



Lenovo ThinkSystem DM5000H Unified Hybrid Storage Array

Product Guide

Lenovo ThinkSystem DM5000H is a unified, hybrid entry-level storage system that is designed to provide performance, simplicity, capacity, security, and high availability for medium to large businesses. Powered by the ONTAP software, ThinkSystem DM5000H delivers enterprise-class storage management capabilities with a wide choice of host connectivity options, flexible drive configurations, and enhanced data management features. The ThinkSystem DM5000H is a perfect fit for a wide range of enterprise workloads, including data analytics, artificial intelligence, engineering and design, enterprise applications, and other storage I/O-intensive applications.

ThinkSystem DM5000H models are 2U rack-mount controller enclosures that include two controllers, 64 GB RAM and 8 GB battery-backed NVRAM (32 GB RAM and 4 GB NVRAM per controller), and 24 SFF hot-swap drive bays (2U24 form factor). Controllers provide universal 1/10 GbE NAS/iSCSI or 8/16 Gb Fibre Channel (FC) ports, or 10 GbE RJ-45 ports for host connectivity.

A single ThinkSystem DM5000H Storage Array scales up to 144 drives with the attachment of Lenovo ThinkSystem DM240S 2U24 SFF, DM120S 2U12, and DM600S 4U60 LFF Expansion Enclosures. It also offers flexible drive configurations with the choice of 2.5-inch (SFF) and 3.5-inch (LFF) form factors, 7.2 K rpm NL SAS hard disk drives (HDDs), and SAS solid-state drives (SSDs).



Figure 1. Lenovo ThinkSystem DM5000H

Up to 12 DM5000H Storage Arrays can be combined into a clustered system in a NAS environment, or up to 6 DM5000H Storage Arrays can be combined into a clustered system in a SAN environment.

Did you know?

A single ThinkSystem DM5000H scales up to 1.2 PB of raw storage capacity. A cluster of the DM5000H storage systems scales up to 15 PB for NAS or up to 7.5 PB for SAN environments.

The ThinkSystem DM5000H offers unified file and block storage connectivity with support for 1 GbE or 10 GbE NAS and iSCSI, and 8 Gb or 16 Gb Fibre Channel protocols at the same time.

Key features

The ThinkSystem DM5000H offers the following key features and benefits:

- Hybrid entry-level storage with dual active/active controller configurations for high availability and performance.
- Improved performance and data protection with RAID-DP and RAID-TEC, as well as support for traditional RAID 4.
- Flexible host connectivity to match diverse client needs with support for unified NAS and SAN storage protocols, including 1/10 GbE NAS and iSCSI, and 8/16 Gb Fibre Channel connectivity.
- 12 Gb SAS drive-side connectivity with multipathing with up to 24x 2.5-inch small form factor (SFF) drives in the 2U24 SFF controller and expansion enclosures, up to 12x 3.5-inch large form factor (LFF) drives in the 2U12 LFF expansion enclosures, or up to 60x 3.5-inch LFF drives in the 4U60 LFF expansion enclosures.
- Scalability to up to 144 SFF or 120 LFF and 24 SFF drives with the attachment of the ThinkSystem DM240S 2U24 SFF, DM120S 2U12 LFF, or DM600S 4U60 LFF expansion enclosures to satisfy growing needs for storage capacity and performance.
- Flexibility in storing data on capacity-optimized SAS SSDs, performance-optimized enterprise SAS HDDs, or capacity-optimized enterprise NL SAS HDDs; mixing and matching drive types within a single system to perfectly meet performance and capacity requirements for various workloads.
- Acceleration of read-centric workloads with the high-speed, low-latency onboard NVMe SSD caching.
- Rich set of standard storage management functions available at no extra cost, including SSD read cache, hybrid storage pools, snapshots, volume copy, quality of service, thin provisioning, compression, deduplication, encryption, and asynchronous mirroring.
- Scale-out clustering of up to 12 ThinkSystem DM Series storage systems for NAS connectivity or up to 6 DM Series storage systems for SAN connectivity.
- Intuitive, web-based GUI for easy system setup and management.
- Lenovo XClarity support for centralized systems management of Lenovo x86 servers, switches, and storage, which provides automated agent-less discovery, inventory, monitoring, alerts, firmware updates, and additional platform-specific functions across multiple systems.
- Designed for high availability with redundant hot-swap components, including controllers and I/O modules, power supplies, and non-disruptive firmware upgrades.

The ThinkSystem DM5000H supports the following drives:

- 2U24 SFF capacity-optimized SSDs: 960 GB, 3.84 TB, 7.68 TB, and 15.36 TB
- 2U24 SFF enterprise SAS HDDs: 900 GB, 1.2 TB, and 1.8 TB 10K rpm
- 2U12 LFF and 4U60 LFF high-capacity nearline HDDs: 4 TB, 8 TB, and 10 TB 7.2K rpm

All drives are dual-port and hot-swappable.

The ThinkSystem DM5000H supports attachment of the following ThinkSystem DM Series expansion enclosures:

- Up to 5 ThinkSystem DM240S 2U24 SFF enclosures.
- Up to 10 ThinkSystem DM120S 2U12 LFF enclosures.
- Up to 2 ThinkSystem DM600S 4U60 LFF enclosures.
- A combination of the DM240S, DM120S, and DM600S enclosures for a maximum of 144 drives.

Customers can intermix 2U24 SFF, 2U12 LFF, and 4U60 LFF expansion enclosures behind a 2U24 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 DM5000H offers high levels of system and data availability with the following technologies:

- Dual-active controllers (high availability pair) with automatic load balancing and failover
- Mirrored, battery-backed controller NVRAM
- Dual-port SAS HDDs and SSDs with automatic drive failure detection and rebuild
- Redundant, hot-swappable and customer replaceable hardware components, including SFP+ transceivers, controllers, I/O modules, power supplies, cooling modules (4U60 LFF only), and drives
- Automated failover for the data path between the host and the drives with multipathing
- Non-disruptive controller and drive firmware upgrades
- Scale-out clustering

Components and connectors

The following figure shows the front of the ThinkSystem DM5000H or DM240S 2U SFF enclosure.

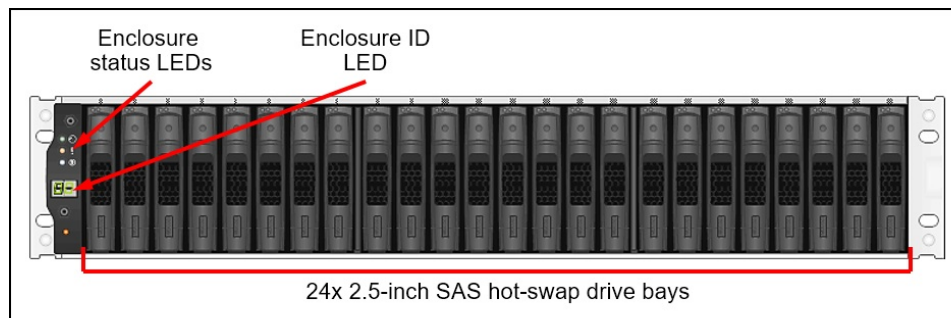


Figure 2. ThinkSystem DM5000H or DM240S enclosure front view

The front of the ThinkSystem DM5000H or DM240S 2U SFF enclosure includes the following components:

- 24 SFF hot-swap drive bays.
- Enclosure status LEDs.
- Enclosure ID LED.

The following figure shows the rear of the ThinkSystem DM5000H 2U controller enclosure with universal SFP+ host ports.

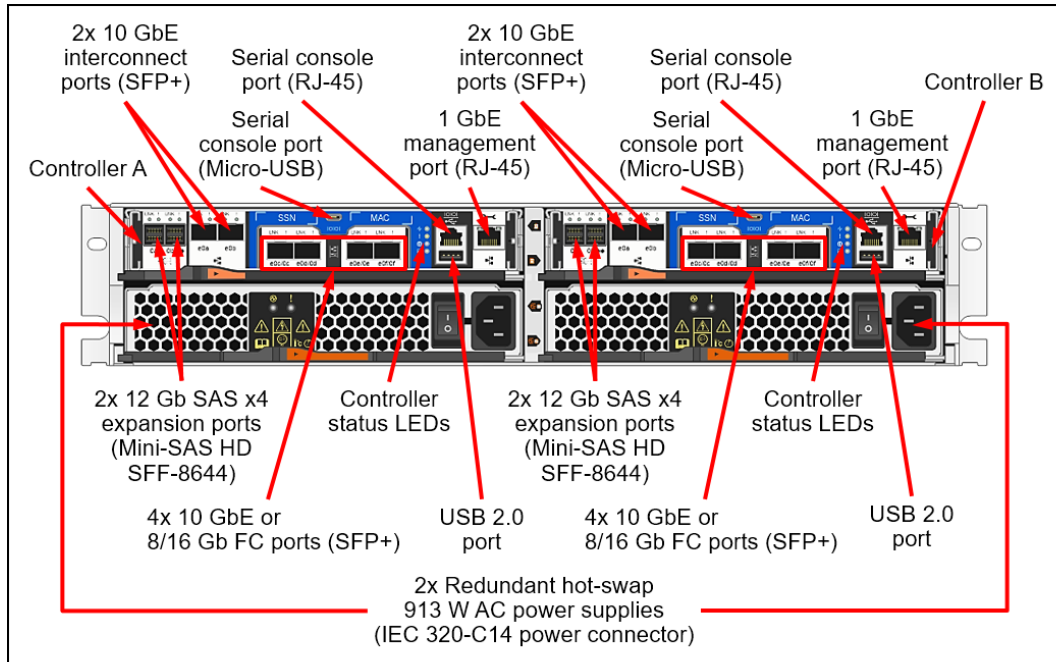


Figure 3. ThinkSystem DM5000H 2U controller enclosure rear view: Universal SFP+ host ports

The following figure shows the rear of the ThinkSystem DM5000H 2U controller enclosure with 10GBASE-T host ports.

