware for this device, please contact your HW vendor."				

Installation Logging

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:

Example:

```
Logs dir: /tmp/MLNX_OFED_LINUX-4.4-1.0.0.0.IBMM2150110033.logs
```

Uninstalling MLNX_OFED

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

Additional Installation Procedures

Installing MLNX_OFED Using YUM

This type of installation is applicable to RedHat/OL and Fedora 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 NVIDIA's 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
--2018-01-25 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

2018-01-25 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

```

Setting up MLNX_OFED YUM Repository Using --add-kernel-support

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. Build the packages with kernel support and create the tarball.

```
# /mnt/mlnx_add_kernel_support.sh --make-tgz <optional -
-kmp> -k $(uname -r) -m /mnt/
Note: This program will create MLNX_OFED_LINUX TGZ for
rhel7.6 under /tmp directory.
Do you want to continue?[y/N]:y
See log file
/tmp/mlnx_iso.4120_logs/mlnx_ofed_iso.4120.log
```

```
Checking if all needed packages are installed...
Building MLNX_OFED_LINUX RPMs . Please wait...
Creating metadata-rpms for 3.10.0-957.21.3.el7.x86_64 ...
WARNING: If you are going to configure this package as a
repository, then please note
WARNING: that it contains unsigned rpms, therefore, you
need to disable the gpgcheck
WARNING: by setting 'gpgcheck=0' in the repository conf file.
Created /tmp/MLNX_OFED_LINUX-5.2-0.5.5.0-rhel7.6-x86_64-
ext.tgz
```

4. Open the tarball.

```
# cd /tmp/
# tar -xvf /tmp/MLNX_OFED_LINUX-5.2-0.5.5.0-rhel7.6-x86_64-
ext.tgz
```

5. 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
gpgcheck=0
```

6. 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-all-user-only.noarch : MLNX_OFED all-user-only
installer package (User Space packages only)
mlnx-ofed-basic.noarch : MLNX_OFED basic installer package
(with KMP support)
mlnx-ofed-basic-user-only.noarch : MLNX_OFED basic-user-
only installer package (User Space packages only)
mlnx-ofed-bluefield.noarch : MLNX_OFED bluefield
installer package (with KMP support)
mlnx-ofed-bluefield-user-only.noarch : MLNX_OFED
bluefield-user-only installer package (User Space
packages only)
mlnx-ofed-dpdk.noarch : MLNX_OFED dpdk installer package
(with KMP support)
```

mlnx-ofed-dpdk-upstream-libs.noarch : MLNX_OFED dpdk-upstream-libs installer [package](#) (with KMP support)

mlnx-ofed-dpdk-upstream-libs-user-only.noarch : MLNX_OFED dpdk-upstream-libs-user-only installer [package](#) (User Space packages only)

mlnx-ofed-dpdk-user-only.noarch : MLNX_OFED dpdk-user-only installer [package](#) (User Space packages only)

mlnx-ofed-eth-only-user-only.noarch : MLNX_OFED eth-only-user-only installer [package](#) (User Space packages only)

mlnx-ofed-guest.noarch : MLNX_OFED guest installer [package](#) (with KMP support)

mlnx-ofed-guest-user-only.noarch : MLNX_OFED guest-user-only installer [package](#) (User Space packages only)

mlnx-ofed-hpc.noarch : MLNX_OFED hpc installer [package](#) (with KMP support)

mlnx-ofed-hpc-user-only.noarch : MLNX_OFED hpc-user-only installer [package](#) (User Space packages only)

mlnx-ofed-hypervisor.noarch : MLNX_OFED hypervisor installer [package](#) (with KMP support)

mlnx-ofed-hypervisor-user-only.noarch : MLNX_OFED hypervisor-user-only installer [package](#) (User Space packages only)

mlnx-ofed-kernel-only.noarch : MLNX_OFED kernel-only 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-eth-user-only.noarch : MLNX_OFED vma-eth-user-only installer [package](#) (User Space packages only)

mlnx-ofed-vma-user-only.noarch : MLNX_OFED vma-user-only installer [package](#) (User Space packages only)

mlnx-ofed-vma-vpi.noarch : MLNX_OFED vma-vpi installer [package](#) (with KMP support)

mlnx-ofed-vma-vpi-user-only.noarch : MLNX_OFED vma-vpi-user-only installer [package](#) (User Space packages only)

where:

Action \ Adapter	Driver Restart	Standard Reboot (Soft Reset)	Cold Reboot (Hard Reset)	Return Code	Meaning
Standard Connect X-4/ConnectX-4 Lx or higher	-	+	-		
Adapters with Multi-Host Support	-	-	+		
Socket Direct Cards	-	-	+		
Software	Most of MLNX_OFED packages are installed under the “/usr” directory except for the following packages				

Action \ Adapter	Driver Restart	Standard Reboot (Soft Reset)	Cold Reboot (Hard Reset)	Return Code	Meaning
	which are installed under the “/opt” directory: ▪ fc and ibutils ▪ iproute2 (rdmactool) - installed under				

Action \ Adapter	Driver Restart	Standard Reboot (Soft Reset)	Cold Reboot (Hard Reset)	Return Code	Meaning
	der /opt/Mellanox/x/iproute2/sbin/rdma - The kernel modules are installed under /lib/module				

Action \ Adapter	Driver Restart	Standard Reboot (Soft Reset)	Cold Reboot (Hard Reset)	Return Code	Meaning
		s/ ` u n a m e - r ` /u p d a t e s o n S L E S a n d F e d o r a D i s t r i b u t i o n s			

Action \ Adapter	Driver Restart	Standard Reboot (Soft Reset)	Cold Reboot (Hard Reset)	Return Code	Meaning
	■ /lib/modules/ uname -r /extra/m lnx-of a - ker nel on R H E L a				

Action \ Adapter	Driver Restart	Standard Reboot (Soft Reset)	Cold Reboot (Hard Reset)	Return Code	Meaning
	n d o t h e r R e d H a t l i k e D i s t r i b u t i o n s /l i b / m o d u l e s/ 、 u n a m e - ▪				

Action \ Adapter	Driver Restart	Standard Reboot (Soft Reset)	Cold Reboot (Hard Reset)	Return Code	Meaning
	r / u p d a t e s/ d k m s/ o n U b u n t u				
Firmware	The firmware of existing network adapter devices will be updated if the following two conditions are fulfilled:				

Action \ Adapter	Driver Restart	Standard Reboot (Soft Reset)	Cold Reboot (Hard Reset)	Return Code	Meaning
	The installation script is run in default mode; that is, without				

Action \ Adapter	Driver Restart	Standard Reboot (Soft Reset)	Cold Reboot (Hard Reset)	Return Code	Meaning
		t t h e o p t i o n '-- w i t h o u t - f w - u p d a t e', ▪ The firmware versions of			

Action \ Adapter	Driver Restart	Standard Reboot (Soft Reset)	Cold Reboot (Hard Reset)	Return Code	Meaning
		the adapter device is older than the firmware version included			

Action \ Adapter	Driver Restart	Standard Reboot (Soft Reset)	Cold Reboot (Hard Reset)	Return Code	Meaning
		ded with the OEM DISO image Note: If an adapter's Flash is			

Action \ Adapter	Driver Restart	Standard Reboot (Soft Reset)	Cold Reboot (Hard Reset)	Return Code	Meaning
		s o r i g i n a l l y p r o g r a m m e d w i t h a n E x p a n s i o n R O M i m a g e, t h e a			

Action \ Adapter	Driver Restart	Standard Reboot (Soft Reset)	Cold Reboot (Hard Reset)	Return Code	Meaning
		u t o m a t i c f i r m w a r e u p d a t e w i l l a l s o b u r n a n E x p a n s i o n R O M			

Action \ Adapter	Driver Restart	Standard Reboot (Soft Reset)	Cold Reboot (Hard Reset)	Return Code	Meaning
	i m a g e. ■ In case 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				

Action \ Adapter	Driver Restart	Standard Reboot (Soft Reset)	Cold Reboot (Hard Reset)	Return Code	Meaning
	NVIDIA driver: 0000:01:00.0 (PSID: IBM2150110033) To obtain firmware for this device, please contact your HW vendor. "				
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				

Action \ Adapter	Driver Restart	Standard Reboot (Soft Reset)	Cold Reboot (Hard Reset)	Return Code	Meaning
	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				
Software	Most of MLNX_OFED packages are installed under the “/usr” directory except for the				

Action \ Adapter	Driver Restart	Standard Reboot (Soft Reset)	Cold Reboot (Hard Reset)	Return Code	Meaning
	following packages which are installed under the “/opt” directory: ▪ fc and ibutils ▪ iproute2 (rdmactool) - install				

Action \ Adapter	Driver Restart	Standard Reboot (Soft Reset)	Cold Reboot (Hard Reset)	Return Code	Meaning
	- le - d - u - n - d - e - r /o - p - t/ - M - e - l - a - n - o - x/ - i - p - r - o - u - t - e 2 /s - b - i - n /r - d - m - a ▪ The kernel modules are installed under ▪ /lib /m				

Action \ Adapter	Driver Restart	Standard Reboot (Soft Reset)	Cold Reboot (Hard Reset)	Return Code	Meaning
		o d u l e s/ ` u n a m e - r ` /u p d a t e s o n S L E S a n d F e d o r a D i s t r i b u t i			

Action \ Adapter	Driver Restart	Standard Reboot (Soft Reset)	Cold Reboot (Hard Reset)	Return Code	Meaning
	o n s ■ /lib/modules/`uname -r`/extra/mInx-of a - k e r n e l o n R H				

Action \ Adapter	Driver Restart	Standard Reboot (Soft Reset)	Cold Reboot (Hard Reset)	Return Code	Meaning
		E L a n d o t h e r R e d H a t l i k e D i s t r i b u t i o n s /l i b / m o d u l e s/ 、 u n a			

Action \ Adapter	Driver Restart	Standard Reboot (Soft Reset)	Cold Reboot (Hard Reset)	Return Code	Meaning
	me-r, /update s/dkms/ on Ubuntu				
Firmware	The firmware of existing network adapter devices will be updated if the following two conditions				

Action \ Adapter	Driver Restart	Standard Reboot (Soft Reset)	Cold Reboot (Hard Reset)	Return Code	Meaning
	ons are fulfilled: ▪ The installation script is run in default mode; that is, with				

Action \ Adapter	Driver Restart	Standard Reboot (Soft Reset)	Cold Reboot (Hard Reset)	Return Code	Meaning
		hout the option '---' without firmware update, the firmware version			

Action \ Adapter	Driver Restart	Standard Reboot (Soft Reset)	Cold Reboot (Hard Reset)	Return Code	Meaning
		n o f t h e a d a p t e r d e v i c e i s o l d e r t h a n t h e f i r m w a r e v e r s i o n			

Action \ Adapter	Driver Restart	Standard Reboot (Soft Reset)	Cold Reboot (Hard Reset)	Return Code	Meaning
		included with the the OFED IS O image Note: If a n a d a p t e r' s F l a s			

Action \ Adapter	Driver Restart	Standard Reboot (Soft Reset)	Cold Reboot (Hard Reset)	Return Code	Meaning
		h w a s o r i g i n a l l y p r o g r a m m e d w i t h a n E x p a n s i o n R O M i m a g e, t			

Action \ Adapter	Driver Restart	Standard Reboot (Soft Reset)	Cold Reboot (Hard Reset)	Return Code	Meaning
		h e a u t o m a t i c f i r m w a r e u p d a t e w i l l a l s o b u r n a n E x p a n s i o n			

Action \ Adapter	Driver Restart	Standard Reboot (Soft Reset)	Cold Reboot (Hard Reset)	Return Code	Meaning
	R O M i m a g e. ▪ In case 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				

Action \ Adapter	Driver Restart	Standard Reboot (Soft Reset)	Cold Reboot (Hard Reset)	Return Code	Meaning
	distributed inside NVIDIA driver: 0000:01:00.0 (PSID: IBM2150110033) To obtain firmware for this device, please contact your HW vendor.				
mlnx-ofed-all	Installs all available packages in MLNX_OFED				
mlnx-ofed-basic	Installs basic packages required for running NVIDIA cards				
mlnx-ofed-guest	Installs packages required by guest OS				

Action \ Adapter	Driver Restart	Standard Reboot (Soft Reset)	Cold Reboot (Hard Reset)	Return Code	Meaning
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				
bluefield	Installs packages required for BlueField				
dpdk	Installs packages required for DPDK				
dpdk-upstream-libs	Installs packages required for DPDK using RDMA-Core				

Action \ Adapter	Driver Restart	Standard Reboot (Soft Reset)	Cold Reboot (Hard Reset)	Return Code	Meaning
kernel-only	Installs packages required for a non-default kernel				

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 system's 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)
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)
```

