



Lenovo ThinkSystem DS2200 Storage Array Product Guide

The Lenovo ThinkSystem DS2200 provides simplicity, speed, scalability, security, and high availability for small to large businesses. The ThinkSystem DS2200 delivers enterprise-class storage management technology in an affordable solution with a wide choice of host connectivity options, flexible drive configurations, and enhanced data management features.

The ThinkSystem DS2200 is a perfect fit for small offices and remote and branch offices of large enterprises that need a primary storage solution that supports general purpose workloads, such as file and print serving, web serving, email and collaboration, and small databases. The DS2200 is also well-suited for secure archive storage or a low-cost backup solution.

The ThinkSystem DS2200 supports up to 96 drives with up to three external expansion enclosures. It also offers flexible drive configurations with the choice of 2.5-inch and 3.5-inch drive form factors, 10 K or 15 K rpm SAS and 7.2 K rpm NL SAS hard disk drives (HDDs) and self-encrypting drives (SEDs), and SAS solid-state drives (SSDs). The DS2200 can be scaled up to 1.47 PB of raw storage capacity.

The Lenovo ThinkSystem DS2200 enclosures are shown in the following figure.



Figure 1. Lenovo ThinkSystem DS2200 SFF (left) and LFF (right) enclosures

Did you know?

The ThinkSystem DS2200 supports Intelligent Real-time Tiering capabilities that help optimize system performance, reduce costs, and simplify management. The base software includes the ability to move data dynamically between SAS HDDs that are optimized for cost per IOPS and NL SAS HDDs that are optimized for cost per GB. With the optional software license, the DS2200 supports hybrid tiering across HDDs and SSDs.

The ThinkSystem DS2200 offers the flexible choice of 12 Gb SAS, 1/10 Gb iSCSI, and 4/8/16 Gb Fibre Channel (FC) host connectivity protocols. The Converged Network Controller (CNC) design of the DS2200 makes the selection of iSCSI or FC host connectivity as simple as attaching corresponding transceivers or Direct-Attach Copper (DAC) cables to the SFP/SFP+ ports on the controller module.

The ThinkSystem DS2200 supports battery-free cache protection, which reduces maintenance costs and provides permanent backup of unwritten cache data if there is a power failure.

Key features

The ThinkSystem DS2200 offers the following key features and benefits:

- Low-cost, entry-level storage with dual active/active controller configurations for high availability and performance.
- Flexible host connectivity to match diverse client needs with support for 12 Gb SAS (SAS controller module) or 1/10 Gb iSCSI or 4/8/16 Gb Fibre Channel connectivity (FC/iSCSI controller module).
- 12 Gb SAS drive-side connectivity with support for 12x 3.5-inch large form factor (LFF) or 24x 2.5-inch small form factor (SFF) drives in the controller enclosure; scalable up to 48 LFF drives per system with the attachment of ThinkSystem DS Series LFF expansion units (12x LFF drives each) or up to 96 SFF drives per system with the attachment of ThinkSystem DS Series SFF expansion units (24x SFF drives each) to satisfy growing needs for storage capacity and performance.
- Flexibility in storing data on high-performance SAS SSDs, performance-optimized enterprise SAS HDDs, or capacity-optimized enterprise NL SAS HDDs; mixing and matching drive types and form factors within a single system to perfectly meet performance and capacity requirements for various workloads.
- Support for self-encrypting drives (SEDs) to allow clients to secure their sensitive data and to comply with various security regulations, when required.
- Rich set of standard functions available at no extra cost, including virtualized storage pools, snapshots, thin provisioning, rapid RAID rebuild, real-time HDD tiering, SSD read cache, and All Flash Array (AFA).
- Optional licensed functions, including higher number of snapshots for more scalability, real-time SSD tiering for boosting IOPS performance, and asynchronous replication for 24x7 data protection.
- Enhanced streaming performance for video surveillance and media/entertainment applications.
- Integration with Microsoft Volume Shadow Copy Services (VSS) to provide the backup infrastructure for Windows Server and a mechanism for creating consistent point-in-time copies of data (known as shadow copies).
- Intuitive, web-based GUI for easy system set up and management, as well as Command Line Interface (CLI).
- EZ Start configuration wizard to quickly provision storage by creating storage pools, allocating storage space, and mapping hosts in just a few simple steps.
- Designed for 99.999% availability.

The ThinkSystem DS2200 supports the complete range of data storage requirements, from highly used applications to high-capacity, low usage applications.

The following 2.5-inch drives are supported:

- Capacity-optimized solid-state drives (1 drive write per day [DWD]): 3.84 TB, 7.68 TB, and 15.36 TB
- Mainstream solid-state drives (3 DWD): 400 GB, 800 GB, 1.6 TB, and 3.84 TB
- High performance solid-state drives (10 DWD): 400 GB, 800 GB, and 1.6 TB
- High performance self-encrypting solid-state drives (10 DWD): 800 GB
- Performance-optimized, enterprise class disk drives:
 - 300 GB, 600 GB, and 900 GB 15 K rpm
 - 600 GB, 900 GB, 1.2 TB, 1.8 TB, and 2.4 TB 10 K rpm
- Performance-optimized, enterprise class self-encrypting disk drives: 1.2 TB 10 K rpm
- High-capacity, archival-class nearline disk drives: 1 TB and 2 TB 7.2 K rpm

The following 3.5-inch drives are supported:

- High-performance solid-state drives (3 DWD and 10 DWD): 400 GB
- Performance-optimized, enterprise class disk drives: 900 GB 10 K rpm
- High-capacity, archival-class nearline HDDs: 2 TB, 4 TB, 6 TB, 8 TB, 10 TB, and 12 TB 7.2 K rpm
- High-capacity, archival-class nearline self-encrypting disk drives: 4 TB 7.2 K rpm

All drives are dual-port and hot-swappable. Drives of the same form factor can be intermixed within the appropriate enclosure, which provides the flexibility to address performance and capacity needs within a single enclosure.

Up to three ThinkSystem DS Series expansion units are supported by a single ThinkSystem DS2200. Customers can intermix 3.5-inch and 2.5-inch expansion enclosures behind a 3.5-inch or 2.5-inch controller enclosure. This configuration delivers the added flexibility to mix 3.5-inch and 2.5-inch drives within a single system (but not within the enclosure). More drives and expansion enclosures are designed to be dynamically added with virtually no downtime, which helps to quickly and seamlessly respond to ever-growing capacity demands.

The ThinkSystem DS2200 offers high levels of system and data availability with the following technologies:

- Dual-active controller modules with low latency cache mirroring
- Dual-port HDDs and SSDs with automatic drive failure detection and rapid RAID rebuild with global hot spares
- Redundant, hot-swappable and customer replaceable hardware components, including SFP/SFP+ transceivers, controller modules, expansion modules, power and cooling modules, and drives
- Automated path failover support for the data path between the host and the drives with multipathing software
- Non-disruptive controller firmware upgrades for dual controller configurations with multipathing

Components and connectors

The following figure shows the front of the ThinkSystem DS2200 SFF chassis and the DS Series SFF expansion unit.

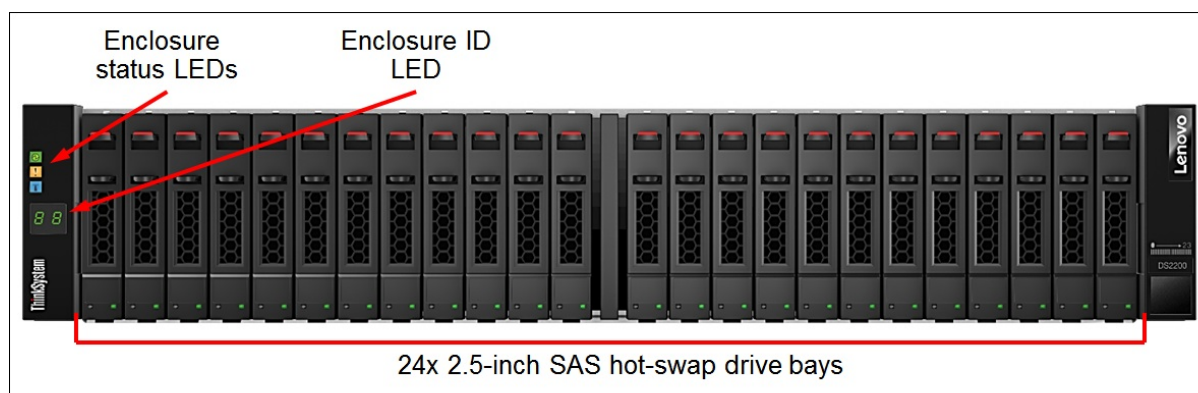


Figure 2. ThinkSystem DS2200 SFF chassis and DS Series SFF expansion unit: Front view

The following figure shows the front of the ThinkSystem DS2200 LFF chassis and the DS Series LFF expansion unit.

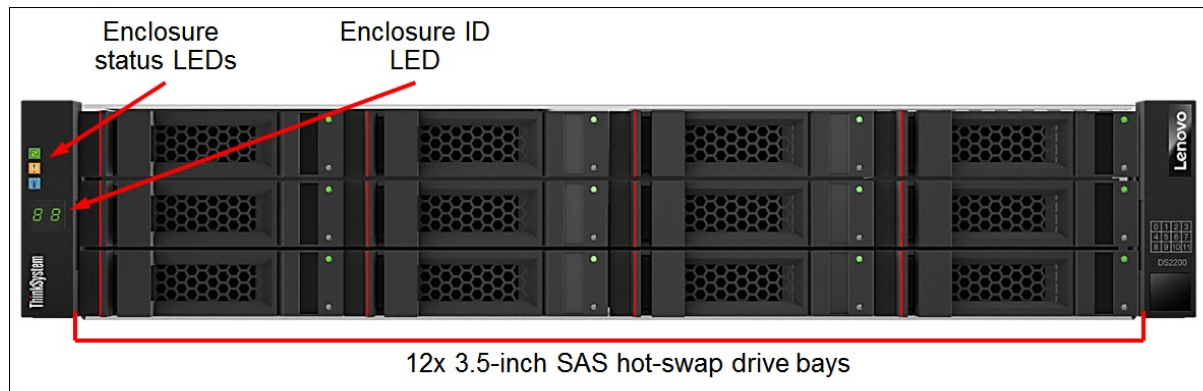


Figure 3. ThinkSystem DS2200 LFF chassis and DS Series LFF expansion unit: Front view

The following figure shows the rear of the ThinkSystem DS2200 with SAS controller modules.

