

ThinkSystem Mellanox ConnectX-6 HDR/200GbE VPI Adapters

Product Guide

The ThinkSystem Mellanox ConnectX-6 HDR/200GbE VPI Adapters offer 200 Gb/s Ethernet and InfiniBand connectivity for high-performance connectivity when running HPC, cloud, storage and machine learning applications.

The following figure shows the ThinkSystem Mellanox ConnectX-6 HDR/200GbE QSFP56 1-port PCIe 4 VPI Adapter connected to the ThinkSystem Mellanox HDR/200GbE Aux Adapter (the standard heat sink has been removed in this photo).

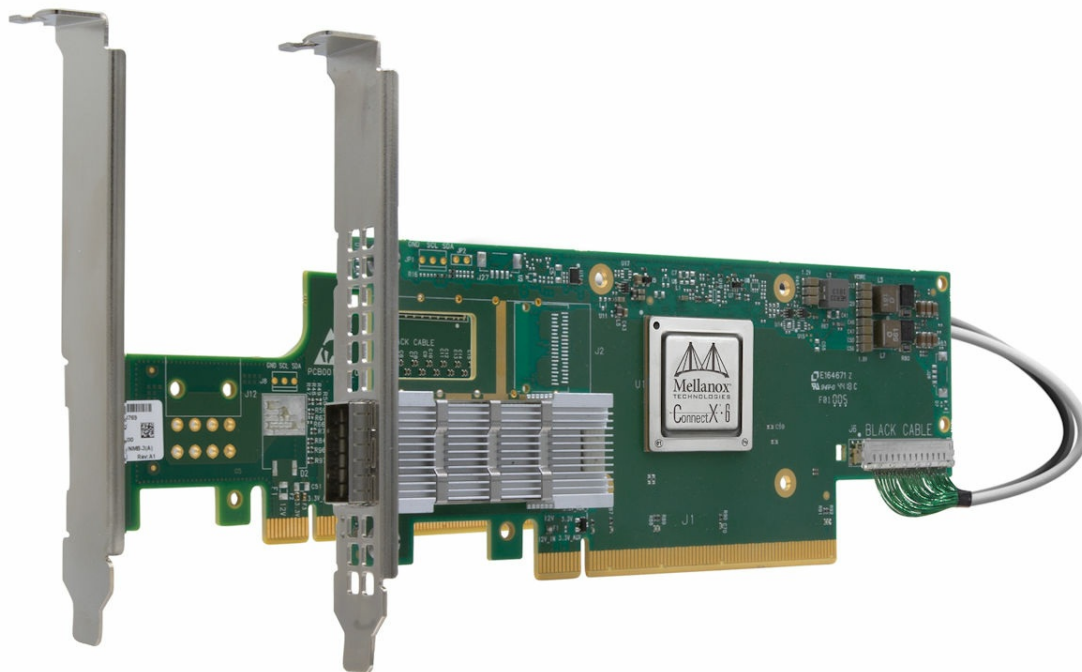


Figure 1. ThinkSystem Mellanox ConnectX-6 HDR/200GbE QSFP56 1-port PCIe 4 VPI Adapter (right) and ThinkSystem Mellanox HDR/200GbE Aux Adapter (left)

Did you know?

Mellanox ConnectX-6 brings new acceleration engines for maximizing High Performance, Machine Learning, Storage, Web 2.0, Cloud, Data Analytics and Telecommunications platforms. ConnectX-6 HDR adapters support up to 200 Gb/s total bandwidth at sub-600 nanosecond latency, and NVMe over Fabric offloads, providing the highest performance and most flexible solution for the most demanding applications and markets. ThinkSystem servers with Mellanox adapters and switches deliver the most intelligent fabrics for High Performance Computing clusters.

Part number information

For servers with support for PCIe 4.0 host interfaces, the ConnectX-6 HDR adapter can be used by itself in a single PCIe 4.0 x16 slot to provide 200 Gb/s connectivity. For servers with PCIe 3.0 interfaces, the ConnectX-6 HDR adapter is used in conjunction with the Aux adapter. The HDR adapter and the Aux adapter are connected together via a cable (included with the Aux adapter) and their combined host interfaces of PCIe 3.0 x32 provides enough bandwidth for 200 Gb/s connectivity.

The following table shows the part numbers for the adapters.

CTO orders: For configure-to-order builds, these adapters are only available when you select one of the HPC & AI modes in the [DCSC configurator](#). Not available in General Purpose mode of DCSC.

Table 1. Ordering information

Part number	Feature code	Mellanox equivalent	Description
Primary adapter			
4C57A15326	B4RC / BN38	MCX653105A-HDAT	ThinkSystem Mellanox ConnectX-6 HDR/200GbE QSFP56 1-port PCIe 4 VPI Adapter
CTO only	B4RG	None	ThinkSystem Mellanox ConnectX-6 HDR/200GbE QSFP56 1-port PCIe 4 VPI Adapter (SharedIO) DWC
CTO only	B951	None	ThinkSystem Mellanox ConnectX-6 HDR/200GbE QSFP56 1-Port PCIe 4 VPI Adapter (SharedIO) DWC
CTO only	B952	None	ThinkSystem Mellanox ConnectX-6 HDR/200GbE QSFP56 1-Port PCIe 4 VPI Adapter DWC
Shared I/O auxiliary adapter			
4C57A14179	B4RB	MTMK0012	ThinkSystem Mellanox HDR/200GbE 2x PCIe Aux Kit

Part number 4C57A15326 includes the following:

- One Mellanox adapter with full-height (3U) adapter bracket attached
- Low-profile (2U) adapter bracket
- Documentation

Part number 4C57A14179 includes the following:

- One Mellanox adapter with full-height (3U) adapter bracket attached
- Low-profile (2U) adapter bracket
- 350mm cable
- Documentation

Note: 4C57A15326 was previously named ThinkSystem Mellanox ConnectX-6 HDR QSFP56 1-port PCIe 4 InfiniBand Adapter

Supported transceivers and cables

The adapter has an empty QSFP56 cage for connectivity. The following table lists the supported transceivers.

