

ThinkSystem QLogic 2770 Series 32Gb Fibre Channel Adapters

Product Guide

The QLogic 2770 (QL2770) Series 32 Gb Fibre Channel (FC) Host Bus Adapters (HBAs) are Generation 6 (Gen 6) FC adapters for Lenovo ThinkSystem servers. These adapters offer industry leading native FC performance with extremely low CPU usage with full hardware offloads. With performance of up to 1 million I/O operations per second (IOPS) per port, these adapters can be used to support all-flash arrays (AFAs) -- Fibre Channel storage systems comprised completely of high-speed solid-state drives.

Powerful management tools automate and simplify SAN provisioning to help reduce cost and complexity, while the unmatched 32 Gbps performance eliminates potential I/O bottlenecks in today's powerful multiprocessor, multicore servers.

The QLogic QLE2772 2-port 32 Gb Fibre Channel HBA is shown in the following figure.



Figure 1. ThinkSystem QLogic QLE2772 32Gb 2-Port PCIe Fibre Channel Adapter

Did you know?

QLogic 2770 Series Adapters incorporate a hardware-based Root of Trust that prevents malicious firmware from hijacking the adapters. The 2770 Series RoT enables both integrity and authenticity during adapter firmware updates by both validating firmware embedded signatures with hardware embedded keys to ensure that only validated firmware executes, and protecting firmware updates that are applied over public networks.

Part numbers

The following table lists the ordering information for the QLogic 2770 Series 32Gb Fibre Channel HBAs.

Table 1. Part numbers and feature codes

Part number	Feature code	Description
4XC7A08279	BA1G	ThinkSystem QLogic QLE2770 32Gb 1-Port PCIe Fibre Channel Adapter
4XC7A08276	BA1F	ThinkSystem QLogic QLE2772 32Gb 2-Port PCIe Fibre Channel Adapter

The part numbers for the QLogic 2770 Series HBAs include the following items:

- An FC HBA adapter with one or two 32 Gb FC SW SFP+ transceivers installed
- 3U (full height) and 2U (low-profile) adapter brackets
- Publications flyer

The ThinkSystem QLogic QLE2770 1-Port HBA is shown in the following figure.



Figure 2. ThinkSystem QLogic QLE2770 32Gb 1-Port PCIe Fibre Channel Adapter

Fiber optic cables

The following table lists the fiber optic cables that are available from Lenovo.

Table 2. Fiber optic cables

Part number	Feature code	Description
LC-LC OM3 MMF 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

Key features

The QL2770 32Gb Fibre Channel HBAs have the following features:

- Maximum performance with up to 1 million input/output operations per second (IOPS) per port (2 million IOPS in a dual-port adapter) to support larger server virtualization deployments and scalable cloud initiatives, and performance to match new multicore processors, SSDs/flash storage, and faster server host bus architectures.
- Independent function, transmit and receive buffers, an on-chip CPU, DMA channels, and a firmware image for each port enable complete port-level isolation, prevent errors and firmware crashes from propagating across all ports, and provide predictable and scalable performance across all ports.
- Support for NVMe over Fibre Channel (FC-NVMe). The adapters support low-latency access to scale out NVMe with full support for the FC-NVMe protocol. The adapters can simultaneously support FC-NVMe and FCP-SCSI storage traffic on the same physical port, enabling customers to migrate to NVMe at their own pace.
- Support forward error correction (FEC) to enhance reliability of transmission and thereby performance.
- Industry-standard class-specific control (CS_CTL)-based frame prioritization Quality of Service (QoS) helps alleviate network congestion by prioritizing traffic for time-sensitive mission critical workloads for optimized performance.
- T10-PI data integrity with high performance offload provides end-to-end data corruption protection.
- Support for Message Signaled Interrupts eXtended (MSI-X) improves host utilization and enhances application performance.
- Fabric-assigned port worldwide name (FA-WWN) and fabric-based boot LUN discovery (F-BLD) pre-provisioning services allow servers to be quickly deployed, replaced, and moved across the SAN; the creation of zones, LUNs, and other services can be completed before the servers arrive on site.
- Using the Brocade ClearLink diagnostic port (D_Port) available on the Brocade Gen 5 switches, administrators can quickly run automated diagnostic tests to assess the health of links and fabric components.
- Read diagnostic parameters (RDP) feature provides detailed port, media, and optics diagnostics to easily discover and diagnose link-related errors and degrading conditions on any N_Port-to-F_Port link.