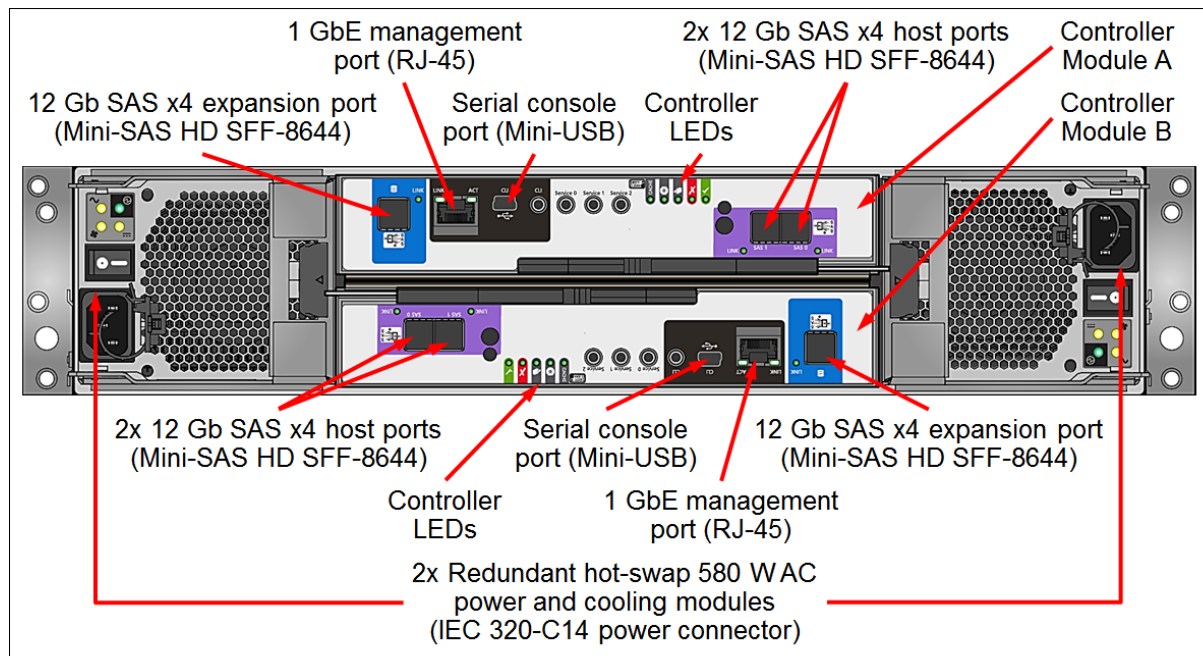


Figure 4. ThinkSystem DS2200 with SAS controller modules: Rear view

The following figure shows the rear view of the ThinkSystem DS2200 with FC/iSCSI controller modules.

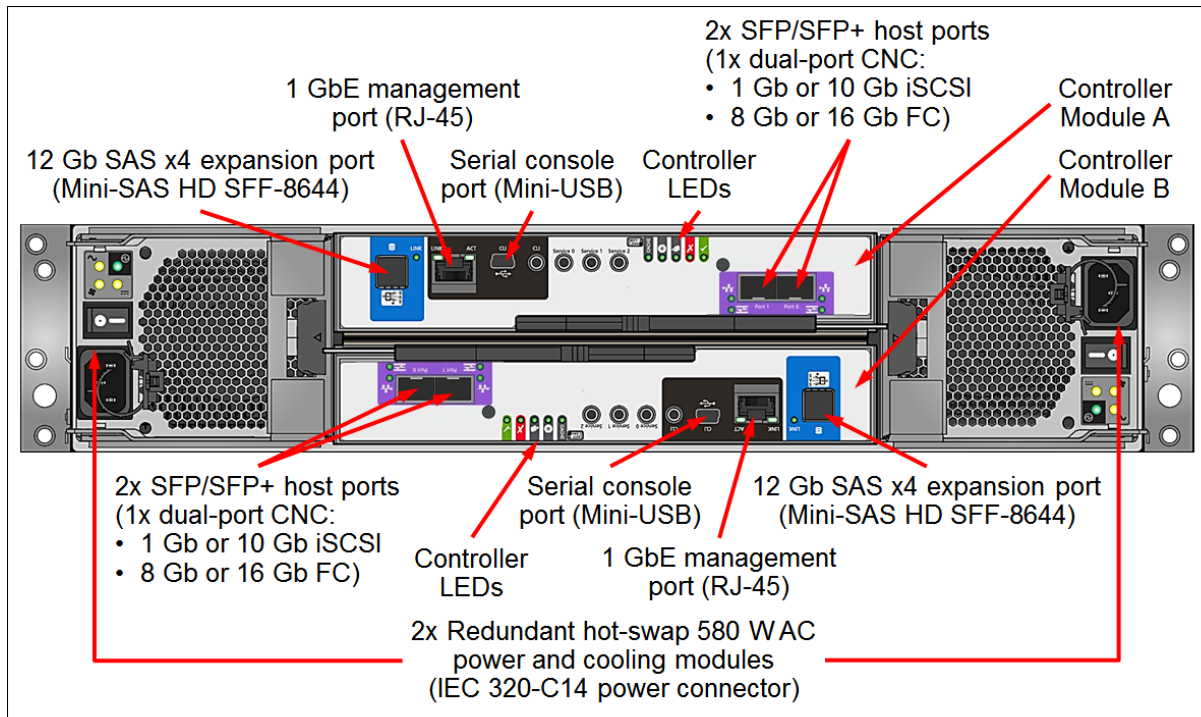


Figure 5. ThinkSystem DS2200 with FC/iSCSI controller modules: Rear view

The following figure shows the rear of the ThinkSystem DS Series expansion unit.

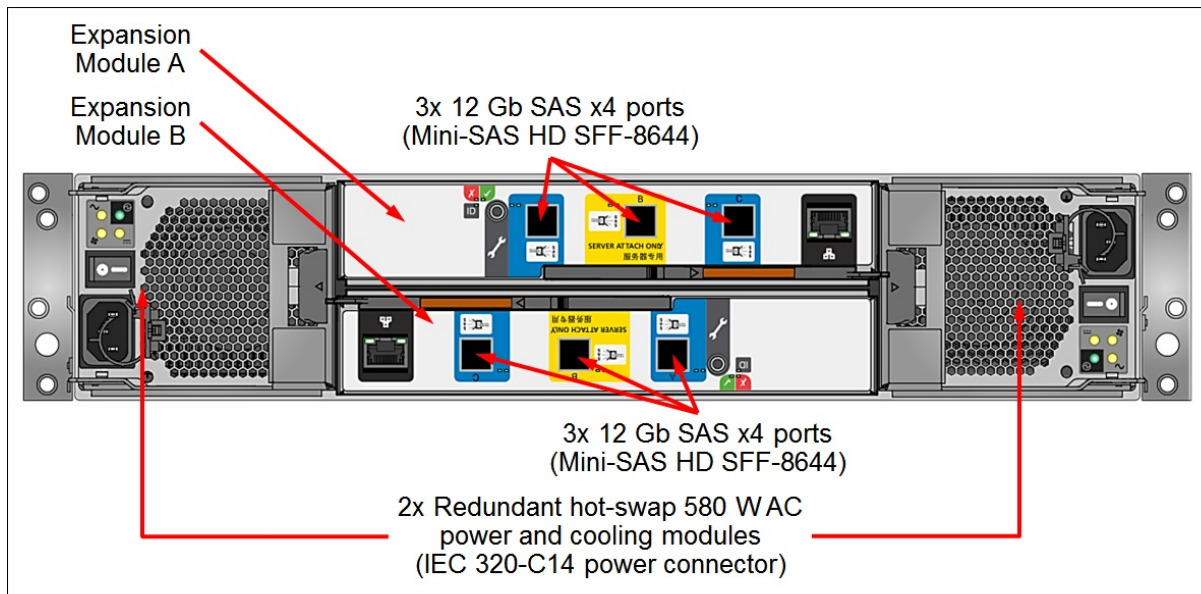


Figure 6. ThinkSystem DS Series expansion unit: Rear view

Note: Port B on the DS Series expansion unit is not used.

System specifications

The following table lists the ThinkSystem DS2200 specifications.

Note: The supported hardware options and software features listed in this product guide are based on the firmware version G265. For details about specific firmware releases that introduced support for certain hardware options and software features, refer to the Release notes of the particular firmware release that can be found at:

<http://datacentersupport.lenovo.com/us/en/products/storage/lenovo-storage/thinksystem-ds2200/downloads>

Table 1. System specifications

Component	Specification
Form factor	<ul style="list-style-type: none"> ThinkSystem DS2200: 2U rack mount (Machine Type 4599) ThinkSystem DS Series Expansion Unit: 2U rack mount (Machine Type 4588)
Controller configuration	<p>Two types of controller modules:</p> <ul style="list-style-type: none"> DS2200 SAS controller module DS2200 FC/iSCSI controller module <p>Dual controller configuration only. Both controllers in the system must be of the same type.</p>
RAID levels	RAID 1, 5, 6, and 10; Rapid Data Protection Technology (ADAPT).
Controller memory	16 GB per system (8 GB per controller module). Battery-free cache protection with flash memory and supercapacitors. Low latency cache mirroring protection for dual controller configurations.
Drive bays	<p>Up to 96 SFF drive bays per storage system:</p> <ul style="list-style-type: none"> 24 SFF drive bays in the DS2200 SFF chassis 24 SFF drive bays in the SFF expansion unit; up to 3 expansion units <p>Up to 48 LFF drive bays per storage system:</p> <ul style="list-style-type: none"> 12 LFF drive bays in the DS2200 LFF chassis 12 LFF drive bays in the LFF expansion unit; up to 3 expansion units <p>Intermix of SFF and LFF enclosures is supported.</p>
Drive technology	SAS and NL SAS HDDs and SEDs, SAS SSDs. Intermix of HDDs and SSDs is supported. Intermix of SEDs with HDDs or SSDs is not supported.
Drive connectivity	<p>Dual-ported 12 Gb SAS drive attachment infrastructure.</p> <p>Controller unit with two controller modules (ports per one controller module):</p> <ul style="list-style-type: none"> 24x 12 Gb SAS internal drive ports (SFF enclosure) 12x 12 Gb SAS internal drive ports (LFF enclosure) 1x 12 Gb SAS x4 (Mini-SAS HD SFF-8644) expansion port for the attachment of the expansion enclosures <p>Expansion unit with two expansion modules (ports per one expansion module):</p> <ul style="list-style-type: none"> 24x 12 Gb SAS internal drive ports (SFF enclosure) 12x 12 Gb SAS internal drive ports (LFF enclosure) 3x 12 Gb SAS x4 (Mini-SAS HD SFF-8644) expansion ports; two of these ports (Ports A and C) are used for the daisy chained attachment of the expansion enclosures; Port B is not used.

