

Lenovo DSS-G NVX2 Storage Server Product Guide

Lenovo Distributed Storage Solution for IBM Storage Scale (DSS-G) with integrated NVMe 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 and AI workloads requiring low latency, high performance storage will benefit the most from the DSS-G implementation.

DSSG-NVX2 is a 2U embedded system which can have up to 24 TLC NVMe drives for performance or can be expanded with 2U QLC NVMe based expansion controllers to provide high capacity, low latency storage. Offering both QLC and TLC based storage, the system can be optimized for low-latency read intensive workloads using QLC, or for high performance read/write workloads with TLC NVMe drives. **DSSG-NVX2 Turbo** product will provide a 25% increase in read performance, with additional memory and networking connections included in this configuration.

Lenovo DSS-G is delivered as an easy-to-deploy rack-level solution that dramatically reduces time-to-value and total cost of ownership (TCO).

In addition to the DSSG-NVX2 product that presents a dense, all NVMe solution, Lenovo also provides DSS-G systems based on spinning disk and SAS-SSD technologies. The DSS-G200 and DSS-G100 systems use the IBM Storage Scale native RAID code, DSSG-NVX2 uses a different internal software RAID coding system. Whilst DSS-G100 is an NVMe based solution, it uses scale-out NVMe rich 1U servers whereas the DSSG-NVX2 uses a 2U system with dual, redundant embedded controllers with the ability to add QLC based 2U expansion enclosures.

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 and High-End AI solutions.

DSS-G200, DSS-G100 and DSSG-NVX2 systems can be combined into the same file-system with different placement pools used to ensure data is placed on the most cost-effective tier of storage.

DSS-G-NVX2

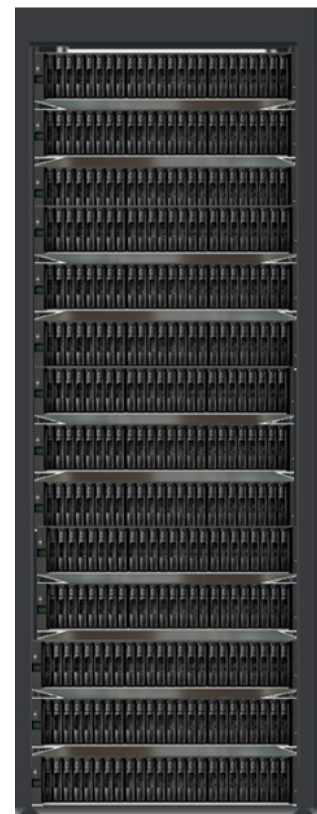


Figure 1. Lenovo DSSG-NVX2

Did you know?

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.

The DSSG-NVX2 uses embedded virtual machines that act as the NSD server which enables the systems to be upgraded without interrupting access to data.

What's New

DSSG-NVX2 / Turbo / QLC is a new product offering, it differs from DSS-G200 and DSS-G100 systems as it uses a different internal software RAID solution for high performance.

Software features

Lenovo DSSG-NVX2 has the following key software features:

- [IBM Storage Scale](#)
- [Embedded software defined RAID](#)

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
Protect data with native software encryption and secure erase, NIST compliant and FIPS certified	No	Yes*
File audit logging	No	Yes
Watch folder	No	Yes
Licensing	Per Flash Device or per Capacity	Per 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, 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>

Embedded software defined RAID

The Lenovo DSSG-NVX2 is internally powered by DDN Storage Fusion Architecture (SFA) software which provides embedded, high-performance software defined RAID encoding. Each storage system contains two embedded Intel Xeon based controllers which act in an active/active manner. One CPU on each controller is used as the “RAID processor” in the system. The second CPU on each controller is used to run the embedded GPFS NSD servers.

Sophisticated data placement and error correction algorithms deliver high levels of storage reliability, availability, serviceability, and performance. Client systems accessing DSSG-NVX2 based storage use the traditional NSD server protocol.

