

Lenovo Distributed Storage Solution for IBM Storage Scale (DSS-G) on ThinkSystem V3

Product Guide

Lenovo Distributed Storage Solution for IBM Storage Scale (DSS-G) is a software-defined storage (SDS) solution for dense scalable file and object storage suitable for high-performance and data-intensive environments. Enterprises or organizations running HPC, AI, Big Data or cloud workloads will benefit the most from the DSS-G implementation.

DSS-G combines the performance of Lenovo ThinkSystem SR655 V3 2U servers with an AMD EPYC 9004 Series processor, Lenovo storage enclosures, and industry leading IBM Storage Scale software, to offer a high performance, scalable building block approach to modern storage needs.

Lenovo DSS-G is delivered as a pre-integrated, easy-to-deploy rack-level engineered solution that dramatically reduces time-to-value and total cost of ownership (TCO). The solution is built on Lenovo ThinkSystem SR655 V3 servers, Lenovo Storage D1224 Drive Enclosures with high-performance 2.5-inch SAS SSDs, and Lenovo Storage D4390 High-Density Drive Enclosures with large capacity 3.5-inch NL SAS HDDs.

Combined with IBM Storage Scale (formerly IBM Spectrum Scale or General Parallel File System, GPFS), an industry leader in high-performance clustered file system, you have an ideal solution for the ultimate file storage solution for HPC, AI & Big Data.



Figure 1. Lenovo DSS-G G260

Did you know?

DSS-G with ThinkSystem V3 is more than doubling the performance over the previous generation and supports up to 25% more capacity in a single building block.

Lenovo DSS-G can be licensed by the number of drives installed or alternatively the usable capacity,

rather than the number of processor cores or the number of connected clients, so there are no added licenses for other servers or clients that mount and work with the file system.

Lenovo DSS-G with storage enclosures supports online enclosure expansion. This enables a customer to grow the number of enclosures in an existing DSS-G building block without bringing down the file system, maximizing flexibility to scale storage capacity based on need.

With available Lenovo Premier Support Services, Lenovo provides a single point of entry for supporting the entire DSS-G solution, including the IBM Storage Scale software, for quicker problem determination and minimized downtime.

Software features

DSS-G has the following key software features:

- [IBM Storage Scale](#)
- [Storage Scale RAID on Data Access and Data Management Edition](#)
- [DSS-G Call Home](#)

IBM Storage Scale

IBM Storage Scale, based on IBM General Parallel File System (GPFS) technology, is a high-performance and highly scalable parallel file system with an extensive suite of enterprise class data management features. IBM Storage Scale was previously known as IBM Spectrum Scale.

Lenovo is a strategic alliance partner of IBM, and combines IBM Storage Scale software with Lenovo servers, storage and networking components for integrated and customized solutions.

IBM Storage Scale offers access to a single file system or set of filesystems from multiple nodes that can be SAN-attached, network attached or a mix of both or even in a shared nothing cluster configuration. It provides a global namespace, shared file system access among IBM Storage Scale clusters, simultaneous file access from multiple nodes, high recoverability and data availability through replication, the ability to make changes while a file system is mounted, and simplified administration even in large environments. When integrated as part of the Lenovo DSS-G system, the Storage Scale Native RAID code (GNR) is used to provide a fully software defined IBM Storage Scale solution.

Lenovo DSS-G supports two editions of IBM Storage Scale:

- IBM Storage Scale Data Access Edition (DAE) provides base GPFS functions including Information Lifecycle Management (ILM), Active File Management (AFM), and Clustered NFS (CNFS) in Linux environments.
- IBM Storage Scale Data Management Edition (DME) provides all the features of the Data Access Edition plus advanced features like asynchronous multi-site disaster recovery, native encryption support, Transparent Cloud Tiering.

Table 1. IBM Storage Scale feature comparison

Feature	Data Access	Data Management
Multi-protocol scalable file service with simultaneous access to a common set of data	Yes	Yes
Facilitate data access with a global namespace, massively scalable file system, quotas and snapshots, data integrity and availability, and filesets	Yes	Yes
Simplify management with GUI	Yes	Yes
Improved efficiency with QoS and compression	Yes	Yes
Create optimized tiered storage pools based on performance, locality, or cost	Yes	Yes
Simplify data management with Information Lifecycle Management (ILM) tools that include policy-based data placement and migration	Yes	Yes
Enable worldwide data access using AFM asynchronous replication	Yes	Yes
Asynchronous multi-site Disaster Recovery	No	Yes
Transparent Cloud Tiering (TCT)	No	Yes
Protect data with native software encryption and secure erase, NIST compliant and FIPS certified	No	Yes*

Feature	Data Access	Data Management
File audit logging	No	Yes
Watch folder	No	Yes
Erasur coding	No	No
Network-disperses erasure coding	No	No
Licensing	Per Disk Drive/Flash Device or per Capacity	Per Disk Drive/Flash Device or per Capacity

* Requires additional key management software to enable
Information about licensing is in the IBM Storage Scale licensing section.

For more information about IBM Storage Scale or IBM GKLM, see the following web pages:

- IBM Storage Scale product page:
<https://www.ibm.com/products/scale-out-file-and-object-storage>
- IBM Storage Scale FAQ:
<https://www.ibm.com/support/knowledgecenter/en/STXKQY/gpfsclustersfaq.html>
- IBM GKLM Encryption KEY Manager:
<https://www.ibm.com/products/guardium-key-lifecycle-manager>

Storage Scale RAID on Data Access and Data Management Edition

IBM Storage Scale RAID (also known as GNR) integrates the functionality of an advanced storage controller into the GPFS NSD server. Unlike an external storage controller, where configuration, LUN definition, and maintenance are beyond the control of IBM Storage Scale, IBM Storage Scale RAID itself takes on the role of controlling, managing, and maintaining physical disks - hard disk drives (HDDs) and solid-state drives (SSDs).

Sophisticated data placement and error correction algorithms deliver high levels of storage reliability, availability, serviceability, and performance. IBM Storage Scale RAID provides a variation of the GPFS network shared disk (NSD) called a virtual disk, or vdisk. Standard NSD clients transparently access the vdisk NSDs of a file system using the conventional NSD protocol.

The features of IBM Storage Scale RAID include:

- **Software RAID**
IBM Storage Scale RAID, which runs on standard Serial Attached SCSI (SAS) disks in a dual-ported JBOD array, does not require external RAID storage controllers or other custom hardware RAID acceleration.
- **Declustering**
IBM Storage Scale RAID distributes client data, redundancy information, and spare space uniformly across all disks of a JBOD. This approach reduces the rebuild (disk failure recovery process) overhead and improves application performance compared to conventional RAID.
- **Pdisk-group fault tolerance**
In addition to declustering data across disks, IBM Storage Scale RAID can place data and parity information to protect against groups of disks that, based on characteristics of a disk enclosure and system, could possibly fail together due to a common fault. The data placement algorithm ensures that even if all members of a disk group fail, the error correction codes will still be capable of recovering damaged data.

- **Checksum**

An end-to-end data integrity check, using checksums and version numbers, is maintained between the disk surface and NSD clients. The checksum algorithm uses version numbers to detect silent data corruption and lost disk writes.

- **Data redundancy**

IBM Storage Scale RAID supports highly reliable 2-fault-tolerant and 3-fault-tolerant Reed-Solomon-based parity codes and 3-way and 4-way replication.

- **Large cache**

A large cache improves read and write performance, particularly for small I/O operations.

- **Arbitrarily-sized disk arrays**

The number of disks is not restricted to a multiple of the RAID redundancy code width, which allows flexibility in the number of disks in the RAID array.

- **Multiple redundancy schemes**

One disk array can support vdisks with different redundancy schemes, for example Reed-Solomon and replication codes.

- **Disk hospital**

A disk hospital asynchronously diagnoses faulty disks and paths, and requests replacement of disks by using past health records.

- **Automatic recovery**

Seamlessly and automatically recovers from primary server failure.

- **Disk scrubbing**

A disk scrubber automatically detects and repairs latent sector errors in the background.

- **Familiar interface**

Standard IBM Storage Scale command syntax is used for all configuration commands, including maintaining and replacing failed disks.

- **Flexible hardware configuration**

Support of JBOD enclosures with multiple disks physically mounted together on removable carriers.

- **Journaling**

For improved performance and recovery after a node failure, internal configuration and small-write data are journaled to solid-state disks (SSDs) in the JBOD or to non-volatile random-access memory (NVRAM) that is internal to the IBM Storage Scale RAID servers.

For more information about IBM Storage Scale RAID see the following documents:

- [Introducing IBM Storage Scale RAID](#)
- [Lenovo DSS-G Declustered RAID Technology and Rebuild Performance](#)

DSS-G Call Home

Call Home provides DSS-G customers with functionality to simplify and accelerate the resolution of support tickets related to hardware issues at no additional charge. Call Home leverages the mmhealth command from IBM Storage Scale to provide status when hardware components are recognized as “degraded”: disk drives, SAS cables, IOMs, and more. Another script packages this data in a bundle fully ready for support triage (either IBM L1 support, or Lenovo L1 support for customers leveraging Premier Support for DSS-G). As an optional add-on, Call Home can then be enabled to automatically route the

ticket to support without any administrator intervention.

The DSS-G call home feature is currently enabled as a Technology Preview. Contact the HPC Storage team at HPCstorage@lenovo.com for further information, or contact Lenovo Managed Services and open a support ticket.

Hardware features

Lenovo DSS-G is fulfilled through Lenovo EveryScale (formerly Lenovo Scalable Infrastructure, LeSI), which offers a flexible framework for the development, configuration, build, delivery and support of engineered and integrated data center solutions. Lenovo thoroughly tests and optimizes all EveryScale components for reliability, interoperability and maximum performance, so clients can quickly deploy the system and get to work achieving their business goals.

The major hardware components of a DSS-G solution are:

- 2x ThinkSystem SR655 V3 servers
- Choice of direct-attach storage enclosures - D1224 and or D4390 enclosures
 - 1x-4x Lenovo Storage D1224 Drive Enclosures each holding 24x 2.5-inch SSDs (small form factor configuration DSS-G20x)
 - 1x-8x Lenovo Storage D4390 External High Density Drive Expansion Enclosure, each holding 90x 3.5-inch HDDs (large form factor configuration DSS-G2x0)
 - 1x-2x D1224 Enclosure plus 1x-7x D4390 Enclosure (max 8x enclosures total, hybrid configuration DSS-G2xx)

Topics in this section:

- [Lenovo ThinkSystem SR655 V3 server](#)
- [Lenovo Storage D1224 Drive Enclosures](#)
- [Lenovo Storage D4390 External Drive Expansion Enclosure](#)
- [Infrastructure and rack installation](#)

Lenovo ThinkSystem SR655 V3 server



Figure 2. Lenovo ThinkSystem SR655 V3

Key features

Combining performance and flexibility, the SR655 V3 server is a great choice for enterprises of all sizes. The server offers a broad selection of drive and slot configurations and offers high performance features that industries such as finance, healthcare and telco need. Outstanding reliability, availability, and serviceability (RAS) and high-efficiency design can improve your business environment and can help save operational costs.

