Intel X722 Integrated 10 GbE Controller for Lenovo ThinkSystem

Product Guide

The Intel Ethernet Connection X722 is a network controller embedded into the Intel C624 "Lewisburg" PCH chipset of Lenovo ThinkSystem servers. The controller connects to available 10 GbE and 1 Gigabit Ethernet LAN-on-motherboard (LOM) adapter cards and onboard connectors to provide a comprehensive 1 GbE / 10 GbE networking solution for ThinkSystem customers.

ThinkSystem servers support either 10 Gb Ethernet copper or optical connections, or Gigabit Ethernet connections depending on the server model.

The following figure shows the ThinkSystem 10Gb 4-port SFP+ LOM adapter which provides four SFP+ cages for optical or direct-attach copper (DAC) connectivity.

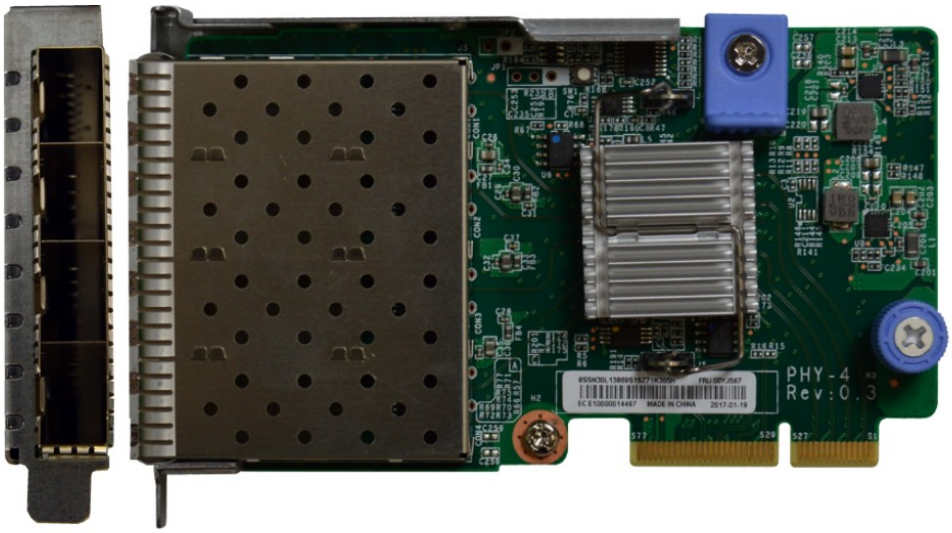

Figure 1. ThinkSystem 10Gb 4-port SFP+ LOM adapter

Did you know?

The Intel Ethernet Connection X722 shares the same core and drivers as the Intel X710 adapters making driver management easier of existing customers.

ThinkSystem LOM adapters are cost-effective adapters that take advantage of the X722 controller embedded in Intel Xeon Processor Scalable Family chipset and offer the flexibility advantages of a PCIe adapter while supporting integrated networking features, such as Wake-on-LAN and direct connectivity to the XClarity Controller management processor for NC-SI-compliant systems management.

Part number information

The following table provides the ordering part numbers and feature codes for the ThinkSystem LOM adapters.

Table 1. Supported LOM adapters

Part number	Feature code	Description	Ports
Gigabit Ethernet			
7ZT7A00544	AUKG	ThinkSystem 1Gb 2-port RJ45 LOM	2x RJ45
7ZT7A00545	AUKH	ThinkSystem 1Gb 4-port RJ45 LOM	4x RJ45
10 Gb Ethernet			
7ZT7A00546	AUKJ	ThinkSystem 10Gb 2-port SFP+ LOM	2x SFP+
7ZT7A00547	AUKK	ThinkSystem 10Gb 4-port SFP+ LOM	4x SFP+
7ZT7A00548	AUKL	ThinkSystem 10Gb 2-port Base-T LOM	2x RJ45 (10GBASE-T)
7ZT7A00549	AUKM	ThinkSystem 10Gb 4-port Base-T LOM	4x RJ45 (10GBASE-T)
EIOM modules for D2 Enclosure for use with SD530 servers			
7M17A04001	AUYA	ThinkSystem D2 10Gb 8-port Base-T (RJ45)	8x RJ45
7M17A04000	AUY9	ThinkSystem D2 10Gb 8-port SFP+	8x SFP+

Note: The SFP+ LOM adapters ship without any SFP+ transceivers or direct attach cables. These items must be ordered separately as described in the following section.