Table 2. Transceivers

Part number	Feature code	Description
100Gb transceivers		
7G17A03539*	AV1D	Lenovo 100GBase-SR4 QSFP28 Transceiver
4M27A67042	BFH1	Lenovo 100Gb SR4 QSFP28 Ethernet Transceiver
Converters		
4G17A10853	B306	Mellanox QSA 100G to 25G Cable Adapter

* 7G17A03539 also supports 40Gb when installed in a Mellanox adapter.

The following table lists the supported fiber optic cables and Active Optical Cables.

Table 3. Optical cables

Part number	Feature code	Description
QSFP28 EDR InfiniBand Optical Cables		
00MP563	ASRN	3m Mellanox EDR IB Optical QSFP28 Cable
00MP540	ASQZ	5m Mellanox EDR IB Optical QSFP28 Cable
00MP544	ASR0	10m Mellanox EDR IB Optical QSFP28 Cable
00MP548	ASR1	15m Mellanox EDR IB Optical QSFP28 Cable
00MP552	ASR2	20m Mellanox EDR IB Optical QSFP28 Cable
00MP556	ASR3	30m Mellanox EDR IB Optical QSFP28 Cable
00MP566	ASRP	50m Mellanox EDR IB Optical QSFP28 Cable
QSFP 40Gb Active Optical Cables		
7Z57A04256	AX42	Lenovo 1m 40G QSFP+ Active Optical Cable
00YL652	ATZ3	Lenovo 3m 40G QSFP+ to QSFP+ Active Optical Cable
00YL655	ATZ4	Lenovo 5m 40G QSFP+ to QSFP+ Active Optical Cable
00YL658	ATZ5	Lenovo 7m 40G QSFP+ to QSFP+ Active Optical Cable
00YL661	ATZ6	Lenovo 15m 40G QSFP+ to QSFP+ Active Optical Cable
00YL664	ATZ7	Lenovo 20m 40G QSFP+ to QSFP+ Active Optical Cable
QSFP 40Gb Optical Cables (these cables require a transceiver)		
00VX003	AT2U	Lenovo 10m QSFP+ MPO-MPO OM3 MMF Cable
00VX005	AT2V	Lenovo 30m QSFP+ MPO-MPO OM3 MMF Cable
QSFP28 100Gb Ethernet Active Optical Cables		
4Z57A10844	B2UZ	Lenovo 1m 100G QSFP28 Active Optical Cable
7Z57A03546	AV1L	Lenovo 3m 100G QSFP28 Active Optical Cable
7Z57A03547	AV1M	Lenovo 5m 100G QSFP28 Active Optical Cable
7Z57A03548	AV1N	Lenovo 10m 100G QSFP28 Active Optical Cable
7Z57A03549	AV1P	Lenovo 15m 100G QSFP28 Active Optical Cable
7Z57A03550	AV1Q	Lenovo 20m 100G QSFP28 Active Optical Cable
100G MPO OM4 MMF Cables (these cables require a transceiver)		

Part number	Feature code	Description
7Z57A03567	AV25	Lenovo 5m MPO-MPO OM4 MMF Cable
7Z57A03568	AV26	Lenovo 7m MPO-MPO OM4 MMF Cable
7Z57A03569	AV27	Lenovo 10m MPO-MPO OM4 MMF Cable
7Z57A03570	AV28	Lenovo 15m MPO-MPO OM4 MMF Cable
7Z57A03571	AV29	Lenovo 20m MPO-MPO OM4 MMF Cable
7Z57A03572	AV2A	Lenovo 30m MPO-MPO OM4 MMF Cable
QSFP56 HDR IB Optical Cables		
4Z57A14188	B4QW	3m Mellanox HDR IB Optical QSFP56 Cable
4Z57A14189	B4QX	5m Mellanox HDR IB Optical QSFP56 Cable
4Z57A14190	B4QY	10m Mellanox HDR IB Optical QSFP56 Cable
4Z57A14191	B4QZ	15m Mellanox HDR IB Optical QSFP56 Cable
4Z57A14192	B4R0	20m Mellanox HDR IB Optical QSFP56 Cable
4Z57A16016	B68P	30m Mellanox HDR IB Active Optical QSFP56 Cable
4Z57A16017	B68N	50m Mellanox HDR IB Active Optical QSFP56 Cable
4Z57A16018	B68M	100m Mellanox HDR IB Active Optical QSFP56 Cable
4Z57A72553	BFXR	3m Mellanox HDR IB Optical QSFP56 Low Latency Cable
4Z57A72554	BFXS	5m Mellanox HDR IB Optical QSFP56 Low Latency Cable
4Z57A72555	BFXT	10m Mellanox HDR IB Optical QSFP56 Low Latency Cable
4Z57A72556	BFXU	15m Mellanox HDR IB Optical QSFP56 Low Latency Cable
4Z57A72557	BFXV	20m Mellanox HDR IB Optical QSFP56 Low Latency Cable
4Z57A72558	BFXW	30m Mellanox HDR IB Optical QSFP56 Low Latency Cable
4Z57A72559	BFXX	50m Mellanox HDR IB Optical QSFP56 Low Latency Cable
4Z57A72560	BFXY	100m Mellanox HDR IB Optical QSFP56 Low Latency Cable
QSFP56 HDR IB to 2x HDR100 Optical Splitter Cables		
4Z57A14196	B4R4	3m Mellanox HDR IB to 2x HDR100 Splitter Optical QSFP56 Cable
4Z57A14197	B4R5	5m Mellanox HDR IB to 2x HDR100 Splitter Optical QSFP56 Cable
4Z57A14198	B4R6	10m Mellanox HDR IB to 2x HDR100 Splitter Optical QSFP56 Cable
4Z57A14199	B4R7	15m Mellanox HDR IB to 2x HDR100 Splitter Optical QSFP56 Cable
4Z57A14214	B4R8	20m Mellanox HDR IB to 2x HDR100 Splitter Optical QSFP56 Cable
4Z57A11490	B68K	30m Mellanox HDR to 2x HDR100 IB Active Optical QSFP56 Splitter Cable
4Z57A72561	BFXZ	3m Mellanox HDR IB to 2x HDR100 Splitter Optical QSFP56 Low Latency Cable
4Z57A72562	BFY0	5m Mellanox HDR IB to 2x HDR100 Splitter Optical QSFP56 Low Latency Cable
4Z57A72563	BFY1	10m Mellanox HDR IB to 2x HDR100 Splitter Optical QSFP56 Low Latency Cable
4Z57A72564	BFY2	15m Mellanox HDR IB to 2x HDR100 Splitter Optical QSFP56 Low Latency Cable
4Z57A72565	BFY3	20m Mellanox HDR IB to 2x HDR100 Splitter Optical QSFP56 Low Latency Cable
4Z57A72566	BFY4	30m Mellanox HDR IB to 2x HDR100 Splitter Optical QSFP56 Low Latency Cable

The following table lists the supported direct-attach copper (DAC) cables.