- Link cable beacon (LCB) enables administrators to visually identify both ends of a physical link by flashing HBA's LEDs, simplifying identification of the connection peers within server racks without tracing the cable.
- Single-pane-of-glass management across generations of QLogic FC adapters with QLogic QConvergeConsole (QCC).
- Deployment flexibility and integration with third-party management tools, including the VMware vCenter and Brocade Network Advisor.
- Support for 32 Gb, 16 Gb and 8 Gb FC devices.
- Comprehensive virtualization capabilities with support for N_Port ID Virtualization (NPIV).
- A common driver model allows a single driver to support all QLogic HBAs on a given OS.
- Reduce the number of cards, cables, and PCIe slots required.
- Exceptional performance per watt and price/performance ratios.
- Backward compatibility with existing 8Gb FC and 16Gb FC infrastructure, leveraging existing SAN investments.
- Allow application of SAN best practices, tools, and processes with virtual server deployments.
- Ensure data availability and data integrity.
- Boot from SAN capability reduces the system management costs and increases uptime.

Technical specifications

The QLogic 2770 Series 32Gb Fibre Channel HBAs have the following specifications:

- Based on the QLogic QLE2770 (single port) and QLE2772 (dual port) adapters
- Host interface: PCIe 4.0 x8
- Ports: Single-port and dual-port SFP+ based adapters
- Link speed: Support for 32 Gb, 16 Gb and 8 Gb link speeds, which are automatically negotiated
- Data rate: 28.05 (3200 MBps), 14.025 Gbps (1600 MBps), and 8.5 Gbps (800 MBps) autosensing (per port), with full duplex
- Performance: Up to 2,000,000 IOPS (up to 1,000,000 IOPS per port)
- Fibre Channel standards compliance:
 - SCSI Fibre Channel Protocol-4 (FCP-4)
 - Fibre Channel Tape (FC-TAPE) Profile
 - Fibre Channel Generation Services-8 (FC-GS-8)
 - Fibre Channel-Physical Interface-5 (FC-PI5)
 - Fibre Channel-Physical Interface-6 (FC-PI6)
 - Fibre Channel Link Services 4 (FC-LS-4)
 - Fibre Channel Framing and Signalling-4 (FC-FS-4)
 - Fibre Channel-NVMe (FC-NVMe)
- Topology: Point-to-point and switched fabric
- Hot-pluggable 32 Gbps Fibre Channel SFP+ short wave optical transceivers (850 nm) with LC connectors (included with the adapters). Note: Other transceivers are not supported.
- Distance support:
 - Operating at 32 Gbps:
 - Up to 20 m on 50/125 µm OM2 Multi-Mode Fiber (MMF)
 - Up to 70 m on 50/125 µm OM3 MMF
 - Up to 100 m on 50/125 µm OM4 MMF

- Operating at 16 Gbps:
 - Up to 35 m on 50/125 µm OM2 Multi-Mode Fiber (MMF)
 - Up to 100 m on 50/125 µm OM3 MMF
 - Up to 125 m on 50/125 µm OM4 MMF
- Operating at 8 Gbps:
 - Up to 50 m on 50/125 µm OM2 MMF
 - Up to 150 m on 50/125 µm OM3 MMF
 - Up to 190 m on 50/125 µm OM4 MMF
- Management software:
 - The QLogic unified management application, QLogic QConvergeConsole (QCC), provides single-pane-of-glass management across generations of QLogic FC adapters.
 - QLogic supports all major APIs for deployment flexibility and integration with third-party management tools, including the VMware vCenter and Brocade Network Advisor.

Server support

The following tables list the ThinkSystem servers that are compatible.

