

Mellanox ConnectX-4 Adapters

Product Guide

ConnectX-4 from Mellanox is a family of high-performance and low-latency Ethernet and InfiniBand adapters. The ConnectX-4 Lx EN adapters are available in 40 Gb and 25 Gb Ethernet speeds and the ConnectX-4 Virtual Protocol Interconnect (VPI) adapters support either InfiniBand or Ethernet.

These adapters address virtualized infrastructure challenges, delivering best-in-class performance to various demanding markets and applications. Providing true hardware-based I/O isolation with unmatched scalability and efficiency, achieving the most cost-effective and flexible solution for Web 2.0, Cloud, data analytics, database, and storage platforms.

The following figure shows the Mellanox ConnectX-4 2x100GbE/EDR IB QSFP28 VPI Adapter (the standard heat sink has been removed in this photo).

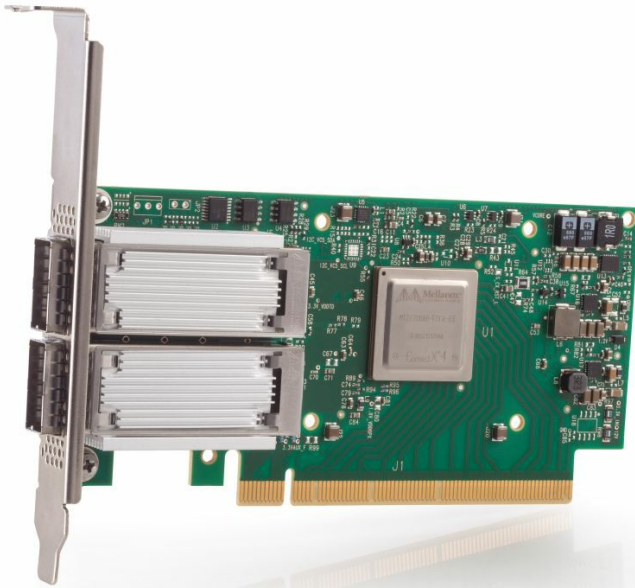


Figure 1. Mellanox ConnectX-4 2x100GbE/EDR IB QSFP28 VPI Adapter (heatsink removed)

Did you know?

Virtual Protocol Interconnect (VPI) enables standard networking, clustering, storage, and management protocols to seamlessly operate over any converged network by leveraging a consolidated software stack. Each port can operate on InfiniBand, Ethernet, or Data Center Bridging (DCB) fabrics, and supports Ethernet over InfiniBand (EoIB) as well as RDMA over Converged Ethernet (RoCE). VPI simplifies I/O system design and makes it easier for IT managers to deploy infrastructure that meets the challenges of a dynamic data center.

Part number information

The following table shows the part numbers for adapters for ThinkSystem, System x and NeXtScale servers.

Table 1. Ordering information - ThinkSystem and System x

Part number	Feature code	Mellanox equivalent	Description
ConnectX-4 Lx 25 Gb & 40 Gb Ethernet adapters - PCIe low-profile form factor			
01GR250	AUAJ	MCX4121A-ACAT	Mellanox ConnectX-4 Lx 2x25GbE SFP28 Adapter
00MM950	ATRN	MCX4131A-BCAT	Mellanox ConnectX-4 Lx 1x40GbE QSFP+ Adapter
ConnectX-4 Lx 25 Gb Ethernet adapters - ML2 form factor			
00MN990	ATZR	MCX4111A-ACAT*	Mellanox ConnectX-4 Lx ML2 1x25GbE SFP28 Adapter
7ZT7A00507	AUKU	MCX4121A-ACAT*	ThinkSystem Mellanox ConnectX-4 Lx ML2 25Gb 2-Port SFP28 Ethernet Adapter
ConnectX-4 FDR InfiniBand / 40 Gb Ethernet adapters			
7XC7A05524	B0WX	MCX453A-FCAT	ThinkSystem Mellanox ConnectX-4 PCIe FDR 1-Port QSFP VPI Adapter
7ZT7A00500	AUVG	MCX454A-FCAT	ThinkSystem Mellanox ConnectX-4 PCIe FDR 2-Port QSFP VPI Adapter
ConnectX-4 EDR InfiniBand / 100 Gb Ethernet adapters			
00MM960	ATRP	MCX456A-ECAT	Mellanox ConnectX-4 2x100GbE/EDR IB QSFP28 VPI Adapter
00KH924	ASWQ	MCX455A-ECAT	Mellanox ConnectX-4 1x100GbE/EDR IB QSFP28 VPI Adapter

* MCX4111A-ACAT and MCX4121A-ACAT are the PCIe version of these ML2 form-factor adapters

The following table shows the part numbers for adapters supported on ThinkServer systems.