Table 4. Copper cables

Part number	Feature code	Description
QSFP28 EDR InfiniBand Passive Copper Cables		
00MP516	ASQT	0.5m Mellanox EDR IB Passive Copper QSFP28 Cable
00MP520	ASQU	0.75m Mellanox EDR IB Passive Copper QSFP28 Cable
00MP524	ASQV	1m Mellanox EDR IB Passive Copper QSFP28 Cable
00MP528	ASQW	1.25m Mellanox EDR IB Passive Copper QSFP28 Cable
00MP532	ASQX	1.5m Mellanox EDR IB Passive Copper QSFP28 Cable
00MP536	ASQY	2m Mellanox EDR IB Passive Copper QSFP28 Cable
00MP560	ASRM	3m Mellanox EDR IB Passive Copper QSFP28 Cable
QSFP28 100Gb Ethernet Passive DAC Cables		
7Z57A03561	AV1Z	Lenovo 1m Passive 100G QSFP28 DAC Cable
7Z57A03562	AV20	Lenovo 3m Passive 100G QSFP28 DAC Cable
7Z57A03563	AV21	Lenovo 5m Passive 100G QSFP28 DAC Cable
QSFP56 HDR InfiniBand Passive DAC Cables		
4Z57A14182	B4QQ	0.5m Mellanox HDR IB Passive Copper QSFP56 Cable
4Z57A14183	B4QR	1m Mellanox HDR IB Passive Copper QSFP56 Cable
4Z57A14184	B4QS	1.5m Mellanox HDR IB Passive Copper QSFP56 Cable
4Z57A14185	B4QT	2m Mellanox HDR IB Passive Copper QSFP56 Cable
QSFP56 HDR InfiniBand to 2x HDR100 Passive DAC Splitter Cables		
4Z57A14193	B4R1	1m Mellanox HDR IB to 2x HDR100 Splitter Passive Copper QSFP56 Cable
4Z57A14194	B4R2	1.5m Mellanox HDR IB to 2x HDR100 Splitter Passive Copper QSFP56 Cable
4Z57A11477	B68L	2m Mellanox HDR to 2x HDR100 IB Passive DAC QSFP56 Splitter Cable
QSFP56 200Gb Ethernet Passive DAC Cables		
4X97A11113	BF6W	Lenovo 1m 200G QSFP56 DAC Cable
4X97A12613	BF92	Lenovo 3m 200G QSFP56 DAC Cable
QSFP56 HDR InfiniBand Active DAC Cables		
4X97A12610	BCQW	3m Mellanox HDR IB Active Copper QSFP56 Cable
4X97A12611	BCQX	4m Mellanox HDR IB Active Copper QSFP56 Cable

Features

Machine learning and big data environments

Data analytics has become an essential function within many enterprise data centers, clouds and hyperscale platforms. Machine learning relies on especially high throughput and low latency to train deep neural networks and to improve recognition and classification accuracy. ConnectX-6 offers an excellent solution to provide machine learning applications with the levels of performance and scalability that they require.

ConnectX-6 utilizes the RDMA technology to deliver low-latency and high performance. ConnectX-6 enhances RDMA network capabilities even further by delivering end-to-end packet level flow control.

Security

ConnectX-6 block-level encryption offers a critical innovation to network security. As data in transit is stored or retrieved, it undergoes encryption and decryption. The ConnectX-6 hardware offloads the IEEE AES-XTS encryption/decryption from the CPU, saving latency and CPU utilization. It also guarantees protection for users sharing the same resources through the use of dedicated encryption keys.

By performing block-storage encryption in the adapter, ConnectX-6 excludes the need for self-encrypted disks. This allows customers the freedom to choose their preferred storage device, including those that traditionally do not provide encryption. ConnectX-6 can support Federal Information Processing Standards (FIPS) compliance.

ConnectX-6 also includes a hardware Root-of-Trust (RoT), which uses HMAC relying on a device-unique key. This provides both a secure boot as well as cloning-protection. Delivering best-in-class device and firmware protection, ConnectX-6 also provides secured debugging capabilities, without the need for physical access.

Storage environments

NVMe storage devices offer very fast access to storage media. The evolving NVMe over Fabric (NVMe-oF) protocol leverages RDMA connectivity to remotely access NVMe storage devices efficiently, while keeping the end-to-end NVMe model at lowest latency. With its NVMe-oF target and initiator offloads, ConnectX-6 brings further optimization to NVMe-oF, enhancing CPU utilization and scalability.

Cloud and Web 2.0 environments

Telco, Cloud and Web 2.0 customers developing their platforms on software-defined network (SDN) environments are leveraging the Virtual Switching capabilities of server operating systems to enable maximum flexibility in the management and routing protocols of their networks.

Open V-Switch (OVS) is an example of a virtual switch that allows virtual machines to communicate among themselves and with the outside world. Software-based virtual switches, traditionally residing in the hypervisor, are CPU intensive, affecting system performance and preventing full utilization of available CPU for compute functions.

To address such performance issues, ConnectX-6 offers Mellanox Accelerated Switching and Packet Processing (ASAP²) Direct technology. ASAP² offloads the vSwitch/vRouter by handling the data plane in the NIC hardware while maintaining the control plane unmodified. As a result, significantly higher vSwitch/vRouter performance is achieved minus the associated CPU load.

The vSwitch/vRouter offload functions supported by ConnectX-5 and ConnectX-6 include encapsulation and de-capsulation of overlay network headers, as well as stateless offloads of inner packets, packet headers re-write (enabling NAT functionality), hairpin, and more.