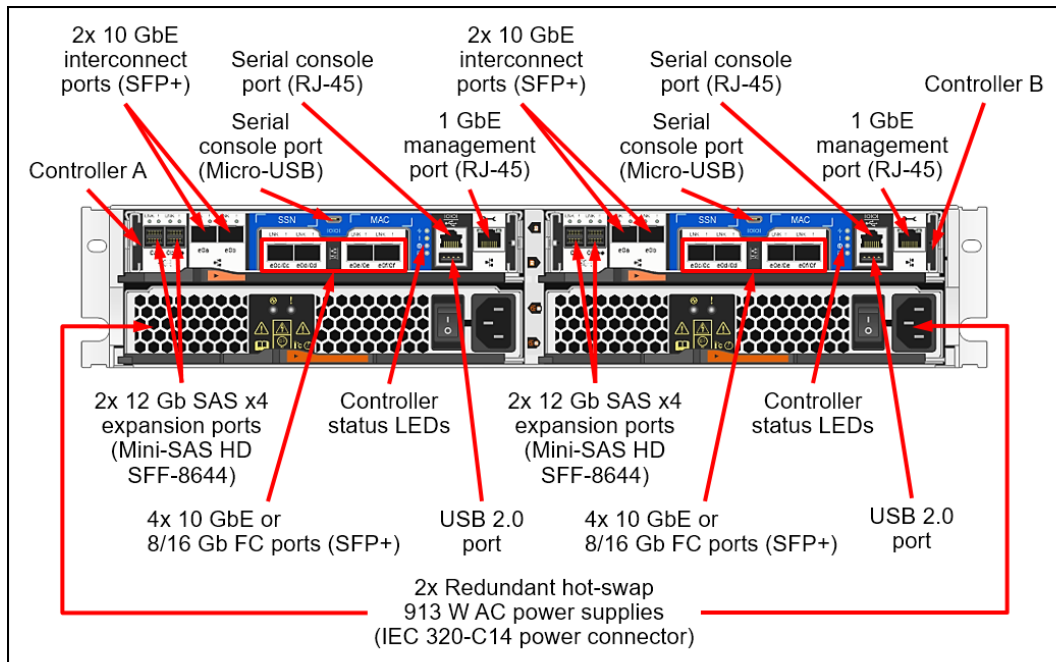


Figure 4. ThinkSystem DM5000H 2U controller enclosure rear view: 10GBASE-T host ports

The rear of the ThinkSystem DM5000H 2U controller enclosure includes the following components:

- Two redundant hot-swap controllers, each with the following ports:
 - Two SFP+ interconnect ports for direct-attach HA pair or switched cluster connections.
 - Four SFP+ host ports for 1/10 Gb GbE or 8/16 Gb FC connectivity or four 10 GbE RJ-45 ports.
 - Two 12 Gb SAS x4 ports (Mini-SAS HD SFF-8644) for connections to the expansion enclosures.
 - One RJ-45 10/100/1000 Mb Ethernet port for out-of-band management.
 - Two serial console ports (RJ-45 and Micro-USB) for another means to configure the system.
 - One USB Type A port (for ONTAP software installation or booting)
- Two redundant hot-swap 913 W (100 - 240 V) AC power supplies (IEC 320-C14 power connector) with integrated cooling fans.
- Controller status LEDs.

The following figure shows the front of the ThinkSystem DM120S 2U LFF expansion enclosure.

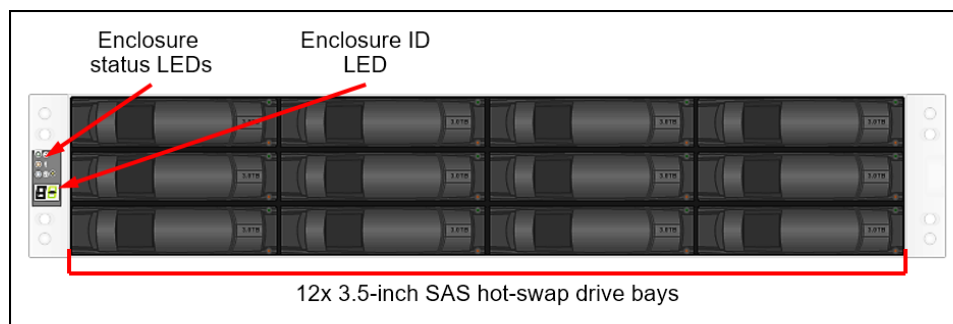


Figure 5. ThinkSystem DM120S 2U LFF expansion enclosure front view

The front of the ThinkSystem DM120S 2U LFF expansion enclosure includes the following components:

- 12 LFF hot-swap drive bays.
- Enclosure status LEDs.
- Enclosure ID LED.

The following figure shows the rear of the ThinkSystem DM240S or DM120S 2U expansion enclosure.

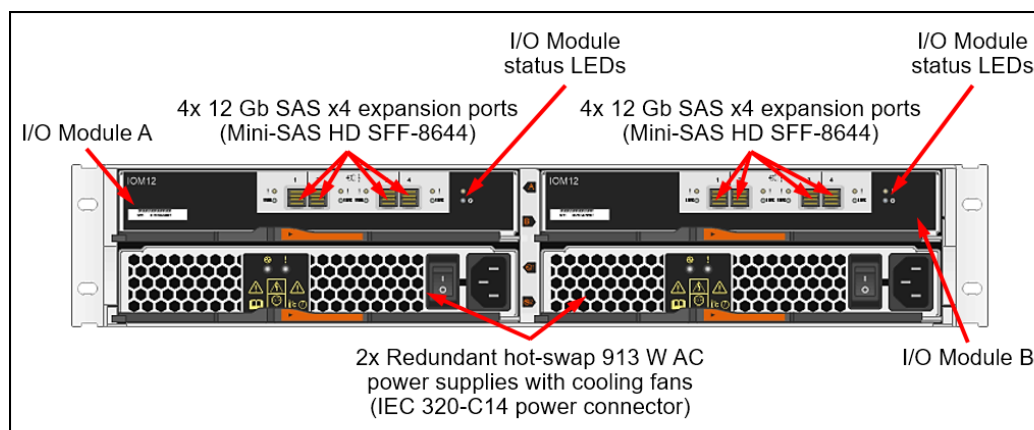


Figure 6. ThinkSystem DM240S or DM120S 2U expansion enclosure rear view

The rear of the ThinkSystem DM240S or DM120S 2U expansion enclosure includes the following components:

- Two redundant hot-swap I/O Modules; each I/O Module provides four 12 Gb SAS x4 expansion ports (Mini-SAS HD SFF-8644) for connections to the controller enclosures and for connecting the expansion enclosures between each other.
- Two redundant hot-swap 913 W (100 - 240 V) AC power supplies (IEC 320-C14 power connector) with integrated cooling fans.
- I/O Module status LEDs.

The following figure shows the front of the ThinkSystem DM600S 4U LFF expansion enclosure.