The following figure shows the ThinkSystem 10Gb 4-port Base-T LOM adapter which provides four RJ45 10GBASE-T ports.

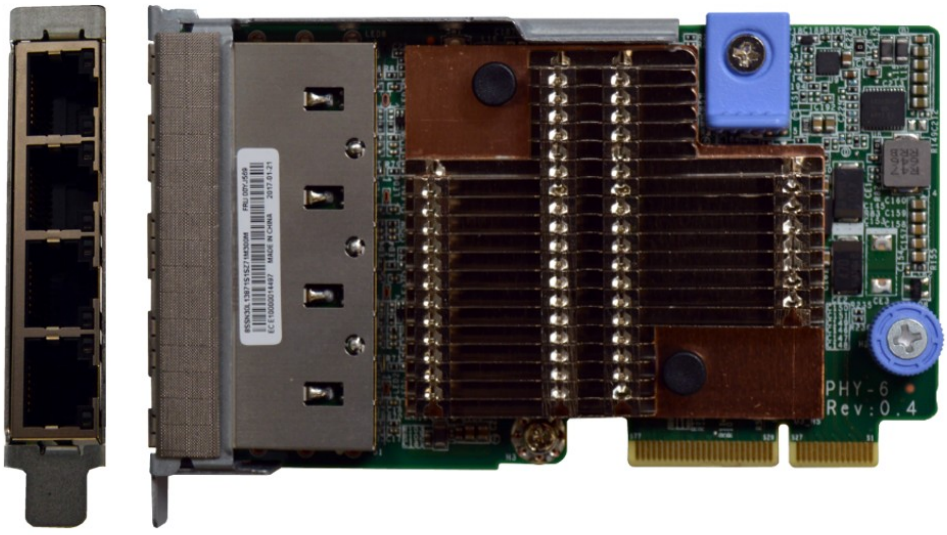

Figure 2. ThinkSystem 10Gb 4-port Base-T LOM

Supported transceivers and direct-attach cables

The SFP+ LOM adapters have empty SFP+ cages that support SFP+ SR and LR transceivers and direct attached copper (DAC) cables, as listed in the following tables.

Table 2. Supported SFP+ transceivers

Part number	Feature code	Description
49Y4216†	0069	Brocade 10Gb SFP+ SR Optical Transceiver
46C3447	5053	SFP+ SR Transceiver (10Gb)
49Y4218†	0064	QLogic 10Gb SFP+ SR Optical Transceiver

† Not supported by ThinkSystem D2 10Gb 8-port SFP+ adapter, 7M17A04000

The following table lists the supported DAC cables.

Table 3. Supported direct attach cables

Part number	Feature code	Description
Active DAC/Twinax 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
95Y0323*†	A25A	1 m Active DAC SFP+ Cable
95Y0326*†	A25B	3 m Active DAC SFP+ Cable
95Y0329*†	A25C	5 m Active DAC SFP+ Cable
Passive DAC/Twinax 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

* Withdrawn from marketing
† Not supported by ThinkSystem D2 10Gb 8-port SFP+ adapter, 7M17A04000

The following figure shows the ThinkSystem 10Gb 2-port Base-T LOM adapter which provides two RJ45 10GBASE-T ports.

