

ThinkSystem Mellanox Innova-2 ConnectX-5 FPGA 25GbE 2-port Adapter

Product Guide (withdrawn product)

The ThinkSystem Mellanox Innova-2 ConnectX-5 FPGA 25GbE 2-port Adapter is an advanced programmable network adapter that combines the advanced ConnectX-5 Ethernet network controller ASIC with an onboard fully-open programmable Xilinx FPGA. Such a combination enables customers to develop custom-made offloads for a range of applications, including storage, HPC, machine learning, and security.

The following figure shows the ThinkSystem Mellanox Innova-2 ConnectX-5 FPGA 25GbE 2-port Adapter (the standard heat sink has been removed in this photo).

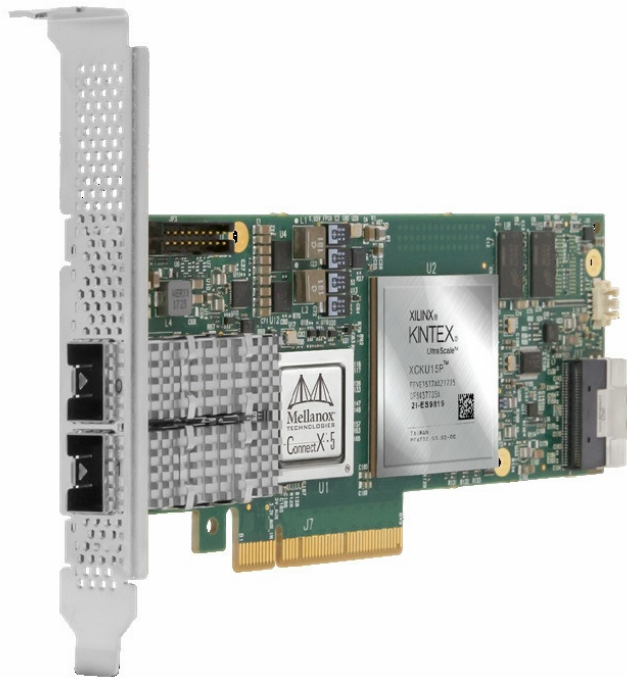


Figure 1. ThinkSystem Mellanox Innova-2 ConnectX-5 FPGA 25GbE 2-port Adapter

Did you know?

The slowing of CPU advancement has created a need for a new era of Data Center accelerators in the form of FPGAs. The increasing diversity and breadth of data center applications is requiring different, optimized accelerator architectures, that is outpacing the speed of innovation in silicon design cycles. FPGAs are a rapidly evolving technology that enable the creation of competitive advantages for the emergence of AI application integration and the explosion in volume of unstructured data requiring accelerated processing.

Part number information

The following table shows the part number for the adapter.

Withdrawn from marketing: The ConnectX-5 FPGA adapter is now withdrawn from marketing.

Table 1. Ordering information

Part number	Feature code	Mellanox equivalent	Description
4XC7A16683	B5XZ	MNV303212A-ADLT	ThinkSystem Mellanox Innova-2 ConnectX-5 FPGA 25GbE 2-port Adapter

The part numbers include the following:

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

Supported transceivers and cables

The following table lists the supported transceivers.

Table 2. Transceivers

Part number	Feature code	Description
10Gb Transceivers		
90Y9412	A1PM	SFP+ LR Transceiver
46C3447	5053	SFP+ SR Transceiver
4TC7A78615	BNDR	ThinkSystem Accelink 10G SR SFP+ Ethernet transceiver
25Gb Transceivers		
4M27A67041	BFH2	Lenovo 25Gb SR SFP28 Ethernet Transceiver
7G17A03537	AV1B	Lenovo Dual Rate 10G/25G SR SFP28 Transceiver
4TC7A88638	BYBJ	ThinkSystem Finisar Dual Rate 10G/25G SR SFP28 Transceiver

25Gb transceivers: When installed in this 25Gb Ethernet adapter, 25Gb transceivers are designed to operate at either 25 Gb/s or 10 Gb/s speeds as listed in the description of the transceiver, however the speed also depends on the negotiation with the connected switch. In most configurations, this negotiation is automatic, however in some configurations you may have to manually set the link speed or FEC mode.