When using 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.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
sdpnstat.x86_64 0:1.60-26
srptools.x86_64 0:1.0.2-12

Complete!
```

Note

Installing MLNX_OFED using the “YUM” tool does not automatically update the firmware.

To update the firmware to the version included in MLNX_OFED package, run:

```
# yum install mlnx-fw-updater
```

Installing MLNX_OFED Using apt-get

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.

It can be downloaded from <https://www.nvidia.com/en-us/networking/> → Products → Software → InfiniBand 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 NVIDIA's Technologies GPG-KEY.

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

5. Verify 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
```

Setting up MLNX_OFED apt-get Repository Using --add-keyring

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. Build the packages with kernel support and create the tarball.

```
# /mnt/mlnx_add_kernel_support.sh --make-tgz <optional -  
-kmp> -k $(uname -r) -m /mnt/  
Note: This program will create MLNX_OFED_LINUX TGZ for  
rhel7.6 under /tmp directory.  
Do you want to continue?[y/N]:y  
See log file  
/tmp/mlnx_iso.4120_logs/mlnx_ofed_iso.4120.log  
  
Checking if all needed packages are installed...  
Building MLNX_OFED_LINUX RPMS . Please wait...  
Creating metadata-rpms for 3.10.0-957.21.3.el7.x86_64 ...  
WARNING: If you are going to configure this package as a  
repository, then please note  
WARNING: that it contains unsigned rpms, therefore, you  
need to disable the gpgcheck  
WARNING: by setting 'gpgcheck=0' in the repository conf file.  
Created /tmp/MLNX_OFED_LINUX-5.2-0.5.5.0-rhel7.6-x86_64-  
ext.tgz
```

4. Open the tarball.

```
# cd /tmp/  
# tar -xvf /tmp/MLNX_OFED_LINUX-5.2-0.5.5.0-rhel7.6-x86_64-  
ext.tgz
```

5. Create an apt-get repository configuration file called `"/etc/apt/sources.list.d/mlnx_ofed.list"` with the following content:

```
deb [trusted=yes] file:./<path to extracted MLNX_OFED
package>/DEBS ./
```