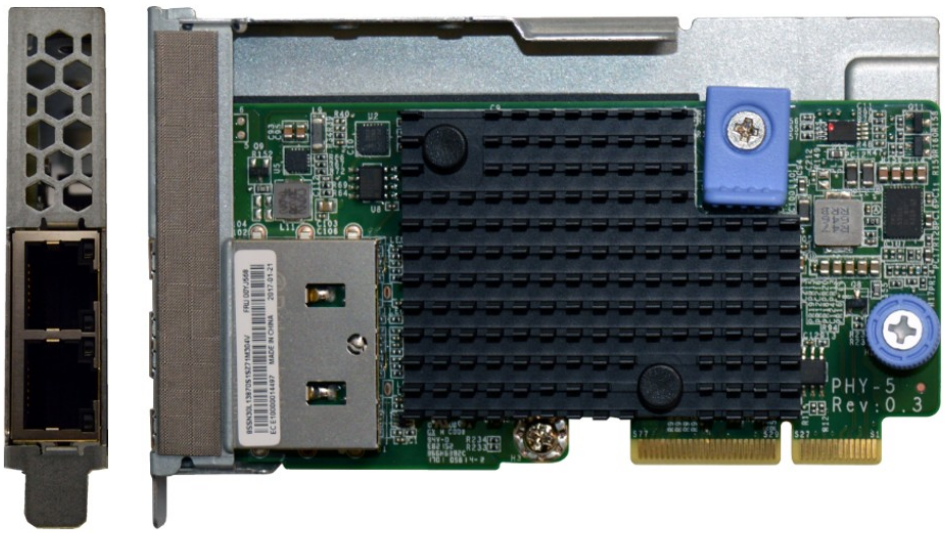

Figure 3. ThinkSystem 10Gb 2-port Base-T LOM

Features

The Intel X722 controller is optimized for data center, cloud, and mobile applications and includes the following features:

- VXLAN/NVGRE Hardware Offloads: These stateless offloads preserve application performance for overlay networks. With these offloads, it is possible to distribute network traffic across CPU cores. At the same time, the controller offloads LSO, GSO, and checksum from the host software, which reduces CPU overhead.
- Low latency: Intel Ethernet Flow Director delivers hardware-based application steering and Intel Data Direct I/O makes the processor cache the primary destination and source of I/O data rather than main memory.
- Virtualization performance: With Intel Virtualization Technology (VT), the controller delivers outstanding I/O performance in virtualized server environments. The controller reduces I/O bottlenecks by providing intelligent offloads for networking traffic per virtual machine (VM), which enables near-line rate speeds for small packets and supports almost an unlimited amount of isolated traffic flows so that you can scale your cloud environment.
- Next-generation VMDq: The controller support up to 128 VMDq VMs and offer enhanced Quality of Service (QoS) feature by providing weighted round-robin servicing for the Tx data. The controller offloads the data-sorting functionality from the hypervisor to the network silicon, which improves data throughput and CPU usage.
- SR-IOV implementation: Provides an implementation of the PCI-SIG standard for I/O Virtualization. The physical configuration of each port is divided into multiple virtual ports. Each virtual port is assigned to an individual VM directly by bypassing the virtual switch in the Hypervisor, which results in near-native performance.
- iWarp RDMA support implements kernel bypass and direct data placement and allows for more efficient high-speed networking by eliminating queues and network related interrupts
- VM load balancing: Provides traffic load balancing (Tx and Rx) across VMs that are bound to the team interface. It also provides fault tolerance if a switch, port, or cable.

- Auto-detect (PnP) feature for the LOM adapters, enabling you to change LOM adapters (eg from a 1Gb LOM to 10 Gb LOM) and the network interface will automatically reconfigure during the boot process

The following figure shows the ThinkSystem 10Gb 2-port SFP+ LOM adapter which provides two SFP+ cages for optical or direct-attach copper (DAC) connectivity.