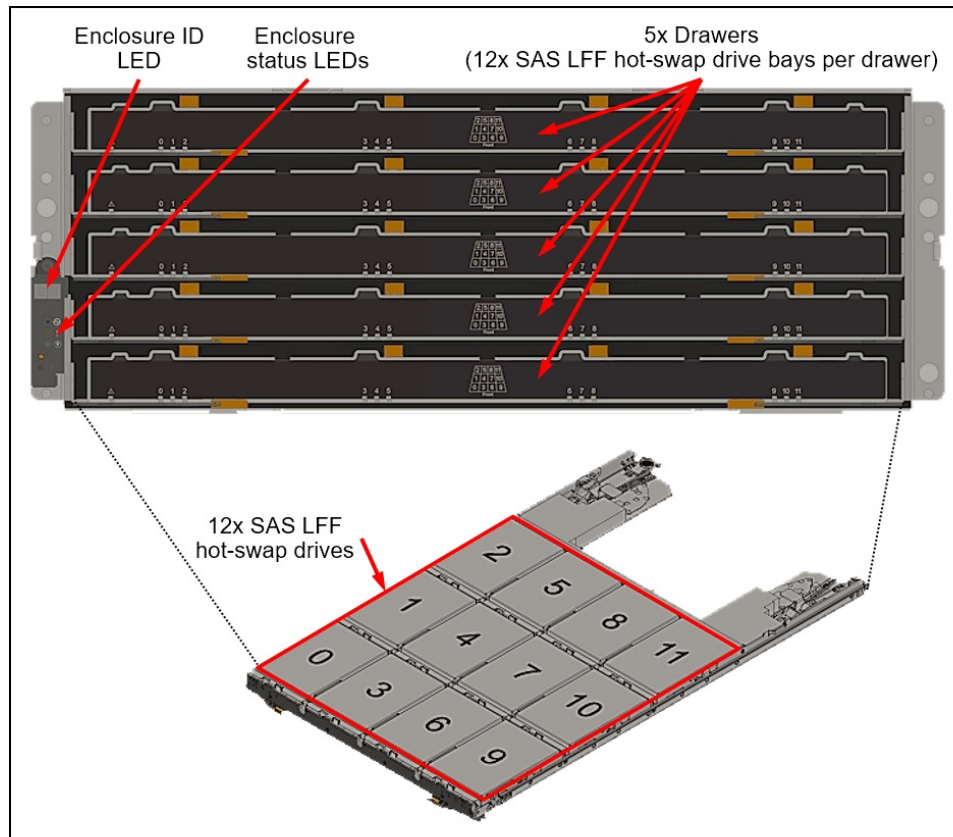


Figure 7. ThinkSystem DM600S 4U LFF expansion enclosure front view

The front of the ThinkSystem DM600S 4U LFF expansion enclosure includes the following components:

- Five drawers, each with 12 LFF hot-swap drive bays.
- Enclosure status LEDs.
- Enclosure ID LED.

The following figure shows the rear of the ThinkSystem DM600S 4U LFF expansion enclosure.

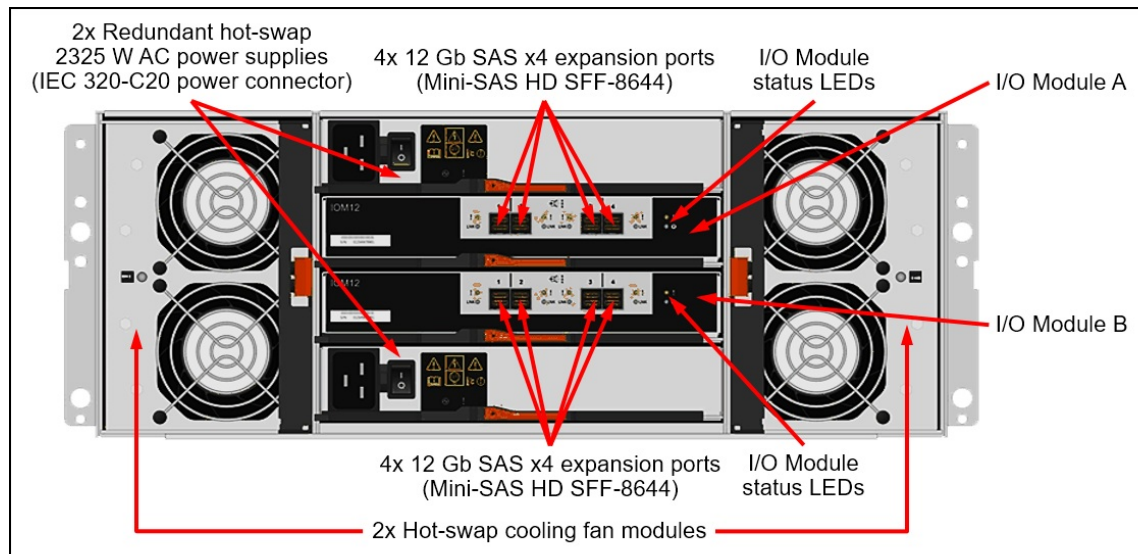


Figure 8. ThinkSystem DM600S 4U LFF expansion enclosure rear view

The rear of the ThinkSystem DM600S 4U LFF expansion enclosure includes the following components:

- Two redundant hot-swap I/O Modules; each I/O Module provides four 12 Gb SAS x4 expansion ports (Mini-SAS HD SFF-8644) for connections to the controller enclosures and for connecting the expansion enclosures between each other.
- Two redundant hot-swap 2325 W (200 - 240 V) AC power supplies (IEC 320-C20 power connector)
- Two hot-swap cooling fan modules; each module has two fans.
Note: The failed cooling module should be replaced as soon as possible.
- I/O Module status LEDs.

System specifications

The following table lists the ThinkSystem DM5000H storage system specifications.

Note: The supported hardware options and software features listed in this product guide are based on the ONTAP software version 9.4. For details about specific software releases that introduced support for certain hardware options and software features, refer to the Release notes of the particular software release for the ThinkSystem DM5000H that can be found at:

<http://datacentersupport.lenovo.com>

Table 1. ThinkSystem DM5000H system specifications

Attribute	Specification
Form factor	<ul style="list-style-type: none"> DM5000H controller enclosure (Machine Type 7Y57): 2U rack mount. DM240S 2U24 SFF expansion enclosure (Machine Type 7Y58): 2U rack mount. DM120S 2U12 LFF expansion enclosure (Machine Type 7Y59): 2U rack mount. DM600S 4U60 LFF expansion enclosure (Machine Type 7Y43): 4U rack mount.
Controller configuration	Dual active-active controller configuration (HA pair). Up to 6 HA pairs can be combined into a single SAN cluster, or up to 12 HA pairs can be combined into a single NAS cluster.
HA pair/cluster interconnect ports	4x 10 GbE SFP+ ports (DAC cables or SW fiber optics [LC]) (2 ports per controller).
RAID levels	RAID-4, RAID-DP, RAID-TEC.
Controller memory	64 GB RAM per system (32 GB per controller). 8 GB battery-backed NVRAM per system (4 GB per controller) mirrored between the controllers.
Controller cache	2 TB NVMe-based Flash Cache (1 TB per controller).
Drive bays	<ul style="list-style-type: none"> Up to 144 SFF hot-swap drive bays (1x 2U24 controller enclosure + up to 5x 2U24 SFF expansion enclosures). Up to 120 LFF and 24 SFF hot-swap drive bays (1x 2U24 controller enclosure + up to 2x 4U60 LFF or up to 10x 2U12 LFF expansion enclosures). <p>Intermix of 2U24 SFF, 2U12 LFF, and 4U60 LFF enclosures is supported.</p>
Drive technology	12 Gb SAS HDDs, 12 Gb NL SAS HDDs, 12 Gb SAS SSDs.
Drive expansion connectivity	<ul style="list-style-type: none"> 2x 12 Gb SAS x4 (Mini-SAS HD SFF-8644) expansion ports on each of two controllers in the controller enclosure for the attachment of the expansion enclosures. 4x 12 Gb SAS x4 (Mini-SAS HD SFF-8644) expansion ports on each of two I/O modules in the expansion enclosure for the attachment to the controller enclosure and daisy chaining of the expansion enclosures.
Drives	<ul style="list-style-type: none"> 2U24 SFF drives: <ul style="list-style-type: none"> 960 GB, 3.84 TB, 7.68 TB, and 15.36 TB SAS SSDs (1 DWD). 900 GB, 1.2 TB, and 1.8 TB 10K rpm SAS HDDs. 2U12 and 4U60 LFF drives: 4 TB, 8 TB, and 10 TB 7.2K rpm NL SAS HDDs.
Storage capacity	Up to 1.2 PB.
Storage protocols	<ul style="list-style-type: none"> NAS (File access): NFS and CIFS/SMB. SAN (Block access): iSCSI and FC.
Host connectivity	<p>Base ports (per controller enclosure):</p> <ul style="list-style-type: none"> 8x 1 GbE (RJ-45 UTP)/10 GbE (DAC cable or SW fiber optic cable, LC) or 8/16 Gb FC (SW fiber optic cable, LC) SFP+ host ports (4 ports per controller); or 8x 10 GbE RJ-45 UTP host ports (4 ports per controller).
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 6.0 and 6.5.