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:

```
# apt-cache search mlnx-ofed-
apt-cache search mlnx-ofed .....
knem-dkms - DKMS support for mlnx-ofed kernel modules
mlnx-ofed-kernel-dkms - DKMS support for mlnx-ofed kernel
modules
mlnx-ofed-kernel-utils - Userspace tools to restart and
tune mlnx-ofed kernel modules
mlnx-ofed-vma-vpi - MLNX_OFED vma-vpi installer package
(with DKMS support)
mlnx-ofed-kernel-only - MLNX_OFED kernel-only installer
package (with DKMS support)
mlnx-ofed-bluefield - MLNX_OFED bluefield installer
package (with DKMS support)
mlnx-ofed-hpc-user-only - MLNX_OFED hpc-user-only
installer package (User Space packages only)
```

mlnx-ofed-dpdk-user-only - MLNX_OFED dpdk-user-only installer [package](#) (User Space packages only)

mlnx-ofed-all-exact - MLNX_OFED all installer [package](#) (with DKMS support) (exact)

mlnx-ofed-all - MLNX_OFED all installer [package](#) (with DKMS support)

mlnx-ofed-vma-vpi-user-only - MLNX_OFED vma-vpi-user-only installer [package](#) (User Space packages only)

mlnx-ofed-eth-only-user-only - MLNX_OFED eth-only-user-only installer [package](#) (User Space packages only)

mlnx-ofed-vma-user-only - MLNX_OFED vma-user-only installer [package](#) (User Space packages only)

mlnx-ofed-hpc - MLNX_OFED hpc installer [package](#) (with DKMS support)

mlnx-ofed-bluefield-user-only - MLNX_OFED bluefield-user-only installer [package](#) (User Space packages only)

mlnx-ofed-dpdk - MLNX_OFED dpdk installer [package](#) (with DKMS support)

mlnx-ofed-vma-eth-user-only - MLNX_OFED vma-eth-user-only installer [package](#) (User Space packages only)

mlnx-ofed-all-user-only - MLNX_OFED all-user-only installer [package](#) (User Space packages only)

mlnx-ofed-vma-eth - MLNX_OFED vma-eth installer [package](#) (with DKMS support)

mlnx-ofed-vma - MLNX_OFED vma installer [package](#) (with DKMS support)

mlnx-ofed-dpdk-upstream-libs-user-only - MLNX_OFED dpdk-upstream-libs-user-only installer [package](#) (User Space packages only)

mlnx-ofed-basic-user-only - MLNX_OFED basic-user-only installer [package](#) (User Space packages only)

mlnx-ofed-basic-exact - MLNX_OFED basic installer [package](#) (with DKMS support) (exact)

mlnx-ofed-basic - MLNX_OFED basic installer [package](#) (with DKMS support)

mlnx-ofed-dpdk-upstream-libs - MLNX_OFED dpdk-upstream-libs installer [package](#) (with DKMS support)

where:

Action \ Adapter	Driver Restart	Standard Reboot (Soft Reset)	Cold Reboot (Hard Reset)	Return Code	Meaning
Standard Connect X-4/ConnectX-4 Lx or higher	-	+	-		
Adapters with Multi-Host Support	-	-	+		
Socket Direct Cards	-	-	+		
Software	Most of MLNX_OFED packages are installed under the “/usr” directory except for the following packages				

Action \ Adapter	Driver Restart	Standard Reboot (Soft Reset)	Cold Reboot (Hard Reset)	Return Code	Meaning
	which are installed under the “/opt” directory: ▪ fc and ibutils ▪ iproute2 (rdmattol)-installed on				

Action \ Adapter	Driver Restart	Standard Reboot (Soft Reset)	Cold Reboot (Hard Reset)	Return Code	Meaning
	der /o p t/ M el la n o x/ ip r o u t e 2 /s bi n /r d m a ▪ The kernel modules are installed under ▪ /lib/module				

Action \ Adapter	Driver Restart	Standard Reboot (Soft Reset)	Cold Reboot (Hard Reset)	Return Code	Meaning
		s/ ` u n a m e - r ` /u p d a t e s o n S L E S a n d F e d o r a D i s t r i b u t i o n s			

Action \ Adapter	Driver Restart	Standard Reboot (Soft Reset)	Cold Reboot (Hard Reset)	Return Code	Meaning
	■ /lib/modules/ uname -r /extra/m lnx-of a - ker nel on R H E L a				

Action \ Adapter	Driver Restart	Standard Reboot (Soft Reset)	Cold Reboot (Hard Reset)	Return Code	Meaning
	n d o t h e r R e d H a t l i k e D i s t r i b u t i o n s /l i b / m o d u l e s/ 、 u n a m e - ▪				

Action \ Adapter	Driver Restart	Standard Reboot (Soft Reset)	Cold Reboot (Hard Reset)	Return Code	Meaning
	• r • /u • p • d • a • t • e • s/ • d • k • m • s/ • o • n • U • b • u • n • t • u				
Firmware	▪ The firmware of existing network adapter devices will be updated if the following two conditions are fulfilled:				

Action \ Adapter	Driver Restart	Standard Reboot (Soft Reset)	Cold Reboot (Hard Reset)	Return Code	Meaning
	The installation script is run in default mode; that is, without				

Action \ Adapter	Driver Restart	Standard Reboot (Soft Reset)	Cold Reboot (Hard Reset)	Return Code	Meaning
		t t h e o p t i o n '_ w i t h o u t - f w - u p d a t e', ▪ The firmware are versions of			

Action \ Adapter	Driver Restart	Standard Reboot (Soft Reset)	Cold Reboot (Hard Reset)	Return Code	Meaning
		the adapter device is older than the firmware version included			

Action \ Adapter	Driver Restart	Standard Reboot (Soft Reset)	Cold Reboot (Hard Reset)	Return Code	Meaning
		d e d w i t h t h e O F F E D I S O i m a g e Note: If a network adapter's Flash is shown as			

Action \ Adapter	Driver Restart	Standard Reboot (Soft Reset)	Cold Reboot (Hard Reset)	Return Code	Meaning
		s o r i g i n a l l y p r o g r a m m e d w i t h a n E x p a n s i o n R O M i m a g e, t h e a			

Action \ Adapter	Driver Restart	Standard Reboot (Soft Reset)	Cold Reboot (Hard Reset)	Return Code	Meaning
		u t o m a t i c f i r m w a r e u p d a t e w i l l a l s o b u r n a n E x p a n s i o n R O M			

Action \ Adapter	Driver Restart	Standard Reboot (Soft Reset)	Cold Reboot (Hard Reset)	Return Code	Meaning
	i m a g e. ■ In case 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				

Action \ Adapter	Driver Restart	Standard Reboot (Soft Reset)	Cold Reboot (Hard Reset)	Return Code	Meaning
	NVIDIA driver: 0000:01:00.0 (PSID: IBM2150110033) To obtain firmware for this device, please contact your HW vendor.				
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				

Action \ Adapter	Driver Restart	Standard Reboot (Soft Reset)	Cold Reboot (Hard Reset)	Return Code	Meaning
	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				
Software	Most of MLNX_OFED packages are installed under the “/usr” directory except for the				

Action \ Adapter	Driver Restart	Standard Reboot (Soft Reset)	Cold Reboot (Hard Reset)	Return Code	Meaning
	following packages which are installed under the “/opt” directory: ▪ fc and distribution ▪ iproute2 (rdmactool) - install				

Action \ Adapter	Driver Restart	Standard Reboot (Soft Reset)	Cold Reboot (Hard Reset)	Return Code	Meaning
	le d u n d e r /o p t/ M e l l a n o x/ i p r o u t e 2 /s b i n /r d m a ▪ The kernel modules are installed under ▪ /lib /m				

Action \ Adapter	Driver Restart	Standard Reboot (Soft Reset)	Cold Reboot (Hard Reset)	Return Code	Meaning
		o d u l e s/ ` u n a m e - r ` /u p d a t e s o n S L E S a n d F e d o r a D i s t r i b u t i			

Action \ Adapter	Driver Restart	Standard Reboot (Soft Reset)	Cold Reboot (Hard Reset)	Return Code	Meaning
	o n s ■ /lib/modules/ uname -r /extra/m ln -xof a -kernel on R H				

Action \ Adapter	Driver Restart	Standard Reboot (Soft Reset)	Cold Reboot (Hard Reset)	Return Code	Meaning
		E L a n d o t h e r R e d H a t l i k e D i s t r i b u t i o n s /l i b / m o d u l e s/ 、 u n a			

Action \ Adapter	Driver Restart	Standard Reboot (Soft Reset)	Cold Reboot (Hard Reset)	Return Code	Meaning
	me - r , /u p d a t e s / d k m s / o n U b u n t u				
Firmware	The firmware of existing network adapter devices will be updated if the following two conditions				

Action \ Adapter	Driver Restart	Standard Reboot (Soft Reset)	Cold Reboot (Hard Reset)	Return Code	Meaning
	ons are fulfilled: ▪ The installation script is run in default mode; that is, with				

Action \ Adapter	Driver Restart	Standard Reboot (Soft Reset)	Cold Reboot (Hard Reset)	Return Code	Meaning
		h o u t t h e o p t i o n '-- w i t h o u t- f w - u p d a t e', ■ The e f i r m w a r e v e r s i o			