The features of DDN SFA RAID include:

- **Software RAID**

DDN SFA runs with dual-ported attached TLC based NVMe drives as well as directly connected QLC based JBODs which present QLC drives internally using redundant, NVMe over Fabrics. DDN SFA does not require external RAID storage controllers or other custom hardware RAID acceleration.

- **Declustering**

DDN SFA Declustered RAID (RCR) 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 and higher IOPs performance compared to conventional RAID approaches with fixed drive counts.

- **Data redundancy**

What raid encodings? Is it reed-soloman based.

- **Battery backed data**

Each controller includes an embedded battery which is used to protect data in the event of power loss to the storage system.

- **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.

- **Flexible hardware configuration**

Support of JBOF enclosures for both TLC and QLC based storage.

Hardware features

Lenovo DSS-G is fulfilled through Lenovo EveryScale, 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 DSSG-NVX2 / Turbo solution product are as follows:

Topics in this section:

- [DSSG NVX2 System components and features](#)
- [I/O Ports](#)
- [Fans inside Controller Modules](#)

DSSG NVX2 System components and features

The Lenovo DSSG-NVX2 system (shown below) is an enclosure together with a set of plug-in modules and comprises:

- Two controller modules each with six sets of fans and one battery backup unit.
- Two power supply units



Figure 2. Standard DSSG-NVX2

Note: Plug-in modules are part of the enclosure and must only be removed when a replacement can be immediately installed. The system must be run with all modules in place.

Key features

- The chassis can be mounted into a 19" wide rack and uses two EIA units (2U) of rack space.
- There are 24 drive slots at the front. Each slot accommodates a plug-in disk module capable of holding an SFF (2.5") NVMe Solid State Drive (SSD).
- The system LEDs are visible from the front of the unit.
- At the rear, the chassis assembly contains two controller modules and two power supply units (PSU)



Figure 3. DSSG_NVX2 / Turbo Enclosure front view

- There are drive position numbers and perforations required for airflow.
- Due to the numerous rack variations, Lenovo cannot guarantee its equipment will fit all non-Lenovo- provided racks.