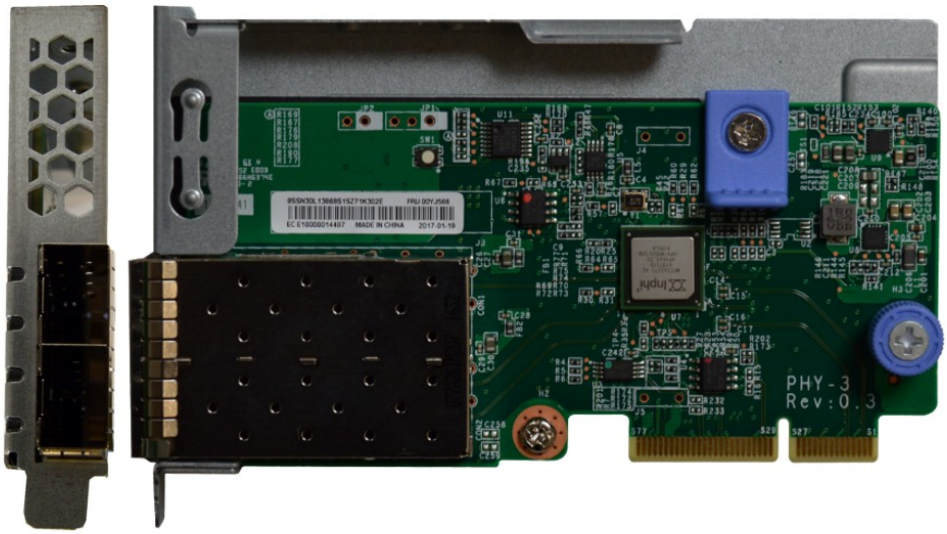

Figure 4. ThinkSystem 10Gb 2-port SFP+ LOM adapter

Specifications

The ThinkSystem LOM adapters support 1 Gb and 10 Gb Ethernet speeds as shown in the following table.

Note: None of the adapters support 100 Mbps and 10 Mbps Ethernet speeds.

Table 4. Supported network speeds and PHY chip used in each LOM adapter

Part number	Description	PHY chp	10Gb	1Gb	100Mb	10Mb
Gigabit Ethernet						
7ZT7A00544	ThinkSystem 1Gb 2-port RJ45 LOM	2x Marvell 88E1514	No	Yes	No	No
7ZT7A00545	ThinkSystem 1Gb 4-port RJ45 LOM	Marvell 88E1543	No	Yes	No	No
10 Gb Ethernet						
7ZT7A00546	ThinkSystem 10Gb 2-port SFP+ LOM	Inphi CS4227	Yes	No	No	No
7ZT7A00547	ThinkSystem 10Gb 4-port SFP+ LOM	Inphi CS4223	Yes	No	No	No
7ZT7A00548	ThinkSystem 10Gb 2-port 10GBASE-T LOM	Intel X557-AT2	Yes	Yes	No	No
7ZT7A00549	ThinkSystem 10Gb 4-port 10GBASE-T LOM	Intel X557-AT4	Yes	Yes	No	No
EIOM modules for D2 Enclosure for use with SD530 servers						
7M17A04000	ThinkSystem D2 10Gb 8-port SFP+	4x Inphi CS4227	Yes	Yes	No	No
7M17A04001	ThinkSystem D2 10Gb 8-port 10GBASE-T	4x Intel X557-AT2	Yes	Yes	No	No

The Intel Ethernet Connection X722 has the following specifications:

- Adapter connectors:
  - Gigabit adapters: RJ45 connectors
  - 10 GbE 10GBASE-T adapters: RJ45 connectors
  - 10 GbE SFP+ adapters: Empty SFP+ cages supporting SFP+ transceivers or DAC cables
- Host interface:
  - PCI Power Management/ACPI Extensions
  - TLP Processing Hint (TPH) Support
  - MSI-X Support - up to 1168 MSI-X vectors
  - Energy Efficient Ethernet
- Virtualization features:
  - Microsoft Network Virtualization that uses Generic Routing Encapsulation (NVGRE)
  - VMware Virtual Extensible LAN (VXLAN)
  - Intel Virtual Technology (VT) with VMDq for virtualization
  - VEB enhancement
  - SR-IOV support (4 physical functions, 128 virtual functions)
  - Virtual Bridging Support: VEPA/802.1Qbg
  - Virtual Functions: Up to 128 per device
  - iWarp RDMA support