Attribute	Specification
Software features	RAID data protection, NVMe SSD read cache (Flash Cache), hybrid storage pools (Flash Pool), snapshots, volume copy (FlexClone), storage quality of service (QoS), thin provisioning, compression, deduplication, encryption, and asynchronous mirroring (SnapMirror).
Performance*	Up to 148 000 random read IOPS (8 KB blocks).
Configuration maximums**	<ul style="list-style-type: none"> • Maximum storage capacity: 1.2 PB • Maximum flash pool capacity: 24 TB • Maximum number of volumes: 2048 (per controller) • Maximum number of FlexVol volumes: 1000 • Maximum volume size: 100 TB • Maximum aggregate size: 400 TB • Maximum number of drives in a RAID group (data + parity drives): <ul style="list-style-type: none"> ◦ RAID 4: 14 (13 + 1 SAS SSDs) or 7 (6 + 1 NL SAS HDDs) ◦ RAID-DP: 28 (26 + 2 SAS SSDs) or 20 (18 + 2 NL SAS HDDs) ◦ RAID-TEC: 29 (26 + 3 SAS SSDs or NL SAS HDDs) • Maximum number of hosts: 512 • Maximum number of snapshots: 255 000 (per controller)
Cooling	Redundant cooling with two cooling modules (DM600S 4U60 LFF) or with the fans that are built into power supplies (DM5000H, DM240S 2U24 SFF, and DM120S 2U12 LFF).
Power supply	Two redundant hot-swap 913 W (100 - 240 V) (DM5000H, DM240S 2U24 SFF, and DM120S SFF enclosures) or 2325 W (200 - 240 V) (DM600S 4U60 LFF enclosures) Platinum AC power supplies.
Hot-swap parts	Controllers, I/O modules, drives, power supplies, cooling modules (DM600S 4U60 LFF only), and SFP+ transceivers and DAC cables.
Management ports	<ul style="list-style-type: none"> • 1x 1 GbE port (UTP, RJ-45) per controller for out-of-band management. • 2x Serial console ports (RJ-45 and Micro-USB) for system configuration.
Management interfaces	ThinkSystem Storage Manager web-based GUI; SSH CLI; Serial console CLI; SNMP, email, and syslog alerts; optional Lenovo XClarity.
Security features	Secure Socket Layer (SSL), Secure Shell (SSH), user level security, role-based access control (RBAC), LDAP authentication.
Hardware warranty	Three-year customer-replaceable unit and onsite limited warranty with 9x5 next business day terms. Optional warranty service upgrades are available through Lenovo: 24x7 coverage, 2-hour or 4-hour response time, 6-hour or 24-hour committed repair, 1-year or 2-year warranty extensions, Premier support, Basic hardware installation services.
Software maintenance	Included in the base warranty and any Lenovo warranty extensions.

Attribute	Specification
Dimensions	Controller enclosure: <ul style="list-style-type: none"> • Height: 85 mm (3.4 in.) • Width: 447 mm (17.6 in.) • Depth: 483 mm (19.0 in.) 2U24 SFF expansion enclosure: <ul style="list-style-type: none"> • Height: 85 mm (3.4 in.) • Width: 449 mm (17.7 in.) • Depth: 484 mm (19.1 in.) 2U12 LFF expansion enclosure: <ul style="list-style-type: none"> • Height: 85 mm (3.4 in.) • Width: 447 mm (17.6 in.) • Depth: 483 mm (19.0 in.) 4U60 LFF expansion enclosure: <ul style="list-style-type: none"> • Height: 174 mm (6.9 in.) • Width: 449 mm (17.7 in.) • Depth: 922 mm (36.3 in.)
Weight	<ul style="list-style-type: none"> • Controller enclosure (fully configured): 27.6 kg (60.8 lb) • 2U24 SFF expansion enclosure (fully configured): 24.4 kg (53.8 lb) • 2U12 LFF expansion enclosure (fully configured): 28.7 kg (63.3 lb) • 4U60 LFF expansion enclosure (fully configured): 111.5 kg (245.8 lb)

* Estimated performance based on internal measurements.

** For a detailed list of configuration limits and restrictions for a specific version of the software, refer to the Lenovo Data Center Support website:

<http://datacentersupport.lenovo.com>

Controller enclosures

Factory-integrated models of the ThinkSystem DM5000H Unified Hybrid Storage Array are configured by using the Lenovo Data Center Solution Configurator (DCSC):

<http://dcsc.lenovo.com>

The following table lists the CTO base models for the ThinkSystem DM5000H.

Table 2. ThinkSystem DM5000H CTO base models

Description	Machine Type/Model	Feature code
Lenovo ThinkSystem Storage 2U24 Chassis (2x PSUs, No controller modules)	7Y57CTO1WW	B38L

Configuration note: Two DM3000/DM5000 10GBASE-T controllers (feature code B39G) or two DM3000/DM5000 SFP+ controllers (feature code B39F) must be selected during the configuration process, and both controllers must be of the same type (either 10GBASE-T or SFP+).

The models of the ThinkSystem DM5000H ship with the following items:

- One chassis with the following components:
 - Two controllers
 - Two power supplies
- Lenovo ThinkSystem Storage Rack Mount Kit 2U24/4U60
- Lenovo ThinkSystem Storage USB Cable (USB Type A to Micro-USB) 2 m
- *Electronic Publications Flyer*
- Two customer-configured power cables

Controllers

The ThinkSystem DM5000H controller enclosures ship with two DM3000/DM5000 10GBASE-T or SFP+ controllers. A *controller* provides interfaces for host connectivity, management, and internal drives, and it runs ONTAP storage management software. Each DM5000H controller enclosure provides 64 GB RAM, 8 GB battery-backed NVRAM, and 2 TB NVMe SSD flash cache (32 GB RAM, 4 GB NVRAM, and 1 TB NVMe SSD flash cache per controller).

The ThinkSystem DM5000H controller enclosures ship with four interconnect 10 GbE SFP+ ports (two ports per controller) to cable a directly-connected dual-controller HA pair or for switched cluster interconnect with multiple dual-controller HA pairs. Up to six HA pairs can be combined into a single SAN cluster or up to 12 HA pairs can be combined into a single NAS cluster.

The ThinkSystem DM5000H controller enclosures ship with one of the following interface types:

- 8x Universal SFP+ ports (four ports per controller) for 1/10 GbE NAS / iSCSI or 16 Gb FC host connectivity
- 8x 10 GbE RJ-45 ports (four ports per controller) for 10 GbE NAS / iSCSI host connectivity.

Each DM5000H controller enclosure also provides four integrated 12 Gb SAS x4 expansion ports (Mini-SAS HD SFF-8644 connectors) (two ports per controller) for the attachment of the ThinkSystem DM Series expansion enclosures.

Configuration notes:

- Two controllers are required for selection. Both controllers must be of the same type (either 16 Gb FC / 10 GbE or 10GBASE-T, but not both types), and they must have matching configurations of the base ports (type and physical connections).
- A pair of the universal SFP+ base ports (e0c/0c and e0d/0d or e0e/0e and e0f/0f) in the system must have the same connectivity type (either Ethernet or Fibre Channel, but not both types) and the same type of physical connections; different pairs might have different types of connectivity.

The following table lists the controllers for the DM5000H Storage Array and supported connectivity options.

Table 3. DM5000H storage array controllers and connectivity options

Description	Part number	Feature code	Maximum quantity per controller enclosure
Controllers			
Lenovo ThinkSystem DM3000/DM5000 Controller, 10GBASE-T	None*	B39G	2
Lenovo ThinkSystem DM3000/DM5000 Controller, 16Gb FC / 10GbE	None*	B39F	2
SFP+ options for base ports			
1Gb RJ-45 iSCSI SFP+ Module 1 pack	None*	B4K7	8
8Gb Fibre Channel SFP+ Module 1 pack	None*	B4K8	8
16Gb Fibre Channel SFP+ Module 1 pack	None*	B4KA	8
SFP+ options for base ports and interconnect ports			
10Gb SW Optical iSCSI SFP+ Module 1 pack	None*	B4K9	12
OM3 cable options for 8/16 Gb FC and 10 GbE SW SFP+ optical transceivers			
Lenovo 0.5m LC-LC OM4 MMF Cable	4Z57A10845	B2P9	12
Lenovo 1m LC-LC OM4 MMF Cable	4Z57A10846	B2PA	12
Lenovo 3m LC-LC OM4 MMF Cable	4Z57A10847	B2PB	12
Lenovo 5m LC-LC OM4 MMF Cable	4Z57A10848	B2PC	12
Lenovo 10m LC-LC OM4 MMF Cable	4Z57A10849	B2PD	12
Lenovo 15m LC-LC OM4 MMF Cable	4Z57A10850	B2PE	12
Lenovo 25m LC-LC OM4 MMF Cable	4Z57A10851	B2PF	12
Lenovo 30m LC-LC OM4 MMF Cable	4Z57A10852	B2PG	12
OM4 cable options for 8/16 Gb FC and 10 GbE SW SFP+ optical transceivers			
Lenovo 0.5m LC-LC OM3 MMF Cable	00MN499	ASR5	12
Lenovo 1m LC-LC OM3 MMF Cable	00MN502	ASR6	12
Lenovo 3m LC-LC OM3 MMF Cable	00MN505	ASR7	12
Lenovo 5m LC-LC OM3 MMF Cable	00MN508	ASR8	12
Lenovo 10m LC-LC OM3 MMF Cable	00MN511	ASR9	12
Lenovo 15m LC-LC OM3 MMF Cable	00MN514	ASRA	12
Lenovo 25m LC-LC OM3 MMF Cable	00MN517	ASRB	12
Lenovo 30m LC-LC OM3 MMF Cable	00MN520	ASRC	12
DAC cable options for 10 GbE SFP+ connectivity (SFP+ base ports and interconnect ports)			
0.5m Passive DAC SFP+ Cable	00D6288	A3RG	12
1m Passive DAC SFP+ Cable	90Y9427	A1PH	12
1.5m Passive DAC SFP+ Cable	00AY764	A51N	12
2m Passive DAC SFP+ Cable	00AY765	A51P	12
3m Passive DAC SFP+ Cable	90Y9430	A1PJ	12
5m Passive DAC SFP+ Cable	90Y9433	A1PK	12
7m Passive DAC SFP+ Cable	00D6151	A3RH	12
UTP Category 6 cables options for 1/10 GbE RJ-45 host connectivity and 1 GbE RJ-45 management ports			
0.75m Green Cat6 Cable	00WE123	AVFW	10