The following image highlights the DSSG_NVX2 features

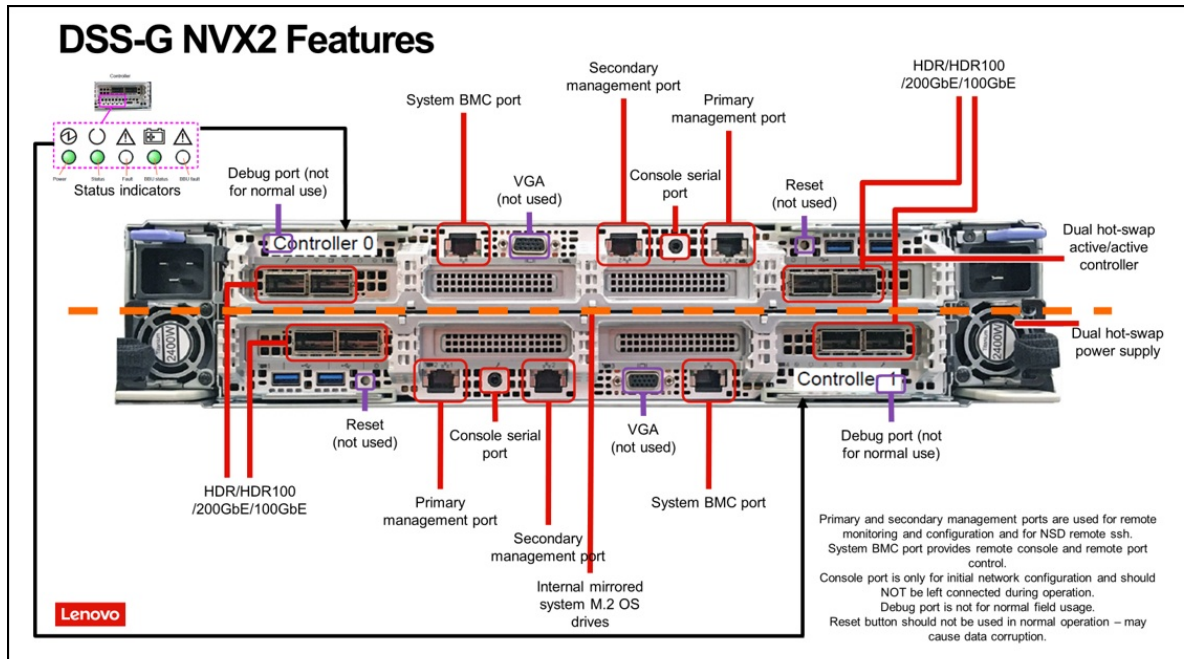


Figure 4. Standard DSSG_NVX2 / Turbo Enclosure

I/O Ports

The following figures illustrate the I/O ports on a controller.

The following provides descriptions for the ports.