The following table lists the supported optical cables.

Table 3. Optical cables

Part number	Feature code	Description
LC-LC OM3 Fiber Optic Cables		
00MN499	ASR5	Lenovo 0.5m LC-LC OM3 MMF Cable
00MN502	ASR6	Lenovo 1m LC-LC OM3 MMF Cable
00MN505	ASR7	Lenovo 3m LC-LC OM3 MMF Cable
00MN508	ASR8	Lenovo 5m LC-LC OM3 MMF Cable
00MN511	ASR9	Lenovo 10m LC-LC OM3 MMF Cable
00MN514	ASRA	Lenovo 15m LC-LC OM3 MMF Cable
00MN517	ASRB	Lenovo 25m LC-LC OM3 MMF Cable
00MN520	ASRC	Lenovo 30m LC-LC OM3 MMF Cable
SFP+ 10Gb Active Optical Cables		
00YL634	ATYX	Lenovo 1M SFP+ to SFP+ Active Optical Cable
00YL637	ATYY	Lenovo 3M SFP+ to SFP+ Active Optical Cable
00YL640	ATYZ	Lenovo 5M SFP+ to SFP+ Active Optical Cable
00YL643	ATZ0	Lenovo 7M SFP+ to SFP+ Active Optical Cable
00YL646	ATZ1	Lenovo 15M SFP+ to SFP+ Active Optical Cable
00YL649	ATZ2	Lenovo 20M SFP+ to SFP+ Active Optical Cable
SFP28 25Gb Active Optical Cables		
4X97A94008	AV1F	Lenovo 3m 25G SFP28 Active Optical Cable
4X97A94011	AV1G	Lenovo 5m 25G SFP28 Active Optical Cable
4X97A94012	AV1H	Lenovo 10m 25G SFP28 Active Optical Cable
4X97A94013	AV1J	Lenovo 15m 25G SFP28 Active Optical Cable
4X97A94702	AV1K	Lenovo 20m 25G SFP28 Active Optical Cable
7Z57A03541	C10R	Lenovo 3m 25G SFP28 Active Optical Cable
7Z57A03542	C10S	Lenovo 5m 25G SFP28 Active Optical Cable
7Z57A03543	C10N	Lenovo 10m 25G SFP28 Active Optical Cable
7Z57A03544	C10T	Lenovo 15m 25G SFP28 Active Optical Cable
7Z57A03545	C1MB	Lenovo 20m 25G SFP28 Active Optical Cable
QSFP28 100Gb Ethernet Breakout Active Optical Cables		
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

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

Table 4. Copper cables

Part number	Feature code	Description
SFP+ 10Gb Passive DAC Cables		
00D6288	A3RG	0.5m Passive DAC SFP+ Cable
90Y9427	A1PH	1m 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	7m Passive DAC SFP+ Cable
SFP+ 10Gb 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
SFP28 25Gb Passive 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

Features

The Mellanox Innova-2 ConnectX-5 FPGA adapter offers a number of features, including the following:

Ease of development and deployment

Customers can easily develop and deploy FPGA applications, using the Xilinx Vivado Design Suite development environment (licensed separately from Xilinx) and the Mellanox tools suite. The feature-rich adapter, together with the High Level Synthesis (HLS) capabilities of the Xilinx Vivado design and backend development environment, create the ideal infrastructure for developers to implement their own applications and to achieve hardware-like performance with minimum time-to-market.

Workload-oriented design

Security: Customers can create highly optimized and unique solutions that serve a variety of security use cases, including data encryption, decryption and more.

Storage: The adapter enables the acceleration and scalability of different types of storage applications. For example, it can help deliver transparent data compression, decompression or deduplication capabilities, improving overall storage utilization with minimal additional load on the server CPU.

Media & entertainment: The adapter offers a unique, compliant and differentiated solution for streaming applications through custom accelerations, providing the ability to manage multiple 4K/8K streams in a single host, with lower CPU and PCIe bandwidth utilization. Other capabilities include customized offload of packet pacing, video down-sampling, and switching for video redundancy.