Description	Part number	Feature code	Maximum quantity per controller enclosure
1.0m Green Cat6 Cable	00WE127	AVFX	10
1.25m Green Cat6 Cable	00WE131	AVFY	10
1.5m Green Cat6 Cable	00WE135	AVFZ	10
3m Green Cat6 Cable	00WE139	AVG0	10
10m Green Cat6 Cable	90Y3718	A1MT	10
25m Green Cat6 Cable	90Y3727	A1MW	10

Expansion enclosures

The ThinkSystem DM5000H supports attachment of the following ThinkSystem DM Series expansion enclosures:

- Up to 5 ThinkSystem DM240S 2U24 SFF enclosures.
- Up to 10 ThinkSystem DM120S 2U12 LFF enclosures.
- Up to 2 ThinkSystem DM600S 4U60 LFF enclosures.
- A combination of the DM240S, DM120S, and DM600S enclosures for a maximum of 144 drives.

Intermix of DM240S 2U24 SFF, DM120S 2U12 LFF, and DM600S 4U60 LFF expansion enclosures behind a 2U24 controller enclosure is supported. The expansion enclosures can be added to the system non-disruptively.

The following table lists the CTO base models for the ThinkSystem DM Series expansion enclosures.

Table 4. CTO base models for the ThinkSystem DM Series expansion enclosures

Description	Machine Type/Model	Feature code
Lenovo ThinkSystem Storage 2U24 Chassis (with 2x PSUs)	7Y58CTO1WW	B38L
Lenovo ThinkSystem Storage 2U12 Chassis (with 2x PSUs)	7Y59CTO1WW	B38M
Lenovo ThinkSystem Storage 4U60 Chassis (with 2x PSUs)	7Y43CTO1WW	B38N

Configuration note: Two I/O expansion modules (feature code B39J) are selected by default in the configurator, and the selection cannot be changed.

The models of the ThinkSystem DM240S, DM120S, and DM600S ship with the following items:

- One chassis with the following components:
 - Two I/O modules
 - Two power supplies
 - Two cooling modules (4U60 LFF only)
- Lenovo ThinkSystem Storage Rack Mount Kit 2U24/4U60 or 2U12
- *Electronic Publications Flyer*
- Two customer-configured power cables

Each ThinkSystem DM Series expansion enclosure ships with two SAS I/O expansion modules. Each *I/O expansion module* provides two external 12 Gb SAS x4 ports (Mini-SAS HD SFF-8644 connectors labelled Port 1-4) that are used for connections to the ThinkSystem DM5000H and for daisy chaining the expansion enclosures between each other.

The example expansion connectivity topology for the enclosures with dual-path HA (high availability) is shown in the following figure.

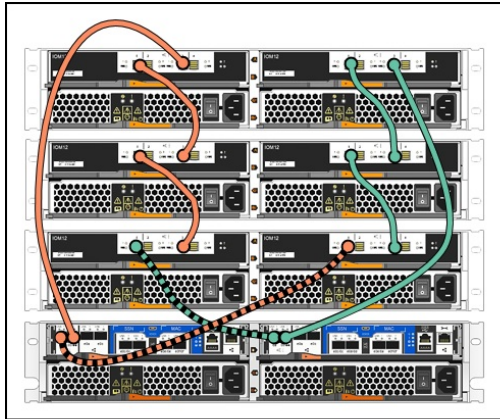


Figure 9. DM5000H expansion enclosure connectivity topology

Configuration notes:

- Port 0b on the Controller 1 is the primary path that is connected to the Port 3 on the I/O Module A in the last expansion enclosure in a stack.
- Port 1 on the I/O Module A in the last expansion enclosure is connected to Port 3 on the I/O Module A in the adjacent expansion enclosure, and so on (until the first expansion enclosure in a stack is cabled).
- Port 0a on the Controller 1 is the secondary path that is connected to the Port 1 on the I/O Module B in the first expansion enclosure in a stack.
- Port 0b on the Controller 2 is the primary path that is connected to the Port 3 on the I/O Module B in the last expansion enclosure in a stack.
- Port 1 on the I/O Module B in the last expansion enclosure is connected to Port 3 on the I/O Module B in the adjacent expansion enclosure, and so on (until the first expansion enclosure in a stack is cabled).
- Port 0a on the Controller 2 is the secondary path that is connected to the Port 1 on the I/O Module A in the first expansion enclosure in a stack.

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

Table 5. Expansion enclosure connectivity options

Description	Part number	Feature code	Quantity per one expansion enclosure
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

Configuration note: Four SAS cables are needed per each expansion enclosure (two SAS cables per I/O Module) for connections to the controller enclosure and for stacking the expansion enclosures.

Drives

The ThinkSystem DM5000H and DM240S 2U24 SFF enclosures support up to 24 SFF hot-swap drives, the DM120S 2U12 LFF expansion enclosures support up to 12 LFF hot-swap drives, and the DM600S 4U60 LFF expansion enclosures support up to 60 LFF hot-swap drives.

The following table lists supported drive options for the DM5000H and DM240S 2U24 SFF enclosures.

Table 6. DM5000H and DM240S 2U24 SFF drive options

Description	Part number	Feature code	Maximum quantity per 2U24 SFF enclosure
2.5-inch 12 Gbps SAS hot-swap SSDs (1 Drive Write per Day)			
Lenovo ThinkSystem DM5000H 11.5TB SSD Pack (12x 960GB SSDs)	4XB7A14695	B3W3	2
Lenovo ThinkSystem DM5000H 23TB SSD Pack (24x 960GB SSDs)	None*	B3WF	1
Lenovo ThinkSystem DM5000H 46TB SSD Pack (12x 3.8TB SSDs)	4XB7A14696	B3W8	2
Lenovo ThinkSystem DM5000H 92TB SSD Pack (24x 3.8TB SSDs)	None*	B3WL	1
Lenovo ThinkSystem DM5000H 184TB SSD Pack (24x 7.6TB SSDs)	None*	B3WR	1
Lenovo ThinkSystem DM5000H 368TB SSD Pack (24x 15.3TB SSDs)	None*	B3WW	1
2.5-inch 12 Gbps SAS 10K rpm hot-swap HDDs			
Lenovo ThinkSystem DM5000H 22TB HDD Pack (24x 900GB 10K HDDs)	None*	B3WY	1
Lenovo ThinkSystem DM5000H 29TB HDD Pack (24x 1.2TB 10K HDDs)	None*	B3X0	1
Lenovo ThinkSystem DM5000H 43TB HDD Pack (24x 1.8TB 10K HDDs)	None*	B3X2	1

* Factory-installed only.

The following table lists supported drive options for the DM120S 2U12 LFF expansion enclosures.

Table 7. DM120S 2U12 LFF drive options

Description	Part number	Feature code	Maximum quantity per 2U12 LFF enclosure
3.5-inch 12 Gbps NL SAS hot-swap HDDs			
Lenovo ThinkSystem DM5000H 48TB HDD Pack (12x 4TB HDDs)	None*	B3WM	1
Lenovo ThinkSystem DM5000H 96TB HDD Pack (12x 8TB HDDs)	None*	B3WS	1
Lenovo ThinkSystem DM5000H 120TB HDD Pack (12x 10TB HDDs)	None*	B3WX	1

* Factory-installed only.

The following table lists supported drive options for the DM600S 4U60 LFF expansion enclosures.

Table 8. DM600S 4U60 LFF drive options

Description	Part number	Feature code	Maximum quantity per 4U60 LFF enclosure
3.5-inch 12 Gbps NL SAS hot-swap HDDs			
Lenovo ThinkSystem DM5000H 120TB HDD Pack (30x 4TB HDDs)	4XB7A14687	B3XB	2
Lenovo ThinkSystem DM5000H 300TB HDD Pack (30x 10TB HDDs)	4XB7A14689	B3XF	2
Lenovo ThinkSystem DM5000H 240TB HDD Pack (30x 8TB HDDs)	4XB7A14688	B3XD	2

Configuration notes:

- The 2U24 SFF drives must be installed in a quantity of 24 at once (except 960 GB and 3.8 TB SSDs that can be installed in a quantity of 12 at once), and these drives must be of the same type and capacity.
- The 2U12 LFF drives must be installed in a quantity of 12 at once, and these drives must be of the same type and capacity.
- The 4U60 LFF drives must be installed in a quantity of 30 at once, and these drives must be of the same type and capacity.