Component	Specification
Drives	<p>SFF drives:</p> <ul style="list-style-type: none"> • 300 GB, 600 GB, and 900 GB 15K rpm 12 Gb SAS HDDs • 600 GB, 900 GB, 1.2 TB, 1.8 TB, and 2.4 TB 10K rpm 12 Gb SAS HDDs • 1.2 TB 10K rpm 12 Gb SAS SED HDD • 1 TB and 2 TB 7.2K rpm 12 Gb NL SAS HDDs • 3.84 TB, 7.68 TB, and 15.36 TB SAS SSDs (1 DWD) • 400 GB, 800 GB, 1.6 TB, and 3.84 TB SAS SSDs (3 DWD) • 400 GB, 800 GB, and 1.6 TB SAS SSDs (10 DWD) • 800 GB 12 Gb SAS SED SSD (10 DWD) <p>LFF drives:</p> <ul style="list-style-type: none"> • 900 GB 10K rpm 12 Gb SAS HDDs • 2 TB, 4 TB, 6 TB, 8 TB, 10 TB, and 12 TB 7.2K rpm 12 Gb NL SAS HDDs • 4 TB 7.2K rpm NL 12 Gb SAS SED HDD • 400 GB 12 Gb SAS SSDs (3 DWD and 10 DWD)
Storage capacity	Up to 1.47 PB (96x 15.36 TB 2.5-inch SAS SSDs).
Host connectivity	<p>DS2200 SAS controller module: 2x 12 Gb SAS host ports (Mini-SAS HD, SFF-8644)</p> <p>DS2200 FC/iSCSI controller module: 2x SFP/SFP+ CNC host ports</p> <p>CNC host port options (per controller module):</p> <ul style="list-style-type: none"> • 2x 1 Gb iSCSI SFP (1 Gb speed, UTP, RJ-45) • 2x 10 Gb iSCSI SFP+ (1/10 Gb speeds, SW fiber optics, LC) • 2x 8 Gb FC SFP+ (4/8 Gb speeds, SW fiber optics, LC) • 2x 16 Gb FC SFP+ (4/8/16 Gb speeds, SW fiber optics, LC) • 2x 10 Gb iSCSI SFP+ DAC cables
Host operating systems	Microsoft Windows Server 2012 R2 and 2016; Red Hat Enterprise Linux (RHEL) 6 and 7; SUSE Linux Enterprise Server (SLES) 11 and 12; VMware vSphere 5.5, 6.0, and 6.5.
Standard software features	Intelligent Real-time Tiering for HDDs, Virtualized Storage Pools, Thin Provisioning, SSD Read Cache, Rapid RAID Rebuild, Snapshots (up to 128 targets), All Flash Array.
Optional software features	Intelligent Real-time Tiering for SSDs, Snapshots (up to 1024 targets), Asynchronous Replication.
Performance	<p>Dual controller configuration</p> <ul style="list-style-type: none"> • Up to 100 000 random disk read IOPS • Up to 3.5 GBps sequential disk read throughput • Up to 3.0 GBps sequential disk write throughput

Component	Specification
Configuration maximums	<p>Per system:</p> <ul style="list-style-type: none"> • Maximum number of virtual storage pools: 2 (1 per controller module) • Maximum virtual pool size: 1 PB • Maximum number of logical volumes: 1024 • Maximum logical volume size: 128 TB • Maximum number of drives in a RAID drive group: 16 • Maximum number of RAID drive groups: 32 • Maximum number of drives in an ADAPT drive group: 128 (12 drives minimum) • Maximum number of ADAPT drive groups: 2 (1 per storage pool) • Maximum global spares: 16 • Maximum number of initiators: 4096 (1024 per host port on the controller module) • Maximum number of initiators per host: 128 • Maximum number of host groups: 32 • Maximum number of hosts in a host group: 256 • Maximum number of drives in an SSD read cache drive group: 2 (RAID-0) • Maximum number of SSD read cache drive groups: 2 (1 per storage pool) • Maximum SSD read cache size: 4 TB • Maximum number of snapshots: 1024 (requires an optional license) • Maximum number of replication peers: 4 (requires an optional license) • Maximum number of replication volumes: 32 (requires an optional license)
Cooling	Redundant cooling with two fans built into power and cooling modules (PCMs).
Power supply	Two redundant hot-swap 580 W AC power supplies built into PCMs.
Hot-swap parts	Controller modules, expansion modules, SFP/SFP+ transceivers, drives, PCMs.
Management interfaces	1 GbE port (UTP, RJ-45) and serial port (Mini-USB) on the controller modules. Web-based interface (WBI); Telnet, SSH, or Direct Connect USB CLI; SNMP and email notifications; optional Lenovo XClarity.
Security features	Secure Socket Layer (SSL), Secure Shell (SSH), Secure FTP (sFTP), Self-encrypting drives (SEDs).
Warranty	Three-year customer-replaceable unit and onsite limited warranty with 9x5 next business day response. Optional warranty service upgrades are available through Lenovo: Technician Installed Parts, 24x7 coverage, 2-hour or 4-hour response time, 6-hour or 24-hour committed repair, 1-year or 2-year warranty extensions, YourDrive YourData, installation services.
Dimensions	Height: 88 mm (3.5 in.); width: 443 mm (17.4 in.); depth: 630 mm (24.8 in.)
Weight	<ul style="list-style-type: none"> • SFF controller enclosure (fully configured): 30 kg (66 lb) • SFF expansion enclosure (fully configured): 25 kg (55 lb) • LFF controller enclosure (fully configured): 32 kg (71 lb) • LFF expansion enclosure (fully configured): 28 kg (62 lb)

Controller enclosures

The following table lists the relationship models of the ThinkSystem DS2200.

Table 2. ThinkSystem DS2200 relationship models

Description	Part number
SFF models - FC/iSCSI	
Lenovo ThinkSystem DS2200 SFF FC/iSCSI Dual Controller Unit (US English documentation)	4599A11*
Lenovo ThinkSystem DS2200 SFF FC/iSCSI Dual Controller Unit (Simplified Chinese documentation)	4599A1C^
Lenovo ThinkSystem DS2200 SFF FC/iSCSI Dual Controller Unit (Japanese documentation)	4599A1J**
SFF models - SAS	
Lenovo ThinkSystem DS2200 SFF SAS Dual Controller Unit (US English documentation)	4599A21*
Lenovo ThinkSystem DS2200 SFF SAS Dual Controller Unit (Simplified Chinese documentation)	4599A2C^
Lenovo ThinkSystem DS2200 SFF SAS Dual Controller Unit (Japanese documentation)	4599A2J**
LFF models - FC/iSCSI	
Lenovo ThinkSystem DS2200 LFF FC/iSCSI Dual Controller Unit (US English documentation)	4599A31*
Lenovo ThinkSystem DS2200 LFF FC/iSCSI Dual Controller Unit (Simplified Chinese documentation)	4599A3C^
Lenovo ThinkSystem DS2200 LFF FC/iSCSI Dual Controller Unit (Japanese documentation)	4599A3J**
LFF models - SAS	
Lenovo ThinkSystem DS2200 LFF SAS Dual Controller Unit (US English documentation)	4599A41*
Lenovo ThinkSystem DS2200 LFF SAS Dual Controller Unit (Simplified Chinese documentation)	4599A4C^
Lenovo ThinkSystem DS2200 LFF SAS Dual Controller Unit (Japanese documentation)	4599A4J**

* Available worldwide (except China and Japan).

^ Available only in China.

** Available only in Japan.

The following table lists the TopSeller models of the ThinkSystem DS2200.

Table 3. ThinkSystem DS2200 TopSeller models: Latin America

Description	Part number
DS2200 SFF FC, 4x 16Gb SFPs, 8x 1.2TB HDDs, 4x 5m LC-LC cables	459916A
DS2200 SFF FC, 4x 16Gb SFPs, 14x 1.2TB HDDs, 4x 5m LC-LC cables	459916B

The following table lists the CTO base models for the ThinkSystem DS2200.

Table 4. ThinkSystem DS2200 CTO base models

Description	Machine Type-Model	Feature code
Lenovo ThinkSystem DS2200 SFF Chassis (2x PCMs, no controller modules)	4599-HC2	AU2A
Lenovo ThinkSystem DS2200 LFF Chassis (2x PCMs, no controller modules)	4599-HC1	AU28

Configuration notes:

- For Relationship and TopSeller models, two DS2200 FC/iSCSI or SAS Controller Modules are included in the model configuration.
- For CTO models, two DS2200 FC/iSCSI Controller Modules (feature code AU2G) or DS2200 SAS Controller Modules (feature code AU2F) must be selected during the configuration process, and both modules must be of the same type - either FC/iSCSI or SAS (mixing of FC/iSCSI and SAS controller modules is not supported).

The models of the ThinkSystem DS2200 include the following items:

- One LFF or SFF chassis with the following components:
 - Dual FC/iSCSI or SAS controller modules
 - Two 580 W AC power and cooling modules
- Lenovo Storage 12Gb SAN Rack Mount Kit - Rails 25"-36"
- Lenovo USB A Male-to-Mini-B 1.5m cable
- *Getting Started Guide*
- *Electronic Publications Flyer*
- Two power cables:
 - 1.5m, 10A/100-250V, C13 to IEC 320-C14 rack power cables (Relationship models)
 - 2.8m, 10A/100-250V, C13 to IEC 320-C14 rack power cables (TopSeller models)
 - Customer-configured power cables (CTO models)

Controller modules

The ThinkSystem DS2200 supports dual controller configurations, and the ThinkSystem DS2200 models ship with two controller modules. The following types of controller modules are available:

- DS2200 SAS Controller Modules
- DS2200 FC/iSCSI Controller Modules

DS2200 SAS Controller Modules provide direct SAS attachment for up to two hosts with a supported SAS HBA installed. Each DS2200 SAS Controller Module has two 12 Gb SAS ports with Mini-SAS HD (SFF-8644) connectors.

DS2200 FC/iSCSI Controller Modules provide SAN based iSCSI or FC connectivity to the hosts with a supported software initiator or HBA installed. Each DS2200 FC/iSCSI Controller Module has a built-in Converged Network Controller (CNC) that has two SFP/SFP+ ports.

The CNC supports the following storage connectivity protocols, depending on the SFP/SFP+ transceiver installed or DAC cables attached:

- 1 Gb iSCSI with 1 GbE RJ-45 SFP optical modules
- 1/10 Gb iSCSI with 10 GbE SW SFP+ optical modules with LC connectors
- 10 Gb iSCSI with 10 GbE SFP+ DAC cables
- 4/8 Gb Fibre Channel with 8 Gb FC SW SFP+ optical modules with LC connectors
- 4/8/16 Gb Fibre Channel with 16 Gb FC SW SFP+ optical modules with LC connectors

Notes:

- Both ports on the CNC on the DS2200 FC/iSCSI Controller Module must have the same connectivity type (the same type of SFP/SFP+ modules or DAC cables).
- Both controller modules in the system must be of the same type, and they must have matching port configurations (that is, the ports on both DS2200 FC/iSCSI controller modules must have SFP/SFP+ modules of the same type).

SAS controller modules and FC/iSCSI controller modules have one 12 Gb SAS x4 expansion port (Mini-SAS HD SFF-8644 connector) for the attachment of the ThinkSystem DS Series expansion units.