Table 2. Ordering part numbers - ThinkServer

Part number	Mellanox equivalent	Description
ConnectX-4 Lx Ethernet adapters for ThinkServer		
4XC0G88861	MCX4121A-ACAT	Lenovo ThinkServer ConnectX-4 Lx PCIe 25Gb 2 Port SFP28 Ethernet Adapter by Mellanox

The part numbers include the following:

- One Mellanox adapter
- Low-profile (2U) and full-height (3U) adapter brackets
- Documentation

Supported cables and transceivers

This section lists the supported transceivers and cables.

- [EDR InfiniBand adapters](#)
- [FDR InfiniBand adapters](#)
- [100 Gb Ethernet adapters](#)
- [40 Gb Ethernet adapter](#)
- [25 Gb Ethernet adapters](#)

EDR InfiniBand adapters

The Mellanox ConnectX-4 100GbE/EDR InfiniBand adapters support the InfiniBand cables listed in the following table.

Table 3. QSFP28 Transceiver

Part number	Feature code	Description
7G17A03539	AV1D	Lenovo 100GBase-SR4 QSFP28 Transceiver

The following table lists the supported fiber optic cables.

Table 4. EDR InfiniBand 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
QSFP28 100Gb 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 (requires transceivers)		
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

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

Table 5. EDR InfiniBand 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 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

FDR InfiniBand adapters

The Mellanox ConnectX-4 FDR InfiniBand adapters supports the cables listed in the following table.

Table 6. Cables for Mellanox FDR InfiniBand QSFP adapters

Part number	Feature code	Description
QSFP to 10Gb Ethernet (SFP+) Conversion		
00D9676	ARZH	Mellanox QSFP to SFP+ adapter
Passive copper cables for Mellanox FDR InfiniBand QSFP adapters		
00KF002	ARZB	0.75m Mellanox QSFP Passive DAC Cable
00KF003	ARZC	1m Mellanox QSFP Passive DAC Cable
00KF004	ARZD	1.25m Mellanox QSFP Passive DAC Cable
00KF005	ARZE	1.5m Mellanox QSFP Passive DAC Cable
00KF006	ARZF	3m Mellanox QSFP Passive DAC Cable
Active optical cables for Mellanox FDR InfiniBand QSFP adapters		
00KF007	ARYC	3m Mellanox IB FDR Active Optical Fiber Cable
00KF008	ARYD	5m Mellanox IB FDR Active Optical Fiber Cable
00KF009	ARYE	10m Mellanox IB FDR Active Optical Fiber Cable
00KF010	ARYF	15m Mellanox IB FDR Active Optical Fiber Cable
00KF011	ARYG	20m Mellanox IB FDR Active Optical Fiber Cable
00KF012	ARYH	30m Mellanox IB FDR Active Optical Fiber Cable

100 Gb Ethernet adapters

The Mellanox ConnectX-4 100GbE/EDR IB Adapters also support the 100 Gb Ethernet SFP+ optical transceivers and DAC cables listed in the following table.

Table 7. Supported optical transceivers and DAC cables - 100 Gb Ethernet

Part number	Feature code	Description
100 GbE QSFP28 transceivers		
7G17A03539	AV1D	Lenovo 100GBase-SR4 QSFP28 Transceiver
100 GbE QSFP28 Active Optical Cables		
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
100 GbE SFP28 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

40 Gb Ethernet adapter

The Mellanox ConnectX-4 Lx 1x40GbE QSFP+ Adapter supports the 40Gb DAC cables, transceiver, and optical cables that are listed in the following table.

Table 8. 40Gb cable support for Mellanox ConnectX-4 Lx 1x40GbE QSFP+ Adapter

Part number	Feature code	Description
40Gb Ethernet (QSFP) - 40GbE copper uses the QSFP+ to QSFP+ cables directly		
49Y7890	A1DP	1 m QSFP+ to QSFP+ Cable
49Y7891	A1DQ	3 m QSFP+ to QSFP+ Cable
00D5810	A2X8	5m QSFP-to-QSFP cable
00D5813	A2X9	7m QSFP-to-QSFP cable
40Gb Ethernet (QSFP) - 40GbE optical uses QSFP+ transceiver with MTP optical cables		
49Y7884	A1DR	QSFP+ 40GBASE-SR4 Transceiver
00VX003	AT2U	Lenovo 10m QSFP+ MTP-MTP OM3 MMF Cable
00VX005	AT2V	Lenovo 30m QSFP+ MTP-MTP OM3 MMF Cable

In addition, the Mellanox ConnectX-4 Lx 1x40GbE QSFP+ Adapter also supports the 40Gb-to-10Gb QSFP to SFP+ adapter and 10Gb DAC cables and optics as shown in the following table.