Action \ Adapter	Driver Restart	Standard Reboot (Soft Reset)	Cold Reboot (Hard Reset)	Return Code	Meaning
		n o f t h e a d a p t e r d e v i c e i s o l d e r t h a n t h e f i r m w a r e v e r s i o n			

Action \ Adapter	Driver Restart	Standard Reboot (Soft Reset)	Cold Reboot (Hard Reset)	Return Code	Meaning
		included with the OEM DISO image Note: If an adapter's Flash			

Action \ Adapter	Driver Restart	Standard Reboot (Soft Reset)	Cold Reboot (Hard Reset)	Return Code	Meaning
		h w a s o r i g i n a l l y p r o g r a m m e d w i t h a n E x p a n s i o n R O M i m a g e, t			

Action \ Adapter	Driver Restart	Standard Reboot (Soft Reset)	Cold Reboot (Hard Reset)	Return Code	Meaning
		h e a u t o m a t i c f i r m w a r e u p d a t e w i l l a l s o b u r n a n E x p a n s i o n			

Action \ Adapter	Driver Restart	Standard Reboot (Soft Reset)	Cold Reboot (Hard Reset)	Return Code	Meaning
	R O M i m a g e. ▪ In case 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				

Action \ Adapter	Driver Restart	Standard Reboot (Soft Reset)	Cold Reboot (Hard Reset)	Return Code	Meaning
	distributed inside NVIDIA driver: 0000:01:00.0 (PSID: IBM2150110033) To obtain firmware for this device, please contact your HW vendor.				
mlnx-ofed-all	Installs all available packages in MLNX_OFED				
mlnx-ofed-basic	Installs basic packages required for running NVIDIA cards				
mlnx-ofed-guest	Installs packages required by guest OS				

Action \ Adapter	Driver Restart	Standard Reboot (Soft Reset)	Cold Reboot (Hard Reset)	Return Code	Meaning
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				
bluefield	Installs packages required for BlueField				
dpdk	Installs packages required for DPDK				
dpdk-upstream-libs	Installs packages required for DPDK using RDMA-Core				

Action \ Adapter	Driver Restart	Standard Reboot (Soft Reset)	Cold Reboot (Hard Reset)	Return Code	Meaning
kernel-only	Installs packages required for a non-default kernel				
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				
knem-dkms	MLNX_OFED DKMS support for mlnx-ofed kernel modules				

Action \ Adapter	Driver Restart	Standard Reboot (Soft Reset)	Cold Reboot (Hard Reset)	Return Code	Meaning
kernel-dkms	MLNX_OFED kernel-dkms installer package				
kernel-only	MLNX_OFED kernel-only installer package				
bluefield	MLNX_OFED bluefield installer package				
mlnx-ofed-all-exact	MLNX_OFED mlnx-ofed-all-exact installer package				
dpdk	MLNX_OFED dpdk installer package				
mlnx-ofed-basic-exact	MLNX_OFED mlnx-ofed-basic-exact installer package				
dpdk-upstream-libs	MLNX_OFED dpdk-upstream-libs installer package				

2. Install the desired group.

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

Example:

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

Note

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
```

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 NVIDIA Network Adapters](#).

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 ConnectX®-4 Lx (EN) (firmware: fw-ConnectX4Lx)
Operating System	ESXi 6.5
Installer Privileges	The installation requires administrator privileges on the target machine.

Installing NATIVE ESXi Driver for VMware vSphere

Note

Please uninstall all previous driver packages prior to installing the new version.

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.zipesxcli
```

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
```

Note

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

Removing Earlier NVIDIA Drivers

Note

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 NATIVE ESXi Driver for VMware vSphere.](#))
3. Remove each module:

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

Note

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

1. Download the VMware bootable binary images v4.6.0 from the [Firmware Tools \(MFT\) site](#).
 1. ESXi 6.5 File: mft-4.6.0.48-10EM-650.0.0.4598673.x86_64.vib
 2. MD5SUM: 0804cffe30913a7b4017445a0f0adbe1
2. Install the image according to the steps described in the [MFT User Manual](#).

Note

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

Windows Driver Installation

For Windows, download and install the latest WinOF-2 for Windows software package available via the NVIDIA website at: [WinOF-2 webpage](#). 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.

Software Requirements

Description	Package
Windows Server 2022	MLNX_WinOF2-<version>_All_x64.exe
Windows Server 2019	
Windows Server 2016	
Windows Server 2012 R2	
Windows 11 Client (64 bit only)	
Windows 10 Client (64 bit only)	
Windows 8.1 Client (64 bit only)	

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

Downloading WinOF-2 Driver

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

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

```
echo %PROCESSOR_ARCHITECTURE%
```

Note

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

2. Go to the WinOF-2 web page at: <https://www.nvidia.com/en-us/networking/> > Products > Software > InfiniBand Drivers (Learn More) > Nvidia WinOF-2.
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>_<arch>.exe.

Note

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”

Installing 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.

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

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

```
MLNX_WinOF2_<revision_version>_All_Arch.exe /v" MT_SKIPFWUPGRD=1"
```

4. **[Optional]** If you do not want to install the Rshim driver, run.

```
MLNX_WinOF2_<revision_version>_All_Arch.exe /v"  
MT_DISABLE_RSHIM_INSTALL=1"
```

Note

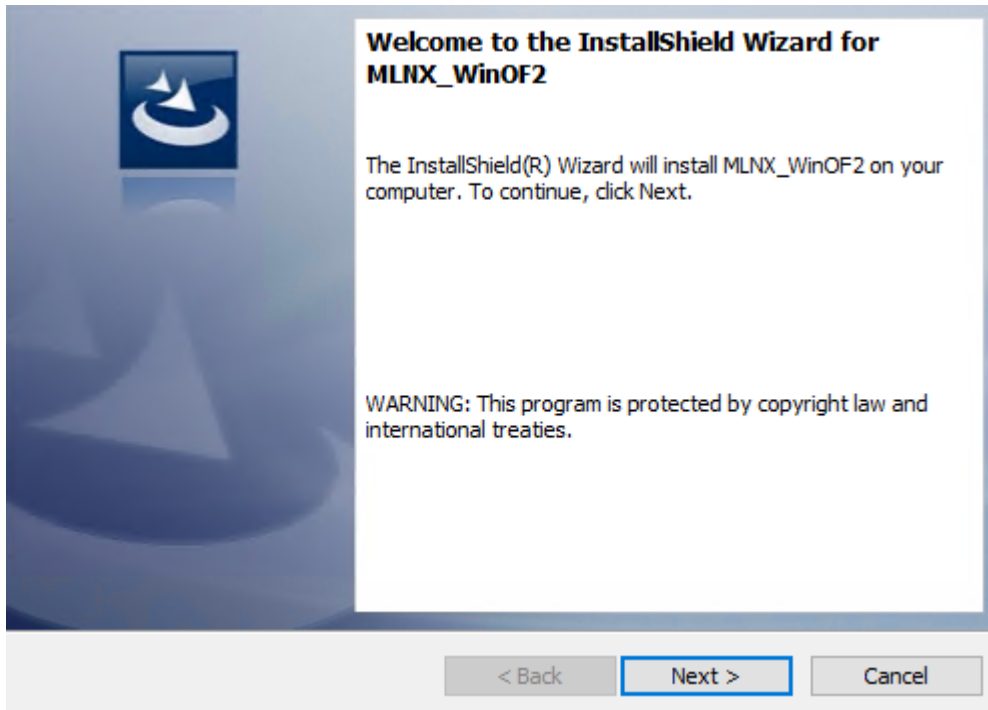
The Rshim driver installation will fail if a prior Rshim driver is already installed. The following fail message will be displayed in the log:

```
"ERROR!!! Installation failed due to following errors: MlxRshim  
drivers installation disabled and MlxRshim drivers Installed,  
Please remove the following oem inf files from driver store:  
<oem inf list>"
```

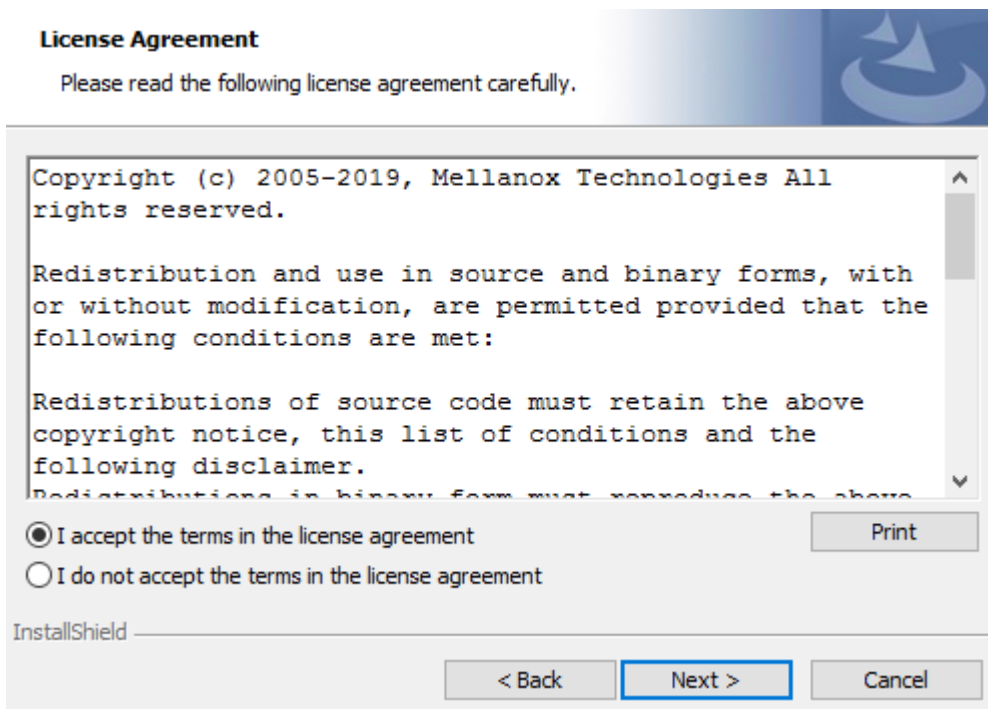
5. **[Optional]** If you want to skip the check for unsupported devices, run.