Convenient packaging

The Mellanox Innova-2 ConnectX-5 FPGA Adapter reduces TCO by combining the FPGA acceleration with the low-latency network controller on a single PCIe slot. The FPGA chip connects to the host via an on-board PCIe switch supporting PCIe x8 Gen4, and also is visible to the host as a PCIe device.

Technical specifications

- Single-slot low-profile adapter:
 - Dual-port 10GbE and 25GbE Ethernet connectivity
 - Xilinx Kintex UltraScale XCKU15P Application Accelerator FPGA
 - 8GB DDR4-2400 on-board memory
 - PCIe 4.0 x8 host interface (backward compatible with PCIe 3.0)
- Ethernet
 - 25GbE / 10GbE
 - IEEE 802.3bj, 802.3bm 25 Gigabit Ethernet
 - IEEE 802.3by, Ethernet Consortium 25 Gigabit
 - IEEE 802.3ae 10 Gigabit Ethernet
 - IEEE 802.3ad Link Aggregation
 - IEEE 802.1Q, 802.1P VLAN tags and priority
 - IEEE 802.1Qau Congestion Notification
 - IEEE 802.1Qaz D0.2 ETS
 - IEEE 802.1Qbb D1.0 Priority-based Flow Control
 - IEEE 1588v2
 - Jumbo frame support (9600 byte)
 - IPv4 (RFC 791)
 - IPv6 (RFC 2460)
- Remote Boot
 - Remote boot over Ethernet
 - UEFI-supported
- Enhanced features and offloads:
 - RDMA over Converged Ethernet (RoCE)
 - RAID offload – erasure coding (Reed-Solomon) offload
 - Hardware-based reliable transport
 - PeerDirect RDMA (GPUDirect communication acceleration)
 - Enhanced Atomic operations
 - Advanced memory mapping support, allowing user mode registration and remapping of memory (UMR)
 - LSO, LRO, checksum offload
 - RSS VLAN and MPLS tag insertion/stripping, Receive flow steering
 - Intelligent interrupt coalescing Hardware-Based I/O Virtualization
 - Single Root IOV
 - SR-IOV: Up to 512 Virtual Function
 - SR-IOV: Up to 2 Physical Functions
 - Virtualizing Physical Functions on a physical port
 - SR-IOV on every Physical Function
 - Address translation and protection
 - Guaranteed QoS for VMs
- Media & entertainment IP video formats
 - SMPTE 2110-20
 - SMPTE 2110-21N/NL
- Management and control interfaces
 - NC-SI
 - MCTP over SMBus
 - NC-SI over MCTP / BMC
- PCI Express host interface
 - TLP (Transaction Layer Packet) Processing Hints (TPH)
 - Access Control Service (ACS) for peer-to-peer secure communication
 - Advance Error Reporting (AER)
 - Process Address Space ID (PASID) Address Translation Services (ATS)

- Support for MSI/MSI-X mechanisms
- Note:** The internal OpenCAPI interface is not supported by Lenovo

Server support

The following tables list the ThinkSystem servers that are compatible.

Table 5. Server support (Part 1 of 4)

Part Number	Description	AMD V3				2S Intel V3/V4				4S 8S Intel V3		Multi Node V3/V4		1S V3							
		SR635 V3 (7D9H / 7D9G)	SR655 V3 (7D9F / 7D9E)	SR645 V3 (7D9D / 7D9C)	SR665 V3 (7D9B / 7D9A)	ST650 V3 (7D7B / 7D7A)	SR630 V3 (7D72 / 7D73)	SR650 V3 (7D75 / 7D76)	SR630 V4 (7DG8 / 7DG9)	SR650 V4 (7DGC / 7DGD)	SR650a V4 (7DGC / 7DGD)	SR850 V3 (7D97 / 7D96)	SR860 V3 (7D94 / 7D93)	SR950 V3 (7DC5 / 7DC4)	SD535 V3 (7DD8 / 7DD1)	SD530 V3 (7DDA / 7DD3)	SD550 V3 (7DD9 / 7DD2)	ST45 V3 (7DH4 / 7DH5)	ST50 V3 (7DF4 / 7DF3)	ST250 V3 (7DCF / 7DCE)	SR250 V3 (7DCM / 7DCL)
4XC7A16683	ThinkSystem Mellanox Innova-2 ConnectX-5 FPGA 25GbE 2-port Adapter	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N