Table 3. Server support (Part 1 of 2)

Part Number	Description	E	2S Intel V2				AMD				Dense V2				4S V2	8S	
		SE350 (7Z46 / 7D1X)	ST650 V2 (7Z75 / 7Z74)	SR630 V2 (7Z70 / 7Z71)	SR650 V2 (7Z72 / 7Z73)	SR670 V2 (7Z22 / 7Z23)	SR635 (7Y98 / 7Y99)	SR655 (7Y00 / 7Z01)	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)
4XC7A08279	ThinkSystem QLogic QLE2770 32Gb 1-Port PCIe Fibre Channel Adapter	N	Y	Y	Y	N	Y	Y	Y	Y	N	N	N	N	Y	Y	N
4XC7A08276	ThinkSystem QLogic QLE2772 32Gb 2-Port PCIe Fibre Channel Adapter	N	Y	Y	Y	N	Y	Y	Y	Y	N	N	N	N	Y	Y	N

Table 4. Server support (Part 2 of 2)

Part Number	Description	1S Intel				2S Intel V1								Dense V1				4S V1		
		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)	SN850 (7X15)	SR850 (7X18 / 7X19)	SR850P (7D2F / 2D2G)	SR860 (7X69 / 7X70)
4XC7A08279	ThinkSystem QLogic QLE2770 32Gb 1-Port PCIe Fibre Channel Adapter	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
4XC7A08276	ThinkSystem QLogic QLE2772 32Gb 2-Port PCIe Fibre Channel Adapter	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N

Operating system support

The following tables list the supported operating systems for each part number:

- [ThinkSystem QLogic QLE2770 32Gb 1-Port PCIe Fibre Channel Adapter, 4XC7A08279](#)
- [ThinkSystem QLogic QLE2772 32Gb 2-Port PCIe Fibre Channel Adapter, 4XC7A08276](#)

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

Table 5. Operating system support for ThinkSystem QLogic QLE2770 32Gb 1-Port PCIe Fibre Channel Adapter, 4XC7A08279

Operating systems	SR635	SR645	SR655	SR665	SR630 V2	SR650 V2	SR850 V2	SR860 V2	ST650 V2
Microsoft Windows Server 2016	Y	Y	Y	Y	Y	Y	Y	Y	Y
Microsoft Windows Server 2019	Y	Y	Y	Y	Y	Y	Y	Y	Y
Microsoft Windows Server 2022	Y	Y	Y	Y	Y	Y	Y	Y	Y
Red Hat Enterprise Linux 7.7	Y	Y	Y	Y	N	N	N	N	N
Red Hat Enterprise Linux 7.8	Y	Y	Y	Y	N	N	N	N	N
Red Hat Enterprise Linux 7.9	Y	Y	Y	Y	Y	Y	Y	Y	Y
Red Hat Enterprise Linux 8.0	Y	N	Y	N	N	N	N	N	N
Red Hat Enterprise Linux 8.1	Y ¹	Y ¹	Y ¹	Y ¹	N	N	N	N	N
Red Hat Enterprise Linux 8.2	Y ²	Y ²	Y ²	Y ²	Y	Y	Y ²	Y ²	Y
Red Hat Enterprise Linux 8.3	Y	Y	Y	Y	Y	Y	Y	Y	Y
Red Hat Enterprise Linux 8.4	Y	Y	Y	Y	N	N	Y	Y	N
SUSE Linux Enterprise Server 12 SP4	Y	N	Y	N	N	N	N	N	N
SUSE Linux Enterprise Server 12 SP4 with Xen	Y	N	Y	N	N	N	N	N	N
SUSE Linux Enterprise Server 12 SP5	Y	Y	Y	Y	Y	Y	Y	Y	Y
SUSE Linux Enterprise Server 12 SP5 with Xen	Y	Y	Y	Y	Y	Y	Y	Y	Y
SUSE Linux Enterprise Server 15 SP1	Y	Y	Y	Y	N	N	N	N	N
SUSE Linux Enterprise Server 15 SP1 with Xen	Y	Y	Y	Y	N	N	N	N	N
SUSE Linux Enterprise Server 15 SP2	Y ³	Y ³	Y ³	Y ³	Y	Y	Y ³	Y ³	Y
SUSE Linux Enterprise Server 15 SP2 with Xen	Y	Y	Y	Y	Y	Y	Y	Y	Y
SUSE Linux Enterprise Server 15 SP3	Y	Y	Y	Y	N	N	Y	Y	N
SUSE Linux Enterprise Server 15 SP3 with Xen	Y	Y	Y	Y	N	N	Y	Y	N
Ubuntu 18.04 LTS	N	N	N	N	Y	Y	N	N	Y
Ubuntu 20.04 LTS	N	N	N	N	Y	Y	N	N	N
VMware vSphere Hypervisor (ESXi) 6.5 U3	Y	N	Y	N	N	N	N	N	N
VMware vSphere Hypervisor (ESXi) 6.7 U3	Y	Y	Y	Y	Y	Y	N	N	Y
VMware vSphere Hypervisor (ESXi) 7.0	Y	Y	Y	Y	N	N	N	N	N
VMware vSphere Hypervisor (ESXi) 7.0 U1	Y	Y	Y	Y	N	N	Y	Y	N
VMware vSphere Hypervisor (ESXi) 7.0 U2	Y	Y	Y	Y	Y	Y	Y	Y	Y