```
MLNX_WinOF2_<revision_version>_All_Arch.exe /v"  
SKIPUNSUPPORTEDDEVCHECK=1"
```

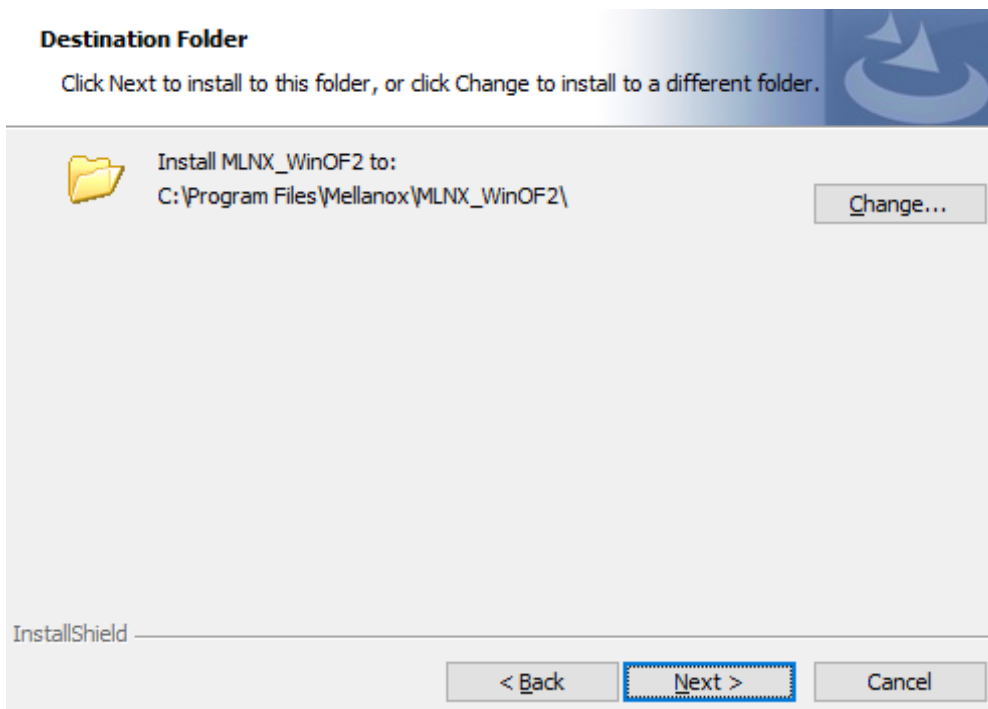
6. Click Next in the Welcome screen.



7. Read and accept the license agreement and click Next.



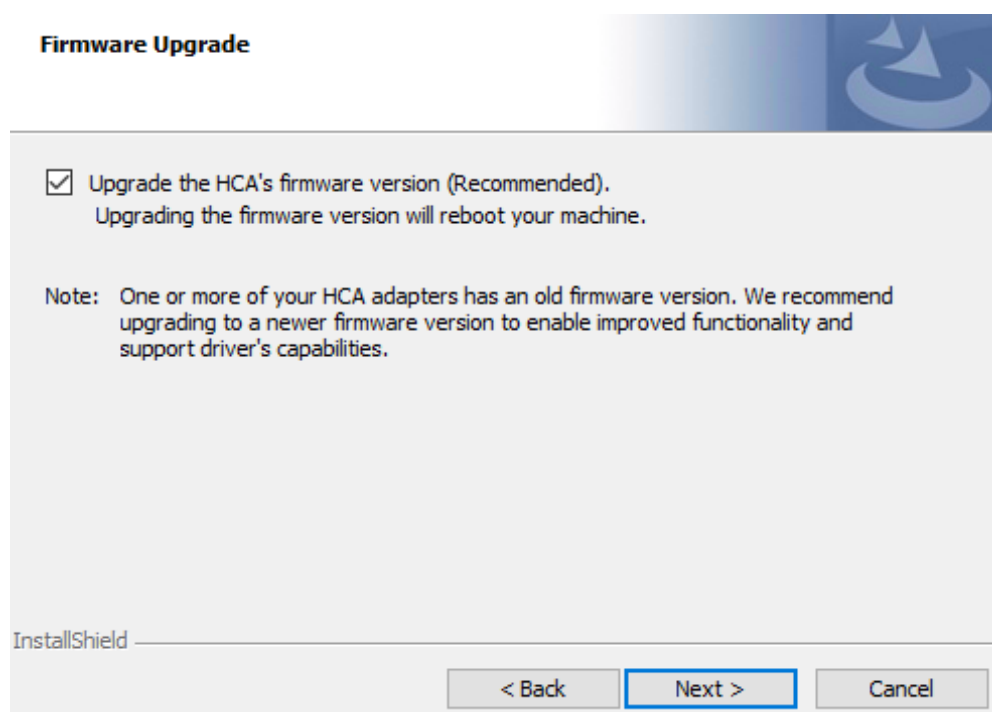
8. Select the target folder for the installation.



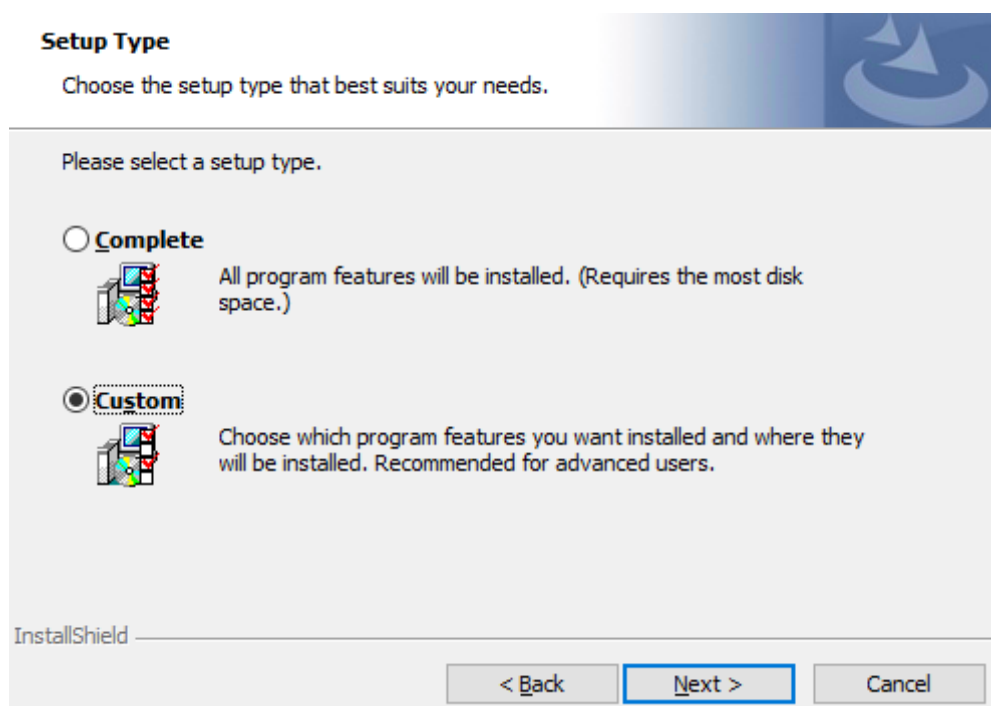
9. The firmware upgrade screen will be displayed in the following cases:

- If the user has an OEM card. In this case, the firmware will not be displayed.
- If the user has a standard NVIDIA® card with an older firmware version, the firmware will be updated accordingly. However, if the user has both an OEM

card and a NVIDIA® card, only the NVIDIA® card will be updated.



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

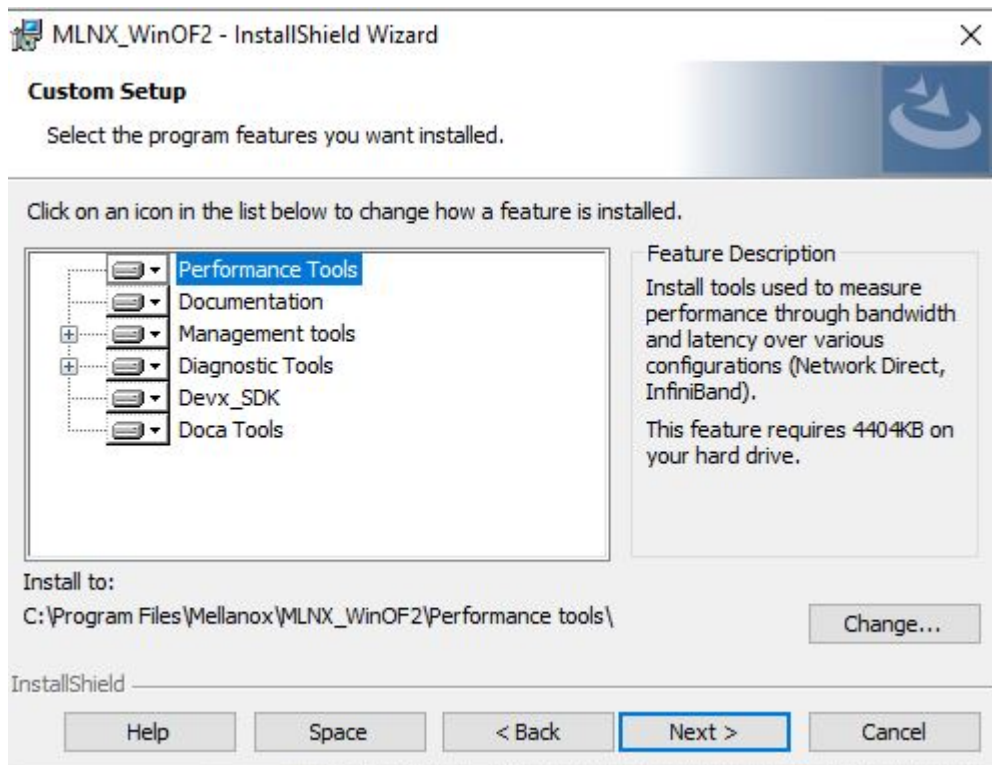


1. Select the desired feature to install:

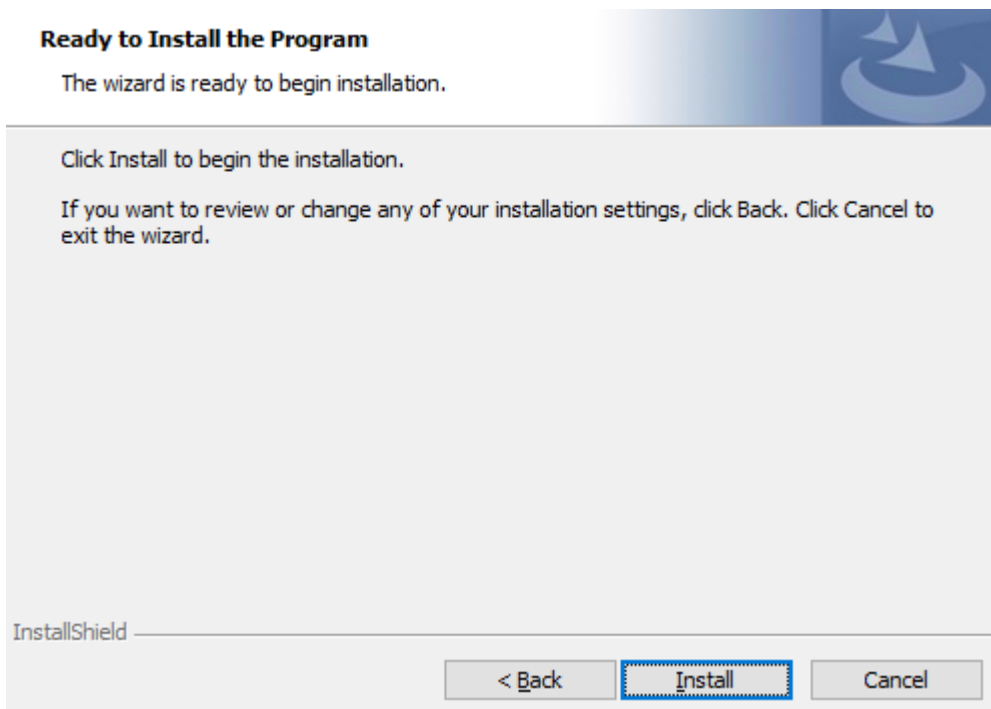
- Performances tools - install the performance tools that are used to measure performance in user environment

- 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

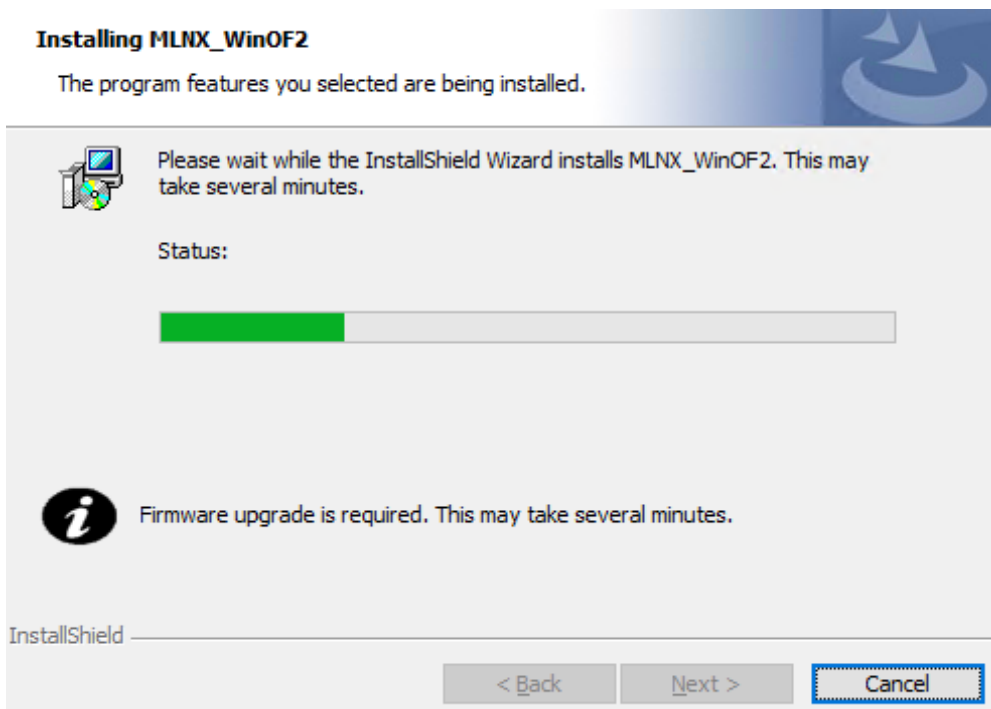
2. Click Next to install the desired tools.



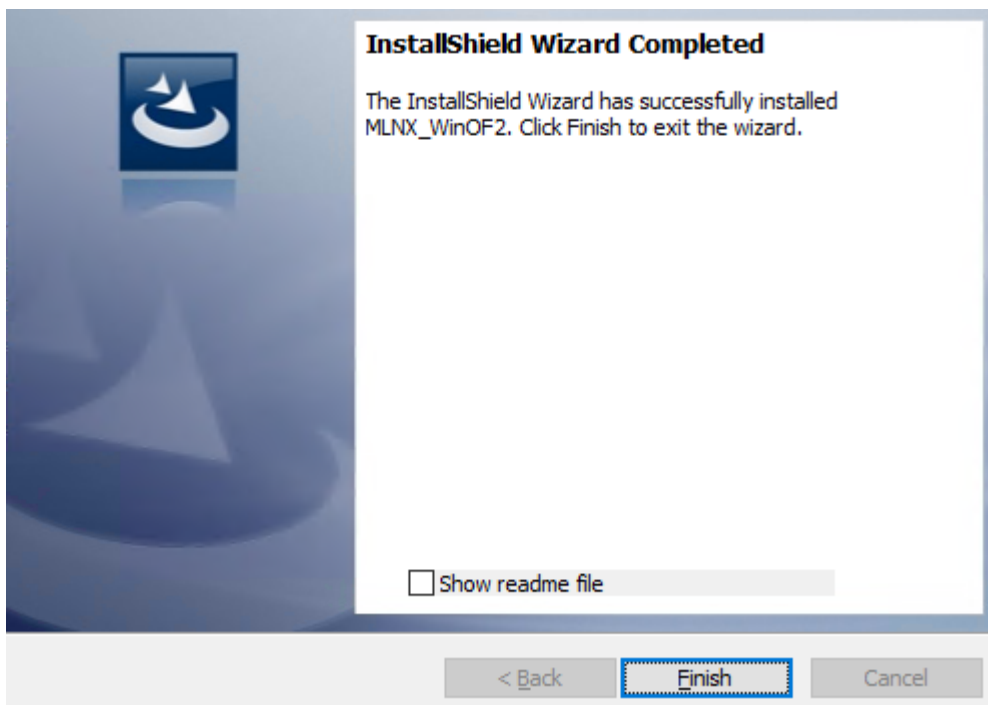
11. Click Install to start the installation.



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



13. Click Finish to complete the installation.



Unattended Installation

Note

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.

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

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

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

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

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

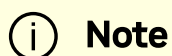
```
MLNX_WinOF2-[Driver/Version]_<revision_version>_All_Arch.exe  
/vMT_NDPROPERTY=1
```

5. **[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
```