The following table lists the controller modules and supported connectivity options.

Table 5. Controller modules and connectivity options

Description	Part number	Feature code	Maximum quantity per DS2200
Controller modules			
DS2200 SAS Controller Module	None	AU2F	2^
DS2200 FC/iSCSI Controller Module	None	AU2G	2^
FC and iSCSI controller host connectivity options			
1G RJ-45 iSCSI SFP+ Module 1 pack	00WC086	AT2C	4*
10G SW Optical iSCSI SFP+ Module 1 pack	00WC087	AT2A	4*
8G Fibre Channel SFP+ Module 1 pack	00WC088	AT28	4*
16G Fibre Channel SFP+ Module 1 pack	00WC089	AT29	4*
Cable options for FC and optical iSCSI host connectivity			
Lenovo 1m LC-LC OM3 MMF Cable	00MN502	ASR6	4**
Lenovo 3m LC-LC OM3 MMF Cable	00MN505	ASR7	4**
Lenovo 5m LC-LC OM3 MMF Cable	00MN508	ASR8	4**
Lenovo 10m LC-LC OM3 MMF Cable	00MN511	ASR9	4**
Lenovo 25m LC-LC OM3 MMF Cable	00MN517	ASRB	4**
DAC cable options for 10 Gb iSCSI host connectivity			
Lenovo 1m Passive SFP+ DAC Cable	90Y9427	A1PH	4**
Lenovo 2m Passive SFP+ DAC Cable	00AY765	A51P	4**
Lenovo 3m Passive SFP+ DAC Cable	90Y9430	A1PJ	4**
SAS host connectivity cables - Mini-SAS HD (controller) to Mini-SAS HD (host)			
External MiniSAS HD 8644/MiniSAS HD 8644 0.5M Cable	00YL847	AU16	4**
External MiniSAS HD 8644/MiniSAS HD 8644 1M Cable	00YL848	AU17	4**
External MiniSAS HD 8644/MiniSAS HD 8644 2M Cable	00YL849	AU18	4**
External MiniSAS HD 8644/MiniSAS HD 8644 3M Cable	00YL850	AU19	4**
Cable options for 1 Gb iSCSI and Ethernet management ports			
Lenovo Ethernet CAT5E shielded 6m cable	00WE747	AT1G	6***
Spare cables for serial management ports			
Lenovo USB A Male-to-Mini-B 1.5m cable	00WE746	AT1F	1

^ Factory-installed only, no field upgrade. Relationship models include two controller modules. CTO models require the selection of two controller modules.

* Up to two SFP/SFP+ modules per controller; the modules must be of the same type.

** Up to two cables per controller.

*** Up to three cables per controller: one cable for 1 GbE management port connection; up to two cables for CNC port connections with 1G RJ-45 modules attached.

System upgrades

The ThinkSystem DS2200 can be upgraded to ThinkSystem DS4200 or DS6200 functionality by replacing the DS2200 controller modules with the DS4200 or DS6200 controller modules during a planned offline maintenance window without the need to migrate or move data.

The following table lists the upgrade kit options.

Table 6. Upgrade kit options

Description	Part number	Quantity per DS2200
DS2200 to DS4200 upgrade kits		
Lenovo DS Storage Dual Controller SAS Upgrade Kit-DS2200 to DS4200	4Y37A11115	1
Lenovo DS Storage Dual Controller FC/iSCSI Upgrade Kit-DS2200 to DS4200	4Y37A11114	1
DS2200 to DS6200 upgrade kits		
Lenovo DS Storage Dual Controller SAS Upgrade Kit-DS2200 to DS6200	4Y37A11117	1
Lenovo DS Storage Dual Controller FC/iSCSI Upgrade Kit-DS2200 to DS6200	4Y37A11116	1

Configuration notes:

- Upgrade kits contain two controller modules, a label sheet, and upgrade instructions.
- The upgrade instructions cover the upgrade process that uses the controller modules of the same type: SAS to SAS or FC/iSCSI to FC/iSCSI. It is allowed to perform SAS to FC/iSCSI or FC/iSCSI to SAS upgrade, however, this process requires significant changes in the external connectivity topology and is beyond the scope of the upgrade instructions provided.
- Upgrade kits are for field upgrades of the DS2200 controller enclosures; expansion enclosures cannot be upgraded.
- Only DS2200 *SFF* controller enclosures can be upgraded to DS6200.
- The majority of the system configuration information is *not saved* during the upgrade process, including license keys, and these settings need to be restored/re-configured manually.
- SFPs are *not included* with the FC/iSCSI upgrade kits; re-use the SFPs from the existing DS2200 FC/iSCSI controller modules or purchase required SFPs from Lenovo.
- The system model will change to DS4200 or DS6200, however, the machine type of the controller enclosure will not change (MT 4599).

For more information about the ThinkSystem DS4200 and DS6200 Storage Arrays, including features, capabilities, components, and options, see the following Lenovo Press Product Guides:

- Lenovo ThinkSystem DS4200 Storage Array
<http://lenovopress.com/lp0510>
- Lenovo ThinkSystem DS6200 Storage Array
<http://lenovopress.com/lp0511>

Expansion enclosures

The ThinkSystem DS2200 supports attachment of up to three ThinkSystem DS Series expansion enclosures. Intermix of LFF and SFF enclosures is supported. The enclosures can be added to the system non-disruptively.

The following table lists the relationship models of the ThinkSystem DS Series expansion enclosures.

Table 7. ThinkSystem DS Series Expansion Unit relationship models

Description	Part number
SFF models	
Lenovo ThinkSystem DS Series Dual IOM SFF Expansion Unit (US English documentation)	4588A21*
Lenovo ThinkSystem DS Series Dual IOM SFF Expansion Unit (Simplified Chinese documentation)	4588A2C^
Lenovo ThinkSystem DS Series Dual IOM SFF Expansion Unit (Japanese documentation)	4588A2J**
LFF models	
Lenovo ThinkSystem DS Series Dual IOM LFF Expansion Unit (US English documentation)	4588A11*
Lenovo ThinkSystem DS Series Dual IOM LFF Expansion Unit (Simplified Chinese documentation)	4588A1C^
Lenovo ThinkSystem DS Series Dual IOM LFF Expansion Unit (Japanese documentation)	4588A1J**

* Available worldwide (except China and Japan).

^ Available only in China.

** Available only in Japan.

The following table lists the CTO base models for the DS Series Expansion Units.

Table 8. ThinkSystem DS Series Expansion Unit CTO base models

Description	Machine Type-Model	Feature code
Lenovo ThinkSystem DS Series SFF Expansion Unit (2x PCMs, no IOMs)	4588-HC2	AU26
Lenovo ThinkSystem DS Series LFF Expansion Unit (2x PCMs, no IOMs)	4588-HC1	AU25

Configuration notes:

- For Relationship models, two SAS I/O expansion modules are included in the model configuration.
- For CTO models, two SAS I/O expansion modules (feature code AU2K) must be selected during the configuration process.

The models of the ThinkSystem DS Series Expansion Units include the following items:

- One LFF or SFF chassis with the following components:
 - Dual SAS I/O expansion modules
 - Two 580 W AC power and cooling modules
- Lenovo Storage 12Gb SAN Rack Mount Kit - Rails 25"-36"
- Lenovo USB A Male-to-Mini-B 1.5m cable
- *Getting Started Guide*
- *Electronic Publications Flyer*
- Two power cables:
 - 1.5m, 10A/100-250V, C13 to IEC 320-C14 rack power cables (Relationship models)
 - Customer-configured power cables (CTO models)

Each ThinkSystem DS Series Expansion Unit ships with two SAS I/O expansion modules. Each *expansion module* provides 12 Gb SAS connectivity to the internal drives, and it has three external 12 Gb SAS x4 ports (Mini-SAS HD SFF-8644 connectors labelled Port A, Port B, and Port C) that are used for connections to the ThinkSystem DS2200 and for daisy chaining the expansion enclosures between each other.

The expansion port on the first controller module is connected to the Port A on the first expansion module in the enclosure, and the Port C on the first expansion module in the enclosure is connected to the Port A on the first expansion module in the adjacent enclosure, and so on.

The expansion port on the second controller module is connected to the Port C on the second expansion module in the enclosure, and the Port A on the second expansion module in the enclosure is connected to the Port C on the second expansion module in the adjacent enclosure, and so on.

Note: The Port B on the expansion module is not used.

The expansion enclosure connectivity topology is shown in the following figure.

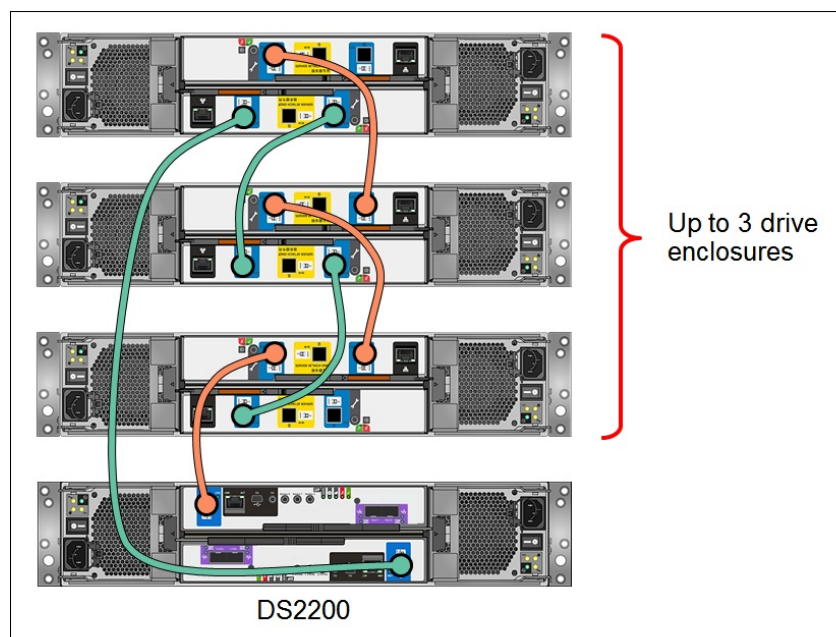


Figure 7. Expansion unit connectivity topology

The following table lists ordering information for the supported expansion enclosure connectivity options.

Table 9. Expansion unit connectivity options

Description	Part number	Feature code	Quantity per one expansion unit
External MiniSAS HD 8644/MiniSAS HD 8644 0.5M Cable	00YL847	AU16	2*
External MiniSAS HD 8644/MiniSAS HD 8644 1M Cable	00YL848	AU17	2*
External MiniSAS HD 8644/MiniSAS HD 8644 2M Cable	00YL849	AU18	2*
External MiniSAS HD 8644/MiniSAS HD 8644 3M Cable	00YL850	AU19	2*

* One cable per expansion module; two cables are required per each expansion enclosure.