  Note: SR-IOV is only supported at 10 Gbps speeds
- Management features:
  - Advanced filtering capabilities (IPv4, IPv6)
  - SNMP
  - RMON statistic counters
  - Wake on LAN support (first port only)
  - NC-SI for XClarity Controller (XCC) shared management port connectivity only through port 1
  - Intel PROSet Utility for easy configuration and management
- Additional features:
  - IPv4 and IPv6 support
  - Jumbo Frame Support: 9728 bytes
  - VLAN support
  - Flow Control
  - 1588 Time Synchronization Support
- TCP/IP Layer 2 features:
  - Receive Side Scaling (RSS)
  - Large Send Offload (LSO)
  - TCP/UDP/IP/SCTP Checksum Offload
  - IPv4, IPv6
- IEEE 802.1Q VLAN support with VLAN tag insertion, with stripping and packet filtering for up to 4096 VLAN tags.
- IEEE 802.3x flow control support
- IEEE 802.1p Class of Service (CoS)/QoS
- Support for Advanced Packet Filtering
- UEFI and legacy PXE boot

The following figure shows the ThinkSystem 1Gb 4-port RJ45 LOM adapter which provides four RJ45 Gigabit Ethernet ports.

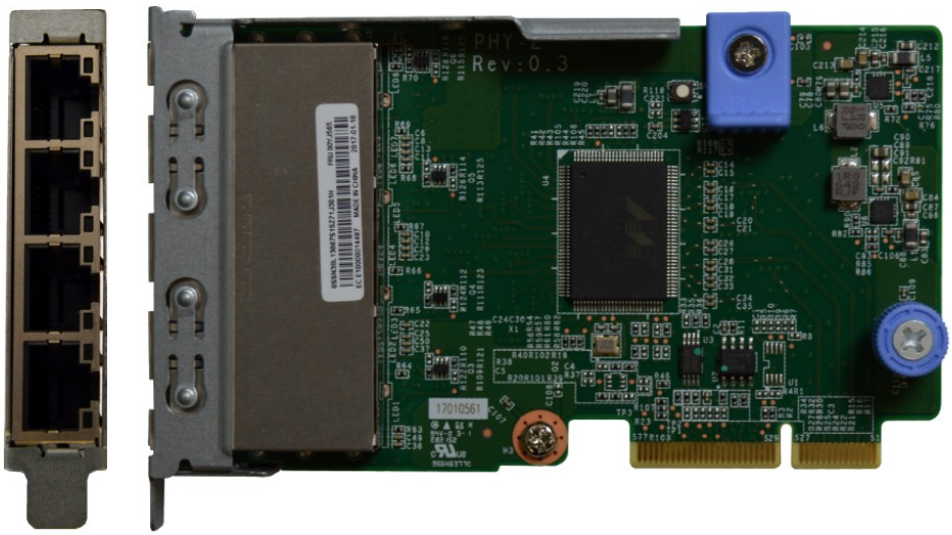

Figure 5. ThinkSystem 1Gb 4-port RJ45 LOM

Standards supported

The X722 controller supports the following IEEE standards:

- IEEE 802.1p CoS traffic prioritization
- IEEE 802.1Q VLAN tagging
- IEEE 802.3ad Link Aggregation Control Protocol
- IEEE 802.3x Full-duplex flow control
- IEEE 1588, 802.1as Time Sync

10 GbE standards:

- IEEE 802.3ae 10GBASE-SR short range fiber optics 10 Gb Ethernet
- 10GSFP+Cu SFP+ Direct Attach copper
- IEEE 802.3ab 1000BASE-T copper twisted pair Gigabit Ethernet
- IEEE 802.3an 10GBASE-T copper twisted pair 10 Gb Ethernet

Server support

The ThinkSystem LOM adapters are supported in the servers listed in the following table.