Table 9. 10Gb support for Mellanox ConnectX-4 Lx 1x40GbE QSFP+ Adapter when using option 00D9676

Part number	Feature code	Description
40Gb Ethernet (QSFP) to 10Gb Ethernet (SFP+) Conversion		
00D9676	ARZH	Mellanox QSFP to SFP+ adapter
10Gb SFP+ cables		
00D6288	A3RG	.5 m Passive DAC SFP+ Cable
90Y9427	A1PH	1 m Passive DAC SFP+ Cable
00AY764	A51N	1.5m Passive DAC SFP+ Cable
00AY765	A51P	2m Passive DAC SFP+ Cable
90Y9430	A1PJ	3m Passive DAC SFP+ Cable
90Y9433	A1PK	5m Passive DAC SFP+ Cable
00D6151	A3RH	7 m Passive DAC SFP+ Cable
10Gb SFP+ transceivers		
49Y4216	0069	Brocade 10Gb SFP+ SR Optical Transceiver
46C3447	5053	SFP+ SR Transceiver (10Gb)
49Y4218	0064	QLogic 10Gb SFP+ SR Optical Transceiver

25 Gb Ethernet adapters

The following table lists the supported 25 GbE transceiver and DAC & AOC cables.

Table 10. Supported optical transceivers and DAC cables - 25 Gb Ethernet

Part number	Feature code	Description
25 GbE SFP28 transceiver		
7G17A03537	AV1B	Lenovo 25GBase-SR SFP28 Transceiver
25 GbE SFP28 DAC cables		
7Z57A03557	AV1W	Lenovo 1m Passive 25G SFP28 DAC Cable
7Z57A03558	AV1X	Lenovo 3m Passive 25G SFP28 DAC Cable
7Z57A03559	AV1Y	Lenovo 5m Passive 25G SFP28 DAC Cable
25 GbE SFP28 AOC cables		
7Z57A03541	AV1F	Lenovo 3m 25G SFP28 Active Optical Cable
7Z57A03542	AV1G	Lenovo 5m 25G SFP28 Active Optical Cable
7Z57A03543	AV1H	Lenovo 10m 25G SFP28 Active Optical Cable
7Z57A03544	AV1J	Lenovo 15m 25G SFP28 Active Optical Cable
7Z57A03545	AV1K	Lenovo 20m 25G SFP28 Active Optical Cable

In addition, the 25Gb adapters also can share a connection to a 100 Gb switch using a 4:1 breakout cable. Supported breakout cables (fiber optic and AOC) are listed in the following table.

Table 11. Breakout cables for connectivity to a 100Gb switch

Part number	Feature code	Description
MTP-4xLC OM3 MMF Breakout Cable		
00FM412	A5UA	Lenovo 1m MPO-4xLC OM3 MMF Breakout Cable
00FM413	A5UB	Lenovo 3m MPO-4xLC OM3 MMF Breakout Cable
00FM414	A5UC	Lenovo 5m MPO-4xLC OM3 MMF Breakout Cable
100G QSFP28 Breakout AOC		
7Z57A03551	AV1R	Lenovo 3m 100G to 4x25G Breakout Active Optical Cable
7Z57A03552	AV1S	Lenovo 5m 100G to 4x25G Breakout Active Optical Cable
7Z57A03553	AV1T	Lenovo 10m 100G to 4x25G Breakout Active Optical Cable
7Z57A03554	AV1U	Lenovo 15m 100G to 4x25G Breakout Active Optical Cable
7Z57A03555	AV1V	Lenovo 20m 100G to 4x25G Breakout Active Optical Cable

In addition, the 25Gb adapters also support the following 10 GbE transceivers and DAC cables.

Table 12. Supported optical transceivers and DAC cables - 10 Gb Ethernet

Part number	Feature code	Description
10Gb SFP+ transceivers		
49Y4216	0069	Brocade 10Gb SFP+ SR Optical Transceiver
46C3447	5053	SFP+ SR Transceiver (10Gb)
49Y4218	0064	QLogic 10Gb SFP+ SR Optical Transceiver
10Gb SFP+ Passive DAC cables		
00D6288	A3RG	.5 m Passive DAC SFP+ Cable
90Y9427	A1PH	1 m Passive DAC SFP+ Cable
00AY764	A51N	1.5m Passive DAC SFP+ Cable
00AY765	A51P	2m Passive DAC SFP+ Cable
90Y9430	A1PJ	3m Passive DAC SFP+ Cable
90Y9433	A1PK	5m Passive DAC SFP+ Cable
00D6151	A3RH	7 m Passive DAC SFP+ Cable
10Gb SFP+ Active DAC cables		
00VX111	AT2R	Lenovo 1m Active DAC SFP+ Cables
00VX114	AT2S	Lenovo 3m Active DAC SFP+ Cables
00VX117	AT2T	Lenovo 5m Active DAC SFP+ Cables

The following figure shows the Mellanox ConnectX-4 Lx ML2 1x25GbE SFP28 Adapter.