Scalability and performance

The following key features boost performance, improve scalability and reduce costs for the Lenovo DSS-G solution:

- Supports one fourth-generation AMD EPYC 9004 processor
 - Up to 128 cores and 256 threads
 - Core speed of up to 4.1 GHz
 - TDP rating of up to 360W
 - In the Lenovo DSS-G solution, the CPU is pre-selected based on Lenovo performance optimisation

- Support for DDR5 memory DIMMs to maximize the performance of the memory subsystem:
 - 12 DDR5 memory DIMMs
 - 12 memory channels (1 DIMM per channel)
 - DIMM speeds up to 4800 MHz
 - Using 128GB 3DS RDIMMs, the server supports up to 1.5TB of system memory
 - In the Lenovo DSS-G solution, the memory sizing is a function of capacity of the solution
- Supports high-speed RAID controllers from Lenovo and Broadcom providing 24Gb & 12Gb SAS connectivity to the drive backplanes. A variety of PCIe 3.0 and PCIe 4.0 RAID adapters are available.
- Up to 10x total PCIe slots (either 10x rear, or 6x rear + 2x front), plus a slot dedicated to the OCP adapter (rear or front). 2.5-inch drive configurations also support an additional internal bay for a cabled RAID adapter or HBA. In the Lenovo DSS-G solution, 6x x16 PCIe slots are available in each IO Server.
- The server has a dedicated industry standard OCP 3.0 small form factor (SFF) slot, with a PCIe 4.0 x16 interface, supporting a variety of Ethernet network adapters. Simple-swap mechanism with thumbscrews and pull-tab enables tool-less installation and removal of the adapter. Supports shared BMC network sideband connectivity to enable out-of-band systems management.
- The server offers PCI Express 5.0 (PCIe Gen 5) I/O expansion capabilities that doubles the theoretical maximum bandwidth of PCIe 4.0 (32GT/s in each direction for PCIe 5.0, compared to 16 GT/s with PCIe 4.0). A PCIe 5.0 x16 slot provides 128 GB/s bandwidth, enough to support a 400GbE network connection.

For more information about the SR655 V3, see the Product Guide:
<https://lenovopress.lenovo.com/lp1610-thinksystem-sr655-v3-server>

Lenovo Storage D1224 Drive Enclosures



Figure 3. Lenovo Storage D1224 Drive Enclosure

Lenovo Storage D1224 Drive Enclosures have the following key features:

- 2U rack mount enclosure with 12 Gbps SAS direct-attached storage connectivity, designed to provide simplicity, speed, scalability, security, and high availability
- Holds 24x 2.5-inch small form factor (SFF) drives
- Dual Environmental Service Module (ESM) configurations for high availability 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 on a single RAID adapter or HBA to perfectly meet performance and capacity requirements for various workloads
- Support multiple host attachments and SAS zoning for storage partitioning

For more information about the Lenovo Storage D1224 Drive Enclosure, see the Lenovo Press product guide:

<https://lenovopress.com/lp0512>

When integrated as part of a Lenovo DSS-G system, the D1224 enclosure is only supported with SAS SSDs installed and without SAS zoning. The D1224 can be supplied both as a SAS SSD only solution or as part of a hybrid configuring with D4390 based HDD.

Lenovo Storage D4390 External Drive Expansion Enclosure



Figure 4. D4390 High Density Expansion Enclosure

The Lenovo ThinkSystem D4390 Direct Attached Storage Enclosure offers 24 Gbps SAS direct-attached drive-rich storage expansion capabilities that are designed to provide density, speed, scalability, security, and high availability for high-capacity application. The D4390 delivers enterprise-class storage technology in a cost-effective dense solution with flexible drive configurations of up to 90 drives in 4U rack space.

Key features

Key features and benefits provided by the Lenovo ThinkSystem D4390 include:

- Versatile, scalable storage expansion with dual Electronic Service Module (ESM) configurations for high availability and performance
- Flexible host connectivity to match diverse client needs for direct attach storage with support. Users are able to use either 24Gb SAS or 12 Gb SAS RAID adapters for advanced data protection.
- Support 90x 3.5-inch large form factor (LFF) 24Gb Nearline SAS drives in a 4U rack space
- Scalability of up to 180 drives per HBA with the attachment of up to two D4390 daisy-chained high density expansion enclosures
- Flexibility in storing data on high performance SAS SSDs or capacity-optimized enterprise NL SAS HDDs; mixing and matching drive types on a single HBA to perfectly meet performance and capacity requirements for various workloads

The D4390 Direct Attached Storage Enclosure is designed to support a wide range of data storage requirements, from highly utilized applications to high-capacity, low usage applications.

The following SAS drives are supported by the D4390:

- High-capacity, archival-class nearline HDDs, up to 24 TB 7.2K rpm
- High performance SSDs (2.5" drive in 3.5" tray): 800 GB

Additional drives and expansion units are designed to be dynamically added with virtually no downtime (operating system dependent), helping to quickly and seamlessly respond to growing capacity demands.

The D4390 Direct Attached Storage Enclosure is designed to offer high levels of system and data

availability with the following technologies:

- Dual ESMs provide redundant paths from a supported HBA to the drives in the enclosures for I/O load balancing and failover
- Dual-port drives (both HDDs and SSDs)
- Redundant hardware, including host ports, ESMs, power supplies, 5V DC/DC regulators and cooling fans
- Hot-swappable and customer replaceable components; including ESMs, power supplies, cooling fans, 5V DC/DC modules, and drives

For more information, see the D4390 product guide:

<https://lenovopress.lenovo.com/lp1681-lenovo-storage-thinksystem-d4390-high-density-expansion-enclosure>

Unlike the previous DSS-G storage JBOD (D3284), there are no separate drive drawers. A cable management arm is installed on the rear of the enclosure to enable the enclosure to be pulled out for drive service without impacting operation of the DSS-G system. The D4390 enclosure includes an ingenious drive access solution with sliding top-panel so that only the row of drives to be serviced is exposed, this design helps to maintain air-flow through the system during maintenance and supports improved maintenance times.

Infrastructure and rack installation

The solution arrives at the customer location installed in the Lenovo 1410 Rack, tested, components and cables labeled and ready to deploy for quick productivity.

- Factory-integrated, pre-configured ready-to-go solution that is delivered in a rack with all the hardware you need for your workloads: servers, storage, and network switches, plus essential software tools.
- Pre integrated high performance managed PDUs.
- IBM Storage Scale software is preinstalled on all servers.
- Optional NVIDIA Networking SN2201 Gigabit Ethernet switch for system management.
- Optional Lenovo ThinkSystem SR635 V3 server to run the Lenovo Confluent cluster administration software and to optionally act as the Storage Scale quorum. One Lenovo Confluent management system is required for a DSS-G deployment, however the management server may be shared across HPC cluster and DSS-G building blocks.
- Designed for effortless integration into existing infrastructures, thereby reducing deployment time and saving money.
- Lenovo deployment services are available with the solution help get customers up and running quickly by allowing to begin deploying workloads in hours — not weeks — and realize substantial savings.
- Available NVIDIA Ethernet switches for a high speed Ethernet DSS-G deployments that provide exceptional performance and low latency, along with cost savings, and are designed to perform seamlessly with other vendors' upstream switches.
- All the components of the solution are available through Lenovo, which provides a single point of entry for all support issues that you might encounter with the server, networking, storage, and software used in the solution, for quicker problem determination and minimized downtime.
- Optional Lenovo Rear Door Heat Exchanger can be installed on the rear of the rack.

In addition to the Lenovo 1410 rack solution, the Lenovo DSS-G can also be supplied for installation into an existing customer rack (called a rackless 7X74 solution). When supplied for installation into existing racks, the DSS-G system is factory integrated and tested in the same manner as a fully racked solution

but is shipped to the customer in traditional boxed packaging. Lenovo services or business partner services can be used to install into the customer rack or the customer can undertake their own rack installation. Where a customer-supplied rack is used, the customer is responsible for ensuring compatibility with the Lenovo components including, but not limited to, depth and fit of enclosure rails and weight loading.

Components

The following figure shows two of the configurations available, the G204 (2x SR655 V3 and 4x D1224) and the G260 (2x SR655 V3 and 6x D4390). See the [Models](#) section for all available configurations.

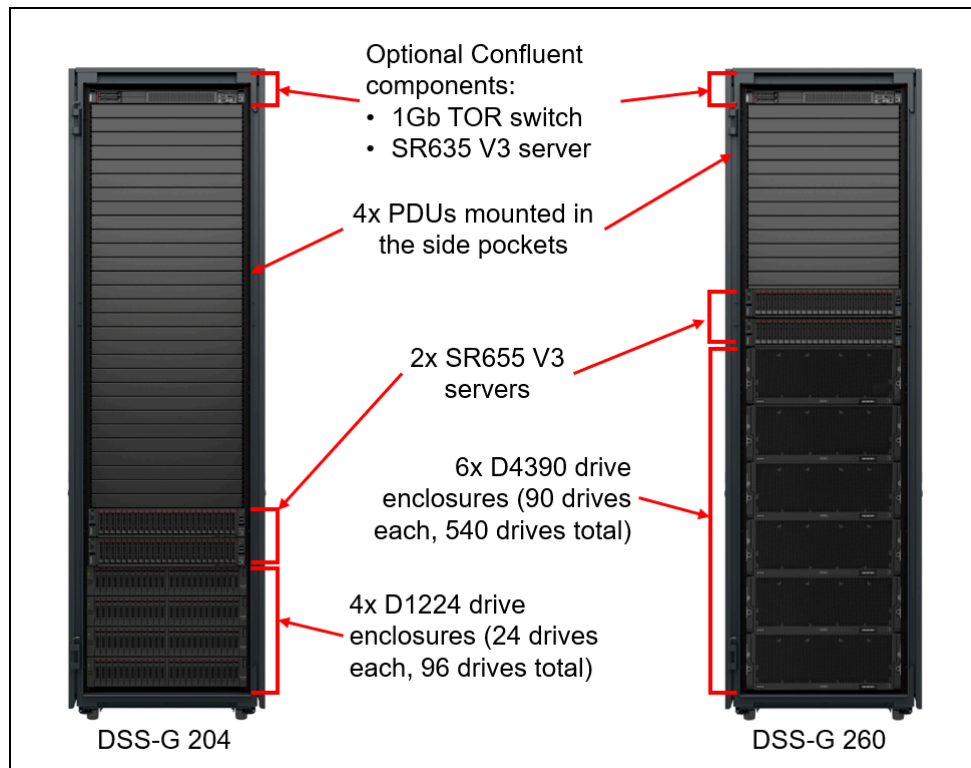


Figure 5. DSS-G components

Specifications

This section lists the system specifications of the components used in the Lenovo DSS-G offerings.

- [SR655 V3 specifications](#)
- [D4390 LFF storage enclosure specifications](#)
- [D1224 SFF storage enclosure specifications](#)
- [Rack cabinet specifications](#)
- [Optional management components](#)

SR655 V3 specifications

The specifications of the SR655 V3 server are listed in the following table.