6. **[Optional]** If you do not want to install the Rshim driver, run.

```
MLNX_WinOF2_<revision_version>_All_Arch.exe /v"  
MT_DISABLE_RSHIM_INSTALL=1"
```



The Rshim driver installation will fail if a prior Rshim driver is already installed. The following fail message will be displayed in the log:

"ERROR!!! Installation failed due to following errors: MlxRshim drivers installation disabled and MlxRshim drivers Installed, Please remove the following oem inf files from driver store: <oem inf list>"

7. **[Optional]** If you want to enable the default configuration for Rivermax, run.

```
MLNX_WinOF2_<revision_version>_All_Arch.exe /v"MT_RIVERMAX=1 /!*vx  
C:\Users\<user>\log.txt "
```

8. **[Optional]** If you want to skip the check for unsupported devices, run/

```
MLNX_WinOF2_<revision_version>_All_Arch.exe /v"  
SKIPUNSUPPORTEDDEVCHECK=1"
```

Firmware Upgrade

If the machine has a standard NVIDIA® card with an older firmware version, the firmware will be automatically updated as part of the NVIDIA® WinOF-2 package installation. For information on how to upgrade firmware manually, please refer to [MFT User Manual](#).

If the machine has a DDA (pass through) facility, firmware update is supported only in the Host. Therefore, to update the firmware, the following must be performed:

1. Return the network adapters to the Host.
2. Update the firmware according to the steps in the [MFT User Manual](#).
3. Attach the adapters back to VM with the DDA tools.

Updating Adapter Firmware

Each adapter card is shipped with the latest version of qualified firmware at the time of manufacturing. However, NVIDIA 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 NVIDIA 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 in [mlxup - Update and Query Utility](#).

Firmware Update Example

```
[server1]# ./mlxup
Querying Mellanox devices firmware ...
Device Type:      ConnectX-4 Lx
Part Number:      MCX4621A-ACAB
Description:      ConnectX®-4 Lx EN network interface card for OCP
3.0, with host management, 25GbE Dual-port SFP28, PCIe3.0 x8,
Thumbscrew bracket
PSID:             MT_2190110032
PCI Device Name:  0000:06:00.0
Base GUID:        e41d2d0300fd8b8a
Versions:         Current          Available
                  FW 16.23.1020    16.24.1000

Status:           Update required

Device Type:      ConnectX-4 Lx
Part Number:      MCX4621A-ACAB
Description:      ConnectX®-4 Lx EN network interface card for OCP
3.0, with host management, 25GbE Dual-port SFP28, PCIe3.0 x8,
Thumbscrew bracket
PSID:             MT_2170110021
```

```
PCI Device Name: 0000:07:00.0
Base MAC:        0000e41d2da206d4
Versions:        Current          Available
                  FW 16.24.1000    16.24.1000

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
```

Specifications

MCX4621A-XCAB Specifications

Physical	Size: 4.52in. x 2.99in. (115mm x 76mm)				
	Connector: Dual SFP28 Ethernet (copper and optical)				
	Bracket: Thumbscrew Bracket				
Protocol Support	Ethernet: 10GBASE-SR, 10GBASE-LR, 10GBASE-ER, 10GBASE-CX4, 10GBASE-CR, 10GBASE-KR, SGMII				
	Data Rate: 1/10 Gb/s Ethernet				
	PCI Express Gen3: SERDES @ 8.0GT/s, 8 lanes (2.0 and 1.1 compatible)				
Power and Airflow	Voltage: 3.3V_EDGE, 12V_EDGE				
	Power	Cable Type	Active Mode		Stand by Mode
			12V_EDGE	3.3V_EDGE	
	Typical Power ^(a)	Passive Cables	8.47W	25mW	3.3W
		1.5W Active Cables	12W	25mW	5W
	Maximum Power	Passive Cables	10.35W	25mW	4.58W
		1.5W Active Cables	13.88W	25mW	6.35W
	Maximum power available through SFP28 port: 1.5W				
	Airflow	Cable Type	Heatsink to Port Hot-Aisle (55°C Ambient)		Port to Heatsink Cold-Aisle (35°C Ambient)
		Passive Cables	150LFM		TBD

		Active 1.5W Cable	300LFM	TBD
		Passive Cables	100LFM ^(b)	TBD
		Active 1.5W Cable	100LFM ^(b)	TBD
Environmental	Temperature	Operational	0°C to 55°C	
		Non-operational	-40°C to 70°C ^(c)	
	Humidity	Operational	10% to 85% relative humidity	
		Non-operational	10% to 90% relative humidity	
	Altitude (Operational)	3050m		
Regulatory	Safety	CB / cTUVus / CE		
	EMC	CE / FCC / VCCI / ICES / RCM		
	RoHS	RoHS compliant		

Notes: a. Typical power for ATIS traffic load.

b. Maximum inlet temperature for standby mode is 45°C (according to OCP3 spec)

c. The non-operational storage temperature specifications apply to the product without its package.