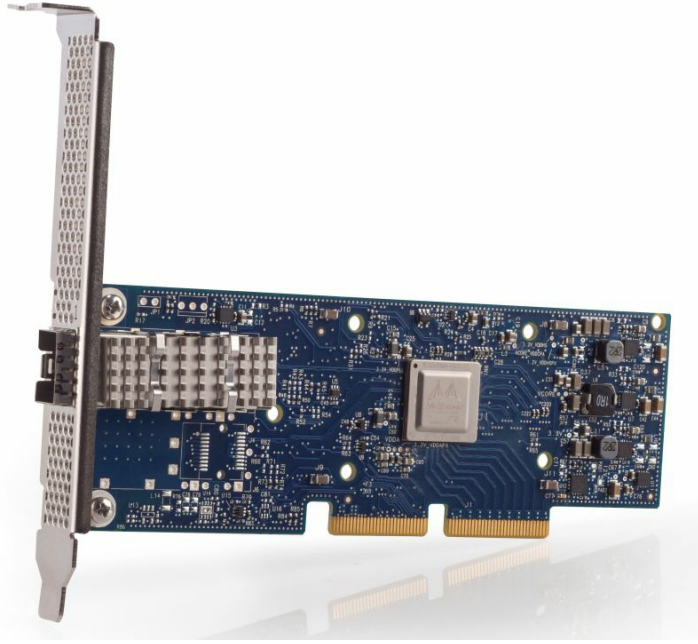


Figure 2. Mellanox ConnectX-4 Lx ML2 1x25GbE SFP28 Adapter (heatsink removed)

Features

The ConnectX-4 family of adapters offer a number of performance features, including the following:

- ConnectX-4 Lx Ethernet adapters

The ConnectX-4 Lx adapters discussed in this product guide offer a high performance Ethernet adapter solution for Ethernet speeds up to 40 Gb/s, enabling seamless networking, clustering, or storage. The Lx adapters reduce application runtime, and offer the flexibility and scalability to make infrastructure run as efficiently and productively as possible.

- ConnectX-4 100 Gb Ethernet / EDR InfiniBand

ConnectX-4 with Virtual Protocol Interconnect (VPI) offers the highest throughput VPI adapter, supporting EDR 100Gb/s InfiniBand and 100Gb/s Ethernet and enabling any standard networking, clustering, or storage to operate seamlessly over any converged network leveraging a consolidated software stack.

- I/O Virtualization

ConnectX-4 SR-IOV technology provides dedicated adapter resources and guaranteed isolation and protection for virtual machines (VMs) within the server. I/O virtualization with ConnectX-4 gives data center administrators better server utilization while reducing cost, power, and cable complexity, allowing more Virtual Machines and more tenants on the same hardware.

- 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-encapsulate the overlay protocol header as well as offloads TCP stateless activities on the encapsulated packet.

- RDMA over Converged Ethernet (RoCE)

ConnectX-4 adapters supports RoCE specifications delivering low-latency and high-performance over Ethernet networks. The ConnectX-4 VPI adapter also supports IBTA RDMA (Remote Data Memory Access) for InfiniBand network performance. Leveraging data center bridging (DCB) capabilities as well as ConnectX-4 advanced congestion control hardware mechanisms, RoCE provides efficient low-latency RDMA services over Layer 2 and Layer 3 networks.

- Mellanox PeerDirect

PeerDirect communication provides high efficiency RDMA access by eliminating unnecessary internal data copies between components on the PCIe bus (for example, from GPU to CPU), and therefore significantly reduces application run time. ConnectX-4 advanced acceleration technology enables higher cluster efficiency and scalability to tens of thousands of nodes.

The following figure shows the Mellanox ConnectX-4 Lx 1x40GbE QSFP+ Adapter.