Software

The following functions are included with the ThinkSystem DM5000H base software:

- **RAID-4, RAID-DP, and RAID-TEC data protection:** Provides the flexibility to choose the level of data protection required and helps improve performance and availability with built-in spare capacity and by distributing data across all physical drives in the aggregate, sustaining to up to one (RAID-4), two (RAID-DP), or three (RAID-TEC) concurrent drive failures.
- **SyncMirror data protection:** Adds extra level of data protection and availability by mirroring a pair of RAID aggregates.
- **All Flash Array (AFA) capability:** Meets the demand for higher speed, lower latency storage and provides higher IOPS and bandwidth with lower power usage and total cost of ownership than hybrid or HDD-based solutions.
- **Flash Cache:** Helps accelerate performance of read-centric workloads with read caching on the onboard NVMe flash module.
- **Flash Pool:** Helps accelerate performance of read- and write-centric workloads with read and write caching on aggregates with HDDs and SSDs.
- **FlexVol:** Provides abstraction layer between the logical volume and its physical location in the storage array.
- **FlexGroup:** Enables a single volume to span across multiple clustered storage arrays to maximize storage capacity and automate load distribution.
- **Thin provisioning:** Optimizes efficiency by allocating storage space based on the minimum space required by each application at any given time, so that applications consume only the space they are actually using, not the total space that has been allocated to them, which allows customers to purchase storage they need today and add more as application requirements grow.
- **Compression:** Provides transparent inline and post-process data compression to reduce the amount of storage that customers need to purchase and manage.

- **Compaction:** Works with compression to pack more data into each storage block to further reduce the amount of storage that customers need to purchase and manage.
- **Deduplication:** Performs general-purpose deduplication for removal of redundant data to reduce the amount of storage that customers need to purchase and manage.
- **Snapshots:** Enables creation of read-only copies of data for backup, parallel processing, testing, and development, and have the copies available almost immediately.
- **FlexClone:** References snapshot metadata to create writable point-in-time copies of a volume.
- **Encryption:** Provides software-based encryption for data at rest for enhanced data security with the traditional drives and embedded key management (requires the encryption-capable version of the ONTAP software [feature code B4D0]).
- **Balanced placement:** Provides automated workload distribution across the cluster to help increase utilization and performance.
- **Dynamic capacity expansion:** Allows the capacity of a volume or aggregate to be expanded by adding new physical drives.
- **Adaptive Quality of Service:** Simplifies operations and maintains consistent workload performance by defining QoS policies and automatically adjusting storage resources to respond to workload changes.
- **SnapMirror asynchronous mirroring:** Provides storage system-based data replication between the storage systems containing primary (local) and secondary (remote) volumes by using asynchronous data transfers over iSCSI or Fibre Channel communication links at pre-configured intervals.

Note: The asynchronous mirroring feature of the ThinkSystem DM5000H interoperate with other ThinkSystem DM Series storage arrays.

The following table lists the base software selection options for the ThinkSystem DM5000H.

Table 9. Base software features

Description	Part number	Feature code
Lenovo ThinkSystem DM Series ONTAP Software, Encryption Capable	None*	B4D0
Lenovo ThinkSystem DM Series ONTAP Software, No Encryption	None*	B4D1

* Factory-installed only.

Configuration note: The encryption-capable version of the ONTAP Software is not available in the following countries:

- Belarus
- Kazakhstan
- People's Republic of China
- Russia

Software maintenance is included in the ThinkSystem DM5000H 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).

Management

The ThinkSystem DM5000H supports the following management interfaces:

- Lenovo ThinkSystem Storage Manager, a web-based interface via HTTPS for single-system management or centralized management of the cluster of systems, that runs on the storage system itself and 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 SSH or through serial console.
- Syslog, SNMP, and e-mail notifications.
- Optional Lenovo XClarity for discovery, inventory, monitoring, alerts, and firmware updates.

Power supplies and cables

The ThinkSystem DM5000H, DM240S 2U24 SFF, and DM120S LFF enclosures ship with two redundant hot-swap 913 W (100 - 240 V) Platinum AC power supplies, each with an IEC 320-C14 connector.

The ThinkSystem DM600S 4U60 LFF expansion enclosures ship with two redundant hot-swap 2325 W (200 - 240 V) Platinum AC power supplies, each with an IEC 320-C20 connector.

Each ThinkSystem DM Series enclosure requires the selection of two power cables.

The following table lists the rack power cable and line cord options that can be ordered for the DM5000H, DM240S 2U24 SFF, and DM120S 2U12 LFF enclosures (two power cords per enclosure).

Table 10. Power cables for DM5000H, DM240S 2U24 SFF, and DM120S 2U12 LFF enclosures

Description	Part number	Feature code
Rack power cables		
1.0m, 10A/100-250V, C13 to IEC 320-C14 Rack Power Cable	00Y3043	A4VP
1.0m, 13A/100-250V, C13 to IEC 320-C14 Rack Power Cable	4L67A08367	B0N5
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
1.5m, 13A/100-250V, C13 to IEC 320-C14 Rack Power Cable	4L67A08368	B0N6
2.0m, 10A/100-250V, C13 to IEC 320-C14 Rack Power Cable	4L67A08365	B0N4
2.0m, 13A/125V-10A/250V, C13 to IEC 320-C14 Rack Power Cable	4L67A08369	6570
2.5m, 16A/100-250V, 2 Long C13s to Short C20 Rack Power Cable	47C2492	A3SX
2.8m, 10A/100-250V, C13 to IEC 320-C14 Rack Power Cable	4L67A08366	6311
2.8m, 13A/125V-10A/250V, C13 to IEC 320-C14 Rack Power Cable	4L67A08370	6400
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, 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
4.3m, 13A/125V-10A/250V, C13 to IEC 320-C14 Rack Power Cable	4L67A08371	6583
Country-specific line cords		
Argentina 2.8m, 10A/250V, C13 to IRAM 2073 Line Cord	39Y7930	6222
Argentina 4.3m, 10A/250V, C13 to IRAM 2073 Line Cord	81Y2384	6492
Australia/New Zealand 2.8m, 10A/250V, C13 to AS/NZS 3112 Line Cord	39Y7924	6211

Description	Part number	Feature code
Australia/New Zealand 4.3m, 10A/250V, C13 to AS/NZS 3112 Line Cord	81Y2383	6574
Brazil 2.8m, 10A/250V, C13 to NBR 14136 Line Cord	69Y1988	6532
Brazil 4.3m, 10A/250V, C13 to NBR14136 Line Cord	81Y2387	6404
China 2.8m, 10A/250V, C13 to GB 2099.1 Line Cord	39Y7928	6210
China 4.3m, 10A/250V, C13 to GB 2099.1 Line Cord	81Y2378	6580
Denmark 2.8m, 10A/250V, C13 to DK2-5a Line Cord	39Y7918	6213
Denmark 4.3m, 10A/250V, C13 to DK2-5a Line Cord	81Y2382	6575
Europe 2.8m, 10A/250V, C13 to CEE7-VII Line Cord	39Y7917	6212
Europe 4.3m, 10A/250V, C13 to CEE7-VII Line Cord	81Y2376	6572
India 2.8m, 10A/250V, C13 to IS 6538 Line Cord	39Y7927	6269
India 4.3m, 10A/250V, C13 to IS 6538 Line Cord	81Y2386	6567
Israel 2.8m, 10A/250V, C13 to SI 32 Line Cord	39Y7920	6218
Israel 4.3m, 10A/250V, C13 to SI 32 Line Cord	81Y2381	6579
Italy 2.8m, 10A/250V, C13 to CEI 23-16 Line Cord	39Y7921	6217
Italy 4.3m, 10A/250V, C13 to CEI 23-16 Line Cord	81Y2380	6493
Japan 2.8m, 12A/125V, C13 to JIS C-8303 Line cord	46M2593	A1RE
Japan 2.8m, 12A/250V, C13 to JIS C-8303 Line Cord	4L67A08357	6533
Japan 4.3m, 12A/125V, C13 to JIS C-8303 Line Cord	39Y7926	6335
Japan 4.3m, 12A/250V, C13 to JIS C-8303 Line Cord	4L67A08362	6495
Korea 2.8m, 12A/250V, C13 to KS C8305 Line Cord	39Y7925	6219
Korea 4.3m, 12A/250V, C13 to KS C8305 Line Cord	81Y2385	6494
South Africa 2.8m, 10A/250V, C13 to SABS 164 Line Cord	39Y7922	6214
South Africa 4.3m, 10A/250V, C13 to SABS 164 Line Cord	81Y2379	6576
Switzerland 2.8m, 10A/250V, C13 to SEV 1011-S24507 Line Cord	39Y7919	6216
Switzerland 4.3m, 10A/250V, C13 to SEV 1011-S24507 Line Cord	81Y2390	6578
Taiwan 2.8m, 10A/250V, C13 to CNS 10917-3 Line Cord	81Y2375	6317
Taiwan 2.8m, 15A/125V, C13 to CNS 10917-3 Line Cord	81Y2374	6402
Taiwan 4.3m, 10A/250V, C13 to CNS 10917-3 Line Cord	81Y2389	6531
Taiwan 4.3m, 15A/125V, C13 to CNS 10917-3 Line Cord	81Y2388	6530
United Kingdom 2.8m, 10A/250V, C13 to BS 1363/A Line Cord	39Y7923	6215
United Kingdom 4.3m, 10A/250V, C13 to BS 1363/A Line Cord	81Y2377	6577
United States 2.8m, 10A/125V, C13 to NEMA 5-15P Line Cord	90Y3016	6313
United States 2.8m, 10A/250V, C13 to NEMA 6-15P Line Cord	46M2592	A1RF
United States 2.8m, 13A/125V, C13 to NEMA 5-15P Line Cord	00WH545	6401
United States 4.3m, 10A/125V, C13 to NEMA 5-15P Line Cord	4L67A08359	6370
United States 4.3m, 10A/250V, C13 to NEMA 6-15P Line Cord	4L67A08361	6373
United States 4.3m, 13A/125V, C13 to NEMA 5-15P Line Cord	4L67A08360	AX8A

The following table lists the rack power cable and line cord options that can be ordered for the DM600S 4U60 LFF expansion enclosures (two power cords per enclosure).