MCX4621A-ACAB Specifications

Physical	Size: 4.52in. x 2.99in. (115mm x 76mm)
	Connector: Dual SFP28 Ethernet (copper and optical)
	Bracket: Thumbscrew Bracket
Protocol Support	Ethernet: 25GBASE-R, 20GBASE-KR2, 1000BASE-CX, 1000BASE-KX, 10GBASE-SR, 10GBASE-LR, 10GBASE-ER, 10GBASE-CX4, 10GBASE-CR, 10GBASE-KR, SGMII
	Data Rate: 1/10/25 Gb/s Ethernet
	PCI Express Gen3: SERDES @ 8.0GT/s, 8 lanes (2.0 and 1.1 compatible)
Power and Airflow	Voltage: 3.3V_EDGE, 12V_EDGE

	Power	Cable Type	Active Mode		Stand by Mode
			12V_EDGE	3.3V_EDGE	
	Typical Power ^(a)	Passive Cables	8.82W	25mW	3.3W
		1.5W Active Cables	12.36W	25mW	5W
	Maximum Power	Passive Cables	10.82W	25mW	4.58W
		1.5W Active Cables	14.35W	25mW	6.35W
	Maximum power available through SFP28 port: 1.5W				
	Airflow	Cable Type	Heatsink to Port Hot-Aisle (55°C Ambient)		Port to Heatsink Cold-Aisle (35°C Ambient)
		Passive Cables	150LFM		TBD
		Active 1.5W Cable	300LFM		TBD
		Passive Cables	100LFM ^(b)		TBD
		Active 1.5W Cable	100LFM ^(b)		TBD
Environmental	Temperature	Operational	0°C to 55°C		
		Non-operational	-40°C to 70°C ^(c)		
	Humidity	Operational	10% to 85% relative humidity		
		Non-operational	10% to 90% relative humidity		
	Altitude (Operational)	3050m			
Regulatory	Safety	CB / cTUVus / CE			
	EMC	CE / FCC / VCCI / ICES / RCM			

Notes: a. Typical power for ATIS traffic load.

b. Maximum inlet temperature for standby mode is 45°C (according to OCP3 spec)

c. The non-operational storage temperature specifications apply to the product without its package.

Board Mechanical Drawing and Dimensions

Note

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

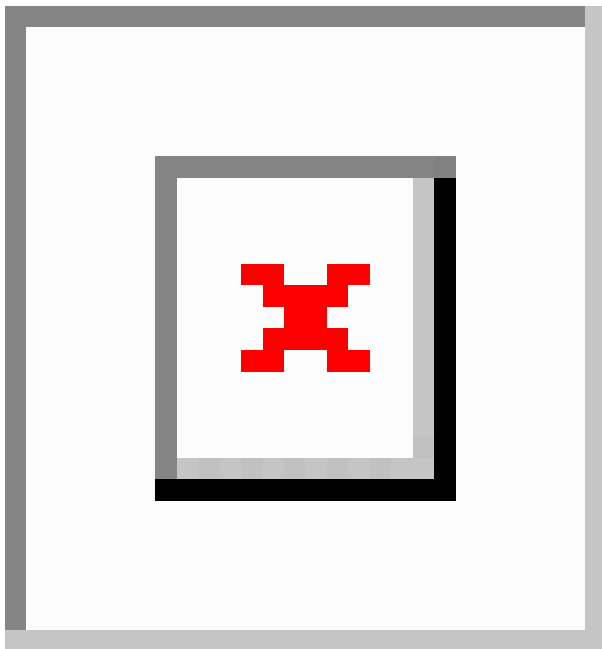
Finding the MAC on the Adapter Card

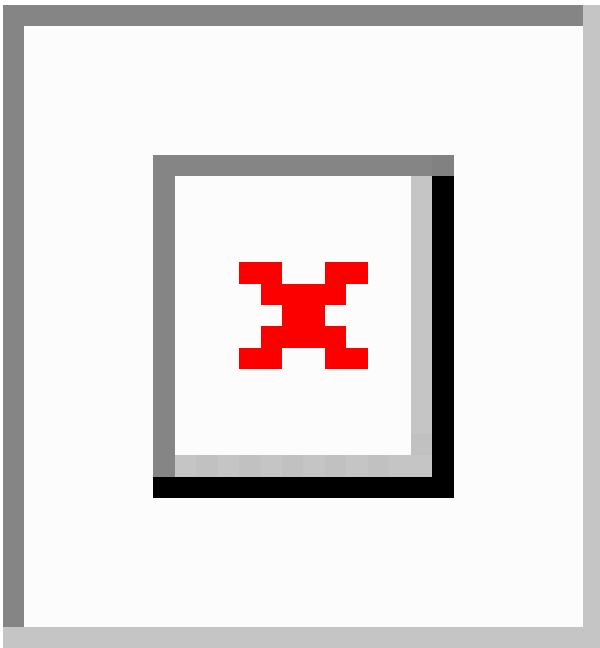
Each NVIDIA adapter card has a different identifier printed on the label: serial number and the card MAC for the Ethernet protocol.

Note

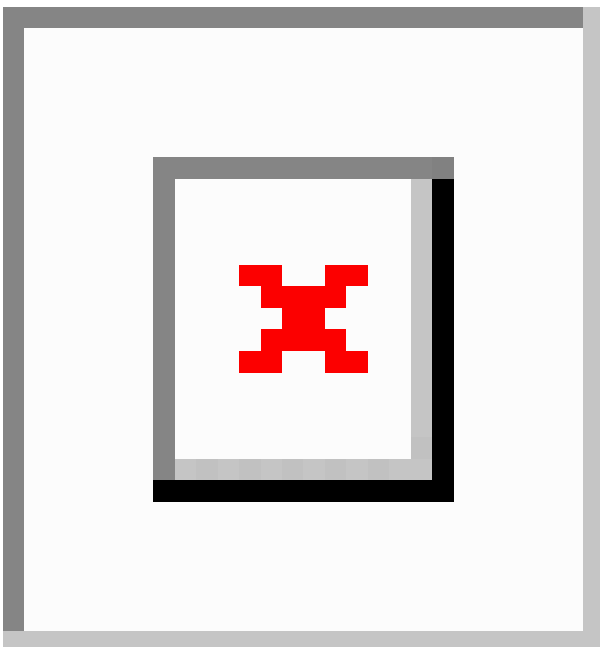
The product revisions indicated on the labels in the following figures do not necessarily represent the latest revisions of the cards.

MCX4621A-XCAB Board Label (Example)





MCX4621A-ACAB Board Label (Example)



Document Revision History

Date	Description of Changes
May. 2023	Added non-operational storage temperature specifications.
Oct. 2020	• Updated airflow numbers in "Specifications". • Updated networking ports LEDs indications.
Oct. 2020	Updated "Specifications" with new power numbers and added standby power numbers.
Sep. 2020	Added OCP 3.0 bracket replacement instructions.
May. 2020	Added MCX4621A-XCAB to relevant sections in the document.
Feb. 2020	Added altitude criteria to "Specifications".
Jan. 2020	Updated airflow specifications in "Specifications".
Nov. 2019	Added a note to "Introduction".
Oct. 2019	Updated the supported Ethernet protocols in "Specifications".
Aug. 2019	Added a note to "Introduction".
May. 2019	Updated PCB tolerance and MCX4621A-ACAB airflow in "Specifications".
Apr. 2019	Migrated to on-line format; minor reorganization.
Dec. 2018	First release

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