In addition, ConnectX-6 offers intelligent flexible pipeline capabilities, including programmable flexible parser and flexible match-action tables, which enable hardware offloads for future protocols.

Socket Direct

Mellanox's Socket Direct technology improves the performance of dual-socket servers in numerous ways, such as by enabling each of their CPUs to access the network through a dedicated PCIe interface. As the connection from each CPU to the network bypasses the QPI (UPI) and the second CPU, Socket Direct reduces latency and CPU utilization. Moreover, each CPU handles only its own traffic (and not that of the second CPU), thus optimizing CPU utilization even further.

Socket Direct also enables GPUDirect RDMA for all CPU/GPU pairs by ensuring that GPUs are linked to the CPUs closest to the adapter card. Socket Direct enables Intel DDIO optimization on both sockets by creating a direct connection between the sockets and the adapter card.

Socket Direct technology is enabled by a main card housing the ConnectX-6 and an auxiliary PCIe card bringing in the remaining PCIe lanes. The ConnectX-6 Socket Direct card is installed into two PCIe x16 slots and connected using the supplied 350mm cable.

The two PCIe x16 slots may also be connected to the same CPU. In this case, the main advantage of the technology lies in delivering 200Gb/s to servers with PCIe Gen3-only support.

SharedIO

An implementation of Sockets Direct is SharedIO (Shared I/O), where a Mellanox VPI adapter is installed in one slot in one server and an auxiliary adapter is installed in a slot in second server in the same enclosure.

The result is that the two servers or processors share the network connection of the VPI adapter with significant savings both in the cost of the adapters but also the cost of switch ports.

The following figure shows the Mellanox SharedIO Adapter and Auxiliary Card installed in two ThinkSystem SD650 V2 servers in the same tray.

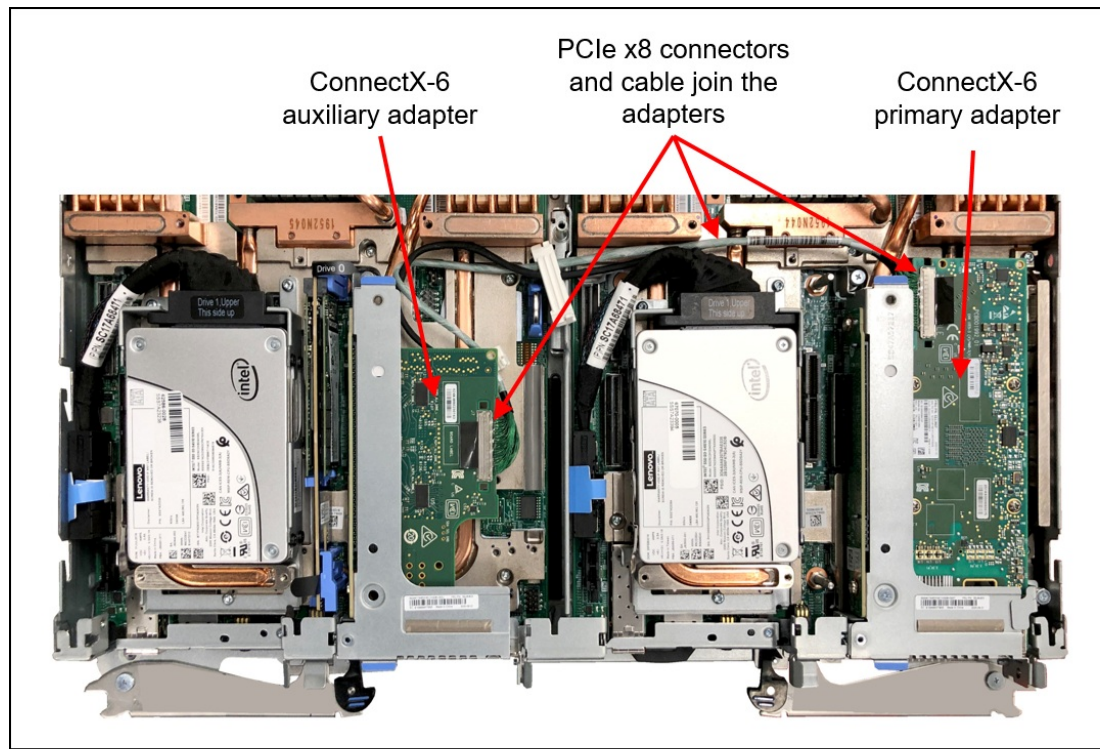


Figure 2. SharedIO adapters installed in the two SD650 V2 servers on a tray

Technical specifications

The adapters have the following technical specifications.

Form factor

- Single-slot low-profile main adapter (6.6-inch x 2.71 in.)
- Single-slot low-profile auxiliary adapter

PCI Express Interface

- Supports PCIe 4.0 or PCIe 3.0
 - In PCIe 4.0 servers, the ConnectX-6 adapter is used by itself to connect 16 PCIe lanes. For two-socket servers, the adapter can be used with the Aux adapter to enable the Socket

Direct feature.

- In PCIe 3.0 servers, the ConnectX-6 adapter is used with the Aux adapter to connect 32 PCIe lanes. For two-socket servers, the adapter can be used with the Aux adapter to enable the Socket Direct feature.
- PCIe Atomic
- TLP (Transaction Layer Packet) Processing Hints (TPH)
- PCIe switch Downstream Port Containment (DPC) enablement for PCIe hot-plug
- Advanced Error Reporting (AER)
- Access Control Service (ACS) for peer-to-peer secure communication
- Process Address Space ID (PASID) Address Translation Services (ATS)
- IBM CAPIv2 (Coherent Accelerator Processor Interface)
- Support for MSI/MSI-X mechanisms

Connectivity

- One QSFP56 port
- Supports passive copper cables with ESD protection
- Powered connectors for optical and active cable support

InfiniBand

- Supports interoperability with InfiniBand switches (up to HDR, as 4 lanes of 50Gb/s data rate)
- Total connectivity is 200 Gb/s:
 - One port adapter supports a single 200 Gb/s link
- HDR / HDR100 / EDR / FDR / QDR / DDR / SDR
- IBTA Specification 1.3 compliant
- RDMA, Send/Receive semantics
- Hardware-based congestion control
- Atomic operations
- 16 million I/O channels
- 256 to 4Kbyte MTU, 2Gbyte messages
- 8 virtual lanes + VL15