Table 2. Standard specifications

Components	Specification
Machine types	7D9F - 1 year warranty 7D9E - 3 year warranty
Form factor	2U rack.
Processor	One AMD EPYC 9004 Series processor (formerly codenamed "Genoa"). Supported processors up to 128 cores, core speeds of up to 4.1 GHz, and TDP ratings of up to 360W. Supports PCIe 5.0 for high performance I/O.
Chipset	Not applicable (platform controller hub functions are integrated into the processor)
Memory	12 DIMM slots. The processor has 12 memory channels, with 1 DIMM per channel (DPC). Lenovo TruDDR5 RDIMMs, 3DS RDIMMs, and 9x4 RDIMMs are supported, up to 4800 MHz
Memory maximum	Up to 1.5TB with 12x 128GB 3DS RDIMMs
Memory protection	ECC, SDDC, Patrol/Demand Scrubbing, Bounded Fault, DRAM Address Command Parity with Replay, DRAM Uncorrected ECC Error Retry, On-die ECC, ECC Error Check and Scrub (ECS), Post Package Repair
Disk drive bays	Up to 20x 3.5-inch or 40x 2.5-inch hot-swap drive bays: <ul style="list-style-type: none"> • Front bays can be 3.5-inch (8 or 12 bays) or 2.5-inch (8, 16 or 24 bays) • Middle bays can be 3.5-inch (4 bays) or 2.5-inch (8 bays) • Rear bays can be 3.5-inch (2 or 4 bays) or 2.5-inch (4 or 8 bays) • Combinations of SAS/SATA, NVMe, or AnyBay (supporting SAS, SATA or NVMe) are available <p>The server also supports these drives for OS boot or drive storage:</p> <ul style="list-style-type: none"> • Two 7mm drives at the rear of the server (optional RAID) • Internal M.2 module supporting up to two M.2 drives (optional RAID)
Maximum internal storage	<ul style="list-style-type: none"> • 2.5-inch drives: <ul style="list-style-type: none"> ◦ 1228.8TB using 40x 30.72TB 2.5-inch SAS/SATA SSDs ◦ 491.52TB using 32x 15.36TB 2.5-inch NVMe SSDs ◦ 96TB using 40x 2.4TB 2.5-inch HDDs • 3.5-inch drives: <ul style="list-style-type: none"> ◦ 480TB using 20x 24TB 3.5-inch HDDs ◦ 307.2TB using 20x 15.36TB 3.5-inch SAS/SATA SSDs ◦ 153.6TB using 12x 12.8TB 3.5-inch NVMe SSDs

Components	Specification
Storage controller	<ul style="list-style-type: none"> • Up to 16x Onboard SATA ports (non-RAID) • Up to 12x Onboard NVMe ports (non-RAID) • NVMe Retimer Adapter (PCIe 4.0 or PCIe 5.0) • NVMe Switch Adapter (PCIe 4.0) • 12 Gb SAS/SATA RAID adapters <ul style="list-style-type: none"> ◦ 8, 16 or 32 ports ◦ Up to 8GB flash-backed cache ◦ PCIe 4.0 or PCIe 3.0 host interface • 12 Gb SAS/SATA HBA (non-RAID) <ul style="list-style-type: none"> ◦ 8-port and 16-port ◦ PCIe 4.0 or PCIe 3.0 host interface
Optical drive bays	No internal optical drive
Tape drive bays	No internal backup drive
Network interfaces	Dedicated OCP 3.0 SFF slot with PCIe 4.0 x16 host interface, either at the rear of the server (rear-accessible) or the front of the server (front-accessible). Supports a variety of 2-port and 4-port adapters with 1GbE, 10GbE and 25GbE network connectivity. One port can optionally be shared with the XClarity Controller 2 (XCC2) management processor for Wake-on-LAN and NC-SI support. Additional PCIe network adapters supported in PCIe slots.
PCI Expansion slots	<p>Up to 10x total PCIe slots (either 10x rear, or 6x rear + 2x front), plus a slot dedicated to the OCP adapter (rear or front). 2.5-inch drive configurations also support an additional internal bay for a cabled RAID adapter or HBA.</p> <p><i>Rear:</i> Up to 10x PCIe slots, plus a slot dedicated to the OCP adapter. Slots are either PCIe 5.0 or 4.0 depending on riser selection and rear drive bay selection. OCP slot is PCIe 4.0.</p> <p>Slots are configured using three riser cards. Riser 1 (slots 1-3) and Riser 2 (slots 4-6) are installed in slots in the system board, Riser 3 (slots 7-8) and Riser 4 (9-10) are cabled to ports on the system board. A variety of riser cards are available.</p> <p><i>Front:</i> The server supports slots at the front of the server (configurations with up to 16 drive bays), as an alternative to rear slots in Riser 3 (and Riser 4). Front slots are 2x PCIe x16 full-height half-length slots plus 1x OCP slot. OCP slot is PCIe 4.0.</p> <p><i>Internal:</i> For 2.5-inch front drive configurations, the server supports the installation of a RAID adapter or HBA in a dedicated area that does not consume any of the PCIe slots.</p>
Ports	<p>Front: 1x USB 3.2 G1 (5 Gb/s) port, 1x USB 2.0 port (also for XCC local management), External diagnostics port, optional VGA port.</p> <p>Rear: 3x USB 3.2 G1 (5 Gb/s) ports, 1x VGA video port, 1x RJ-45 1GbE systems management port for XCC remote management. Optional 2nd XCC remote management port (installs in OCP slot). Optional DB-9 COM serial port (installs in slot 3).</p> <p>Internal: 1x USB 3.2 G1 (5 Gb/s) connector for operating system or license key purposes.</p>
Cooling	Up to 6x N+1 redundant hot swap 60 mm fans, configuration dependent. One fan integrated in each power supply.
Power supply	Up to two hot-swap redundant AC power supplies, 80 PLUS Platinum or 80 PLUS Titanium certification. 750 W, 1100 W, 1800 W, 2400 W, and 2600 W AC, supporting 220 V AC. 750 W and 1100 W options also support 110V input supply. In China only, all power supply options support 240 V DC. Also available is a 1100W power supply with a -48V DC input.

Components	Specification
Video	Embedded video graphics with 16 MB memory with 2D hardware accelerator, integrated into the XClarity Controller. Maximum resolution is 1920x1200 32bpp at 60Hz.
Hot-swap parts	Drives, power supplies, and fans.
Systems management	Operator panel with status LEDs. Optional External Diagnostics Handset with LCD display. Models with 16x 2.5-inch front drive bays can optionally support an Integrated Diagnostics Panel. XClarity Controller 2 (XCC2) embedded management based on the ASPEED AST2600 baseboard management controller (BMC). Dedicated rear Ethernet port for XCC2 remote access for management. Optional 2nd redundant XCC2 remote port supported, installs in the OCP slot. XClarity Administrator for centralized infrastructure management, XClarity Integrator plugins, and XClarity Energy Manager centralized server power management. Optional XCC Platinum to enable remote control functions and other features.
Security features	Chassis intrusion switch, Power-on password, administrator's password, Root of Trust module supporting TPM 2.0 and Platform Firmware Resiliency (PFR). Optional lockable front security bezel.
Limited warranty	Three-year or one-year (model dependent) customer-replaceable unit and onsite limited warranty with 9x5 next business day (NBD).
Service and support	Optional service upgrades are available through Lenovo Services: 4-hour or 2-hour response time, 6-hour fix time, 1-year or 2-year warranty extension, software support for Lenovo hardware and some third-party applications.
Dimensions	Width: 445 mm (17.5 in.), height: 87 mm (3.4 in.), depth: 766 mm (30.1 in.).
Weight	Maximum: 38.8 kg (85.5 lb)

D4390 LFF storage enclosure specifications

The following table lists the D4390 standard system specifications.

Table 3. System specifications

Attribute	Specification
Machine types	7DAH
Form factor	4U rack mount.
Number of ESMs	2
Expansion ports	4x 24Gbps Mini-SAS HD (SFF-8674) ports per ESM.
Drive technologies	NL SAS HDDs and SAS SSDs. Intermix of HDDs and SSDs for DSS-G is only supported in the first enclosure. <ul style="list-style-type: none"> Up to 90x hot-swap SAS drives per enclosure Up to 24TB 7,200rpm NL-SAS HDDs 800GB SSDs (2.5" drive in 3.5" tray)
Drive connectivity	Dual-ported 12 Gb SAS drive attachment infrastructure.
Host adapters	Host bus adapters (non-RAID) for DSS-G: <ul style="list-style-type: none"> ThinkSystem 450W-16e PCIe 24Gb SAS HBA
Cooling	Five 80 mm hot-swap/redundant fan modules, hot-pluggable from the top.
Power supply	Four hot-swap 80PLUS Titanium 1300W AC power supplies (3+1 AC100~240V, 2+2 AC200~240V)
Hot-swap parts	HDDs, SSDs, ESMs, 5V DC-DC modules, fans, power supplies.
Management interfaces	In-band SES commands.

Attribute	Specification
Warranty	Three-year limited warranty, 9x5 Next Business Day Onsite (upgradeable).
Service and support	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, hardware installation.
Dimensions	Height: 175.3mm (6.9 in); Width: 446mm (17.56"); Depth: 1080mm (42.52") w/ CMA.
Weight	min. 45kg (95lbs); max. 118kg (260lbs) with full drive configuration.

D1224 SFF storage enclosure specifications

The following table lists the D1224 specifications.

Table 4. D1224 specifications

Attribute	Specification
Form factor	2U rack mount
Number of ESMs	2
Expansion ports	3x 12 Gb SAS x4 (Mini-SAS HD SFF-8644) ports (A, B, C) per ESM
Drive bays	24 SFF hot-swap drive bays; up to 8x D1224 enclosures can be daisy chained on a supported RAID adapter or HBA for a total of up to 192 SFF drives.
Drive technologies	SAS and NL SAS HDDs and SEDs; SAS SSDs. Intermix of HDDs, SEDs, and SSDs is supported within an enclosure, but not within a RAID array.
Drive connectivity	Dual-ported 12 Gb SAS drive attachment infrastructure.
Storage capacity	Up to 1.47 PB (8 enclosures and 192x 7.68 TB SFF SAS SSDs)
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	ESMs, drives, PCMs.
Management interfaces	SAS Enclosure Services, 10/100 Mb Ethernet for external management.
Security features	SAS zoning, self-encrypting drives (SEDs).
Warranty	Three-year customer-replaceable unit, parts delivered limited warranty with 9x5 next business day response.
Service and support	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, remote technical support, hardware installation.
Dimensions	Height: 88 mm (3.5 in), width: 443 mm (17.4 in), depth: 630 mm (24.8 in)
Maximum weight	24 kg (52.9) lb

Rack cabinet specifications

The DSS-G can be pre-installed and shipped in a 42U or 48U Lenovo EveryScale Heavy Duty Rack Cabinet. The specifications of the rack are in the following table.

Table 5. Rack cabinet specifications

Component	42U EveryScale Heavy Duty Rack Cabinet	48U EveryScale Heavy Duty Rack Cabinet
Model	1410-O42 (42U Black) 1410-P42 (42U White)	1410-O48 (48U Black) 1410-P48 (48U White)
Rack U Height	42U	48U
Dimensions	Height: 2011 mm / 79.2 inches Width: 600 mm / 23.6 inches Depth: 1200 mm / 47.2 inches	Height: 2277 mm / 89.6 inches Width: 600 mm / 23.6 inches Depth: 1200 mm / 47.2 inches
Front & Rear Doors	Lockable, perforated, full doors (rear door is not split) Optional water-cooled Rear Door Heat Exchanger (RDHX)	
Side Panels	Removable and lockable side doors	
Side Pockets	6 side pockets	8 side pockets
Cable exits	Top cable exits (front & rear); Bottom cable exit (rear only)	
Stabilizers	Front & side stabilizers	
Ship Loadable	Yes	
Load Capacity for Shipping	1600 kg / 3500 lb	1800kg / 4000 lb
Maximum Loaded Weight	1600 kg / 3500 lb	1800kg / 4000 lb

For more information about the EveryScale Heavy Duty Rack Cabinets, see the Lenovo Heavy Duty Rack Cabinets product guide, <https://lenovopress.com/lp1498>

Besides shipping fully integrated into the Lenovo 1410 rack cabinet, DSS-G solution gives clients the choice of shipping with the Lenovo Client Site Integration Kit (7X74) which allows clients to have Lenovo or a business partner install the solution in a rack of their own choosing.

Optional management components

Optionally, the configuration can include a management node and Gigabit Ethernet switch. The management node will run the Confluent cluster administration software. If this node and switch are not selected as part of the DSS-G configuration, an equivalent customer-supplied management environment needs to be available.