Drives

The ThinkSystem DS2200 SFF chassis and the DS Series SFF expansion enclosures support up to 24 SFF hot-swap drives, and the ThinkSystem DS2200 LFF chassis and the DS Series LFF expansion enclosures support up to 12 LFF hot-swap drives.

The following table lists supported drive options for the DS2200 SFF chassis and the DS Series SFF expansion enclosures.

Table 10. SFF drive options

Description	Part number	Feature code	Maximum quantity per SFF enclosure
2.5-inch 12 Gbps SAS hot-swap HDDs			
Lenovo Storage 300GB 15K 2.5" SAS HDD	01DC197	AU1J	24
Lenovo Storage 600GB 10K 2.5" SAS HDD	01DC427	AU1Q	24
Lenovo Storage 600GB 15K 2.5" SAS HDD	01DC192	AU1H	24
Lenovo Storage 900GB 10K 2.5" SAS HDD	01DC417	AU1N	24
Lenovo Storage 900GB 15K 2.5" SAS HDD	01KP040	AVP5	24
Lenovo Storage 1.2TB 10K 2.5" SAS HDD	01DC407	AU1L	24
Lenovo Storage 1.8TB 10K 2.5" SAS HDD	01DC402	AU1K	24
Lenovo Storage 2.4TB 10K 2.5" SAS HDD	4XB7A09101	B103	24
2.5-inch 12 Gbps SAS hot-swap SEDs			
Lenovo Storage 1.2TB 10K 2.5" SAS HDD (SED)	01DC412	AU1M	24
2.5-inch 12 Gbps NL SAS hot-swap HDDs			
Lenovo Storage 1TB 7.2K 2.5" NL-SAS HDD	01DC442	AU1S	24
Lenovo Storage 2TB 7.2K 2.5" NL-SAS HDD	01DC437	AU1R	24
2.5-inch 12 Gbps SAS hot-swap SSDs (1 Drive Write per Day [DWD])			
Lenovo Storage 1.92TB 1DWD 2.5" SAS SSD (1200.2)	4XB7A12067	B30K	24
Lenovo Storage 3.84TB 1DWD 2.5" SAS SSD (1200.2)	01CX632	AV2F	24
Lenovo Storage 3.84TB 1DWD 2.5" SAS SSD (PM1633a)	01KP065	AVPA	24
Lenovo Storage 7.68TB 1DWD 2.5" SAS SSD (PM1633a)	01KP060	AVP9	24
Lenovo Storage 15.36TB 1DWD 2.5" SAS SSD (PM1633a)	4XB7A08817	B104	24
2.5-inch 12 Gbps SAS hot-swap SSDs (3 Drive Writes per Day)			
Lenovo Storage 400GB 3DWD 2.5" SAS SSD	01DC482	AU1V	24
Lenovo Storage 800GB 3DWD 2.5" SAS SSD	01DC477	AU1U	24
Lenovo Storage 1.6TB 3DWD 2.5" SAS SSD	01DC472	AU1T	24
Lenovo Storage 3.84TB 3DWD 2.5" SAS SSD	4XB7A12066	B30J	24
2.5-inch 12 Gbps SAS hot-swap SSDs (10 Drive Writes per Day)			
Lenovo Storage 400GB 10DWD 2.5" SAS SSD	01DC462	AUDK	24
Lenovo Storage 800GB 10DWD 2.5" SAS SSD	01DC452	AUDH	24
Lenovo Storage 1.6TB 10DWD 2.5" SAS SSD	01DC447	AUDG	24
2.5-inch 12 Gbps SAS hot-swap SED SSDs (10 Drive Writes per Day)			
Lenovo Storage 800GB 10DWD 2.5" SAS SSD (SED)	01DC457	AUDJ	24

The following table lists supported drive options for the DS2200 LFF chassis and the DS Series LFF expansion enclosures.

Table 11. LFF drive options

Description	Part number	Feature code	Maximum quantity per LFF enclosure
3.5-inch 12 Gbps SAS hot-swap HDDs			
Lenovo Storage 900GB 10K SAS HDD (2.5" in 3.5" Hybrid Tray)	01DC182	AU1G	12
3.5-inch 12 Gbps NL SAS hot-swap HDDs			
Lenovo Storage 2TB 7.2K 3.5" NL-SAS HDD	00YH993	AU1F	12
Lenovo Storage 4TB 7.2K 3.5" NL-SAS HDD	01DC487	AU1D	12
Lenovo Storage 6TB 7.2K 3.5" NL-SAS HDD	00YG668	AU1C	12
Lenovo Storage 8TB 7.2K 3.5" NL-SAS HDD	00YG663	AU1B	12
Lenovo Storage 10TB 7.2K 3.5" NL-SAS HDD	01DC626	AU3S	12
Lenovo Storage 12TB 7.2K 3.5" NL-SAS HDD	4XB7A09100	B102	12
3.5-inch 12 Gbps NL SAS hot-swap SEDs			
Lenovo Storage 4TB 7.2K 3.5" NL-SAS HDD (SED)	00YG673	AU1E	12
3.5-inch 12 Gbps SAS hot-swap SSDs (3 Drive Writes per Day)			
Lenovo Storage 400GB 3DWD SAS SSD (2.5" in 3.5" Hybrid Tray)	01GV682	AV2H	12
3.5-inch 12 Gbps SAS hot-swap SSDs (10 Drive Writes per Day)			
Lenovo Storage 400GB 10DWD SAS SSD (2.5" in 3.5" Hybrid Tray)	01CX642	AV2G	12

Software

The following functions are included with every ThinkSystem DS2200:

- **Intelligent Real-time Tiering for HDDs:** Storage tiering helps optimize storage use with intelligent data placement to improve system performance, reduce costs, and simplify management. The DS2200 automatically and dynamically moves frequently accessed data to higher performing HDDs in the system without manually creating and managing storage tier policies.
- **All Flash Array (AFA) capability:** Meets the demand for higher speed storage and provide higher IOPs and bandwidth with lower power usage and total cost of ownership than hybrid or HDD-based solutions.
- **Rapid Data Protection Technology (ADAPT):** Helps improve performance and availability with significantly faster rebuild time and built-in spare capacity by allowing data to be distributed across all physical drives in the storage pool (drives do not need to be of the same capacity) and sustaining up to two concurrent drive failures.
- **RAID levels 1, 5, 6, and 10:** Provide the flexibility to choose the level of data protection required.
- **Virtualized storage pools:** Enables rapid, flexible storage provisioning and simple configuration changes. Stored data is distributed across all drive groups in the pool (wide striping) which helps improve performance, lower latency, and achieve higher volume capacities. When a new drive group is added to the pool, the system performs automatic rebalancing to utilize all drives in the pool for better performance.
- **Thin provisioning:** Optimizes efficiency by allocating drive storage space in a flexible manner among multiple applications, based on the minimum space required by each application at any given time. With thin provisioning, applications consume only the space they are actually using, not the total space that has been allocated to them, which allows clients to purchase storage they need today and add more as application requirements grow.

- **SSD Read Cache:** An extension of the controller's cache to improve performance of read-centric workloads
- **Rapid RAID Rebuild:** Helps significantly decrease the time to recover lost data by only rebuilding the stripe where the corruption occurred, not the empty space or other stripes
- **Snapshots:** Enables creation of copies of data for backup, parallel processing, testing, and development, and have the copies available almost immediately. Base software supports up to 128 snapshot targets per system.

The ThinkSystem DS2200 capabilities can be expanded with optional licensed functions.

Optional licensed functions include:

- **Intelligent Real-time Tiering for SSDs:** The SSD tiering upgrade option allows the use of SSDs as read and write storage in the hybrid HDD and SSD storage configurations. Also, this option makes it easy and economical to deploy hybrid storage by dynamically moving frequently accessed data to SSDs in the system, resulting in flash drive performance without manually creating and managing storage tier policies.
- **Snapshots upgrade:** The snapshot upgrade options increase the supported number of snapshot targets to 512 or 1024 per system.
- **Asynchronous Replication:** The asynchronous replication feature provides storage system-based data replication between primary (local) and secondary (remote) systems by using asynchronous data transfers over IP (iSCSI) or Fibre Channel communication links. The secondary system can be a replication target for up to four primary systems.

The replication is performed manually or at predetermined schedule with at least 60 minutes between consecutive runs. For ultimate flexibility, DS2200 asynchronous replication interoperates with the ThinkSystem DS4200 and DS6200, as well as Lenovo Storage S2200 and S3200.

The asynchronous replication option must be acquired (or licensed) for both primary and secondary systems.

The following table lists the Feature on Demand (FoD) upgrades for the ThinkSystem DS2200 to enable optional software features. Each optional DS2200 function is licensed on a per-system basis and covers both controller enclosure and all attached expansion units.

Table 12. Optional software features

Description	Part number	Feature code
512 Snapshot Upgrade License	01GV559	AWGM
1024 Snapshot Upgrade License	01GV560	AWGN
SSD Data Tiering License	01GV561	AWGP
Asynchronous Replication License	01GV562	AWGQ

Configuration notes:

- The SSD Data Tiering Upgrade option is not required for all flash array configurations (a storage system with SSDs only; no HDDs installed) and for hybrid configurations (a storage system with SSDs and HDDs) in which SSDs are used exclusively for SDD read cache; however, it is required for *any other* hybrid configuration (a storage system with SSDs and HDDs) even when the SSD storage tiering is not used.
- Asynchronous Replication requires an FC/iSCSI Controller-based DS2200 storage unit.

Software maintenance for standard software features is included in the ThinkSystem DS2200 base warranty and optional warranty extensions, which provides 3-year software support with the option to extend it up to 5 years in 1-year or 2-year increments (see [Warranty services and upgrades](#) for details).

Optional software features include 3-year software maintenance with the ability to extend it up to 5 years in 1-year or 2-year increments with the purchase of the software maintenance extension options that are listed in the following table.

Note: The ThinkSystem DS2200 must have active warranty coverage for the duration of an intended software maintenance extension period.

Table 13. Software maintenance extension options

Description	Part number	Feature code
512 Snapshot Upgrade Maintenance 1 Year	00WF825	ATT4
512 Snapshot Upgrade Maintenance 2 Years	00WF829	ATT5
1024 Snapshot Upgrade Maintenance 1 Year	00WF833	ATT6
1024 Snapshot Upgrade Maintenance 2 Years	00WF837	ATT7
SSD Data Tiering Maintenance 1 Year	00WF841	ATT8
SSD Data Tiering Maintenance 2 Years	00WF845	ATT9
Asynchronous Replication Maintenance 1 Year	00YG680	ATTA
Asynchronous Replication Maintenance 2 Years	00YG684	ATTB

Management

The ThinkSystem DS2200 supports the following management interfaces:

- Lenovo Storage Management Console (SMC), a web-based interface (WBI) via HTTP, that requires only a supported browser (Microsoft Internet Explorer, Google Chrome, or Mozilla Firefox), so there is no need for a separate console or plug-in.
- Command line interface (CLI) via Telnet or SSH or through Direct Connect USB.
Note: Direct Connect USB may require device drivers on the connected computer that uses older Windows operating systems. Drivers are provided on the Lenovo support site, if needed.
- SNMP and e-mail notifications.
- Optional Lenovo XClarity for discovery, inventory, monitoring, alerts, and firmware updates.