¹ The Qlogic QLE2660 / QLE2690 / QLE2692 / QLE2740 / QLE2742 / QLE2770 / QLE2772 HBA & QML2692 Mezz HBA no support the FC protocol with RHEL8.1 OS on DM series. Please refer LSIC (interop site) for latest DM series support result, the LSIC link as below:
<https://datacentersupport.lenovo.com/ca/en/lsic/>

² The Qlogic QLE2660 / QLE2690 / QLE2692 / QLE2740 / QLE2742 / QLE2770 / QLE2772 HBA & QML2692 Mezz HBA no support the FC protocol with RHEL8.2 OS on DM series. Please refer LSIC (interop site) for latest DM series support result, the LSIC link as below:
<https://datacentersupport.lenovo.com/ca/en/lsic/>

³ The Qlogic QLE2770 HBA no support the FC protocol with SLES15.2 OS on DM series, only support NVMe over FC protocol. Please refer LSIC (interop site) for latest DM series support result, the LSIC link as below: <https://datacentersupport.lenovo.com/ca/en/lsc/>

Table 6. Operating system support for ThinkSystem QLogic QLE2772 32Gb 2-Port PCIe Fibre Channel Adapter, 4XC7A08276

Operating systems	SR635	SR645	SR655	SR665	SR630 V2	SR650 V2	SR850 V2	SR860 V2	ST650 V2
Microsoft Windows Server 2016	Y	Y	Y	Y	Y	Y	Y	Y	Y
Microsoft Windows Server 2019	Y	Y	Y	Y	Y	Y	Y	Y	Y
Microsoft Windows Server 2022	Y	Y	Y	Y	Y	Y	Y	Y	Y
Red Hat Enterprise Linux 7.7	Y	Y	Y	Y	N	N	N	N	N
Red Hat Enterprise Linux 7.8	Y	Y	Y	Y	N	N	N	N	N
Red Hat Enterprise Linux 7.9	Y	Y	Y	Y	Y	Y	Y	Y	Y
Red Hat Enterprise Linux 8.0	Y	N	Y	N	N	N	N	N	N
Red Hat Enterprise Linux 8.1	Y ¹	Y ¹	Y ¹	Y ¹	N	N	N	N	N
Red Hat Enterprise Linux 8.2	Y ²	Y ²	Y ²	Y ²	Y	Y	Y ²	Y ²	Y
Red Hat Enterprise Linux 8.3	Y	Y	Y	Y	Y	Y	Y	Y	Y
Red Hat Enterprise Linux 8.4	Y	Y	Y	Y	N	N	Y	Y	N
SUSE Linux Enterprise Server 12 SP4	Y	N	Y	N	N	N	N	N	N
SUSE Linux Enterprise Server 12 SP4 with Xen	Y	N	Y	N	N	N	N	N	N
SUSE Linux Enterprise Server 12 SP5	Y	Y	Y	Y	Y	Y	Y	Y	Y
SUSE Linux Enterprise Server 12 SP5 with Xen	Y	Y	Y	Y	Y	Y	Y	Y	Y
SUSE Linux Enterprise Server 15 SP1	Y	Y	Y	Y	N	N	N	N	N
SUSE Linux Enterprise Server 15 SP1 with Xen	Y	Y	Y	Y	N	N	N	N	N
SUSE Linux Enterprise Server 15 SP2	Y ³	Y ³	Y ³	Y ³	Y	Y	Y ³	Y ³	Y
SUSE Linux Enterprise Server 15 SP2 with Xen	Y	Y	Y	Y	Y	Y	Y	Y	Y
SUSE Linux Enterprise Server 15 SP3	Y	Y	Y	Y	N	N	Y	Y	N
SUSE Linux Enterprise Server 15 SP3 with Xen	Y	Y	Y	Y	N	N	Y	Y	N
Ubuntu 18.04 LTS	N	N	N	N	Y	Y	N	N	Y
Ubuntu 20.04 LTS	N	N	N	N	Y	Y	N	N	N
VMware vSphere Hypervisor (ESXi) 6.5 U3	Y	N	Y	N	N	N	N	N	N
VMware vSphere Hypervisor (ESXi) 6.7 U3	Y	Y	Y	Y	Y	Y	N	N	Y
VMware vSphere Hypervisor (ESXi) 7.0	Y	Y	Y	Y	N	N	N	N	N
VMware vSphere Hypervisor (ESXi) 7.0 U1	Y	Y	Y	Y	N	N	Y	Y	N
VMware vSphere Hypervisor (ESXi) 7.0 U2	Y	Y	Y	Y	Y	Y	Y	Y	Y