Table 11. Power cables for DM600S 4U60 enclosures

Description	Part number	Feature code
Rack power cables		
2.5m, 16A/100-250V, C19 to IEC 320-C20 Rack Power Cable	39Y7916	6252
Country-specific line cords		
Argentina 4.3m, 16A/250V, C19 to IRAM 2073 Line Cord	40K9777	6276
Australia/New Zealand 4.3m, 15A/250V, C19 to AS/NZS 3112 Line Cord	40K9773	6284
Brazil 4.3m, 16A/250V, C19 to NBR 14136 Line Cord	40K9775	6277
China 4.3m, 16A/250V, C19 to GB2099.1 Line Cord	40K9774	6288
Denmark/Switzerland 4.3m, 16A/250V, C19 to IEC 309 P+N+G Line Cord	40K9769	6283
Europe 4.3m, 16A/250V, C19 to CEE7-VII Line Cord	40K9766	6279
India 4.3m, 16A/250V, C19 to IS6538 Line Cord	40K9776	6285
Israel 4.3m, 16A/250V, C19 to SI 32 Line Cord	40K9771	6282
Italy 4.3m, 16A/250V, C19 to CEI 23-16 Line Cord	40K9768	6281
Japan 4.3m, 15A/200V, C19 to JIS C-8303 Line Cord	41Y9233	6291
Korea 4.3m, 15A/250V, C19 to KSC 8305 Line Cord	41Y9231	6289
South Africa 4.3m, 16A/250V, C19 to SABS 164 Line Cord	40K9770	6280
Switzerland 4.3m, 16A/250V, C19 to SEV 1011 Line Cord	81Y2391	6549
Taiwan 4.3m, 16A/250V, C19 to CNS 10917-3 Line Cord	41Y9230	6287
United Kingdom 4.3m, 13A/250V, C19 to BS 1363/A Line Cord	40K9767	6278
United States 4.3m, 15A/250V, C19 to NEMA 6-15P Line Cord	00D7197	A1NV
United States 4.3m, 18A/250V, C19 to NEMA L6-20P Line Cord	40K9772	6275

Physical specifications

The ThinkSystem DM5000H controller enclosure has the following dimensions and weight (approximate):

- Height: 85 mm (3.4 in.)
- Width: 447 mm (17.6 in.)
- Depth: 483 mm (19.0 in.)
- Weight (fully configured): 27.6 kg (60.8 lb)

The ThinkSystem DM240S 2U24 SFF enclosures have the following dimensions and weight (approximate):

- Height: 85 mm (3.4 in.)
- Width: 449 mm (17.7 in.)
- Depth: 484 mm (19.1 in.)
- Weight (fully configured): 24.4 kg (53.8 lb)

The ThinkSystem DM120S 2U12 LFF enclosures have the following dimensions and weight (approximate):

- Height: 85 mm (3.4 in.)
- Width: 447 mm (17.6 in.)
- Depth: 483 mm (19.0 in.)
- Weight (fully configured): 28.7 kg (63.3 lb)

The ThinkSystem DM600S 4U60 LFF enclosures have the following dimensions and weight (approximate):

- Height: 174 mm (6.9 in.)
- Width: 449 mm (17.7 in.)
- Depth: 922 mm (36.3 in.)
- Weight (fully configured): 111.5 kg (245.8 lb)

Operating environment

The ThinkSystem DM5000H and DM240S 2U24 SFF enclosures are supported in the following environment:

- Air temperature:
 - Operating:
 - DM5000H and DM240S 2U24 SFF: 5 °C - 45 °C (41 °F - 113 °F)
 - DM120S 2U12 LFF and DM600S 4U60 LFF: 10 °C - 40 °C (50 °F - 104 °F)
 - Non-operating: -40 °C - +70 °C (-40 °F - 158 °F)
 - Maximum altitude: 3050 m (10,000 ft)
- Relative humidity:
 - Operating: 8% - 90% (non-condensing)
 - Non-operating: 10% - 95% (non-condensing)
- Electrical power:
 - DM5000H
 - 100 to 127 (nominal) V AC; 50 Hz or 60 Hz; 5.35 A
 - 200 to 240 (nominal) V AC; 50 Hz or 60 Hz; 2.67 A
 - Maximum system power load: 508 W
 - DM240S 2U24 SFF
 - 100 to 127 (nominal) V AC; 50 Hz or 60 Hz; 4.11 A
 - 200 to 240 (nominal) V AC; 50 Hz or 60 Hz; 2.05 A
 - Maximum system power load: 390 W
 - DM120S 2U12 LFF
 - 100 to 127 (nominal) V AC; 50 Hz or 60 Hz; 3.56 A
 - 200 to 240 (nominal) V AC; 50 Hz or 60 Hz; 1.78 A
 - Maximum system power load: 338 W
 - DM600S 4U60 LFF
 - 200 to 240 (nominal) V AC; 50 Hz or 60 Hz; 8.11 A
 - Maximum system power load: 1541 W
- Heat dissipation:
 - DM5000H: 1733 BTU/hour
 - DM240S 2U24 SFF: 1331 BTU/hour
 - DM120S 2U12 LFF: 1153 BTU/hour
 - DM600S 4U60 LFF: 5258 BTU/hour
- Acoustical noise emission:
 - DM5000H: 6.9 bels
 - DM240S 2U24 SFF: 6.9 bels
 - DM120S 2U12 LFF: 6.3 bels
 - DM600S 4U60 SFF: 7.2 bels

Warranty services and upgrades

The ThinkSystem DM Series enclosures have a three-year Customer Replaceable Unit (CRU) and onsite warranty with 9x5/next business day (NBD) terms.

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
<http://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.
- Basic 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 DM Series enclosures conform to the following regulations:

- United States: FCC Part 15, Class A; UL 60950-1
- Canada: ICES-003, Class A; CAN/CSA-C22.2 60950-1
- Mexico NOM
- European Union: CE Mark (EN55032 Class A, EN55024, IEC/EN60950-1); ROHS Directive 2011/65/EU
- Russia, Kazakhstan, Belarus: EAC
- China: CCC GB 4943.1, GB 17625.1, GB 9254 Class A; CELP; CECP
- Japan: VCCI, Class A
- Taiwan: BSMI CNS 13438, Class A; CNS 14336-1
- Korea KN32/35, Class A
- Australia/New Zealand: AS/NZS CISPR 22 Class A

Interoperability

Lenovo provides end-to-end storage compatibility testing to deliver interoperability throughout the network. The ThinkSystem DM5000H Unified Hybrid Storage Array supports attachment to Lenovo ThinkSystem, System x, ThinkServer, and Flex System hosts by using NAS (NFS and CIFS/SMB), iSCSI, and Fibre Channel storage connectivity protocols. Hybrid storage connectivity also is supported.

For end-to-end storage configuration support, refer to the Lenovo ThinkSystem DM5000H Interoperability Matrix that can be found on the ThinkSystem DM5000H Documentation page on the Lenovo Data Center Support web site:

<http://datacentersupport.lenovo.com>

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 DM5000H Hybrid Storage Array in IT 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 DM5000H Interoperability Matrix.

Adapters

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

- NAS and iSCSI connectivity
- Fibre Channel connectivity

NAS and iSCSI connectivity

The ThinkSystem DM5000H supports NAS and iSCSI attachments via standard 1 Gb and 10 Gb Ethernet connections (direct attach or switch-based). Any compatible Ethernet switch, including Lenovo ThinkSystem and RackSwitch Ethernet switches and embedded Flex System Ethernet I/O modules, can be used to provide NAS and iSCSI connectivity for the ThinkSystem DM5000H storage.

With software iSCSI initiators, any supported 1 Gb or 10 Gb Ethernet adapter for Lenovo servers is compatible with the ThinkSystem DM5000H NAS and iSCSI storage.