Power supplies and cables

The ThinkSystem DS2200 and DS Series enclosures have two redundant hot-swap 580 W AC power supplies, each with an IEC 320-C14 connector.

The relationship models of the ThinkSystem DS2200 and DS Series enclosures ship standard with two 1.5m, 10A/100-250V, C13 to IEC 320-C14 rack power cables. The CTO models require the selection of two power cables.

The part numbers and feature codes to order the power cables are listed in the following table (two power cables should be ordered per each enclosure, if needed).

Table 14. Power cable options

Description	Part number	Feature code
Rack power cables		
1.2m, 10A/100-250V, 2 Short C13s to Short C14 Rack Power Cable	47C2487	A3SS
1.2m, 16A/100-250V, 2 Short C13s to Short C20 Rack Power Cable	47C2491	A3SW
1.5m, 10A/100-250V, C13 to IEC 320-C14 Rack Power Cable	39Y7937	6201
2.5m, 10A/100-250V, 2 Long C13s to Short C14 Rack Power Cable	47C2488	A3ST
2.5m, 16A/100-250V, 2 Long C13s to Short C20 Rack Power Cable	47C2492	A3SX
2.8m, 10A/100-250V, 2 Short C13s to Long C14 Rack Power Cable	47C2489	A3SU
2.8m, 10A/100-250V, C13 to IEC 320-C14 Rack Power Cable	4L67A08366	6311
2.8m, 10A/100-250V, C13 to IEC 320-C20 Rack Power Cable	39Y7938	6204
2.8m, 16A/100-250V, 2 Short C13s to Long C20 Rack Power Cable	47C2493	A3SY
4.1m, 10A/100-250V, 2 Long C13s to Long C14 Rack Power Cable	47C2490	A3SV
4.1m, 16A/100-250V, 2 Long C13s to Long C20 Rack Power Cable	47C2494	A3SZ
4.3m, 10A/100-250V, C13 to IEC 320-C14 Rack Power Cable	39Y7932	6263
Country-specific line cords		
Argentina 10A/250V C13 to IRAM 2073 2.8m line cord	39Y7930	6222
Australia/NZ 10A/250V C13 to AS/NZ 3112 2.8m line cord	39Y7924	6211
Brazil 10A/250V C13 to NBR 14136 2.8m line cord	69Y1988	6532
China 10A/250V C13 to GB 2099.1 2.8m line cord	39Y7928	6210
Denmark 10A/250V C13 to DK2-5a 2.8m line cord	39Y7918	6213
European 10A/230V C13 to CEE7-VII 2.8m line cord	39Y7917	6212
Denmark/Switzerland 10A/230V C13 to IEC 309 P+N+G 2.8m line cord	None*	6377
India 10A/250V C13 to IS 6538 2.8m line cord	39Y7927	6269
Israel 10A/250V C13 to SI 32 2.8m line cord	39Y7920	6218
Italy 10A/250V C13 to CEI 23-16 2.8m line cord	39Y7921	6217
Japan 12A/125V C13 to JIS C-8303 2.8m line cord	46M2593	A1RE
Korea 12A/250V C13 to KETI 2.8m line cord	39Y7925	6219
South Africa 10A/250V C13 to SABS 164 2.8m line cord	39Y7922	6214
Switzerland 10A/250V C13 to SEV 1011-S24507 2.8m line cord	39Y7919	6216
Taiwan 15A/125V C13/CNS 10917 2.8m line cord	00CG267	6402
United Kingdom 10A/250V C13 to BS 1363/A 2.8m line cord	39Y7923	6215
United States 10A/125V C13 to NEMA 5-15P 4.3m line cord	39Y7931	6207
United States 10A/250V C13 to NEMA 6-15P 2.8m line cord	46M2592	A1RF

* CTO only.

Physical specifications

The ThinkSystem DS2200 and DS Series enclosures have the following dimensions and weight (approximate):

- Height: 88 mm (3.5 in.)
- Width: 443 mm (17.4 in.)
- Depth: 630 mm (24.8 in.)
- Weight
 - SFF controller enclosure (fully configured): 30 kg (66 lb)
 - SFF expansion enclosure (fully configured): 25 kg (55 lb)
 - LFF controller enclosure (fully configured): 32 kg (71 lb)
 - LFF expansion enclosure (fully configured): 28 kg (62 lb)

Operating environment

The ThinkSystem DS2200 and DS Series enclosures are supported in the following environment:

- Air temperature:
 - Operating:
 - Controller enclosure: 5 °C to 35 °C (41 °F to 95 °F)
 - Expansion enclosure: 5 °C to 40 °C (41 °F to 104 °F)
 - Storage: -40 °C to +60 °C (-40 °F to 140 °F)
 - Maximum altitude: 3045 m (10000 ft)
- Humidity:
 - Operating: 20% to 80% (non-condensing)
 - Storage: 5% to 100% (no precipitation)
- Electrical:
 - 100 to 127 (nominal) V AC; 50 Hz or 60 Hz; 6.11 A
 - 200 to 240 (nominal) V AC; 50 Hz or 60 Hz; 3.05 A
- BTU output: 1979 BTU/hr (580 W)
- Noise level: 6.6 bels

Warranty services and upgrades

The ThinkSystem DS2200 and DS Series enclosures have a three-year customer-replaceable unit (CRU) and onsite (for field-replaceable units [FRUs] only) limited warranty with standard call center support during normal business hours and 9x5 Next Business Day Parts Delivered.

Some countries might have different warranty terms and conditions than the standard warranty. This is due to local business practices or laws in the specific country. Local service teams can assist in explaining country-specific terms when needed. Examples of country-specific warranty terms are second or longer business day parts delivery or parts-only base warranty.

If warranty terms and conditions include onsite labor for repair or replacement of parts, Lenovo will dispatch a service technician to the customer site to perform the replacement. Onsite labor under base warranty is limited to labor for replacement of parts that have been determined to be field-replaceable units (FRUs). Parts that are determined to be customer-replaceable units (CRUs) do not include onsite labor under base warranty.

If warranty terms include parts-only base warranty, Lenovo is responsible for delivering only replacement parts that are under base warranty (including FRUs) that will be sent to a requested location for self-service. Parts-only service does not include a service technician being dispatched onsite. Parts must be changed at customer's own cost and labor and defective parts must be returned following the instructions supplied with the spares parts.

Also available are Lenovo Services warranty upgrades and post-warranty maintenance agreements, with a well-defined scope of services, including service hours, response time, term of service, and service agreement terms and conditions.

Lenovo warranty service upgrade offerings are country-specific. Not all warranty service upgrades are available in every country. For information about Lenovo warranty service upgrade offerings that are available in your country or area, refer to the following resources:

- Service part numbers in Lenovo Data Center Solution Configurator (DCSC):
<http://dcsc.lenovo.com/#/services>
- Lenovo Services Availability Locator
<https://lenovolocator.com/>

In general, the following Lenovo warranty service upgrades are available:

- Warranty and maintenance service upgrades:
 - 3, 4, or 5 years of warranty service coverage
 - 1-year or 2-year post-warranty extensions
 - Foundation Service: 9x5 service coverage with next business day onsite response
 - Essential Service: 24x7 service coverage with 4-hour onsite response or 24-hour committed repair (available only in select countries)
 - Advanced Service: 24x7 service coverage with 2-hour onsite response or 6-hour committed repair (available only in select countries)
- Premier Support
Premier Support service offers single point of contact for end-to-end problem resolution and collaborative third-party software support with direct access to Lenovo's most advanced technicians for faster troubleshooting.
- YourDrive YourData
Lenovo's YourDrive YourData service (where applicable) is a multi-drive retention offering that ensures your data is always under your control, regardless of the number of drives that are installed in your Lenovo server. In the unlikely event of a drive failure, you retain possession of your drive while Lenovo replaces the failed drive part. Your data stays safely on your premises, in your hands. The YourDrive YourData service can be purchased in convenient bundles with Foundation, Essential, or Advanced Service upgrades and extensions.
- Hardware Installation Services
Lenovo experts can seamlessly manage the physical installation of your server, storage, or networking hardware. Working at a time convenient for you (business hours or off shift), the technician will unpack and inspect the systems on your site, install options, mount in a rack cabinet, connect to power and network, check and update firmware to the latest levels, verify operation, and dispose of the packaging, allowing your team to focus on other priorities.

For service definitions, country-specific details, and service limitations, please refer to the following documents:

- Lenovo Statement of Limited Warranty for Data Center Group (DCG) Servers and System Storage
<http://pcsupport.lenovo.com/us/en/solutions/ht503310>
- Lenovo Data Center Services Agreement
<http://support.lenovo.com/us/en/solutions/ht116628>

Regulatory compliance

The ThinkSystem DS2200 and DS Series enclosures conform to the following regulations:

- BSMI CNS 13438, Class A; CNS 14336-1 (Taiwan)
- CCC GB 4943.1, GB 17625.1, GB 9254 Class A (China)
- CE Mark (European Union)
- EAC (Russia)
- EN55032, Class A
- EN55024
- FCC Part 15, Class A (United States)
- ICES-003/NMB-03, Class A (Canada)
- IEC/EN60950-1
- MSIP (Korea)
- NOM-019 (Mexico)
- RCM (Australia)
- Reduction of Hazardous Substances (ROHS)
- UL/CSA IEC 60950-1
- VCCI, Class A (Japan)

Interoperability

Lenovo provides end-to-end storage compatibility testing to deliver interoperability throughout the network. The ThinkSystem DS2200 supports attachment to Lenovo ThinkSystem, System x, ThinkServer, and Flex System hosts by using SAS, iSCSI, or Fibre Channel storage connectivity protocols.

For end-to-end storage configuration support, refer to the Lenovo ThinkSystem DS2200 Interoperability Matrix that can be found on the ThinkSystem DS2200 Documentation page:

<http://datacentersupport.lenovo.com/us/en/products/storage/lenovo-storage/thinksystem-ds2200/documentation>

The following sections list adapters and Ethernet LAN and FC SAN switches that are currently offered by Lenovo that can be used with the ThinkSystem DS2200 in storage solutions:

- [Adapters](#)
- [Ethernet LAN switches](#)
- [Fibre Channel SAN switches](#)

Note: Tables that are provided in these sections are for ordering reference purposes only. End-to-end storage configuration support *must* be verified through the Lenovo ThinkSystem DS2200 Interoperability Matrix.