¹ The Qlogic QLE2660 / QLE2690 / QLE2692 / QLE2740 / QLE2742 / QLE2770 / QLE2772 HBA & QML2692 Mezz HBA no support the FC protocol with RHEL8.1 OS on DM series. Please refer LSIC (interop site) for latest DM series support result, the LSIC link as below: <https://datacentersupport.lenovo.com/ca/en/lsc/>

² The Qlogic QLE2660 / QLE2690 / QLE2692 / QLE2740 / QLE2742 / QLE2770 / QLE2772 HBA & QML2692 Mezz HBA no support the FC protocol with RHEL8.2 OS on DM series. Please refer LSIC (interop site) for latest DM series support result, the LSIC link as below:
<https://datacentersupport.lenovo.com/ca/en/lsic/>

³ The Qlogic QLE2772 HBA no support the FC protocol with SLES15.2 OS on DM series, only support NVMe over FC protocol. Please refer LSIC (interop site) for latest DM series support result, the LSIC link as below: <https://datacentersupport.lenovo.com/ca/en/lsic/>

SAN switches

Lenovo offers the ThinkSystem DB Series of Fibre Channel SAN switches for high-performance storage expansion. See the DB Series product guides for models and configuration options:

- ThinkSystem DB Series SAN Switches:
<https://lenovopress.com/storage/switches/rack#rt=product-guide>

Warranty

The adapters carry a one-year limited warranty. When installed in a supported server, the adapters assume the server's base warranty and any Lenovo Services warranty upgrade.

Physical specifications

The adapters have the following dimensions (approximate):

- Low profile form factor card
- 168 mm x 69 mm (6.60 in. x 2.7 in.)
- Standard (3U) and low-profile (2U) brackets included

Operating environment

The adapters are supported in the following environment:

- Temperature:
 - Operating: 0 - 55 °C (32 - 131 °F)
 - Storage: -20 - 70 °C (-4 - 185 °F)
- Relative humidity:
 - Operating: 10 - 90% (non-condensing)
 - Storage: 5 - 95% (non-condensing)

Agency approvals

The adapters conform to the following regulations:

- Safety:
 - UL 60950-1
 - CSA C22.2
 - TUV EN60950-1
 - TUV IEC 60950-1
 - CB Certified
- EMI and EMC (Class A)
 - FCC Rules, CFR Title 47, Part 15, Subpart Class A
 - Industry Canada, ICES-003: Class A
 - EN55032
 - EN55024
 - EN61000-3-2
 - EN61000-3-3
 - Japan VCCI: Class A
 - New Zealand and Australia AS/NZS: Class A
 - Korea KC-RRA Class A
 - Taiwan BSMI CNS 13438