As shown in the table, some ThinkSystem servers do not support the LOM adapters even though they offer Intel Ethernet Connection X722:

- The ST550 tower server has two onboard Gigabit ports that connect to the X722 controller
- The SD530 dense server routes two 10 GbE connections form the X722 controller to the Ethernet ports in the EIOM network modules in the D2 Enclosure.
- The SN550 and SN850 Blade servers use use a Fabric Connector ("Periscope connector") to route four 10 GbE connections to the midplane of the Flex System Enterprise Chassis.

Table 5. ThinkSystem server support

Part number	Feature code	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)	SN550 (7X16)	SN850 (7X15)
None	None	Integrated 2-port 1Gb RJ45	Y	N	N	N	N	N	N	N	N	N	N	N	N
7ZT7A00544	AUKG	ThinkSystem 1Gb 2-port RJ45 LOM	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N	N
7ZT7A00545	AUKH	ThinkSystem 1Gb 4-port RJ45 LOM	N	N	N	N	N	Y	Y	Y	Y	Y	N	N	N
7ZT7A00546	AUKJ	ThinkSystem 10Gb 2-port SFP+ LOM	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N	N
7ZT7A00547	AUKK	ThinkSystem 10Gb 4-port SFP+ LOM	N	N	N	N	N	Y	Y	Y	Y	Y	N	N	N
7ZT7A00548	AUKL	ThinkSystem 10Gb 2-port Base-T LOM	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N	N
7ZT7A00549	AUKM	ThinkSystem 10Gb 4-port Base-T LOM	N	N	N	N	N	Y	Y	Y	Y	Y	N	N	N
None	None	Integrated 2-port 10Gb (requires EIOM module in D2 Enclosure)	N	N	N	N	N	N	N	N	N	N	Y	N	N
None	None	Integrated 4-port 10 Gb (requires Fabric Connector)	N	N	N	N	N	N	N	N	N	N	N	Y	Y

The following figure shows the ThinkSystem 1Gb 2-port RJ45 LOM adapter which provides two RJ45 Gigabit Ethernet ports.

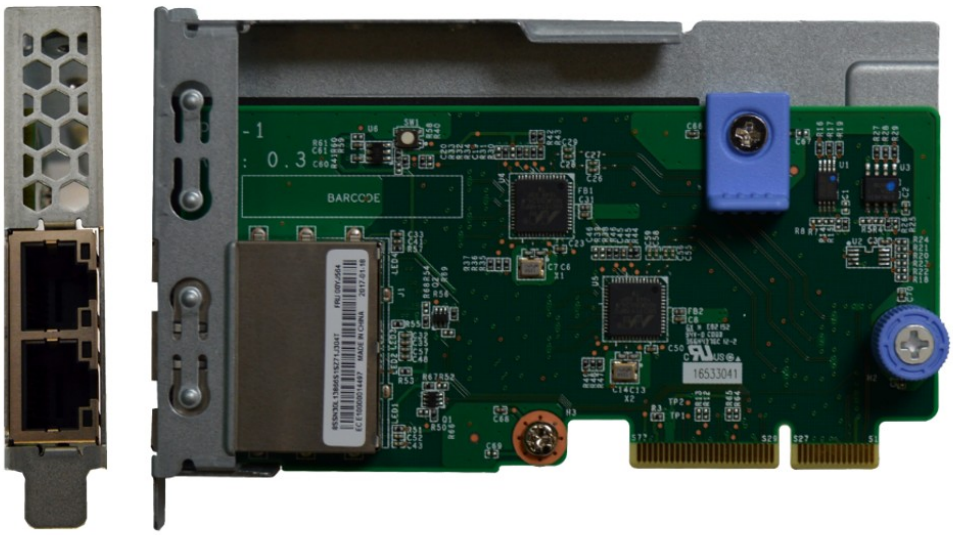

Figure 6. ThinkSystem 1Gb 2-port RJ45 LOM

Cabling requirements

The network cables that can be used with the adapters are described in the following sections.