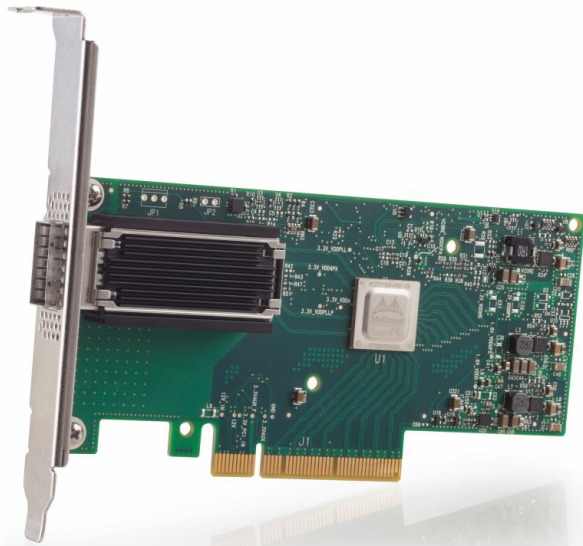


Figure 3. Mellanox ConnectX-4 Lx 1x40GbE QSFP+ Adapter (heatsink removed)

Technical specifications

PCIe 3.0 host interface:

- ConnectX-4 Lx Ethernet adapters: PCIe 3.0 x8 interface
- ConnectX-4 EDR InfiniBand / 100 Gb Ethernet adapter: PCIe 3.0 x16 interface
- Support for MSI/MSI-X mechanisms

External connectors:

- 25 Gb PCIe and ML2 adapters: SFP28
- 40 Gb and 100 Gb adapters: QSFP28

Ethernet standards (all adapters, except where noted):

- 25G Ethernet Consortium (25 Gb)
- 25G Ethernet Consortium (50 Gb) (100Gb/EDR adapter only)
- IEEE 802.3bj, 802.3bm 100 Gigabit Ethernet (100Gb/EDR adapter only)
- IEEE 802.3ba 40 Gigabit Ethernet (100Gb/EDR and 40Gb adapters only)
- IEEE 802.3by 25 Gigabit Ethernet
- IEEE 802.3ae 10 Gigabit Ethernet
- IEEE 802.3az Energy Efficient Ethernet
- IEEE 802.3ap based auto-negotiation and KR startup
- Proprietary Ethernet protocols (20/40GBASE-R2) (40Gb adapter only)
- IEEE 802.3ad, 802.1AX Link Aggregation
- IEEE 802.1Q, 802.1P VLAN tags and priority
- IEEE 802.1Qau (QCN) – Congestion Notification
- IEEE 802.1Qaz (ETS)
- IEEE 802.1Qbb (PFC)
- IEEE 802.1Qbg
- IEEE 1588v2
- Jumbo frame support (9.6KB)

InfiniBand protocols (VPI Infiniband adapters only):

- InfiniBand: IBTA v1.3 Auto-Negotiation
- 1X/2X/4X SDR (2.5 Gb/s per lane)
- DDR (5 Gb/s per lane)
- QDR (10 Gb/s per lane)
- FDR10 (10.3125 Gb/s per lane)
- FDR (14.0625 Gb/s per lane) port
- EDR (25.78125 Gb/s per lane)

InfiniBand features (VPI Infiniband adapters only)

- RDMA, Send/Receive semantics
- Hardware-based congestion control
- Atomic operations
- 16 million I/O channels
- 256 to 4Kbyte MTU, 2Gbyte messages

Note: The feature of 8 virtual lanes with VL15 is currently not supported

Enhanced Features

- Hardware-based reliable transport
- Collective operations offloads
- Vector collective operations offloads
- PeerDirect RDMA (GPUDirect communication acceleration)
- 64/66 encoding
- Extended Reliable Connected transport (XRC)
- Dynamically Connected transport (DCT)
- Enhanced Atomic operations
- Advanced memory mapping support, allowing user mode registration and remapping of memory (UMR)
- On demand paging (ODP) – registration free RDMA memory access

Storage Offloads

- RAID offload - erasure coding (Reed-Solomon) offload
- T10 DIF - Signature handover operation at wire speed, for ingress and egress traffic (100Gb/EDR adapter only)

Overlay Networks

- Stateless offloads for overlay networks and tunneling protocols
- Hardware offload of encapsulation and decapsulation of NVGRE and VXLAN overlay networks

Hardware-Based I/O Virtualization

- Single Root IOV (SR-IOV)
- Multi-function per port
- Address translation and protection
- Multiple queues per virtual machine
- Enhanced QoS for vNICs
- VMware NetQueue support
- Windows Hyper-V Virtual Machine Queue (VMQ)

Virtualization

- SR-IOV: Up to 256 Virtual Functions, Up to 16 Physical Functions per port
- SR-IOV on every Physical Function
- 1K ingress and egress QoS levels
- Guaranteed QoS for VMs

Note: NPAR (NIC partitioning) is currently not supported.