Ethernet (requires firmware 20.28.1002 or later)

- Support interoperability with Ethernet switches (up to 200GbE, as 4 lanes of 50Gb/s data rate)
- Total connectivity is 200 Gb/s:
 - One port adapter supports a single 200 Gb/s link
- Supports 200 GbE / 100GbE / 50GbE / 40GbE / 25GbE / 10GbE / 1GbE
- IEEE 802.3bj, 802.3bm 100 Gigabit Ethernet
- IEEE 802.3by, Ethernet Consortium 25, 50 Gigabit Ethernet, supporting all FEC modes
- IEEE 802.3ba 40 Gigabit Ethernet
- IEEE 802.3ae 10 Gigabit Ethernet
- IEEE 802.3az Energy Efficient Ethernet
- IEEE 802.3ap based auto-negotiation and KR startup
- IEEE 802.3ad, 802.1AX Link Aggregation
- IEEE 802.1Q, 802.1P VLAN tags and priority
- IEEE 802.1Qau (QCN) – Congestion Notification
- IEEE 802.1Qaz (ETS)
- IEEE 802.1Qbb (PFC)
- IEEE 802.1Qbg
- IEEE 1588v2
- Jumbo frame support (9.6KB)
- IPv4 (RFQ 791)
- IPv6 (RFC 2460)

Enhanced Features

- Hardware-based reliable transport
- Collective operations offloads
- Vector collective operations offloads
- PeerDirect RDMA (GPUDirect) communication acceleration
- 64/66 encoding
- Enhanced Atomic operations
- Advanced memory mapping support, allowing user mode registration and remapping of memory (UMR)
- Extended Reliable Connected transport (XRC)
- Dynamically Connected transport (DCT)
- On demand paging (ODP)
- MPI Tag Matching
- Rendezvous protocol offload
- Out-of-order RDMA supporting Adaptive Routing
- Burst buffer offload
- In-Network Memory registration-free RDMA memory access

CPU Offloads

- RDMA over Converged Ethernet (RoCE)
- TCP/UDP/IP stateless offload
- LSO, LRO, checksum offload
- RSS (also on encapsulated packet), TSS, HDS, VLAN and MPLS tag insertion/stripping, Receive flow steering
- Data Plane Development Kit (DPDK) for kernel bypass applications
- Open VSwitch (OVS) offload using ASAP²
 - Flexible match-action flow tables
 - Tunneling encapsulation / de-capsulation
- Intelligent interrupt coalescence
- Header rewrite supporting hardware offload of NAT router

Storage Offloads

- Block-level encryption: XTS-AES 256/512 bit key
- NVMe over Fabric offloads for target machine
- Erasure Coding offload - offloading Reed-Solomon calculations
- T10 DIF - signature handover operation at wire speed, for ingress and egress traffic
- Storage Protocols: SRP, iSER, NFS RDMA, SMB Direct, NVMe-oF

Overlay Networks

- RoCE over overlay networks
- Stateless offloads for overlay network tunneling protocols
- Hardware offload of encapsulation and decapsulation of VXLAN, NVGRE, and GENEVE overlay networks

Hardware-Based I/O Virtualization

- Single Root IOV
- Address translation and protection
- VMware NetQueue support
- SR-IOV: Up to 512 Virtual Functions
- SR-IOV: Up to 16 Physical Functions per host
- Virtualization hierarchies (network partitioning, NPAR)
 - Virtualizing Physical Functions on a physical port
 - SR-IOV on every Physical Function
- Configurable and user-programmable QoS
- Guaranteed QoS for VMs

HPC Software Libraries

- HPC-X, OpenMPI, MVAPICH, MPICH, OpenSHMEM, PGAS and varied commercial packages

Management and Control

- NC-SI, MCTP over SMBus and MCTP over PCIe - BMC interface
- PLDM for Monitor and Control DSP0248
- PLDM for Firmware Update DSP0267
- SDN management interface for managing the eSwitch
- I2C interface for device control and configuration
- General Purpose I/O pins
- SPI interface to Flash
- JTAG IEEE 1149.1 and IEEE 1149.6

Remote Boot

- Remote boot over InfiniBand
- Remote boot over Ethernet
- Remote boot over iSCSI
- Unified Extensible Firmware Interface (UEFI)
- Pre-execution Environment (PXE)

NVIDIA Unified Fabric Manager

NVIDIA Unified Fabric Manager (UFM) is InfiniBand networking management software that combines enhanced, real-time network telemetry with fabric visibility and control to support scale-out InfiniBand data centers.

The two offerings available from Lenovo are as follows:

- UFM Telemetry** for Real-Time Monitoring
 The UFM Telemetry platform provides network validation tools to monitor network performance and conditions, capturing and streaming rich real-time network telemetry information, application workload usage, and system configuration to an on-premises or cloud-based database for further analysis.
- UFM Enterprise** for Fabric Visibility and Control
 The UFM Enterprise platform combines the benefits of UFM Telemetry with enhanced network monitoring and management. It performs automated network discovery and provisioning, traffic monitoring, and congestion discovery. It also enables job schedule provisioning and integrates with industry-leading job schedulers and cloud and cluster managers, including Slurm and Platform Load Sharing Facility (LSF).

The following table lists the subscription licenses available from Lenovo.

Table 5. NVIDIA Unified Fabric Manager subscriptions

Part number	Feature code (7S02CTO1WW)	Description
UFM Telemetry		
7S02003HWW	S88D	UFM Telemetry 1-year License and Gold-Support for Lenovo clusters. Per node.
7S02003JWW	S88E	UFM Telemetry 3-year License and Gold-Support for Lenovo clusters. Per node.
7S02003KWW	S88F	UFM Telemetry 5-year License and Gold-Support for Lenovo clusters. Per node.
UFM Enterprise		
7S02003LWW	S88G	UFM Enterprise 1-year License and Gold-Support for Lenovo clusters. Per node.
7S02003MWW	S88H	UFM Enterprise 3-year License and Gold-Support for Lenovo clusters. Per node.
7S02003NWW	S88J	UFM Enterprise 5-year License and Gold-Support for Lenovo clusters. Per node.