A management network and Confluent management server are required and can be either configured as part of the DSS-G solution, or can be provided by the customer. The following server and network switch are configurations that are added by default in x-config but can be removed or replaced if an alternative management system is provided:

- Management node - Lenovo ThinkSystem SR635 V3
 - 1U rack server
 - One AMD EPYC 7004 Series processor
 - Memory up to 2TB using 16x 128GB 3DS RDIMMs
 - 2x ThinkSystem 2.5" 300GB 10K SAS 12Gb Hot Swap 512n HDD
 - 2x 750W (230V/115V) Platinum Hot-Swap Power Supply

For more information about the server see the Lenovo Press product guide:

<https://lenovopress.lenovo.com/lp1160-thinksystem-sr635-server#supported-drive-bay-combinations>

- Gigabit Ethernet switch - NVIDIA Networking SN2201:
 - 1U top-of-rack switch
 - 48x 10/100/1000BASE-T RJ-45 ports

- 4x 100 Gigabit Ethernet QSFP28 uplink ports
- 1x 10/100/1000BASE-T RJ-45 management port
- 2x 250W AC (100-240V) power supplies

Models

Lenovo DSS-G is available in the configurations listed in the following table. Each configuration is installed in a 42U rack, although multiple DSS-G configurations can share the same rack.

Naming convention: The three numbers in the **Gxyz** configuration number represent the following:

- **x** = Number of servers (SR655 V3)
- **y** = Number of D4390 drive enclosures
- **z** = Number of D1224 drive enclosures

Table 6. Lenovo DSS-G configurations

Configuration	SR655 V3 servers	D4390 drive enclosures	D1224 drive enclosures	Hybrid solution	PDUs	SR635 V3 (Mgmt)	SN2201 switch (for Confluent)
DSS G201	2	0	1	No	2	1 (optional)	1 (optional)
DSS G202	2	0	2	No	2	1 (optional)	1 (optional)
DSS G203	2	0	3	No	2	1 (optional)	1 (optional)
DSS G204	2	0	4	No	2	1 (optional)	1 (optional)
DSS G211	2	1	1	Hybrid†	2	1 (optional)	1 (optional)
DSS G212	2	1	2	Hybrid†	2	1 (optional)	1 (optional)
DSS G221	2	2	1	Hybrid†	2	1 (optional)	1 (optional)
DSS G222	2	2	2	Hybrid†	2	1 (optional)	1 (optional)
DSS G231	2	3	1	Hybrid†	2	1 (optional)	1 (optional)
DSS G232	2	3	2	Hybrid†	2	1 (optional)	1 (optional)
DSS G241	2	4	1	Hybrid†	2	1 (optional)	1 (optional)
DSS G242	2	4	2	Hybrid†	2	1 (optional)	1 (optional)
DSS G251	2	5	1	Hybrid†	2	1 (optional)	1 (optional)
DSS G252	2	5	2	Hybrid†	2	1 (optional)	1 (optional)
DSS G261	2	6	1	Hybrid†	2	1 (optional)	1 (optional)
DSS G262	2	6	2	Hybrid†	2	1 (optional)	1 (optional)
DSS G271	2	7	1	Hybrid†	2	1 (optional)	1 (optional)
DSS G210	2	1	0	No	2	1 (optional)	1 (optional)
DSS G220	2	2	0	No	2	1 (optional)	1 (optional)
DSS G230	2	3	0	No	2	1 (optional)	1 (optional)
DSS G240	2	4	0	No	2	1 (optional)	1 (optional)
DSS G250	2	5	0	No	2	1 (optional)	1 (optional)
DSS G260	2	6	0	No	2	1 (optional)	1 (optional)
DSS G270	2	7	0	No	2	1 (optional)	1 (optional)
DSS G280	2	8	0	No	2	1 (optional)	1 (optional)

† These models are a hybrid configuration that combines HDDs and SSDs in one building block. See the tables in the [Drive Enclosure configuration](#) section for available storage options.

Configurations are built using the x-config configurator tool:

<https://lpsc.lenovo.com/products/hardware/configurator/worldwide/bhui/asit/index.html>

The configuration process includes the following steps:

1. Select the drive and drive enclosure, as listed in the previous table.
2. Node configuration, as described in the next subsections:
 - Memory
 - Network adapter
 - Red Hat Enterprise Linux (RHEL) premium subscription
 - Enterprise Software Support (ESS) subscription
3. Confluent management network selection
4. IBM Storage Scale license selection
5. Power distribution infrastructure selection
6. Professional Services selection

The following sections provide information about these configuration steps.

When installed into a customer rack, additional PDUs may be required depending on the orientation they are to be installed into a rack. Refer to the Lenovo 1U Switched & Monitored 3-Phase PDUs product guide for more information on preferred orientation of Lenovo rack PDUs:

<https://lenovopress.lenovo.com/lp1556-lenovo-1u-switched-monitored-3-phase-pdu>

Drive Enclosure configuration

All drives used in all the enclosures in a DSS-G configuration are identical. The only exception to this is a pair of 800 GB SSDs that are required in the *first* drive enclosure for any configuration using HDDs. These SSDs are for *logtip* use by the IBM Storage Scale software and are not for user data.

The drive requirements are as follows:

- For configurations that use HDDs (D4390 only), two 800GB logtip SSDs must also be selected in the *first* drive enclosure in the DSS-G configuration.
- All subsequent enclosures in HDD-based DSS-G configuration do not require these logtip SSDs.
- Configurations using SSDs do not require the pair of logtip SSDs.
- Only one drive size & type is selectable per DSS-G configuration.
- All drive enclosures must be fully populated with drives. Partially filled enclosures are not supported.

The following table lists the drives available for selection in a D1224 enclosure. D1224 configurations are all SSDs and do not require separate logtip drives.

Table 7. SSD selections for the D1224 enclosures

Capacity	Feature code	Description
D1224 External Enclosure SSDs		
800GB	AU1U	Lenovo Storage 800GB 3DWD SSD 2.5" SAS
800GB	AUDH	Lenovo Storage 800GB 10DWD 2.5" SAS SSD
1.6TB	AU1T	Lenovo Storage 1.6TB 3DWD SSD 2.5" SAS
1.6TB	AUDG	Lenovo Storage 1.6TB 10DWD 2.5" SAS SSD
3.84TB	AVPA	Lenovo Storage 3.84TB 1DWD 2.5" SAS SSD
7.68TB	AVP9	Lenovo Storage 7.68TB 1DWD 2.5" SAS SSD
15TB	BV2T	Lenovo Storage 15TB SSD Drive for D1212/D1224

The following table lists the drives available for selection in a D4390 enclosure.

Table 8. HDD selections for the D4390 enclosures

Capacity	Feature code	Description
D4390 External Enclosure HDDs		
12TB	C5D1	Seagate 3.5" 12TB 7.2K NL-SAS-DSSG
12TB x15	C5D2	Seagate (15x HDD) 3.5" 12TB 7.2K NL-SAS-DSSG
14TB	BT4Q	Lenovo Storage D4390 3.5" 14TB 7.2K SAS HDD
14TB x15	BT4V	Lenovo Storage D4390 15x pack 3.5 14TB 7.2K SAS HDD
16TB	C5D3	Seagate 3.5" 16TB 7.2K NL-SAS-DSSG
16TB x15	C5D4	Seagate (15x HDD) 3.5" 16TB 7.2K NL-SAS-DSSG
18TB	BT4N	Lenovo Storage D4390 3.5" 18TB 7.2K SAS HDD
18TB x15	BT4T	Lenovo Storage D4390 15x pack 3.5 18TB 7.2K SAS HDD
18TB	C4CG	Seagate 18TB EvansBP NL-SAS 3.5" HDD – 1x drive (DSSG)
18TB x15	C4CH	Seagate 18TB EvansBP NL-SAS 3.5" HDD – 15x drive (DSSG)
20TB	C4CL	Seagate 20TB LongsPeak NL-SAS 3.5" HDD – 1x drive (DSSG)

Capacity	Feature code	Description
20TB x15	C4CM	Seagate 20TB LongsPeak NL-SAS 3.5" HDD – 15x drive (DSSG)
20TB	C5D5	Seagate 3.5" 20TB 7.2K NL-SAS-DSSG
20TB x15	C5D6	Seagate (15x HDD) 3.5" 20TB 7.2K NL-SAS-DSSG
20TB	BWD6	Lenovo Storage D4390 3.5" 20TB 7.2K SAS HDD
20TB x15	BWD8	Lenovo Storage D4390 15x pack 3.5" 20TB 7.2K SAS HDD
22TB	BYP8	Lenovo Storage D4390 3.5" 22TB 7.2K SAS HDD
22TB x15	BYP9	Lenovo Storage D4390 15x pack 3.5" 22TB 7.2K SAS HDD
24TB	C4KS	(1x) Seagate 3.5" 24TB 7.2K NL-SAS (Summit 24TB) (DSSG)
24TB x15	C4KT	Seagate 3.5" 24TB 7.2K NL-SAS (Summit 24TB) (15x HDD) (DSSG)
24TB	C465	(1x) WDC 3.5" 24TB 7.2K NL-SAS (DSSG)
24TB x15	C466	WDC 3.5" 24TB 7.2K NL-SAS (15x HDD) (DSSG)
D4390 External Enclosure SSDs		
800GB	BT4S	Lenovo Storage D4390 2.5" 800GB 3DWD SAS SSD

D4390 configurations are all HDDs, as follows:

- First D4390 enclosure in a configuration: 88 HDDs + 2x 800GB SSDs (BT4S)
- Subsequent D4390 enclosures in a configuration: 90x HDDs

Guaranteed Quality: Lenovo DSS-G is working exclusively with Enterprise grade hard drives. Where common drives are only rated at up to 180 TB/year, the Lenovo Enterprise drives are always warranted to up to 550TB/year.

Mixing D4390 and D3284 enclosures: DSS-G configurations cannot have mixed hard disk enclosures. A DSS-G system based on ThinkSystem SR650 V2 and D3284 enclosures cannot be expanded by adding D4390 enclosures. The D3284 is not supported for DSS-G when using ThinkSystem SR655 V3 configurations therefore an existing DSS-G building block cannot be retrofitted with ThinkSystem SR655 V3 NSD servers.

SR655 V3 configuration

The Lenovo DSS-G configurations described in this product guide use the ThinkSystem SR655 server, which features the AMD Family processors. Details about the configurations are in the [Specifications](#) section.

- [SR655 V3 memory](#)
- [SR655 V3 internal storage](#)
- [SR655 V3 SAS HBAs](#)
- [SR655 V3 network adapter](#)

SR655 V3 memory

The DSS-G offerings allow three different memory configurations for the SR655 V3 servers

- 384 GB using 12x 32 GB TruDDR5 RDIMMs (1 DIMM per memory channel)
- 768 GB using 12x 64 GB TruDDR5 RDIMMs (1 DIMM per memory channel)
- 1536 GB using 12x 128 GB TruDDR5 RDIMMs (1 DIMM per memory channel)

The following tables indicates memory requirements on the DSS-G configurations containing D4390 enclosures for different drive capacities. This table assumes a 16MB block size and RAID level of 8+2P. If your use configuration deviates from these parameters, please check with your Lenovo sales representative for the required memory.

Use of smaller block sizes on the DSS-G systems will require more memory. When selecting memory sizing, it is not always best to go larger than required – the 128GB DIMMs are both more expensive and 4 rank which can impact memory performance.

Future larger drive capacities may require different memory configurations. The Lenovo configurator will automatically scale memory based on the selection of file system block size, drive capacity and drive count.