- 10GBASE-SR (supported with the 10 GbE SFP+ SR transceivers listed in Table 2)
  850 nm communication that uses multimode fiber cable (50 µ or 62.5 µ) up to 300 m that uses an LC duplex connector
- 10GSFP+Cu (supported with the SFP+ DAC cables listed in Table 3)

Operating system support

The Intel Ethernet Connection X722 and ThinkSystem LOM adapters support the following operating systems:

- Microsoft Windows Server 2012 R2
- Microsoft Windows Server 2016
- SUSE Linux Enterprise Server 11 SP4
- SUSE Linux Enterprise Server 12 SP2
- Red Hat Enterprise Linux 6.9
- Red Hat Enterprise Linux 7.3
- VMware ESXi 6.0 U3
- VMware ESXi 6.5

For more information about the specific supported versions and service packs, go to the ServerProven web page, http://www.lenovo.com/us/en/serverproven. Navigate to ThinkSystem LAN adapters, then select the check mark that is associated with the server in question to see the operating system support information.

Warranty

One-year limited warranty. When installed in a supported server, these adapters assume the system's base warranty and any warranty upgrade.

Agency approvals

The LOM adapters conform to the following standards:

- UL recognized to UL60950-1 2nd Edition
- FCC Rules, Part 15, Class A
- Australian EMC Framework (RCM)
- Japan VCCI, Class A
- Industry Canada, ICES-003, Class A
- EU (CE Mark)
- Korea KC-RRA, Class A
- China RoHS compliant

Top-of-rack Ethernet switches

The following table lists the Ethernet LAN switches that are offered by Lenovo.

Table 6. Ethernet LAN switches

Part number	Description
1 Gb Ethernet switches	
7165H1X	Juniper EX2300-C PoE Switch
7165H2X	Juniper EX2300-24p PoE Switch
7159BAX	Lenovo RackSwitch G7028 (Rear to Front)
7159CAX	Lenovo RackSwitch G7052 (Rear to Front)
7159G52	Lenovo RackSwitch G8052 (Rear to Front)
10 Gb Ethernet switches	
7159A1X	Lenovo ThinkSystem NE1032 RackSwitch (Rear to Front)
7159B1X	Lenovo ThinkSystem NE1032T RackSwitch (Rear to Front)
7159C1X	Lenovo ThinkSystem NE1072T RackSwitch (Rear to Front)
7159BR6	Lenovo RackSwitch G8124E (Rear to Front)
7159G64	Lenovo RackSwitch G8264 (Rear to Front)
7159DRX	Lenovo RackSwitch G8264CS (Rear to Front)
7159CRW	Lenovo RackSwitch G8272 (Rear to Front)
7159GR6	Lenovo RackSwitch G8296 (Rear to Front)
40 Gb Ethernet switches	
7159BRX	Lenovo RackSwitch G8332 (Rear to Front)
100 Gb Ethernet switches	
7159D1X	Lenovo ThinkSystem NE10032 RackSwitch (Rear to Front)

For more information, see the list of Product Guides in the following switch categories:

- 1 Gb Ethernet switches: http://lenovopress.com/networking/tor/1gb?rt=product-guide
- 10 Gb Ethernet switches: http://lenovopress.com/networking/tor/10gb?rt=product-guide
- 40 Gb Ethernet switches: http://lenovopress.com/networking/tor/40gb?rt=product-guide
- 100 Gb Ethernet switches: https://lenovopress.com/networking/tor/100Gb?rt=product-guide

Related publications

For more information, see the following resources:

- Lenovo product page for network adapters
  http://shop.lenovo.com/us/en/systems/servers/options/systemx/networking/adapters/
- Lenovo ServerProven compatibility information for network adapters:
  http://www.lenovo.com/us/en/serverproven
- Lenovo ThinkSystem product publications:
  http://thinksystem.lenovofiles.com/help/index.jsp

Related product families

Product families related to this document are the following:

- Ethernet Adapters

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