CPU Offloads

- RDMA over Converged Ethernet (RoCE)
- TCP/UDP/IP stateless offload
- LSO, LRO, checksum offload
- RSS (can be done on encapsulated packet), TSS, HDS, VLAN insertion / stripping, Receive flow steering
- Intelligent interrupt coalescence

Remote Boot

- Remote boot over InfiniBand (VPI Infiniband adapters only)
- Remote boot over Ethernet
- Remote boot over iSCSI
- PXE and UEFI

Protocol Support

- OpenMPI, IBM PE, OSU MPI (MVAPICH/2), Intel MPI
- Platform MPI, UPC, Open SHMEM
- TCP/UDP, MPLS, VxLAN, NVGRE, GENEVE
- EoIB, IPoIB, SDP, RDS (VPI Infiniband adapters only)
- iSER, NFS RDMA, SMB Direct
- uDAPL

Management and Control Interfaces

- NC-SI (25Gb ML2 adapter only)
- PLDM over MCTP over PCIe
- SDN management interface for managing the eSwitch

Server support - ThinkSystem

The following table lists the ThinkSystem servers that are compatible.

Table 13. ThinkSystem server support

Part number	Description	2S Rack & Tower						4S Rack			Dense/ Blade				
		ST550 (7X09/7X10)	SR530 (7X07/7X08)	SR550 (7X03/7X04)	SR570 (7Y03/7Y04)	SR590 (7X98/7X99)	SR630 (7X01/7X02)	SR650 (7X05/7X06)	SR850 (7X18/7X19)	SR860 (7X69/7X70)	SR950 (7X11/12/13)	SD530 (7X21)	SD650 (7X58)	SN550 (7X16)	SN850 (7X15)
ConnectX-4 Lx Ethernet adapters															
01GR250	Mellanox ConnectX-4 Lx 2x25GbE SFP28 Adapter	N	N	N	N	N	Y	Y	Y	Y	Y	Y	N	N	N
00MM950	Mellanox ConnectX-4 Lx 1x40GbE QSFP+ Adapter	N	N	N	N	N	Y	Y	Y	Y	Y	Y	N	N	N
00MN990	Mellanox ConnectX-4 Lx ML2 1x25GbE SFP28 Adapter	N	N	N	N	N	Y	Y	Y	Y	Y	N	N	N	N
7ZT7A00507	ThinkSystem Mellanox ConnectX-4 Lx ML2 25Gb 2-Port SFP28 Ethernet Adapter	N	N	N	N	N	Y	Y	Y	Y	Y	N	N	N	N
ConnectX-4 VPI InfiniBand adapters															
7XC7A05524	ThinkSystem Mellanox ConnectX-4 PCIe FDR 1-Port QSFP VPI Adapter	N	N	N	N	N	Y	Y	N	N	N	Y	N	N	N
7ZT7A00500	ThinkSystem Mellanox ConnectX-4 PCIe FDR 2-Port QSFP VPI Adapter	N	N	N	N	N	Y	Y	Y	Y	Y	Y	N	N	N
00MM960	Mellanox ConnectX-4 2x100GbE/EDR IB QSFP28 VPI Adapter	N	N	N	N	N	Y	Y	Y	Y	Y	Y	N	N	N
00KH924	Mellanox ConnectX-4 1x100GbE/EDR IB QSFP28 VPI Adapter	N	N	N	N	N	Y	Y	Y	Y	Y	Y	N	N	N

Server support - System x

The following tables list the System x and dense servers that are compatible.

Support for System x and dense servers with Xeon E5 v4 and E3 v5 processors

Table 14. Support for System x and dense servers with Xeon E5 v4 and E3 v5 processors

Part number	Description	x3250 M6 (3943)	x3250 M6 (3633)	x3550 M5 (8869)	x3650 M5 (8871)	x3850 X6/x3950 X6 (6241, E7 v4)	nx360 M5 (5465, E5-2600 v4)	sd350 (5493)	nx360 M5 WCT (5467, v4)
ConnectX-4 Lx Ethernet adapters									
01GR250	Mellanox ConnectX-4 Lx 2x25GbE SFP28 Adapter	N	N	Y	Y	Y	Y	N	N
00MM950	Mellanox ConnectX-4 Lx 1x40GbE QSFP+ Adapter	N	N	Y	Y	Y	Y	N	N
00MN990	Mellanox ConnectX-4 Lx ML2 1x25GbE SFP28 Adapter	N	N	Y	Y	Y	Y	N	N
7ZT7A00507	ThinkSystem Mellanox ConnectX-4 Lx ML2 25Gb 2-Port SFP28 Ethernet Adapter	N	N	N	N	N	N	N	N
ConnectX-4 VPI InfiniBand adapters									
7XC7A05524	ThinkSystem Mellanox ConnectX 4 PCIe FDR 1 Port QSFP VPI Adapter	N	N	N	N	N	N	N	N
7ZT7A00500	ThinkSystem Mellanox ConnectX-4 PCIe FDR 2-Port QSFP VPI Adapter	N	N	N	N	N	N	N	N
00MM960	Mellanox ConnectX-4 2x100GbE/EDR IB QSFP28 VPI Adapter	N	N	Y	Y	Y	Y	N	N
00KH924	Mellanox ConnectX-4 1x100GbE/EDR IB QSFP28 VPI Adapter	N	N	Y	Y	Y	Y	Y	N