Table 9. Memory for G201, G202, G203, G204

NL-SAS Drive Size	Required Memory
All	384 GB

Table 10. Memory for G210, G211, G212, G220, G221, G230

NL-SAS Drive Size	Required Memory (8MB)	Required Memory (16MB block)
12 TB	384 GB	384 GB
14 TB	384 GB	384 GB
18 TB	384 GB	384 GB
20 TB	384 GB	384 GB
22 TB	384 GB	384 GB
24 TB	384 GB	384 GB

Table 11. Memory for G222, G231, G232, G240, G241, G250

NL-SAS Drive Size	Required Memory (8MB)	Required Memory (16MB block)
12 TB	384 GB	384 GB
14 TB	384 GB	384 GB

NL-SAS Drive Size	Required Memory (8MB)	Required Memory (16MB block)
18 TB	384 GB	384 GB
20 TB	384 GB	384 GB
22 TB	384 GB	384 GB
24 TB	384 GB	384 GB

Table 12. Memory for G242, G251, G252, G260, G261, G270

NL-SAS Drive Size	Required Memory (8MB)	Required Memory (16MB block)
12 TB	384 GB	384 GB
14 TB	384 GB	384 GB
18 TB	384 GB	384 GB
20 TB	768 GB	384 GB
22 TB	768 GB	768 GB
24 TB	768 GB	768 GB

Table 13. Memory for G262, G271, G280

NL-SAS Drive Size	Required Memory (8MB)	Required Memory (16MB block)
12 TB	384 GB	384 GB
14 TB	384 GB	384 GB
18 TB	384 GB	384 GB
20 TB	768 GB	384 GB
22 TB	768 GB	768 GB
24 TB	768 GB	768 GB

The following table lists the memory options that are available for selection.

Table 14. Memory selection

Memory selection	Quantity	Feature code	Description
384GB	12	BQ37	ThinkSystem 32GB TruDDR5 4800MHz (2Rx8) RDIMM-A
768GB	12	BQ3D	ThinkSystem 64GB TruDDR5 4800MHz (2Rx4) 10x4 RDIMM-A
1536GB	12	BQ3A	ThinkSystem 128GB TruDDR5 4800MHz (4Rx4) 3DS RDIMM-A

SR655 V3 internal storage

The SR655 V3 servers have two internal hot-swap drives, configured as a RAID-1 pair and connected to a RAID 930-8i adapter with 2GB of flash-backed cache.

Table 15. Internal storage

Feature code	Description	Quantity
B8P0	ThinkSystem RAID 940-16i 8GB Flash PCIe Gen4 12Gb Internal Adapter	1
BNW8	ThinkSystem 2.5" PM1655 800GB Mixed Use SAS 24Gb HS SSD	2

SR655 V3 SAS HBAs

The SR655 V3 servers use SAS HBAs to connect the external D4390 or D1224 JBODs. The system is required to have 4 HBAs per server. It is not supported to change the SAS HBAs in the DSS-G solution. The PCIe slots used for the DSS-G solution are fixed and the location of the adapters should not be changed.

Table 16. SAS HBAs

Feature code	Description	Quantity
BWKP	ThinkSystem 450W-16e SAS/SATA PCIe Gen4 24Gb HBA	4

SR655 V3 network adapter

The following table lists the adapters that are available for use for cluster fabric.

Table 17. Network adapter

Part number	Feature code	Port count and speed	Description	Quantity
4XC7A80289	BQ1N	1x 400 Gb/s	ThinkSystem NVIDIA ConnectX-7 NDR OSFP400 1-port PCIe Gen5 x16 InfiniBand/Ethernet Adapter	2
4XC7A81883	BQBN	2x 200 Gb/s	ThinkSystem NVIDIA ConnectX-7 NDR200/HDR QSFP112 2-port PCIe Gen5 x16 InfiniBand Adapter	2

For details about these adapters, see the Mellanox ConnectX-7 Adapter product guides:

- NDR400 adapter:
<https://lenovopress.lenovo.com/lp1692-thinksystem-nvidia-connectx-7-ndr-infiniband-osfp400-adapters>
- NDR200 adapter
<https://lenovopress.lenovo.com/lp1693-thinksystem-nvidia-connectx-7-ndr200-infiniband-qsfp112-adapters>

The dual-port NDR200 adapter can be used in either Ethernet mode or InfiniBand mode.

The transceivers and optical cables, or the DAC cables needed to connect the adapters to the customer-supplied network switches can be configured together with the system in x-config. Consult the Product Guides for the adapters for details.

The following table lists the OCP LOM modules that are available for use for deployment/OS network.

Table 18. Supported OCP adapters

Feature code	Description
B5ST	ThinkSystem Broadcom 57416 10GBASE-T 2-port OCP Ethernet Adapter
BN2T	ThinkSystem Broadcom 57414 10/25GbE SFP28 2-Port OCP Ethernet Adapter
BPPW	ThinkSystem Broadcom 57504 10/25GbE SFP28 4-Port OCP Ethernet Adapter
BPPX	ThinkSystem Broadcom 57508 100GbE QSFP56 2-Port OCP Ethernet Adapter

DSS-G supported network adapters are required in slots 1 and 7, and the SAS adapters are always located in slots 2, 4, 5, and 8, as shown in the following figure.

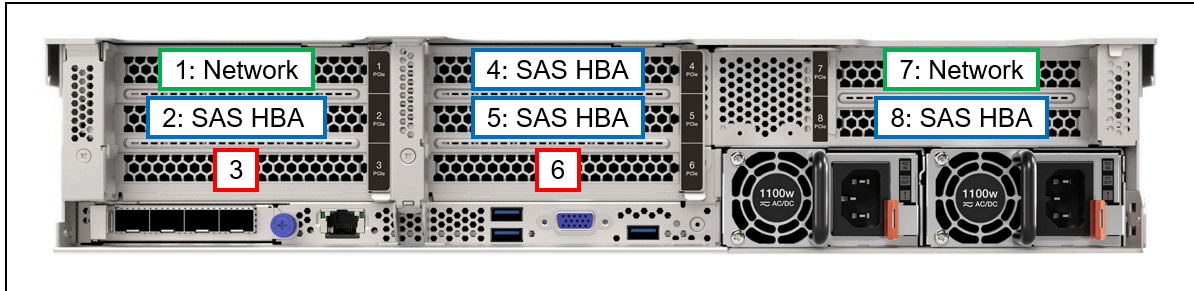


Figure 6. SR655 V3 slot allocation

Cluster network

The Lenovo DSS-G offering connects as a storage block to the customer's Storage Scale cluster network using the high-speed network adapters installed in the servers. Each pair of servers has two or three network adapters, which are either Ethernet or InfiniBand. Each DSS-G storage block connects to the cluster network.

In concert with the cluster network is the Confluent management network. In lieu of a customer-supplied management network, the Lenovo DSS-G offering includes a ThinkSystem SR635 V3 server running Confluent and a NVIDIA Networking SN2201 48-port Gigabit Ethernet switch.

These components are shown in the following figure.

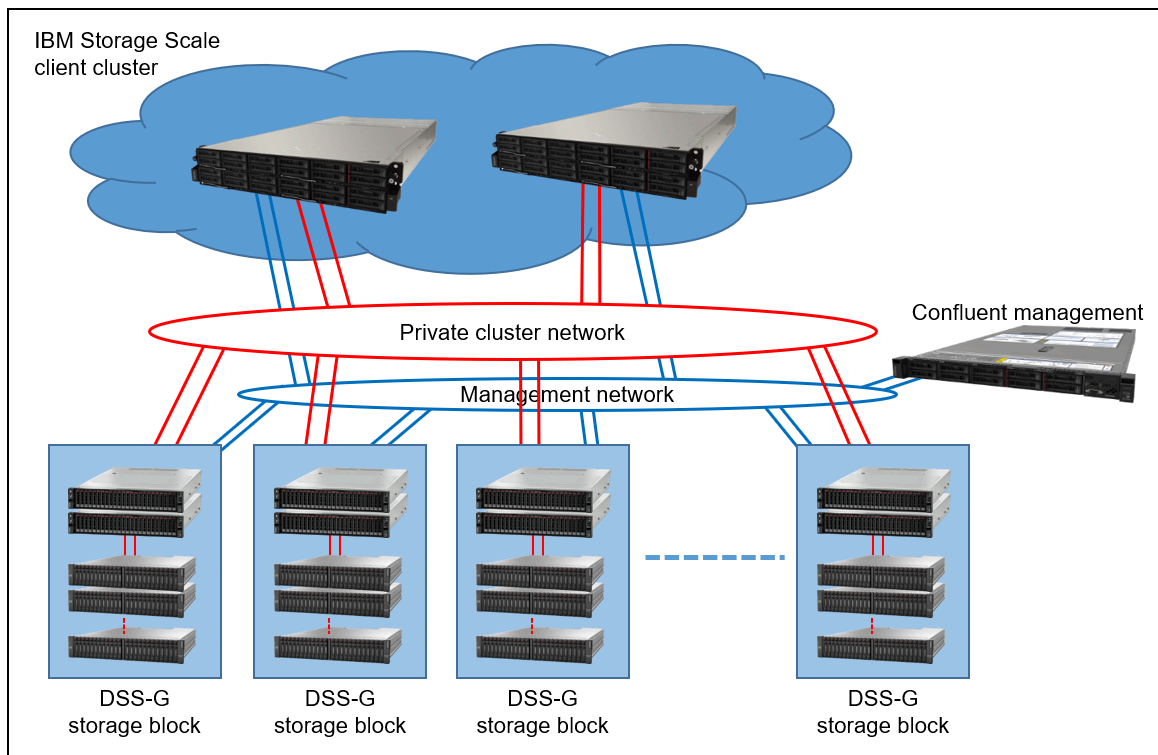


Figure 7. Lenovo DSS-G storage blocks in a Storage Scale client network

Red Hat Enterprise Linux

The SR655 V3 servers run Red Hat Enterprise Linux which is preinstalled on the RAID-1 pair of 300 GB drives installed in the servers.

Each server requires a Lenovo RHEL Premium Support subscription. The subscription provides Level 1 and Level 2 support, with 24x7 for Severity 1 situations.

Table 19. Operating system licensing

Part number	Feature code	Description
7S0F0004WW	S0N8	RHEL Server Physical or Virtual Node, 2 Skt Premium Subscription w/Lenovo Support 1Yr
7S0F0005WW	S0N9	RHEL Server Physical or Virtual Node, 2 Skt Premium Subscription w/Lenovo Support 3Yr
7S0F0006WW	S0NA	RHEL Server Physical or Virtual Node, 2 Skt Premium Subscription w/Lenovo Support 5Yr

Lenovo recommended customers have RHEL Extended Update Support (EUS) enabled which provides critical patches for the LTS release of RHEL installed on the DSS-G systems. EUS is included with x86-64 Red Hat Enterprise Linux Server Premium subscriptions.

IBM Storage Scale licensing

DSS-G can be configured with two types of license models:

- Per Disk/Flash Drive

The number of licenses needed is based on the total number of HDDs and SSDs in the drive enclosures (excluding the logTip SSDs) and will be derived automatically by the configurator.

This License model is available for the Data Access Edition and the Data Management Edition.

- Per managed capacity

The number of licenses needed is based on the storage capacity being managed in an IBM Storage Scale cluster and will also be derived automatically by the configurator based on the selection of parity level made. The storage capacity to be licensed is the capacity in Tebibytes (TiB) from all Network Shared Disk (NSDs) in the IBM Storage Scale cluster after applying IBM Storage Scale RAID. The capacity to be licensed is not affected by using functions such as replication or compression or by doing tasks such as creating or deleting files, file systems, or snapshots.