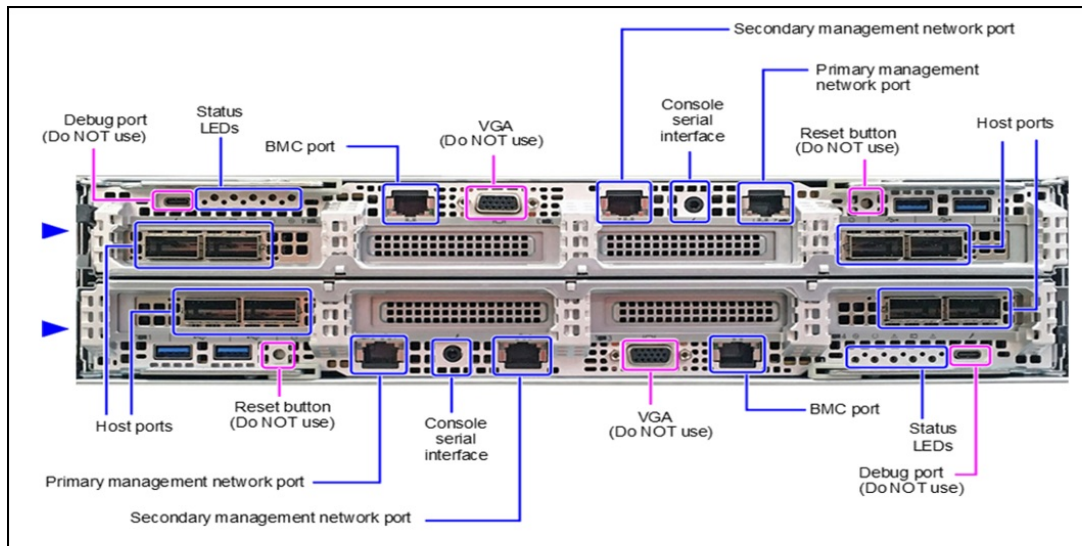


Figure 5. I/O Ports on Systems with 4x HCA

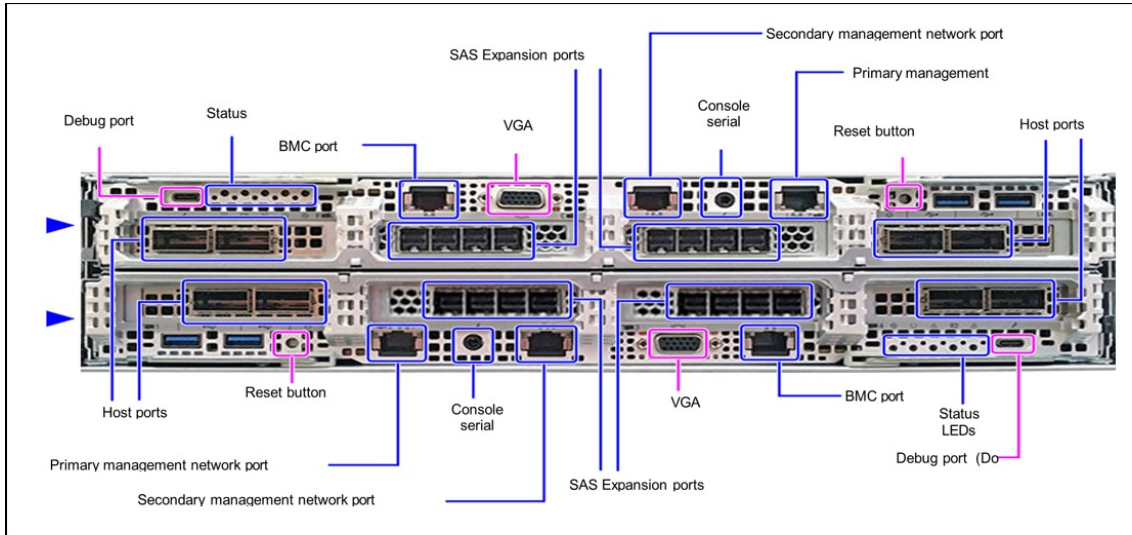


Figure 6. I/O Ports on Systems with SAS Expansion

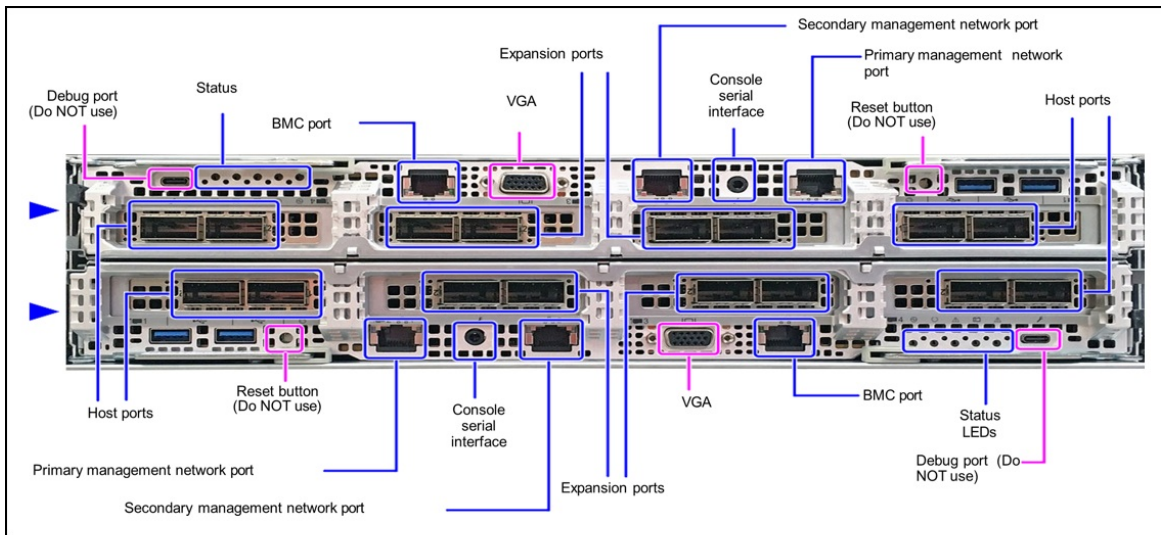


Figure 7. I/O Ports on Systems with Ethernet Expansion

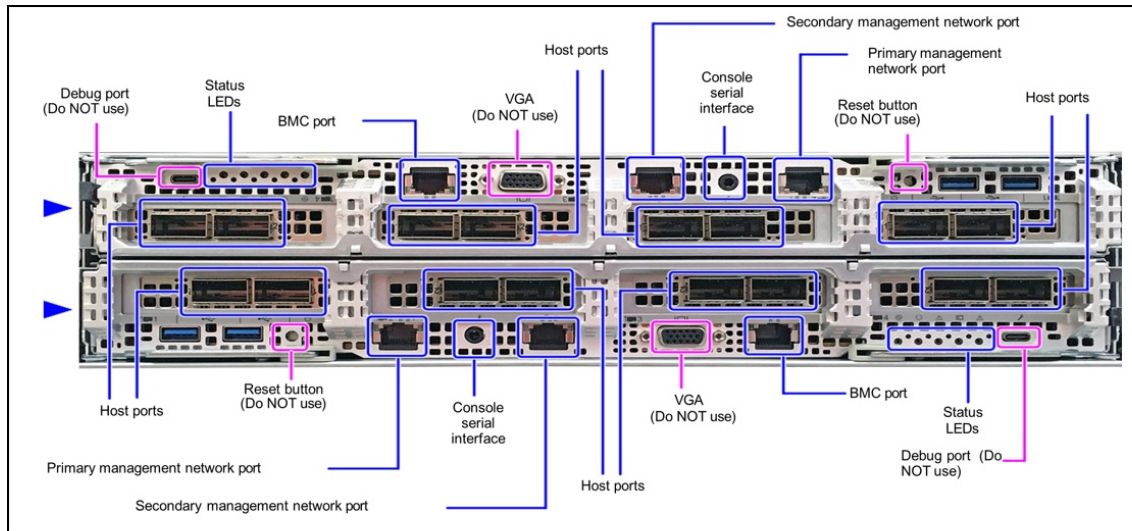


Figure 8. I/O Ports on Systems with 8x HCA (Turbo)

The following table details the I/O Ports on Controllers

Table 2. I/O Ports on Controllers

Ports	Description
RP host ports on block platforms	Provide IB host connections on each controller
Host ports on embedded platforms	<ul style="list-style-type: none"> On systems with 4x HCA (HDR or NDR-200), each port is software configurable for IB or Ethernet (up to 200GbE) On DSSG-NVX2 Turbo (8x HCA), each port is software configurable for IB NDR-200 or Ethernet (up to 200GbE) On DSSG -NVX2/T, ports have virtual functions which are assigned to the pre-configured virtual machines,
Network ports	Provide remote monitoring and configuration capabilities
BMC port	(Baseboard Management Controller) Provides remote console and remote power control
Console serial interface	May be used for initial network configuration. NOTE: Disconnect console port on both controllers when not in use. Do NOT leave serial cables connected to the serial ports.
Reset button	Do NOT use during normal operation; Improper use may result in data loss
USB ports	Only used in advanced troubleshooting

Fans inside Controller Modules

There are six sets of fans installed inside each of the controller modules.

These fans are redundant. If one fan fails, the other fans will maintain sufficient cooling inside the enclosure. The presence of the faulty fan ensures proper air flow inside the controller module so do not remove it until a new fan is available for replacement.