Support for System x and dense servers with Intel E5 v3 and E3 v3 processors

Table 15. Support for servers with Intel Xeon v3 processors

Part number	Description	x3100 M5 (5457)	x3250 M5 (5458)	x3500 M5 (5464)	x3550 M5 (5463)	x3650 M5 (5462)	x3850 X6/x3950 X6 (6241, E7 v3)	nx360 M5 (5465)
ConnectX-4 Lx Ethernet adapters								
01GR250	Mellanox ConnectX-4 Lx 2x25GbE SFP28 Adapter	N	N	N	Y	Y	Y	Y
00MM950	Mellanox ConnectX-4 Lx 1x40GbE QSFP+ Adapter	N	N	N	Y	Y	Y	Y
00MN990	Mellanox ConnectX-4 Lx ML2 1x25GbE SFP28 Adapter	N	N	N	Y	Y	Y	Y
7ZT7A00507	ThinkSystem Mellanox ConnectX-4 Lx ML2 25Gb 2-Port SFP28 Ethernet Adapter	N	N	N	N	N	N	N
ConnectX-4 VPI InfiniBand adapters								
7ZT7A00500	ThinkSystem Mellanox ConnectX-4 PCIe FDR 2-Port QSFP VPI Adapter	N	N	N	N	N	N	N
00MM960	Mellanox ConnectX-4 2x100GbE/EDR IB QSFP28 VPI Adapter	N	N	N	Y	Y	Y	Y
00KH924	Mellanox ConnectX-4 1x100GbE/EDR IB QSFP28 VPI Adapter	N	N	N	Y	Y	Y	Y

Support for System x servers with Intel Xeon v2 processors

Table 16. Support for servers with Intel Xeon v2 processors

Part number	Description	x3300 M4 (7382)	x3500 M4 (7383, E5-2600 v2)	x3550 M4 (7914, E5-2600 v2)	x3630 M4 (7158, E5-2400 v2)	x3650 M4 (7915, E5-2600 v2)	x3650 M4 BD (5466)	x3750 M4 (8753)	x3850 X6/x3950 X6 (6241, E7 v2)
ConnectX-4 Lx Ethernet adapters									
01GR250	Mellanox ConnectX-4 Lx 2x25GbE SFP28 Adapter	N	N	N	N	N	N	N	Y
00MM950	Mellanox ConnectX-4 Lx 1x40GbE QSFP+ Adapter	N	N	N	N	N	N	N	Y
00MN990	Mellanox ConnectX-4 Lx ML2 1x25GbE SFP28 Adapter	N	N	N	N	N	N	N	Y
7ZT7A00507	ThinkSystem Mellanox ConnectX-4 Lx ML2 25Gb 2-Port SFP28 Ethernet Adapter	N	N	N	N	N	N	N	N
ConnectX-4 VPI InfiniBand adapters									
7ZT7A00500	ThinkSystem Mellanox ConnectX-4 PCIe FDR 2-Port QSFP VPI Adapter	N	N	N	N	N	N	N	N
00MM960	Mellanox ConnectX-4 2x100GbE/EDR IB QSFP28 VPI Adapter	N	N	N	N	N	N	N	Y
00KH924	Mellanox ConnectX-4 1x100GbE/EDR IB QSFP28 VPI Adapter	N	N	N	N	N	N	Y	Y

Server support - ThinkServer

The following tables list the ThinkServer systems that are compatible.

Support for sd350: The ThinkServer sd350 is listed in [Table 6](#).