This License model is available for the Data Access Edition, the Data Management Edition, and the Erasure Code Edition.

Each of these is offered in 1, 3, 4 and 5-year support periods. The total number of Storage Scale licenses needed will be split between the two DSS-G servers. Half will appear on one server and half will appear on the other server. The license however relates to the total solution and storage drives/capacity within.

Table 20. IBM Storage Scale licensing

Description	Part number	Feature code
IBM Storage Scale -- licensed per Disk/Flash Drive		
Spectrum Scale for Lenovo Storage Data Management Edition per Disk Drive w/1Yr S&S	None	AVZ7
Spectrum Scale for Lenovo Storage Data Management Edition per Disk Drive w/3Yr S&S	None	AVZ8
Spectrum Scale for Lenovo Storage Data Management Edition per Disk Drive w/4Yr S&S	None	AVZ9
Spectrum Scale for Lenovo Storage Data Management Edition per Disk Drive w/5Yr S&S	None	AVZA
Spectrum Scale for Lenovo Storage Data Management Edition per Flash Drive w/1Yr S&S	None	AVZB
Spectrum Scale for Lenovo Storage Data Management Edition per Flash Drive w/3Yr S&S	None	AVZC
Spectrum Scale for Lenovo Storage Data Management Edition per Flash Drive w/4Yr S&S	None	AVZD
Spectrum Scale for Lenovo Storage Data Management Edition per Flash Drive w/5Yr S&S	None	AVZE
Spectrum Scale for Lenovo Storage Data Access Edition per Disk Drive w/1Yr S&S	None	S189
Spectrum Scale for Lenovo Storage Data Access Edition per Disk Drive w/3Yr S&S	None	S18A
Spectrum Scale for Lenovo Storage Data Access Edition per Disk Drive w/4Yr S&S	None	S18B
Spectrum Scale for Lenovo Storage Data Access Edition per Disk Drive w/5Yr S&S	None	S18C
Spectrum Scale for Lenovo Storage Data Access Edition per Flash Drive w/1Yr S&S	None	S18D
Spectrum Scale for Lenovo Storage Data Access Edition per Flash Drive w/3Yr S&S	None	S18E

Description	Part number	Feature code
Spectrum Scale for Lenovo Storage Data Access Edition per Flash Drive w/4Yr S&S	None	S18F
Spectrum Scale for Lenovo Storage Data Access Edition per Flash Drive w/5Yr S&S	None	S18G
IBM Storage Scale -- licensed per managed capacity		
Spectrum Scale Data Management Edition per TiB w/1Yr S&S	None	AVZ3
Spectrum Scale Data Management Edition per TiB w/3Yr S&S	None	AVZ4
Spectrum Scale Data Management Edition per TiB w/4Yr S&S	None	AVZ5
Spectrum Scale Data Management Edition per TiB w/5Yr S&S	None	AVZ6
Spectrum Scale Data Access Edition per TiB w/1Yr S&S	None	S185
Spectrum Scale Data Access Edition per TiB w/3Yr S&S	None	S186
Spectrum Scale Data Access Edition per TiB w/4Yr S&S	None	S187
Spectrum Scale Data Access Edition per TiB w/5Yr S&S	None	S188

Additional licensing information:

- No additional licenses (for example, client or server) are needed for Storage Scale for DSS. Only licenses based on the number of drives (non-logtip) or capacity in TebiBytes (TiB) after applying IBM Storage Scale RAID are needed.
- Capacity licensing is measured on Binary format (1 TiB = 2⁴⁰ Bytes), which means that you must multiply the nominal Decimal format (1TB = 10¹² Bytes) chosen by drive vendors with 0.9185 to get to the actual capacity to be licensed. For DSS-G the Lenovo configurator will take care of that for you.
- For non-DSS Lenovo storage in the same Cluster (for example, separated metadata on traditional controller-based storage), you have the same options of capacity-based per Disk/Flash drive or per TiB licenses.
- It is not supported to mix Data Access Edition and Data Management Edition licensing within a cluster.
- You can expand a Data Access Edition or a Data Management Edition cluster with Erasure Code Edition systems. The limitations of Data Access Edition features apply if expanding a Data Access Edition cluster.
- Disk/Flash drive-based Storage Scale licenses can only be transferred from the existing Lenovo storage solution that is being decommissioned and re-used on its equivalent future or replacement Lenovo storage solution.
- Existing capacity licenses through for example an Enterprise License Agreement with IBM can be applied to Lenovo DSS-G after providing Proof of Entitlement. While Lenovo provides the solution level support, software support needs to be requested from IBM directly in such a case. When configuring a system using an ELA, at least 1 Lenovo Storage Scale license should be attached to the configuration to ensure customer entitlement via the Lenovo download portal functions correctly.
- Lenovo sub-contracts the L1/L2 support for IBM Storage Scale to IBM for Lenovo supplied licenses. Where a customer has premier support on the solution, they can raise a service call with Lenovo who will raise a call with IBM if required. Where a customer does not have Premium support on the DSS-G solution, the customer uses the IBM service portal to directly raise support questions for IBM Storage Scale support.

Lenovo Confluent support

Lenovo's cluster management software, Confluent, is used to deploy Lenovo DSS-G systems. Whilst Confluent is an open source software package, support for the software is chargeable. Support for each DSS-G server and any support nodes is normally included in the configuration.

Table 21. Lenovo Confluent support

Part number	Feature code	Description
7S090039WW	S9VH	Lenovo Confluent 1 Year Support per managed node
7S09003AWW	S9VJ	Lenovo Confluent 3 Year Support per managed node
7S09003BWW	S9VK	Lenovo Confluent 5 Year Support per managed node
7S09003CWW	S9VL	Lenovo Confluent 1 Extension Year Support per managed node

Lenovo EveryScale factory integration for DSS-G

Lenovo manufacturing implements a robust testing and integration program to ensure Lenovo EveryScale components are fully operational when shipped out of the factory. In addition to the standard component level validation performed on all hardware components produced by Lenovo, EveryScale performs rack level testing to verify that the EveryScale cluster operates as a solution. The rack level testing and validation includes the following:

- Performing a power on test. Assure device power is present, with no error indicators
- Set up RAID (when required)
- Set up storage devices and verify functionality
- Validate network connectivity and functionality
- Verify functionality of server hardware, network infrastructure, and server configuration correctness. Verify health of components
- Configure all devices per Best Recipe software settings
- Perform stress testing of server CPU and memory via software and power cycling
- Data collection for quality records and test results

Lenovo EveryScale onsite installation for DSS-G

Lenovo experts will manage the physical installation of your pre-integrated Racks so you can quickly benefit from your investment. Working at a time convenient to you, the technician will unpack and inspect the systems at your site, finalize the cabling, verify operation, and dispose of the packaging at the on-site location.

Any racked EveryScale solution comes with this basic Lenovo Hardware Installation services included, automatically sized and configured based on the solution scope detailed in the [Lenovo EveryScale Hardware Installation Statement of Work](#).

Table 22. Lenovo EveryScale onsite installation

Part number	Description	Purpose
5AS7B07693	Lenovo EveryScale Rack Setup Services	Base service per rack
5AS7B07694	Lenovo EveryScale Basic Networking Services	Service per device cabled out of the rack with 12 or less cables
5AS7B07695	Lenovo EveryScale Advanced Networking Services	Service per device cabled out of the rack with more than 12 cables

Customized installation services beyond the basic Lenovo Hardware Installation services are also available to meet the specific needs of the client and for solutions with Client Site Integration Kit.

Before installation, the client should complete the following steps to ensure the hardware will be successfully installed:

- Backing up the data being migrated to the new hardware
- Ensuring the new hardware is available and in place
- Assign a technical lead to act as liaison with Lenovo, who can coordinate access to other resources if required
- Designated data center location has the required power and cooling in place to support purchased solution
- Providing a safe workspace and appropriate access for the technician

Once the client is ready, an expert technician will perform the basic Lenovo Hardware Installation services. This process will include the following:

- Verify receipt and condition of all rack(s) and components
- Verify the client environment is ready for consequent installation
- Unpack and visually inspect hardware for damage
- Place rack(s) and complete installation and inter-rack cabling as specified by the solution configuration
- Connect the equipment to customer-supplied power
- Ensure the equipment is operational: Power on equipment, check for green lights and obvious issues
- Remove packaging and other waste materials to the customer designated dumpster
- Provide completion form for customer to authorize
- If a hardware failure occurs during the installation, service call will be opened.

Additional client requirements beyond the basic Lenovo Hardware Installation services scope, can be offered with customized installation services sized specifically to the client's needs.

To get operational a final onsite software installation and configuration for the specific environment is required. Lenovo can also provide comprehensive onsite configuration of software, including integration

and validation for operating systems and software, virtualization and high-availability configurations.

For additional information, see the [Services](#) section.

Client Site Integration Kit onsite installation

Besides shipping fully integrated into the Lenovo 1410 rack cabinet, DSS-G solution gives clients the choice of shipping with the Lenovo Client Site Integration Kit (7X74) which allows clients to have Lenovo or a business partner install the solution in a rack of their own choosing. The Lenovo Client Site Integration Kit enables clients to gain the interoperability warranty benefit of an integrated DSS-G solution while also providing them flexibility in custom-fitting into the client datacenter.

With the Lenovo Client Site Integration Kit, the DSS-G solution is built and tested at the racklevel in Lenovo manufacturing just like described for factory integration above. Afterwards it is disassembled again, and Servers, switches and other items are packaged in individual boxes with a ship group box for cables, publications, labeling, and other rack documentation. Clients are required to purchase installation services from Lenovo or a business partner for the physical setup. The installation team will install the solution at the customer site into the customer provided rack per racking diagrams and point-to-point instructions.

The Client Side Integration Kit includes a “virtual” rack serial number for the DSS-G solution. This virtual rack serial number is used when raising service calls against the DSS-G solution.

To get operational a final onsite software installation and configuration for the specific environment is required. Lenovo can also provide comprehensive onsite configuration of software, including integration and validation for operating systems and software, virtualization and high-availability configurations.

For additional information, see the [Services](#) section.

Operating environment

Lenovo Distributed Storage Solution for IBM Storage Scale fully complies with ASHRAE class A2 specifications for the air-cooled data center. Please find more details in the product guides of the individual components.