Related publications and links

For more information, see the following resources:

- Lenovo ThinkSystem networking options product web page
<https://lenovopress.com/lp0765-networking-options-for-thinksystem-servers>
- Lenovo support
<http://datacentersupport.lenovo.com>
- Lenovo ServerProven
<http://www.lenovo.com/us/en/serverproven>
- Marvell home page for Lenovo products
<https://www.marvell.com/lenovo>

Related product families

Product families related to this document are the following:

- [Host Bus Adapters](#)

Notices

Lenovo may not offer the products, services, or features discussed in this document in all countries. Consult your local Lenovo representative for information on the products and services currently available in your area. Any reference to a Lenovo product, program, or service is not intended to state or imply that only that Lenovo product, program, or service may be used. Any functionally equivalent product, program, or service that does not infringe any Lenovo intellectual property right may be used instead. However, it is the user's responsibility to evaluate and verify the operation of any other product, program, or service. Lenovo may have patents or pending patent applications covering subject matter described in this document. The furnishing of this document does not give you any license to these patents. You can send license inquiries, in writing, to:

Lenovo (United States), Inc.
8001 Development Drive
Morrisville, NC 27560
U.S.A.
Attention: Lenovo Director of Licensing

LENOVO PROVIDES THIS PUBLICATION "AS IS" WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF NON-INFRINGEMENT, MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. Some jurisdictions do not allow disclaimer of express or implied warranties in certain transactions, therefore, this statement may not apply to you.

This information could include technical inaccuracies or typographical errors. Changes are periodically made to the information herein; these changes will be incorporated in new editions of the publication. Lenovo may make improvements and/or changes in the product(s) and/or the program(s) described in this publication at any time without notice.

The products described in this document are not intended for use in implantation or other life support applications where malfunction may result in injury or death to persons. The information contained in this document does not affect or change Lenovo product specifications or warranties. Nothing in this document shall operate as an express or implied license or indemnity under the intellectual property rights of Lenovo or third parties. All information contained in this document was obtained in specific environments and is presented as an illustration. The result obtained in other operating environments may vary. Lenovo may use or distribute any of the information you supply in any way it believes appropriate without incurring any obligation to you.

Any references in this publication to non-Lenovo Web sites are provided for convenience only and do not in any manner serve as an endorsement of those Web sites. The materials at those Web sites are not part of the materials for this Lenovo product, and use of those Web sites is at your own risk. Any performance data contained herein was determined in a controlled environment. Therefore, the result obtained in other operating environments may vary significantly. Some measurements may have been made on development-level systems and there is no guarantee that these measurements will be the same on generally available systems. Furthermore, some measurements may have been estimated through extrapolation. Actual results may vary. Users of this document should verify the applicable data for their specific environment.

© Copyright Lenovo 2021. All rights reserved.

This document, LP1307, was created or updated on February 18, 2021.

Send us your comments in one of the following ways:

- Use the online Contact us review form found at:
<https://lenovopress.com/LP1307>
- Send your comments in an e-mail to:
comments@lenovopress.com

This document is available online at <https://lenovopress.com/LP1307>.

Trademarks

Lenovo and the Lenovo logo are trademarks or registered trademarks of Lenovo in the United States, other countries, or both. A current list of Lenovo trademarks is available on the Web at <https://www.lenovo.com/us/en/legal/copytrade/>.

The following terms are trademarks of Lenovo in the United States, other countries, or both:

Lenovo®

Lenovo Services

ServerProven®

ThinkSystem

The following terms are trademarks of other companies:

Intel® is a trademark of Intel Corporation or its subsidiaries.

Linux® is the trademark of Linus Torvalds in the U.S. and other countries.

Microsoft®, Windows Server®, and Windows® are trademarks of Microsoft Corporation in the United States, other countries, or both.

Other company, product, or service names may be trademarks or service marks of others.