For more information, see the following web page:
<https://www.nvidia.com/en-us/networking/infiniband/ufm/>

Server support

The following servers offer a PCIe 4.0 host interface. All other supported servers have a PCIe 3.0 host interface.

- ThinkSystem SR635
- ThinkSystem SR655
- ThinkSystem SR645
- ThinkSystem SR665

The following tables list the ThinkSystem servers that are compatible.

Table 6. Server support (Part 1 of 3)

Part Number	Description	Edge		1S Intel V2			AMD V3			Dense		2S Intel V2			AMD V1				
		SE350 (7Z46 / 7D1X)	SE450 (7D8T)	ST50 V2 (7D8K / 7D8J)	ST250 V2 (7D8G / 7D8F)	SR250 V2 (7D7R / 7D7Q)	SR645 V3 (7D9D / 7D9C)	SR665 V3 (7D9B / 7D9A)	SR675 V3 (7D9Q / 7D9R)	SD665 V3 (7D9P)	SD665-N V3 (7DAZ)	ST650 V2 (7Z75 / 7Z74)	SR630 V2 (7Z70 / 7Z71)	SR650 V2 (7Z72 / 7Z73)	SR670 V2 (7Z22 / 7Z23)	SR635 (7Y98 / 7Y99)	SR655 (7Y00 / 7Z01)	SR655 Client OS	SR645 (7D2Y / 7D2X)
4C57A15326	ThinkSystem Mellanox ConnectX-6 HDR/200GbE QSFP56 1-port PCIe 4 VPI Adapter	N	N	N	N	N	N	N	N	N	N	Y	Y	Y	Y	Y	N	Y	Y
B951	ThinkSystem Mellanox ConnectX-6 HDR/200GbE QSFP56 1-Port PCIe 4 VPI Adapter (SharedIO) DWC	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
B952	ThinkSystem Mellanox ConnectX-6 HDR/200GbE QSFP56 1-Port PCIe 4 VPI Adapter DWC	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
4C57A14179	ThinkSystem Mellanox HDR/200GbE 2x PCIe Aux Kit	N	N	N	N	N	N	N	N	N	N	Y	Y	Y	N	N	N	Y	Y

Table 7. Server support (Part 2 of 3)

Part Number	Description	4S/8S V2			4S V1			Dense V2			1S Intel V1			
		SR850 V2 (7D31 / 7D32)	SR860 V2 (7Z59 / 7Z60)	SR950 (7X11 / 7X12)	SR850 (7X18 / 7X19)	SR850P (7D2F / 2D2G)	SR860 (7X69 / 7X70)	SD630 V2 (7D1K)	SD650 V2 (7D1M)	SD650-N V2 (7D1N)	SN550 V2 (7Z69)	ST50 (7Y48 / 7Y50)	ST250 (7Y45 / 7Y46)	SR150 (7Y54)
4C57A15326	ThinkSystem Mellanox ConnectX-6 HDR/200GbE QSFP56 1-port PCIe 4 VPI Adapter	Y	Y	Y	N	N	N	Y	N	N	N	N	N	N
B951	ThinkSystem Mellanox ConnectX-6 HDR/200GbE QSFP56 1-Port PCIe 4 VPI Adapter (SharedIO) DWC	N	N	N	N	N	N	N	Y	N	N	N	N	N
B952	ThinkSystem Mellanox ConnectX-6 HDR/200GbE QSFP56 1-Port PCIe 4 VPI Adapter DWC	N	N	N	N	N	N	N	Y	Y	N	N	N	N
4C57A14179	ThinkSystem Mellanox HDR/200GbE 2x PCIe Aux Kit	Y	Y	Y	N	N	N	N	Y	N	N	N	N	N

Table 8. Server support (Part 3 of 3)

Part Number	Description	2S Intel V1							Dense V1				
		ST550 (7X09 / 7X10)	SR530 (7X07 / 7X08)	SR550 (7X03 / 7X04)	SR570 (7Y02 / 7Y03)	SR590 (7X98 / 7X99)	SR630 (7X01 / 7X02)	SR650 (7X05 / 7X06)	SR670 (7Y36 / 7Y37)	SD530 (7X21)	SD650 (7X58)	SN550 (7X16)	SN850 (7X15)
4C57A15326	ThinkSystem Mellanox ConnectX-6 HDR/200GbE QSFP56 1-port PCIe 4 VPI Adapter	N	N	N	N	N	Y	Y	Y	N	N	N	N
B951	ThinkSystem Mellanox ConnectX-6 HDR/200GbE QSFP56 1-Port PCIe 4 VPI Adapter (SharedIO) DWC	N	N	N	N	N	N	N	N	N	N	N	N
B952	ThinkSystem Mellanox ConnectX-6 HDR/200GbE QSFP56 1-Port PCIe 4 VPI Adapter DWC	N	N	N	N	N	N	N	N	N	N	N	N
4C57A14179	ThinkSystem Mellanox HDR/200GbE 2x PCIe Aux Kit	N	N	N	N	N	Y	Y	Y	N	Y	N	N

Operating system support

The adapters support the operating systems listed in the following tables.

- [ThinkSystem Mellanox ConnectX-6 HDR/200GbE QSFP56 1-port PCIe 4 VPI Adapter, 4C57A15326](#)
- [ThinkSystem Mellanox HDR/200GbE 2x PCIe Aux Kit, 4C57A14179](#)

Tip: These tables are automatically generated based on data from [Lenovo ServerProven](#).