- Air temperature:
 - Operating:
 - ASHRAE Class A2: 10 °C - 35 °C (50 °F - 95 °F); for altitudes above 900 m (2,953 ft), decrease the maximum ambient temperature by 1 °C for every 300-m (984-ft) increase in altitude
 - Non-operating: 5 °C - 45 °C (41 °F - 113 °F)
 - Storage: -40 °C - +60 °C (-40 °F - 140 °F)
- Maximum altitude: 3,050 m (10,000 ft)
- Humidity:
 - Operating:
 - ASHRAE Class A2: 8% - 80% (non-condensing); maximum dew point: 21 °C (70 °F)
 - Storage: 8% - 90% (non-condensing)
- Electrical:
 - 100 - 127 (nominal) V AC; 50 Hz / 60 Hz
 - 200 - 240 (nominal) V AC; 50 Hz / 60 Hz

Regulatory compliance

Lenovo Distributed Storage Solution for Storage Scale adopts the conformity of its individual components to international standards, which for the server and storage enclosures are listed below:

The SR655 V3 conforms to the following standards:

- ANSI/UL 62368-1
- IEC 62368-1 (CB Certificate and CB Test Report)
- CSA C22.2 No. 62368-1
- Mexico NOM-019
- India BIS 13252 (Part 1)
- Germany GS
- TUV-GS (EN62368-1, and EK1-ITB2000)
- Ukraine UkrCEPRO
- Morocco CMIM Certification (CM)
- Russia, Belorussia and Kazakhstan, TP EAC 037/2016 (for RoHS)
- Russia, Belorussia and Kazakhstan, EAC: TP TC 004/2011 (for Safety); TP TC 020/2011 (for EMC)
- CE, UKCA Mark (EN55032 Class A, EN62368-1, EN55024, EN55035, EN61000-3-2, EN61000-3-3, (EU) 2019/424, and EN IEC 63000 (RoHS))
- FCC - Verified to comply with Part 15 of the FCC Rules, Class A
- Canada ICES-003, issue 7, Class A
- CISPR 32, Class A, CISPR 35
- Korea KN32, Class A, KN35
- Japan VCCI, Class A
- Taiwan BSMI CNS15936, Class A; CNS15598-1; Section 5 of CNS15663
- Australia/New Zealand AS/NZS CISPR 32, Class A; AS/NZS 62368.1
- UL Green Guard, UL2819
- [Energy Star 4.0](#)
- EPEAT (NSF/ ANSI 426) Bronze
- Japanese Energy-Saving Act
- EU2019/424 Energy Related Product (ErP Lot9)
- China CCC certificate, GB17625.1; GB4943.1; GB/T9254
- China CECF certificate, CQC3135
- China CELP certificate, HJ 2507-2011

The D1224 / D4390 conform to the following standards:

- BSMI CNS 13438, Class A; CNS 14336 (Taiwan)
- CCC GB 4943.1, GB 17625.1, GB 9254 Class A (China)
- CE Mark (European Union)
- CISPR 22, Class A
- EAC (Russia)
- EN55022, Class A
- EN55024
- FCC Part 15, Class A (United States)
- ICES-003/NMB-03, Class A (Canada)
- IEC/EN60950-1
- D1224: KC Mark (Korea); D3284: MSIP (Korea)
- NOM-019 (Mexico)
- D3284: RCM (Australia)
- Reduction of Hazardous Substances (ROHS)
- UL/CSA IEC 60950-1
- D1224: VCCI, Class A (Japan); D3284: VCCI, Class B (Japan)

Find more details on the regulatory compliance for the individual components in their respective product

guides.

Warranty upgrades and post-warranty support

Lenovo EveryScale exclusive components (Machine Types 1410, 7X74, 0724, 0449, 7D5F; for the other Hardware and Software components configured within EveryScale their respective warranty terms apply) have a three-year customer replaceable unit (CRU) and onsite limited (for field-replaceable units (FRUs) only) warranty with standard call center support during normal business hours and 9x5 Next Business Day Parts Delivered.

Some markets might have different warranty terms and conditions than the standard warranty. This is due to local business practices or laws in the specific market. Local service teams can assist in explaining market-specific terms when needed. Examples of market-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.

Our global network of regional support centers offers consistent, local-language support enabling you to vary response times and level of service* to match the criticality of your support needs:

- **Standard Next Business Day** – Best choice for non-essential systems requiring simple maintenance.
- **Premier Next Business Day** – Best choice for essential systems requiring technical expertise from senior-level Lenovo engineers.
- **Premier 24x7 4-Hour Response** – Best choice for systems where maximum uptime is critical.
- **Premier Enhanced Storage Support 24x7 4-Hour Response** – Best choice for storage systems where maximum uptime is critical.

For more information, consult the brochure [Lenovo Operational Support Services for Data Centers Services](#).

* Some service levels may not be available in all markets. Contact your sales representative for more information.

The following tables list the warranty upgrade part numbers for each DSS-G component:

- [Warranty Upgrades for D1224 Enclosure \(4587\)](#)
- [Warranty Upgrades for 1410 Rack \(1410\)](#)
- [Warranty Upgrades for Client Site Integration Kit \(7X74\)](#)
- [Warranty Upgrades for DSS-G Ethernet Management Switch \(7D5FCTO1WW\)](#)

Warranty Upgrades for D1224 Enclosure (4587)

Table 23. Warranty Upgrade Part Numbers – D1224 Enclosure (4587)

Description	Option Part Number	
	Standard Support	Premier Support
D1224 Enclosure (4587)		
Foundation Service w/Next Business Day Response, 3Yr + YourDriveYourData	01JY572	5PS7A07837
Foundation Service w/Next Business Day Response, 4Yr + YourDriveYourData	01JY582	5PS7A07900
Foundation Service w/Next Business Day Response, 5Yr + YourDriveYourData	01JY592	5PS7A07967
Essential Service w/24x7 4Hr Response, 3Yr + YourDriveYourData	01JR78	5PS7A06959
Essential Service w/24x7 4Hr Response, 4Yr + YourDriveYourData	01JR88	5PS7A07047
Essential Service w/24x7 4Hr Response, 5Yr + YourDriveYourData	01JR98	5PS7A07144
Advanced Service w/24x7 2Hr Response, 3Yr + YourDriveYourData	01JR76	5PS7A06603
Advanced Service w/24x7 2Hr Response, 4Yr + YourDriveYourData	01JR86	5PS7A06647
Advanced Service w/24x7 2Hr Response, 5Yr + YourDriveYourData	01JR96	5PS7A06694

Warranty Upgrades for 1410 Rack (1410)

Table 24. Warranty Upgrade Part Numbers – 1410 Rack (1410)

Description	Option Part Number	
	Standard Support	Premier Support
Scalable Infrastructure Rack Cabinets (1410-O42, -P42)		
Foundation Service w/Next Business Day Response, 3Yr	5WS7A92764	5WS7A92814
Foundation Service w/Next Business Day Response, 4Yr	5WS7A92766	5WS7A92816
Foundation Service w/Next Business Day Response, 5Yr	5WS7A92768	5WS7A92818
Essential Service w/24x7 4Hr Response, 3Yr	5WS7A92779	5WS7A92829
Essential Service w/24x7 4Hr Response, 4Yr	5WS7A92781	5WS7A92831
Essential Service w/24x7 4Hr Response, 5Yr	5WS7A92783	5WS7A92833
Advanced Service w/24x7 2Hr Response, 3Yr	5WS7A92794	5WS7A92844
Advanced Service w/24x7 2Hr Response, 4Yr	5WS7A92796	5WS7A92846
Advanced Service w/24x7 2Hr Response, 5Yr	5WS7A92798	5WS7A92848
Scalable Infrastructure Rack Cabinets (1410-O48, -P48)		
Foundation Service w/Next Business Day Response, 3Yr	5WS7A92864	5WS7A92914
Foundation Service w/Next Business Day Response, 4Yr	5WS7A92866	5WS7A92916
Foundation Service w/Next Business Day Response, 5Yr	5WS7A92868	5WS7A92918
Essential Service w/24x7 4Hr Response, 3Yr	5WS7A92879	5WS7A92929
Essential Service w/24x7 4Hr Response, 4Yr	5WS7A92881	5WS7A92931
Essential Service w/24x7 4Hr Response, 5Yr	5WS7A92883	5WS7A92933
Advanced Service w/24x7 2Hr Response, 3Yr	5WS7A92894	5WS7A92944
Advanced Service w/24x7 2Hr Response, 4Yr	5WS7A92896	5WS7A92946
Advanced Service w/24x7 2Hr Response, 5Yr	5WS7A92898	5WS7A92948

Warranty Upgrades for Client Site Integration Kit (7X74)

Table 25. Warranty Upgrade Part Numbers – Client Site Integration Kit (7X74)

Description	Option Part Number	
	Standard Support	Premier Support
Client Site Integration Kit (7X74)		
Premier Support Service - 3Yr Integration Kit (DSS-G)	Not available	5WS7A35451
Premier Support Service - 4Yr Integration Kit (DSS-G)	Not available	5WS7A35452
Premier Support Service - 5Yr Integration Kit (DSS-G)	Not available	5WS7A35453

Warranty Upgrades for DSS-G Ethernet Management Switch (7D5FCTO1WW)

Table 26. Warranty Upgrade Part Numbers – DSS-G Ethernet Management Switch (7D5FCTOFWW)

Description	Option Part Number	
	Standard Support	Premier Support
NVIDIA SN2201 1GbE Managed Switch (7D5F-CTOFWW)		
Foundation Service w/Next Business Day Response, 3Yr	5WS7B14371	5WS7B14380
Foundation Service w/Next Business Day Response, 4Yr	5WS7B14372	5WS7B14381
Foundation Service w/Next Business Day Response, 5Yr	5WS7B14373	5WS7B14382
Essential Service w/24x7 4Hr Response, 3Yr	5WS7B14377	5WS7B14386
Essential Service w/24x7 4Hr Response, 4Yr	5WS7B14378	5WS7B14387
Essential Service w/24x7 4Hr Response, 5Yr	5WS7B14379	5WS7B14388

Lenovo EveryScale Interoperability Support for DSS-G

On top of their individual warranty and maintenance scope or support entitlement, EveryScale offers solution-level interoperability support for HPC and AI configurations based on the above selection of Lenovo ThinkSystem portfolio and OEM components.

The extensive testing results in a “Best Recipe” release of software and firmware levels Lenovo warrants to work seamlessly together as a fully integrated data center solution instead of a collection of individual components at the time of implementation.

To see the latest Best Recipe for Scalable Infrastructure at Lenovo, see the following link:

<https://support.lenovo.com/us/en/solutions/HT505184#5>

The Solution Support is engaged by opening a hardware ticket based on the EveryScale Rack (Model 1410) or EveryScale Client Site Integration Kit (Model 7X74). The EveryScale Support team then will triage the issue and recommend next steps for you, including potentially to open tickets with other components of the solution.

For issues that require debugging beyond hardware and firmware (Driver, UEFI, IMM/XCC) an additional ticket will have to be opened with the software vendor (e.g. Lenovo SW Support or 3rd party SW vendor) to assist working towards a fix. The EveryScale Support team will then work with the SW Support team in isolating root cause and fixing the defect.

For more information about opening tickets, as well as the scope of support for different EveryScale components, see the [Lenovo Scalable Infrastructure Support Plan information page](#).

When a cluster ships the most recent Best Recipe is its compliant version, which is always defined exactly for that specific Scalable Infrastructure release and the cluster is delivered as a solution of that specific release. Using a Support call clients can request a review if their solution is also compatible with a newer Best Recipe release and if it is, are able to upgrade to that while maintaining solution interoperability support.

As long as a cluster (Model 1410, 7X74) is under Lenovo warranty or maintenance entitlement, full solution interoperability support will be provided for the original Best Recipes. Even when newer Best Recipes are available the previous Recipe will remain valid and supported.

Of course, any client is free to choose to not adhere to the Best Recipe and instead deploy different software and firmware versions or integrate other components that were not tested for interoperability. While Lenovo cannot warrant interoperability with those deviations from the tested scope, a client continues to receive full break & fix support for the components based on the individual warranty and maintenance entitlement of the components. This is comparable to the level of support clients will receive when not buying it as a EveryScale solution, but building the solution from individual components – so-called “roll your own” (RYO).

In those cases, to minimize risk we suggest still staying as close as possible to the Best Recipe even when deviating. We also suggest when deviating first to test it on a small portion of the cluster and only roll it out completely if this test was stable.

For clients who need to upgrade the firmware or software of a component – for example due to OS entitlement support issues or Common Vulnerabilities and Exposures (CVE) fixes – that is part of the best recipe, a support call should be placed on the 1410/7X74 rack and serial number. Lenovo product engineering will review the proposed changes, and advise the client on the viability of an upgrade path. If an upgrade can be supported and is performed, EveryScale will note the change in the support records for the solution.