Fibre Channel connectivity

The ThinkSystem DM5000H 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 DM5000H FC storage are listed in the following table. Other FC HBAs also might be supported (see the Interoperability Matrix for details).

Table 12. Fibre Channel adapters

Description	Part number
ThinkSystem HBAs: 32 Gb FC (8/6/32 Gb FC connectivity)	
ThinkSystem Emulex LPe32000-M6-LP PCIe 32Gb 1-Port SFP+ Fibre Channel Adapter	7ZT7A00517
ThinkSystem Emulex LPe32002-M6-LP 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
ThinkSystem HBAs: 8 Gb FC	
Emulex LPe12000-M8-L PCIe 8Gb 1-Port SFP+ FC HBA	4XC7A08220
Emulex LPe12002-M8-L PCIe 8Gb 2-Port SFP+ FC HBA	4XC7A08221
System x HBAs: 16 Gb FC	
Emulex 16Gb Gen6 FC Single-port HBA (LPe31000)	01CV830
Emulex 16Gb Gen6 FC Dual-port HBA (LPe31002)	01CV840
Emulex 16Gb FC Single-port HBA (LPe16000)	81Y1655
Emulex 16Gb FC Dual-port HBA (LPe16002)	81Y1662
QLogic 16Gb Enhanced Gen5 FC Single-port HBA (QLE2690)	01CV750
QLogic 16Gb Enhanced Gen5 FC Dual-port HBA (QLE2692)	01CV760
QLogic 16Gb FC Single-port HBA (QLE2660)	00Y3337
QLogic 16Gb FC Dual-port HBA (QLE2662)	00Y3341
System x HBAs: 8 Gb FC	
Emulex 8Gb FC Single-port HBA (LPe12000)	42D0485
Emulex 8Gb FC Dual-port HBA (LPe12002)	42D0494
QLogic 8Gb FC Single-port HBA (QLE2560)	42D0501

Description	Part number
QLogic 8Gb FC Dual-port HBA (QLE2562)	42D0510
ThinkServer HBAs: 16 Gb FC	
ThinkServer LPe16000B Single Port 16Gb Fibre Channel HBA by Emulex	4XB0F28653
ThinkServer LPe16002B Dual Port 16GB Fibre Channel HBA by Emulex	4XB0F28650
ThinkServer LPe16002B-M6-L PCIe 16Gb 2 Port Fibre Channel Adapter by Emulex	4XB0F28705
ThinkServer LPe16004B-M6-L PCIe 16Gb 4 Port Fibre Channel Adapter by Emulex	4XB0F28681
ThinkServer LPm16002-M6-L AnyFabric 16Gb 2 Port Fibre Channel Adapter by Emulex	4XB0F28706
ThinkServer QLE2672 PCIe 16Gb 2 Port Fibre Channel Adapter by QLogic	4XC0F28745
ThinkServer HBAs: 8 Gb FC	
ThinkServer LPe12002 PCIe 8Gb 2 Port Fibre Channel Adapter by Emulex	0C19478
ThinkServer LPe16000B Single Port 8Gb Fibre Channel HBA by Emulex	4XB0F28652
ThinkServer LPe16002B Dual Port 8Gb Fibre Channel HBA by Emulex	4XB0F28643
ThinkServer LPe16002B-M8-L PCIe 8Gb 2 Port Fibre Channel Adapter by Emulex	4XB0F28704
ThinkServer QLE2560 Single Port 8Gb Fibre Channel HBA by QLogic	4XB0F28649
ThinkServer QLE2562 Dual Port 8Gb Fibre Channel HBA by QLogic	0C19482
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

Ethernet LAN switches

The following table lists currently available rack-mount Ethernet switches that are currently offered by Lenovo that can be used with the ThinkSystem DM5000H Unified Hybrid Storage Array in IT solutions.

Table 13. Ethernet rack-mount switches

Description	Part number
1 Gb Ethernet (1 GbE connectivity; NAS and iSCSI)	
Lenovo RackSwitch G7028 (Rear to Front)	7159BAX
Lenovo RackSwitch G7052 (Rear to Front)	7159CAX
Lenovo RackSwitch G8052 (Rear to Front)	7159G52
10 Gb Ethernet (10 GbE connectivity; NAS and iSCSI)	
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 G8272 (Rear to Front)	7159CRW
Lenovo RackSwitch G8296 (Rear to Front)	7159GR6

Description	Part number
25 Gb Ethernet (10 GbE connectivity out of an SFP28 port; NAS and iSCSI)	
Lenovo ThinkSystem NE2572 RackSwitch (Rear to Front)	7159E1X
40 Gb Ethernet (4x 10 GbE breakout connectivity out of a QSFP+ port; NAS and iSCSI)	
Lenovo RackSwitch G8332 (Rear to Front)	7159BRX
100 Gb Ethernet (4x 10 GbE breakout connectivity out of a QSFP28 port; NAS and iSCSI)	
Lenovo ThinkSystem NE10032 RackSwitch (Rear to Front)	7159D1X

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 embedded Ethernet switches and pass-thru modules for Flex System that can be used with the ThinkSystem DM5000H Unified Hybrid Storage Array in IT solutions.

Table 14. Embedded Ethernet switches for Flex System

Description	Part number
1 Gb Ethernet (1 GbE connectivity; NAS and iSCSI)	
Lenovo Flex System EN2092 1Gb Ethernet Scalable Switch	49Y4294
10 Gb Ethernet (10 GbE connectivity; NAS and iSCSI)	
Lenovo Flex System Fabric EN4093R 10Gb Scalable Switch	00FM514
Lenovo Flex System SI4091 10Gb System Interconnect Module	00FE327
Lenovo Flex System Fabric SI4093 System Interconnect Module	00FM518
Cisco Nexus B22 Fabric Extender for Flex System*	94Y5350
Cisco Nexus B22 Fabric Extender with FET bundle for Flex System*	94Y5355
25 Gb Ethernet (10 GbE connectivity out of an SFP28 port; NAS and iSCSI)	
Lenovo ThinkSystem NE2552E Flex Switch	4SG7A08868
Pass-thru modules (10 GbE connectivity [require a compatible external switch]; NAS and iSCSI)	
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 rack-mount Fibre Channel SAN switches that are offered by Lenovo that can be used with the ThinkSystem DM5000H Unified Hybrid Storage Array in IT solutions.

Table 15. Rack-mount Fibre Channel SAN switches

Description	Part number
8 Gb FC	
Lenovo B300, 8 ports activated, 8x 8Gb SWL SFPs, 1 PS, Rail Kit	3873AR3
Lenovo B300, E_Port License included, 8 ports activated, 8x 8Gb SWL SFPs, 1 PS, Rail Kit	3873AR6
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, No SFPs, 2 PS, Rail Kit	6415G3A
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 embedded Fibre Channel SAN switches for Flex System that can be used with the ThinkSystem DM5000H Unified Hybrid Storage Array in IT solutions.

Table 16. Embedded FC SAN switches for Flex System

Description	Part number
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

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 DM5000H 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 6 Update 9
- SUSE:
 - SUSE Linux Enterprise Server 12 SP2
 - SUSE Linux Enterprise Server 11 SP4
- VMware:
 - VMware vSphere 6.5
 - VMware vSphere 6.0 Update 3

Rack cabinets

The following table lists the rack cabinets that are offered by Lenovo that can be used with the ThinkSystem DM5000H Unified Hybrid Storage Array in IT solutions.

Table 17. 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 offered by Lenovo that can be used with the ThinkSystem DM5000H Unified Hybrid Storage Array in IT solutions.

Table 18. 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 line 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 / Monitored 32A/200-240V/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 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 PDU 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 ThinkSystem DM5000H Unified Hybrid Storage Array in IT solutions.

Table 19. Uninterruptible power supply units

Description	Part number
Worldwide models	
RT1.5kVA 2U Rack or Tower UPS (100-125VAC) (8x NEMA 5-15R 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
ASEAN, HTK, INDIA, and PRC models	
ThinkSystem RT3kVA 2U Standard UPS (200-230VAC) (2x C13 & 2x GB 10A, 1x C19 16A outlets)	55943KT
ThinkSystem RT3kVA 2U Long Backup UPS (200-230VAC) (2x C13 & 2x GB 10A, 1x C19 16A outlets)	55943LT
ThinkSystem RT6kVA 5U UPS (200-230VAC) (2x C13 10A outlets, 1x Terminal Block output)	55946KT
ThinkSystem RT10kVA 5U UPS (200-230VAC) (2x C13 10A outlets, 1x Terminal Block output)	5594XKT

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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For more information about your region-specific offers, contact your Lenovo sales representative or your technology provider about the use of Lenovo Financial Services. For more information, see the following Lenovo website:

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Related publications and links

For more information, see the following resources:

- [Lenovo Data Center SAN Storage product page](http://www.lenovo.com/us/en/c/storage-area-network)
- [Lenovo Data Center Solution Configurator](http://dcsc.lenovo.com)
- [Lenovo Data Center Support](http://datacentersupport.lenovo.com)

Related product families

Product families related to this document are the following:

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

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