Table 9. Operating system support for ThinkSystem Mellanox ConnectX-6 HDR/200GbE QSFP56 1-port PCIe 4 VPI Adapter, 4C57A15326

Operating systems	SD630 V2	SR630 V2	SR650 V2	SR670 V2	SR850 V2	SR860 V2	SR635	SR645	SR655	SR665	SR630 (Gen 2)	SR650 (Gen 2)	SR670 (Gen 2)	SR950 (Gen 2)	SR630 (Gen 1)	SR650 (Gen 1)	SR950 (Gen 1)
Microsoft Windows 10	N	N	N	N	N	N	N	N	Y ²	N	N	N	N	N	N	N	N
Microsoft Windows 11	N	N	N	N	N	N	N	N	Y	N	N	N	N	N	N	N	N
Microsoft Windows Server 2016	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	N	Y	Y	Y	Y
Microsoft Windows Server 2019	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	Y
Microsoft Windows Server 2022	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Microsoft Windows Server version 1709	N	N	N	N	N	N	N	N	N	N	N	N	N	N	Y	N	Y
Microsoft Windows Server version 1803	N	N	N	N	N	N	N	N	N	N	N	N	N	N	Y	N	Y
Red Hat Enterprise Linux 6.10	N	N	N	N	N	N	N	N	N	N	N	N	N	N	Y	Y	Y
Red Hat Enterprise Linux 6.9	N	N	N	N	N	N	N	N	N	N	N	N	N	N	Y	Y	Y
Red Hat Enterprise Linux 7.3	N	N	N	N	N	N	N	N	N	N	N	N	N	N	Y	Y	Y
Red Hat Enterprise Linux 7.4	N	N	N	N	N	N	N	N	N	N	N	N	N	N	Y	Y	Y
Red Hat Enterprise Linux 7.5	N	N	N	N	N	N	N	N	N	N	N	N	Y	N	Y	Y	Y
Red Hat Enterprise Linux 7.6	N	N	N	N	N	N	Y ¹	Y ¹	N	Y ¹	Y	Y	Y	Y	Y	Y	Y
Red Hat Enterprise Linux 7.7	N	N	N	N	N	N	Y ¹	Y ¹	Y ¹	Y ¹	Y	Y	Y	Y	Y	Y	Y
Red Hat Enterprise Linux 7.8	N	N	N	N	N	N	Y ¹	Y ¹	Y ¹	Y ¹	Y	Y	Y	Y	Y	Y	Y
Red Hat Enterprise Linux 7.9	Y	Y	Y	Y	Y	Y	Y ¹	Y ¹	Y ¹	Y ¹	Y	Y	Y	Y	Y	Y	Y
Red Hat Enterprise Linux 8.0	N	N	N	N	N	N	Y ¹	N	Y ¹	N	Y	Y	Y	Y	Y	Y	Y
Red Hat Enterprise Linux 8.1	N	N	N	N	N	N	Y ¹	Y ¹	Y ¹	Y ¹	Y	Y	Y	Y	Y	Y	Y
Red Hat Enterprise Linux 8.2	Y	Y	Y	Y	Y	Y	Y ¹	Y ¹	Y ¹	Y ¹	Y	Y	Y	Y	Y	Y	Y
Red Hat Enterprise Linux 8.3	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Red Hat Enterprise Linux 8.4	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Red Hat Enterprise Linux 8.5	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Red Hat Enterprise Linux 8.6	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Red Hat Enterprise Linux 8.7	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Red Hat Enterprise Linux 9.0	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Red Hat Enterprise Linux 9.1	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
SUSE Linux Enterprise Server 12 SP3	N	N	N	N	N	N	N	N	N	N	N	N	N	N	Y	Y	Y
SUSE Linux Enterprise Server 12 SP4	N	N	N	N	N	N	Y ¹	N	Y ¹	N	Y	Y	N	Y	Y	Y	Y
SUSE Linux Enterprise Server 12 SP5	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
SUSE Linux Enterprise Server 15	N	N	N	N	N	N	N	N	N	N	Y	Y	N	Y	Y	Y	Y
SUSE Linux Enterprise Server 15 SP1	N	N	N	N	N	N	Y ¹	Y ¹	Y ¹	Y ¹	Y	Y	Y	Y	Y	Y	Y
SUSE Linux Enterprise Server 15 SP2	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
SUSE Linux Enterprise Server 15 SP3	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y

Operating systems	SD630 V2	SR630 V2	SR650 V2	SR670 V2	SR850 V2	SR860 V2	SR635	SR645	SR655	SR665	SR630 (Gen 2)	SR650 (Gen 2)	SR670 (Gen 2)	SR950 (Gen 2)	SR630 (Gen 1)	SR650 (Gen 1)	SR950 (Gen 1)
SUSE Linux Enterprise Server 15 SP4	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Ubuntu 18.04.5 LTS	Y	Y	Y	Y	N	N	N	N	N	N	N	N	N	N	N	N	N
Ubuntu 20.04 LTS	N	Y	Y	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Ubuntu 22.04 LTS	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
VMware vSphere Hypervisor (ESXi) 6.7	N	N	N	N	N	N	N	N	N	N	N	N	N	N	Y	Y	Y
VMware vSphere Hypervisor (ESXi) 6.7 U1	N	N	N	N	N	N	N	N	N	N	Y	Y	N	Y	Y	Y	Y
VMware vSphere Hypervisor (ESXi) 6.7 U2	N	N	N	N	N	N	N	N	N	N	Y	Y	N	Y	Y	Y	Y
VMware vSphere Hypervisor (ESXi) 6.7 U3	Y	Y	Y	Y	N	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
VMware vSphere Hypervisor (ESXi) 7.0	N	N	N	N	N	N	Y ¹	Y ¹	Y ¹	Y ¹	Y	Y	Y	Y	Y	Y	Y
VMware vSphere Hypervisor (ESXi) 7.0 U1	N	N	N	N	Y	Y	Y ¹	Y	Y ¹	Y	Y	Y	Y	Y	Y	Y	Y
VMware vSphere Hypervisor (ESXi) 7.0 U2	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
VMware vSphere Hypervisor (ESXi) 7.0 U3	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
VMware vSphere Hypervisor (ESXi) 8.0	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y

¹ The OS is not supported with EPYC 7003 processors.

² ISG will not sell/preload this OS, but compatibility and cert only.