Table 6. Server support (Part 2 of 4)

Part Number	Description	GPU Rich				Edge				Super Computing									
		SR670 V2 (7Z22 / 7Z23)	SR675 V3 (7D9Q / 7D9R)	SR680a V3 (7DHE)	SR685a V3 (7DHC)	SR780a V3 (7DJ5)	SE100 (7DGR)	SE350 (7Z46 / 7D1X)	SE350 V2 (7DA9)	SE360 V2 (7DAM)	SE450 (7D8T)	SE455 V3 (7DBY)	SC750 V4 (7DDJ)	SC777 V4 (7DKA)	SD665 V3 (7D9P)	SD665-N V3 (7DAZ)	SD650 V3 (7D7M)	SD650-I V3 (7D7L)	SD650-N V3 (7D7N)
4XC7A16683	ThinkSystem Mellanox Innova-2 ConnectX-5 FPGA 25GbE 2-port Adapter	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N

Table 7. Server support (Part 3 of 4)

Part Number	Description	1S Intel V2			2S Intel V2			AMD V1				Dense V2		4S V2	8S				
		ST50 V2 (7D8K / 7D8J)	ST250 V2 (7D8G / 7D8F)	SR250 V2 (7D7R / 7D7Q)	ST650 V2 (7Z75 / 7Z74)	SR630 V2 (7Z70 / 7Z71)	SR650 V2 (7Z72 / 7Z73)	SR635 (7Y98 / 7Y99)	SR655 (7Y00 / 7Z01)	SR655 Client OS	SR645 (7D2Y / 7D2X)	SR665 (7D2W / 7D2V)	SD630 V2 (7D1K)	SD650 V2 (7D1M)	SD650-N V2 (7D1N)	SN550 V2 (7Z69)	SR850 V2 (7D31 / 7D32)	SR860 V2 (7Z59 / 7Z60)	SR950 (7X11 / 7X12)
4XC7A16683	ThinkSystem Mellanox Innova-2 ConnectX-5 FPGA 25GbE 2-port Adapter	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	Y

Table 8. Server support (Part 4 of 4)

Part Number	Description	4S V1			1S Intel V1			2S Intel V1						Dense V1					
		SR850 (7X18 / 7X19)	SR850P (7D2F / 2D2G)	SR860 (7X69 / 7X70)	ST50 (7Y48 / 7Y50)	ST250 (7Y45 / 7Y46)	SR150 (7Y54)	SR250 (7Y52 / 7Y51)	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)
4XC7A16683	ThinkSystem Mellanox Innova-2 ConnectX-5 FPGA 25GbE 2-port Adapter	N	N	N	N	N	N	N	N	N	N	N	Y	Y	N	Y	N	N	N

Operating system support

The adapter supports the operating systems listed in the following table.

Tip: This table is automatically generated based on data from [Lenovo ServerProven](#).

Table 9. Operating system support for ThinkSystem Mellanox Innova-2 ConnectX-5 FPGA 25GbE 2-port Adapter, 4XC7A16683

Operating systems	SD530 (Xeon Gen 2)	SR630 (Xeon Gen 2)	SR650 (Xeon Gen 2)	SR950 (Xeon Gen 2)	SD530 (Xeon Gen 1)	SR630 (Xeon Gen 1)	SR650 (Xeon Gen 1)	SR950 (Xeon Gen 1)
Red Hat Enterprise Linux 7.5	N	N	N	N	Y	Y	Y	Y
Red Hat Enterprise Linux 7.6	Y	Y	N	Y	Y	Y	N	Y
Red Hat Enterprise Linux 8.1	Y	Y	Y	Y	Y	Y	Y	Y

Warranty

One year limited warranty. When installed in a Lenovo server, this 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 Innova-2 Flex Open Programmable SmartNIC product page
<https://www.nvidia.com/en-us/networking/ethernet/innova-2-flex/>
- Mellanox User Manuals:
<https://docs.nvidia.com/networking/display/Innova2Flex>

Related product families

Product families related to this document are the following:

- [25 Gb Ethernet Connectivity](#)
- [Coproducts and Accelerators](#)
- [Ethernet Adapters](#)

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