Adapters

This section lists the adapters for the following types of storage connectivity:

- SAS connectivity
- iSCSI connectivity
- Fibre Channel connectivity

SAS connectivity

The following table lists currently available SAS adapters for Lenovo servers that are compatible with the ThinkSystem DS2200 SAS storage (direct attach).

Table 15. SAS adapters

Description	Part number
ThinkSystem SAS HBAs	
ThinkSystem 430-8e SAS/SATA 12Gb HBA	7Y37A01090
ThinkSystem 430-16e SAS/SATA 12Gb HBA	7Y37A01091
System x SAS HBAs	
N2225 SAS/SATA HBA (12Gb)	00AE912
N2226 SAS/SATA HBA (12Gb)	00AE916
ThinkServer SAS HBAs	
ThinkServer 9300-8e PCIe 12Gb 8 Port External SAS Adapter by LSI	4XB0F28703

iSCSI connectivity

The ThinkSystem DS2200 supports iSCSI attachments via standard 1 Gb or 10 Gb Ethernet connections (direct or switch-based). Any compatible Ethernet switch, including Lenovo RackSwitch Ethernet switches and integrated Flex System Ethernet I/O modules, can be used to provide iSCSI connectivity for the ThinkSystem DS2200 storage.

With software iSCSI initiators, any supported 1 Gb Ethernet or 10 Gb Ethernet adapter for Lenovo servers is compatible with the ThinkSystem DS2200 iSCSI storage.

Currently available converged iSCSI adapters for Lenovo servers that are compatible with the ThinkSystem DS2200 are listed in the following table. Other converged iSCSI HBAs also might be supported (see the Interoperability Matrix for details).

Table 16. Converged iSCSI adapters

Description	Part number
System x converged adapters (iSCSI only)	
Emulex VFA5 ML2 Dual Port 10GbE SFP+ Adapter (Requires 00D8544)	00D1996
QLogic 8200 Dual Port 10GbE SFP+ VFA (Requires 00Y5624)	90Y4600
System x FoD upgrades required for iSCSI support	
Emulex VFA5 ML2 FCoE/iSCSI License (FoD) (For 00D1996)	00D8544
QLogic 8200 VFA FCoE/iSCSI License (FoD) (For 90Y4600)	00Y5624
ThinkServer converged adapters (iSCSI only)	
ThinkServer OCe14102-UX-L PCIe 10Gb 2 Port SFP+ CNA by Emulex	4XC0F28736
ThinkServer OCm14102-UX-L AnyFabric 10Gb 2 Port SFP+ CNA by Emulex	4XC0F28743
ThinkServer OCm14104-UX-L AnyFabric 10Gb 4 Port SFP+ CNA by Emulex	4XC0F28744
Flex System converged adapters (iSCSI only)	
Flex System CN4022 2-port 10Gb Converged Adapter	88Y5920
Flex System CN4052 2-port 10Gb Virtual Fabric Adapter (Requires 00JY804)	00JY800
Flex System CN4054R 10Gb Virtual Fabric Adapter (Requires 90Y3558)	00Y3306

Description	Part number
Flex System CN4058S 8-port 10Gb Virtual Fabric Adapter (Requires 94Y5164)	94Y5160
Flex System FoD upgrades required for iSCSI support	
Flex System CN4052 Virtual Fabric Adapter SW Upgrade (FoD) (For 00JY800)	00JY804
Flex System CN4054 Virtual Fabric Adapter Upgrade (FoD) (For 00Y3306)	90Y3558
Flex System CN4058S Virtual Fabric Adapter SW Upgrade (FoD) (For 94Y5160)	94Y5164

Fibre Channel connectivity

The ThinkSystem DS2200 supports direct FC attachments and FC switch-based attachments. Lenovo B Series and DB Series FC SAN switches and directors can be used to provide FC connectivity.

Currently available FC adapters for Lenovo servers that are compatible with the ThinkSystem DS2200 FC storage are listed in the following table. Other FC HBAs also might be supported (see the Interoperability Matrix for details).

Table 17. Fibre Channel adapters

Description	Part number
ThinkSystem HBAs: 32 Gb FC	
ThinkSystem Emulex LPe32000-M2-L PCIe 32Gb 1-Port SFP+ Fibre Channel Adapter	7ZT7A00517
ThinkSystem Emulex LPe32002-M2-L PCIe 32Gb 2-Port SFP+ Fibre Channel Adapter	7ZT7A00519
ThinkSystem QLogic QLE2740 PCIe 32Gb 1-Port SFP+ Fibre Channel Adapter	7ZT7A00516
ThinkSystem QLogic QLE2742 PCIe 32Gb 2-Port SFP+ Fibre Channel Adapter	7ZT7A00518
System x HBAs: 16 Gb FC	
Emulex 16Gb FC Single-port HBA	81Y1655
Emulex 16Gb FC Dual-port HBA	81Y1662
Emulex 16Gb Gen6 FC Single-port HBA	01CV830
Emulex 16Gb Gen6 FC Dual-port HBA	01CV840
QLogic 16Gb FC Single-port HBA	00Y3337
QLogic 16Gb FC Dual-port HBA	00Y3341
QLogic 16Gb Enhanced Gen5 FC Single-port HBA	01CV750
QLogic 16Gb Enhanced Gen5 FC Dual-port HBA	01CV760
System x HBAs: 8 Gb FC	
Emulex 8Gb FC Single-port HBA	42D0485
Emulex 8Gb FC Dual-port HBA	42D0494
QLogic 8Gb FC Single-port HBA	42D0501
QLogic 8Gb FC Dual-port HBA	42D0510
ThinkServer HBAs: 16 Gb FC	
ThinkServer LPe16000B Single Port 16Gb FC HBA by Emulex	4XB0F28653
ThinkServer LPe16002B-M6-L PCIe 16Gb 2 Port FC HBA by Emulex	4XB0F28705
ThinkServer LPm16002-M6-L AnyFabric 16Gb 2 Port FC HBA by Emulex	4XB0F28706
ThinkServer HBAs: 8 Gb FC	
ThinkServer LPe12002 PCIe 8Gb 2 Port FC HBA by Emulex	0C19478
ThinkServer LPm15004-M8-L AnyFabric 8Gb 4 Port FC HBA by Emulex	4XB0F28707

Description	Part number
Flex System HBAs: 16 Gb FC	
ThinkSystem Emulex LPm16002B-L Mezz 16Gb 2-Port Fibre Channel Adapter	7ZT7A00521
ThinkSystem Emulex LPm16004B-L Mezz 16Gb 4-Port Fibre Channel Adapter	7ZT7A00522
ThinkSystem QLogic QML2692 Mezz 16Gb 2-Port Fibre Channel Adapter	7ZT7A00520
Flex System FC5052 2-port 16Gb FC Adapter	95Y2386
Flex System FC5054 4-port 16Gb FC Adapter	95Y2391
Flex System FC5172 2-port 16Gb FC Adapter	69Y1942
Flex System HBAs: 8 Gb FC	
Flex System FC3052 2-port 8Gb FC Adapter	95Y2375
Flex System FC3172 2-port 8Gb FC Adapter	69Y1938

Ethernet LAN switches

The following table lists currently available Ethernet rack-mount switches that are currently offered by Lenovo that can be used with the ThinkSystem DS2200 in storage solutions.

Table 18. Ethernet rack-mount switches

Description	Part number
1 Gb Ethernet (iSCSI connectivity)	
Lenovo RackSwitch G7028 (Rear to Front)	7159BAX
Lenovo RackSwitch G7052 (Rear to Front)	7159CAX
Lenovo RackSwitch G8052 (Rear to Front)	7159G52
10 Gb Ethernet (iSCSI connectivity)	
Lenovo ThinkSystem NE1032 RackSwitch (Rear to Front)	7159A1X
Lenovo ThinkSystem NE1032T RackSwitch (Rear to Front)	7159B1X
Lenovo ThinkSystem NE1072T RackSwitch (Rear to Front)	7159C1X
Lenovo RackSwitch G8124E (Rear to Front)	7159BR6
Lenovo RackSwitch G8264 (Rear to Front)	7159G64
Lenovo RackSwitch G8264CS (Rear to Front)	7159DRX
Lenovo RackSwitch G8272 (Rear to Front)	7159CRW
Lenovo RackSwitch G8296 (Rear to Front)	7159GR6

For more information, see the list of Product Guides in the Top-of-Rack Switches category:

<http://lenovopress.com/servers/options/switches#rt=product-guide>

The following table lists currently available Ethernet embedded switches and pass-thru modules for Flex System that can be used with the ThinkSystem DS2200 in storage solutions.

Table 19. Ethernet embedded switches for Flex System

Description	Part number
1 Gb Ethernet (iSCSI connectivity)	
Lenovo Flex System EN2092 1Gb Ethernet Scalable Switch	49Y4294
10 Gb Ethernet (iSCSI connectivity)	
Lenovo Flex System SI4091 10Gb System Interconnect Module	00FE327
Lenovo Flex System Fabric SI4093 System Interconnect Module	00FM518
Lenovo Flex System Fabric EN4093R 10Gb Scalable Switch	00FM514
Lenovo Flex System Fabric CN4093 10Gb Converged Scalable Switch	00FM510
Lenovo Flex System EN4023 10Gb Scalable Switch	94Y5212
Cisco Nexus B22 Fabric Extender for Flex System*	94Y5350
Cisco Nexus B22 Fabric Extender with FET bundle for Flex System*	94Y5355
Pass-thru modules (iSCSI connectivity; require a compatible external switch)	
Lenovo Flex System EN4091 10Gb Ethernet Pass-thru	88Y6043

* Requires a supported Cisco Nexus top of rack switch.

For more information, see the list of Product Guides in the Blade Network Modules category:
<http://lenovopress.com/servers/blades/networkmodule#rt=product-guide>

Fibre Channel SAN switches

The following table lists currently available Fibre Channel rack-mount switches that are currently offered by Lenovo that can be used with the ThinkSystem DS2200 in storage solutions.