Support for ThinkServer Generation 5 servers with E5 v4 and E3 v5/v6 processors

Table 17. Support for ThinkServer Generation 5 servers with E5 v4 and E3 v5/v6 processors

Part number	Description	TS150	TS450	TS460	RS160	TD350	RD350 (70Qx)	RD450 (70Qx)	RD550 (70Rx/70Sx)	RD650 (70Rx)
4XC0G88861	Lenovo ThinkServer ConnectX-4 Lx PCIe 25Gb 2 Port SFP28 Ethernet Adapter by Mellanox	N	N	N	N	N	Y	Y	Y	Y

Support for ThinkServer Generation 5 servers with E5 v3 and E3 v3 processors

Table 18. Support for ThinkServer Generation 5 servers with E5 v3 and E3 v3 processors

Part number	Description	TS140	TS440	RS140	TD350	RD350 (70Dx)	RD450 (70Dx)	RD550 (70Cx)	RD650 (70Dx)
4XC0G88861	Lenovo ThinkServer ConnectX-4 Lx PCIe 25Gb 2 Port SFP28 Ethernet Adapter by Mellanox	N	N	N	N	N	N	N	N

The following figure shows the Mellanox ConnectX-4 Lx 2x25GbE SFP28 Adapter.

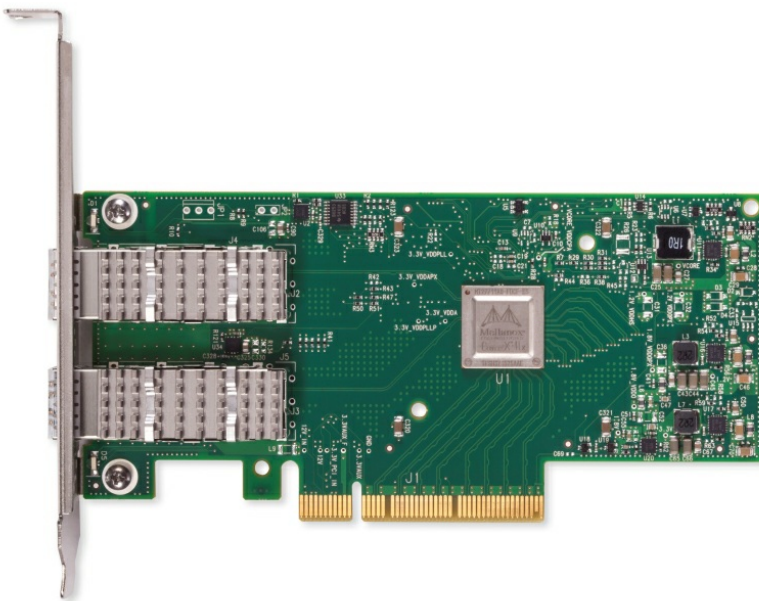


Figure 4. Mellanox ConnectX-4 Lx 2x25GbE SFP28 Adapter (heatsink removed)

Operating system support

The Mellanox ConnectX-4 adapters support the following operating systems:

- Microsoft Windows Server 2012 (no SR-IOV support)
- Microsoft Windows Server 2012 R2
- Microsoft Windows Server 2016
- Red Hat Enterprise Linux 6 Server x64 Edition, U7
- Red Hat Enterprise Linux 7, U2
- SUSE LINUX Enterprise Server 11 for AMD64/EM64T, SP4**
- SUSE LINUX Enterprise Server 12, SP1**
- VMware ESXi 5.5, U3*
- VMware ESXi 6.0, U2*

* **InfiniBand mode not supported with VMware:** With VMware, these adapters are supported only in Ethernet mode. InfiniBand is not supported.

** **Xen Support:** The Mellanox adapters do not support Xen

Regulatory approvals

The adapters meet the following regulatory standards:

- Safety: CB, cTUVus, CE
- EMC: CE, FCC, VCCI, ICES, RCM
- RoHS: RoHS-R6

Operating environment

Power consumption:

Table 19. Power consumption

Adapter	Typical power (passive cable)	Maximum power (passive cable)	Maximum power (active cable)
2x25 Gb adapter (01GR250)	9.47 W	10.69 W	14.03 W
1x25 Gb ML2 adapter (00MN990)	8.82 W	10.04 W	11.70 W
1x40 Gb adapter (00MM950)	10.16 W	11.38 W	13.05 W
2x100 Gb adapter (00MM960)	16.12 W	18.04 W	24.80 W

Maximum power through external connectors:

- 25Gb adapters: 1.5 W
- 40Gb adapter: 1.5 W
- 100Gb adapter: 3.5 W

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, these cards assume 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 page for ConnectX-4 Lx Ethernet adapters (includes link to User Manuals):
http://www.mellanox.com/page/products_dyn?product_family=219&mtag=connectx_4_lx_en_card
- Mellanox page for ConnectX-4 VPI adapter (includes link to User Manuals):
http://www.mellanox.com/page/products_dyn?product_family=201&mtag=connectx_4_vpi_card

Related product families

Product families related to this document are the following:

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

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