Table 10. Operating system support for ThinkSystem Mellanox HDR/200GbE 2x PCIe Aux Kit, 4C57A14179

Operating systems	SR630 V2	SR650 V2	SR670 V2	SR850 V2	SR860 V2	SR645	SR665	SR630 (Gen 2)	SR650 (Gen 2)	SR670 (Gen 2)	SR950 (Gen 2)	SR630 (Gen 1)	SR650 (Gen 1)	SR950 (Gen 1)
Microsoft Windows Server 2016	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	Y
Microsoft Windows Server 2019	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	Y
Microsoft Windows Server 2022	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Microsoft Windows Server version 1709	N	N	N	N	N	N	N	N	N	N	N	Y	N	Y
Microsoft Windows Server version 1803	N	N	N	N	N	N	N	N	N	N	N	Y	N	Y
Red Hat Enterprise Linux 6.10	N	N	N	N	N	N	N	N	N	N	N	Y	Y	Y
Red Hat Enterprise Linux 6.9	N	N	N	N	N	N	N	N	N	N	N	Y	Y	Y
Red Hat Enterprise Linux 7.3	N	N	N	N	N	N	N	N	N	N	N	Y	Y	Y
Red Hat Enterprise Linux 7.4	N	N	N	N	N	N	N	N	N	N	N	Y	Y	Y
Red Hat Enterprise Linux 7.5	N	N	N	N	N	N	N	N	N	Y	N	Y	Y	Y
Red Hat Enterprise Linux 7.6	N	N	N	N	N	Y ¹	Y ¹	Y	Y	Y	Y	Y	Y	Y
Red Hat Enterprise Linux 7.7	N	N	N	N	N	Y ¹	Y ¹	Y	Y	Y	Y	Y	Y	Y
Red Hat Enterprise Linux 7.8	N	N	N	N	N	Y ¹	Y ¹	Y	Y	Y	Y	Y	Y	Y
Red Hat Enterprise Linux 7.9	Y	Y	Y	Y	Y	Y ¹	Y ¹	Y	Y	Y	Y	Y	Y	Y
Red Hat Enterprise Linux 8.0	N	N	N	N	N	N	N	Y	Y	Y	Y	Y	Y	Y

	SR630 V2	SR650 V2	SR670 V2	SR850 V2	SR860 V2	SR645	SR665	SR630 (Gen 2)	SR650 (Gen 2)	SR670 (Gen 2)	SR950 (Gen 2)	SR630 (Gen 1)	SR650 (Gen 1)	SR950 (Gen 1)
Operating systems														
Red Hat Enterprise Linux 8.1	N	N	N	N	N	Y ¹	Y ¹	Y	Y	Y	Y	Y	Y	Y
Red Hat Enterprise Linux 8.2	Y	Y	Y	Y	Y	Y ¹	Y ¹	Y	Y	Y	Y	Y	Y	Y
Red Hat Enterprise Linux 8.3	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Red Hat Enterprise Linux 8.4	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Red Hat Enterprise Linux 8.5	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Red Hat Enterprise Linux 8.6	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Red Hat Enterprise Linux 8.7	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Red Hat Enterprise Linux 9.0	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Red Hat Enterprise Linux 9.1	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
SUSE Linux Enterprise Server 12 SP3	N	N	N	N	N	N	N	N	N	N	N	Y	Y	Y
SUSE Linux Enterprise Server 12 SP4	N	N	N	N	N	N	N	Y	Y	N	Y	Y	Y	Y
SUSE Linux Enterprise Server 12 SP5	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
SUSE Linux Enterprise Server 15	N	N	N	N	N	N	N	Y	Y	N	Y	Y	Y	Y
SUSE Linux Enterprise Server 15 SP1	N	N	N	N	N	Y ¹	Y ¹	Y	Y	Y	Y	Y	Y	Y
SUSE Linux Enterprise Server 15 SP2	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
SUSE Linux Enterprise Server 15 SP3	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
SUSE Linux Enterprise Server 15 SP4	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Ubuntu 18.04.5 LTS	Y	Y	Y	N	N	N	N	N	N	N	N	N	N	N
Ubuntu 20.04 LTS	Y	Y	N	N	N	N	N	N	N	N	N	N	N	N
Ubuntu 22.04 LTS	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
VMware vSphere Hypervisor (ESXi) 6.7	N	N	N	N	N	N	N	N	N	N	N	Y	Y	Y
VMware vSphere Hypervisor (ESXi) 6.7 U1	N	N	N	N	N	N	N	Y	Y	N	Y	Y	Y	Y
VMware vSphere Hypervisor (ESXi) 6.7 U2	N	N	N	N	N	N	N	Y	Y	N	Y	Y	Y	Y
VMware vSphere Hypervisor (ESXi) 6.7 U3	Y	Y	Y	N	N	Y	Y	Y	Y	Y	Y	Y	Y	Y
VMware vSphere Hypervisor (ESXi) 7.0	N	N	N	N	N	Y ¹	Y ¹	Y	Y	Y	Y	Y	Y	Y
VMware vSphere Hypervisor (ESXi) 7.0 U1	N	N	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
VMware vSphere Hypervisor (ESXi) 7.0 U2	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
VMware vSphere Hypervisor (ESXi) 7.0 U3	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
VMware vSphere Hypervisor (ESXi) 8.0	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y

¹ The OS is not supported with EPYC 7003 processors.

Regulatory approvals

The adapters have the following regulatory approvals:

- Safety: CB / cTUVus / CE
- EMC: CE / FCC / VCCI / ICES / RCM / KC
- RoHS: RoHS Compliant

Operating environment

The adapters have the following operating characteristics:

- Typical power consumption (passive cables): 19.3W
- Maximum power available through QSFP56 port: 5W
- Temperature
 - Operational: 0°C to 55°C
 - Non-operational: -40°C to 70°C
- Humidity: 90% relative humidity

Warranty

One year limited warranty. When installed in a Lenovo server, the adapter assumes the server's base warranty and any warranty upgrades.

Related publications

For more information, refer to these documents:

- Networking Options for ThinkSystem Servers:
<https://lenovopress.com/lp0765-networking-options-for-thinksystem-servers>
- ServerProven compatibility:
<http://www.lenovo.com/us/en/serverproven>
- Mellanox InfiniBand product page:
<https://www.nvidia.com/en-us/networking/infiniband-adapters/>
- ConnectX-6 VPI user manual:
<https://docs.nvidia.com/networking/display/ConnectX6VPI>

Related product families

Product families related to this document are the following:

- [Ethernet Adapters](#)
- [InfiniBand & Omni-Path Adapters](#)

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