Table 20. Fibre Channel rack-mount switches

Description	Part number
8 Gb FC	
Lenovo B300, 8 ports activated, 8x 8Gb SWL SFPs, 1 PS, Rail Kit	3873AR3
Lenovo B6505, 12 ports activated, 12x 8Gb SWL SFPs, 1 PS, Rail Kit	3873AR4
Lenovo B6510, 24 ports activated, 24x 8Gb SWL SFPs, 2 PS, Rail Kit	3873BR2
16 Gb FC	
Lenovo ThinkSystem DB610S, 8 ports activated, 8x 16Gb SWL SFPs, 1 PS, Rail Kit	6559D2Y
Lenovo ThinkSystem DB610S, 24 ports activated, 24x 16Gb SWL SFP, Enterprise SW, 1 PS, Rail Kit	6559D1Y
Lenovo B6505, 12 ports activated w/ 16Gb SWL SFPs, 1 PS, Rail Kit	3873AR5
Lenovo B6510, 24 ports activated w/ 16Gb SWL SFPs, 2 PS, Rail Kit	3873BR3
32 Gb FC	
Lenovo ThinkSystem DB610S, 8 ports activated, 1 PS, Rail Kit	6559D3Y
Lenovo ThinkSystem DB620S, 24 Ports Activated, 24x 32Gb SWL SFPs, 2 PS, Rail Kit	6415G11
Lenovo ThinkSystem DB620S, 48 Ports Activated, 48x 32Gb SWL SFPs, 2 PS, Rail Kit	6415G2A
Lenovo ThinkSystem DB400D 32Gb FC Director, up to 192 ports, 8U, Enterprise SW	6684B2A
Lenovo ThinkSystem DB800D 32Gb FC Director, up to 384 ports, 14U, Enterprise SW	6682B1A

For more information, see the list of Product Guides in the Rack SAN Switches category:
<http://lenovopress.com/storage/switches/rack#rt=product-guide>

The following table lists currently available Fibre Channel embedded switches and pass-thru modules for Flex System that can be used with the ThinkSystem DS2200 in storage solutions.

Table 21. Fibre Channel embedded switches for Flex System

Description	Part number
8 Gb FC	
Lenovo Flex System FC3171 8Gb SAN Switch	69Y1930
16 Gb FC	
Lenovo Flex System FC5022 16Gb SAN Scalable Switch	88Y6374
Lenovo Flex System FC5022 24-port 16Gb SAN Scalable Switch (includes two 16 Gb SFPs)	00Y3324
Lenovo Flex System FC5022 24-port 16Gb ESB SAN Scalable Switch	90Y9356
Pass-thru modules (require a compatible external switch)	
Lenovo Flex System FC3171 8Gb SAN Pass-thru	69Y1934

For more information, see the list of Product Guides in the Blade Storage Modules category:
<http://lenovopress.com/servers/blades/storagemodule#rt=product-guide>

Operating systems

The ThinkSystem DS2200 supports host attachments to the Lenovo servers running the following operating systems:

- Microsoft:
 - Microsoft Windows Server 2016
 - Microsoft Windows Server 2012 R2
- Red Hat:
 - Red Hat Enterprise Linux 7 Update 3
 - Red Hat Enterprise Linux 7 Update 2
 - Red Hat Enterprise Linux 7
 - Red Hat Enterprise Linux 6 Update 8
 - Red Hat Enterprise Linux 6 Update 7
- SUSE:
 - SUSE Linux Enterprise Server 12 SP2
 - SUSE Linux Enterprise Server 12 SP1
 - SUSE Linux Enterprise Server 12
 - SUSE Linux Enterprise Server 11 SP4
- VMware:
 - VMware vSphere 6.5
 - VMware vSphere 6.0 Update 3
 - VMware vSphere 6.0 Update 2
 - VMware vSphere 6.0 Update 1
 - VMware vSphere 6.0
 - VMware vSphere 5.5 Update 3
 - VMware vSphere 5.5 Update 2
 - VMware vSphere 5.5

Rack cabinets

The following table lists the rack cabinets that are currently offered by Lenovo that can be used with the DS2200 in storage solutions.

Table 22. Rack cabinets

Description	Part number
25U S2 Standard Rack (1000 mm deep; 2 sidewall compartments)	93072RX
25U Static S2 Standard Rack (1000 mm deep; 2 sidewall compartments)	93072PX
42U S2 Standard Rack (1000 mm deep; 6 sidewall compartments)	93074RX
42U 1100mm Enterprise V2 Dynamic Rack (6 sidewall compartments)	93634PX
42U 1100mm Enterprise V2 Dynamic Expansion Rack (6 sidewall compartments)	93634EX
42U 1200mm Deep Dynamic Rack (6 sidewall compartments)	93604PX
42U 1200mm Deep Static Rack (6 sidewall compartments)	93614PX
42U Enterprise Rack (1105 mm deep; 4 sidewall compartments)	93084PX
42U Enterprise Expansion Rack (1105 mm deep; 4 sidewall compartments)	93084EX

For more information, see the list of Product Guides in the Rack cabinets category:

<http://lenovopress.com/servers/options/racks#rt=product-guide>

Power distribution units

The following table lists the power distribution units (PDUs) that are currently offered by Lenovo that can be used with the DS2200 in storage solutions.

Table 23. Power distribution units

Description	Part number
0U Basic PDUs	
0U 36 C13/6 C19 24A/200-240V 1 Phase PDU with NEMA L6-30P line cord	00YJ776
0U 36 C13/6 C19 32A/200-240V 1 Phase PDU with IEC60309 332P6 line cord	00YJ777
0U 21 C13/12 C19 32A/200-240V/346-415V 3 Phase PDU with IEC60309 532P6 cord	00YJ778
0U 21 C13/12 C19 48A/200-240V 3 Phase PDU with IEC60309 460P9 line cord	00YJ779
Switched and Monitored PDUs	
0U 20 C13/4 C19 Switched and Monitored 24A/200-240V/1Ph PDU w/ NEMA L6-30P line cord	00YJ781
0U 20 C13/4 C19 Switched and Monitored 32A/200-240V/1Ph PDU w/ IEC60309 332P6 line cord	00YJ780
0U 18 C13/6 C19 Switched and Monitored 32A/200-240/346-415V/3Ph PDU w/ IEC60309 532P6 cord	00YJ782
0U 12 C13/12 C19 Switched and Monitored 48A/200-240V/3Ph PDU w/ IEC60309 460P9 line cord	00YJ783
1U 9 C19/3 C13 Switched and Monitored DPI PDU (without line cord)	46M4002
1U 9 C19/3 C13 Switched and Monitored 60A 3Ph PDU with IEC 309 3P+Gnd line cord	46M4003
1U 12 C13 Switched and Monitored DPI PDU (without line cord)	46M4004
1U 12 C13 Switched and Monitored 60A 3 Phase PDU with IEC 309 3P+Gnd line cord	46M4005
Ultra Density Enterprise PDUs (9x IEC 320 C13 + 3x IEC 320 C19 outlets)	
Ultra Density Enterprise C19/C13 PDU Module (without line cord)	71762NX
Ultra Density Enterprise C19/C13 PDU 60A/208V/3ph with IEC 309 3P+Gnd line cord	71763NU
C13 Enterprise PDUs (12x IEC 320 C13 outlets)	
DPI C13 Enterprise PDU+ (without line cord)	39M2816
DPI Single Phase C13 Enterprise PDU (without line cord)	39Y8941
C19 Enterprise PDUs (6x IEC 320 C19 outlets)	
DPI Single Phase C19 Enterprise PDU (without line cord)	39Y8948
DPI 60A 3 Phase C19 Enterprise PDU with IEC 309 3P+G (208 V) fixed line cord	39Y8923
Front-end PDUs (3x IEC 320 C19 outlets)	
DPI 30amp/125V Front-end PDU with NEMA L5-30P line cord	39Y8938
DPI 30amp/250V Front-end PDU with NEMA L6-30P line cord	39Y8939
DPI 32amp/250V Front-end PDU with IEC 309 2P+Gnd line cord	39Y8934
DPI 60amp/250V Front-end PDU with IEC 309 2P+Gnd line cord	39Y8940
DPI 63amp/250V Front-end PDU with IEC 309 2P+Gnd line cord	39Y8935
Universal PDUs (7x IEC 320 C13 outlets)	
DPI Universal 7 C13 PDU (with 2 m IEC 320-C19 to C20 rack power cord)	00YE443
NEMA PDUs (6x NEMA 5-15R outlets)	
DPI 100-127V PDU with fixed NEMA L5-15P line cord	39Y8905
Line cords for PDUs that ship without a line cord	
DPI 30a Line Cord (NEMA L6-30P)	40K9614
DPI 32a Line Cord (IEC 309 P+N+G)	40K9612

Description	Part number
DPI 32a Line Cord (IEC 309 3P+N+G)	40K9611
DPI 60a Cord (IEC 309 2P+G)	40K9615
DPI 63a Cord (IEC 309 P+N+G)	40K9613
DPI Australian/NZ 3112 Line Cord (32A)	40K9617
DPI Korean 8305 Line Cord (30A)	40K9618

For more information, see the list of Product Guides in the Power Distribution Units category:
<http://lenovopress.com/servers/options/pdu#rt=product-guide>

Uninterruptible power supply units

The following table list the uninterruptible power supply (UPS) units that are currently offered by Lenovo that can be used with the DS2200 in storage solutions.

Table 24. Uninterruptible power supply units

Description	Part number
RT1.5kVA 2U Rack or Tower UPS (100-125VAC) (8x NEMA5-15R 12A outlets)	55941AX
RT1.5kVA 2U Rack or Tower UPS (200-240VAC) (8x IEC 320 C13 10A outlets)	55941KX
RT2.2kVA 2U Rack or Tower UPS (100-125VAC) (8x NEMA 5-20R 16A outlets)	55942AX
RT2.2kVA 2U Rack or Tower UPS (200-240VAC) (8x IEC 320 C13 10A, 1x IEC 320 C19 16A outlets)	55942KX
RT3kVA 2U Rack or Tower UPS (100-125VAC) (6x NEMA5-20R 16A, 1x NEMA L5-30R 24A outlets)	55943AX
RT3kVA 2U Rack or Tower UPS (200-240VAC) (8x IEC 320 C13 10A, 1x IEC 320 C19 16A outlets)	55943KX
RT5kVA 3U Rack or Tower UPS (200-240VAC) (8x IEC 320 C13 10A, 2x IEC 320 C19 16A outlets)	55945KX
RT6kVA 3U Rack or Tower UPS (200-240VAC) (8x IEC 320 C13 10A, 2x IEC 320 C19 16A outlets)	55946KX
RT8kVA 6U Rack or Tower UPS (200-240VAC) (4x IEC 320-C19 16A outlets)	55948KX
RT11kVA 6U Rack or Tower UPS (200-240VAC) (4x IEC 320-C19 16A outlets)	55949KX
RT8kVA 6U 3:1 Phase Rack or Tower UPS (380-415VAC) (4x IEC 320-C19 16A outlets)	55948PX
RT11kVA 6U 3:1 Phase Rack or Tower UPS (380-415VAC) (4x IEC 320-C19 16A outlets)	55949PX

For more information, see the list of Product Guides in the Uninterruptible Power Supply Units category:
<http://lenovopress.com/servers/options/ups#rt=product-guide>

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Related publications and links

For more information, see the following resources:

- Lenovo Storage product page:
<http://www.lenovo.com/systems/storage>
- Lenovo Data Center Solution Configurator (DCSC):
<http://dcsc.lenovo.com>
- Lenovo Data Center Support for the ThinkSystem DS2200:
<http://datacentersupport.lenovo.com/us/en/products/storage/lenovo-storage/thinksystem-ds2200>

Related product families

Product families related to this document are the following:

- [Lenovo Storage](#)
- [External Storage](#)

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