Services

Lenovo Data Center Services empower you at every stage of your IT lifecycle. From expert advisory and strategic planning to seamless deployment and ongoing support, we ensure your infrastructure is built for success. Our comprehensive services accelerate time to value, minimize downtime, and free your IT staff to focus on driving innovation and business growth.

Note: Some service options may not be available in all markets or regions. For more information, go to <https://lenovocator.com/>. For information about Lenovo service upgrade offerings that are available in your region, contact your local Lenovo sales representative or business partner.

In this section:

- [Lenovo Advisory Services](#)
- [Lenovo Plan & Design Services](#)
- [Lenovo Deployment, Migration, and Configuration Services](#)
- [Lenovo Support Services](#)
- [Lenovo Managed Services](#)
- [Lenovo Sustainability Services](#)
- [Installation Services](#)

Lenovo Advisory Services

Lenovo Advisory Services simplify the planning process, enabling customers to build future-proofed strategies in as little as six weeks. Consultants provide guidance on projects including VM migration, storage, backup and recovery, and cost management to accelerate time to value, improve cost efficiency, and build a flexibly scalable foundation.

- **Assessment Services**

An Assessment helps solve your IT challenges through an onsite, multi-day session with a Lenovo technology expert. We perform a tools-based assessment which provides a comprehensive and thorough review of a company's environment and technology systems. In addition to the technology based functional requirements, the consultant also discusses and records the non-functional business requirements, challenges, and constraints. Assessments help organizations like yours, no matter how large or small, get a better return on your IT investment and overcome challenges in the ever-changing technology landscape.

- **Design Services**

Professional Services consultants perform infrastructure design and implementation planning to support your strategy. The high-level architectures provided by the assessment service are turned into low level designs and wiring diagrams, which are reviewed and approved prior to implementation. The implementation plan will demonstrate an outcome-based proposal to provide business capabilities through infrastructure with a risk-mitigated project plan.

Lenovo Plan & Design Services

Unlock faster time to market with our tailored, strategic design workshops to align solution approaches with your business goals and technical requirements. Leverage our deep solution expertise and end-to-end delivery partnership to meet your goals efficiently and effectively.

Lenovo Deployment, Migration, and Configuration Services

Optimize your IT operations by shifting labor-intensive functions to Lenovo's skilled technicians for seamless on-site or remote deployment, configuration, and migration. Enjoy peace of mind, faster time to

value, and comprehensive knowledge sharing with your IT staff, backed by our best-practice methodology.

- **Deployment Services for Storage and ThinkAgile**

A comprehensive range of remote and onsite options tailored specifically for your business needs to ensure your storage and ThinkAgile hardware are fully operational from the start.

- **Hardware Installation Services**

A full-range, comprehensive setup for your hardware, including unpacking, inspecting, and positioning components to ensure your equipment is operational and error-free for the most seamless and efficient installation experience, so you can quickly benefit from your investments.

- **DM/DG File Migration Services**

Take the burden of file migration from your IT's shoulders. Our experts will align your requirements and business objectives to the migration plans while coordinating with your team to plan and safely execute the data migration to your storage platforms.

- **DM/DG/DE Health Check Services**

Our experts perform proactive checks of your Firmware and system health to ensure your machines are operating at peak and optimal efficiency to maximize up-time, avoid system failures, ensure the security of IT solutions and simplify maintenance.

- **Factory Integrated Services**

A suite of value-added offerings provided during the manufacturing phase of a server or storage system that reduces time to value. These services aim at improving your hardware deployment experience and enhance the quality of a standard configuration before it arrives at your facility.

Lenovo Support Services

In addition to response time options for hardware parts, repairs, and labor, Lenovo offers a wide array of additional support services to ensure your business is positioned for success and longevity. Our goal is to reduce your capital outlays, mitigate your IT risks, and accelerate your time to productivity.

- **Premier Support for Data Centers**

Your direct line to the solution that promises the best, most comprehensive level of support to help you fully unlock the potential of your data center.

- **Premier Enhanced Storage Support (PESS)**

Gain all the benefits of Premier Support for Data Centers, adding dedicated storage specialists and resources to elevate your storage support experience to the next level.

- **Committed Service Repair (CSR)**

Our commitment to ensuring the fastest, most seamless resolution times for mission-critical systems that require immediate attention to ensure minimal downtime and risk for your business. This service is only available for machines under the Premier 4-Hour Response SLA.

- **Multivendor Support Services (MVS)**

Your single point of accountability for resolution support across vast range of leading Server, Storage, and Networking OEMs, allowing you to manage all your supported infrastructure devices seamlessly from a single source.

- **Keep Your Drive (KYD)**

Protect sensitive data and maintain compliance with corporate retention and disposal policies to ensure your data is always under your control, regardless of the number of drives that are installed in your Lenovo server.

- **Technical Account Manager (TAM)**

Your single point of contact to expedite service requests, provide status updates, and furnish reports to track incidents over time, ensuring smooth operations and optimized performance as your business grows.

- **Enterprise Software Support (ESS)**

Gain comprehensive, single-source, and global support for a wide range of server operating systems and Microsoft server applications.

For more information, consult the brochure [Lenovo Operational Support Services for Data Centers](#).

Lenovo Managed Services

Achieve peak efficiency, high security, and minimal disruption with Lenovo's always-on Managed Services. Our real-time monitoring, 24x7 incident response, and problem resolution ensure your infrastructure operates seamlessly. With quarterly health checks for ongoing optimization and innovation, Lenovo's remote active monitoring boosts end-user experience and productivity by keeping your data center's hardware performing at its best.

Lenovo Managed Services provides continuous 24x7 remote monitoring (plus 24x7 call center availability) and proactive management of your data center using state-of-the-art tools, systems, and practices by a team of highly skilled and experienced Lenovo services professionals.

Quarterly reviews check error logs, verify firmware & OS device driver levels, and software as needed. We'll also maintain records of latest patches, critical updates, and firmware levels, to ensure you systems are providing business value through optimized performance.

Lenovo Sustainability Services

- **Asset Recovery Services**

Lenovo Asset Recovery Services (ARS) provides a secure, seamless solution for managing end-of-life IT assets, ensuring data is safely sanitized while contributing to a more circular IT lifecycle. By maximizing the reuse or responsible recycling of devices, ARS helps businesses meet sustainability goals while recovering potential value from their retired equipment. For more information, see the [Asset Recovery Services offering page](#).

- **CO2 Offset Services**

Lenovo's CO2 Offset Services offer a simple and transparent way for businesses to take tangible action on their IT footprint. By integrating CO2 offsets directly into device purchases, customers can easily support verified climate projects and track their contributions, making meaningful progress toward their sustainability goals without added complexity.

- **Lenovo Certified Refurbished**

Lenovo Certified Refurbished offers a cost-effective way to support IT circularity without compromising on quality and performance. Each device undergoes rigorous testing and certification, ensuring reliable performance and extending its lifecycle. With Lenovo's trusted certification, you gain peace of mind while making a more sustainable IT choice.

- **Data Center Power and Cooling Services**

The Data Center Infrastructure team will provide solution design and implementation services to support the power and cooling needs of the multi-node chassis and multi-rack solutions. This includes designing for various levels of power redundancy and integration into the customer power infrastructure. The Infrastructure team will work with site engineers to design an effective cooling strategy based on facility constraints or customer goals and optimize a cooling solution to ensure high efficiency and availability. The Infrastructure team will provide the detailed solution design and complete integration of the cooling solution into the customer data center. In addition, the Infrastructure team will provide rack and chassis level commissioning and stand-up of the water-cooled solution which includes setting and tuning of the flow rates based on water temperature and heat recovery targets. Lastly, the Infrastructure team will provide cooling solution optimization and performance validation to ensure the highest overall operational efficiency of the solution.

Installation Services

To get operational a final onsite software installation and configuration for the specific environment is required. Five days of Lenovo Professional Services are included by default with the DSS-G solutions to get customers up and running quickly. This selection can be removed if so desired when for example an experienced channel partner of Lenovo will provide those services.

Services are tailored to the customer need and typically include:

- Conduct a preparation and planning call
- Configure Confluent on the SR635 V3 quorum/management server
- Verify, and update if needed, firmware and software versions to implement the DSS-G
- Configure the network settings specific to the customer environment for
 - XClarity Controller (XCC) service processors on the SR655 V3 and SR635 V3 servers
 - Red Hat Enterprise Linux on the SR655 V3 and SR635 V3 servers
- Configure IBM Storage Scale on the DSS-G servers
- Create file and exporting systems from the DSS-G storage
- Provide skills transfer to customer personnel
- Develop post-installation documentation describing the specifics of the firmware/software versions and network and file system configuration work that was done

Table 27. HPC Professional Services Part Numbers

Part number	Description
Lenovo Professional Services	
5MS7A85671	HPC Technical Consultant Hourly Unit (Remote)
5MS7A85672	HPC Technical Consultant Labor Unit (Remote)
5MS7A85673	HPC Technical Consultant Hourly Unit (Onsite)
5MS7A85674	HPC Technical Consultant Labor Unit (Onsite)
5MS7A85675	HPC Principal Consultant Hourly Unit (Remote)
5MS7A85676	HPC Principal Consultant Labor Unit (Remote)
5MS7A85677	HPC Principal Consultant Hourly Unit (Onsite)
5MS7A85678	HPC Principal Consultant Labor Unit (Onsite)
5MS7A85679	HPC Technical Consultant Services Bundle (Small)
5MS7A85680	HPC Technical Consultant Services Bundle (Medium)
5MS7A85681	HPC Technical Consultant Services Bundle (Large)

Part number	Description
5MS7A85682	HPC Technical Consultant Services Bundle (Extra Large)

Lenovo TruScale

Lenovo TruScale XaaS is your set of flexible IT services that makes everything easier. Streamline IT procurement, simplify infrastructure and device management, and pay only for what you use – so your business is free to grow and go anywhere.

Lenovo TruScale is the unified solution that gives you simplified access to:

- The industry's broadest portfolio – from pocket to cloud – all delivered as a service
- A single-contract framework for full visibility and accountability
- The global scale to rapidly and securely build teams from anywhere
- Flexible fixed and metered pay-as-you-go models with minimal upfront cost
- The growth-driving combination of hardware, software, infrastructure, and solutions – all from one single provider with one point of accountability.

For information about Lenovo TruScale offerings that are available in your region, contact your local Lenovo sales representative or business partner.

Related publications and links

For more information, see these resources:

- Lenovo DSS-G product page
<https://www.lenovo.com/us/en/data-center/servers/high-density/Distributed-Storage-Solution-for-IBM-Spectrum-Scale/p/WMD00000275>
- Lenovo high-density offerings page
<https://www.lenovo.com/us/en/c/data-center/servers/high-density>
- Paper, "DSS-G Declustered RAID Technology and Rebuild Performance"
<https://lenovopress.com/lp1227-dss-g-declustered-raid-technology-and-rebuild-performance>
- ThinkSystem SR655 V3 Product Guide
<https://lenovopress.lenovo.com/lp1610-thinksystem-sr655-v3-server#internal-drive-options>
- x-config configurator:
<https://lesc.lenovo.com/products/hardware/configurator/worldwide/bhui/asit/index.html>
- Lenovo DSS-G datasheet:
<https://lenovopress.com/DS0026>
- Lenovo DSS-G product life-cycle:
<https://support.lenovo.com/gb/en/solutions/ht510974>
- Lenovo 1U Switched and Monitored Rack PDUs product guide:
<https://lenovopress.lenovo.com/lp1556>

Related product families

Product families related to this document are the following:

- [2-Socket Rack Servers](#)
- [Direct-Attached Storage](#)
- [High Performance Computing](#)
- [IBM Alliance](#)
- [Software-Defined Storage](#)

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

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