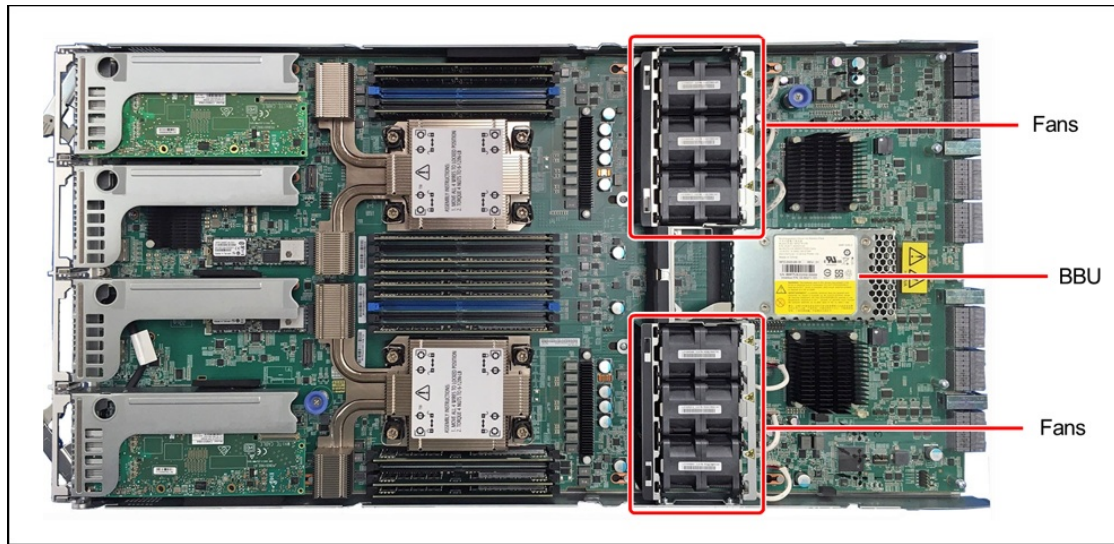


Figure 9. Fans and BBU inside Controller Module

Battery Backup Unit inside Controller Modules

Each controller module contains a battery backup unit (BBU) that is capable of sustaining power to the controller and its fans in the event that both power supply units fail. Note that the BBUs will not power the disk bays.

Power Supply Units

Each DSSG_NVX2 includes two power supply units (PSU). These modules are redundant and hot-swappable. If one PSU fails, the other PSU will maintain sufficient power to the enclosure. The presence of the faulty power supply unit ensures proper air flow for the enclosure so do not remove it until a new unit is available for replacement.

The PSU inlet is an IEC 320 C-20 connector. Only use the power cables that are provided with the system.

There is a bi-color LED mounted on each PSU to indicate the status of the module.

Power Interface Board

The Power Interface Board (PIB) provides the mechanical connection from the PSU to the midplane. There are two PIBs in the enclosure, one for each PSU, installed behind the PSU. The PIB is hot-swappable and can be removed after the PSU is removed to provide access.

Drive Modules

A drive module comprises an SSD mounted in a carrier. Each disk bay can house a single low profile 2.5" small form factor disk drive in its carrier. A fully loaded DSSG_NVX2 enclosure contains 24 disk modules.

The module handle provides the following functions:

- Camming of the module into and out of disk bays
- Positive "spring loading" of the disk/baseplane connector

Each module has a green Status LED and an amber Fault LED

Power Supply Unit AC Input Specifications

Note: The PSU for SFA400NVX2 is an 2400W power supply.

Table 3. Specifications

Input Parameter	Value
Input voltage	200 - 240 VAC nominal
Input frequency	50/60 Hz
Input connector	IEC 320 C-20
Efficiency	80 Plus® Titanium compliant
Maximum input current	15.0 A RMS
Peak inrush current	35A per supply
Maximum leakage current	1.75 mA per supply
AC hold-over time	10 msec

Power Cable Specifications

- Must be IEC 60320 C19/C20 style rated $\geq 14A$
- PSU must NOT be used with a C13/14 cord or extension cord Only use the power cables provided with the system

DSSG-NVX2 (QLC) Expansion Enclosure System Overview

The DSSG - QLC is a two-unit (2U), rack-mountable enclosure with a set of plug-in modules and comprises of the following components :

Topics in this section:

- [The chassis or enclosure](#)
- [IO Modules](#)
- [Fans inside IO Modules](#)
- [Drive Modules](#)
- [Power supply units](#)

The chassis or enclosure

The chassis can be mounted into 19" wide rack and uses two EIA units (2U) of rack space.

There are 24 drive slots at the front. Each slot accommodates a plug-in disk module capable of holding an SFF (2.5") NVMe Solid State Drive (SSD).



Figure 10. The DSSG - QLC enclosure unit front view

Note: Plug-in modules are part of the enclosure and must only be removed when a replacement can be immediately installed. The enclosure must not be run without all modules in place.

- Two I/O modules (IOM)—each with six sets of fans
- Two power supply units
- Up to 24 removable drives
- There are 24 drive slots at the front. Each slot accommodates a plug-in disk module capable of holding an SFF (2.5") NVMe Solid State Drive (SSD).
- The system LEDs are visible at the front of the system.
- At the rear, the chassis assembly contains two I/O modules (IOM) and two power supply units (PSU).

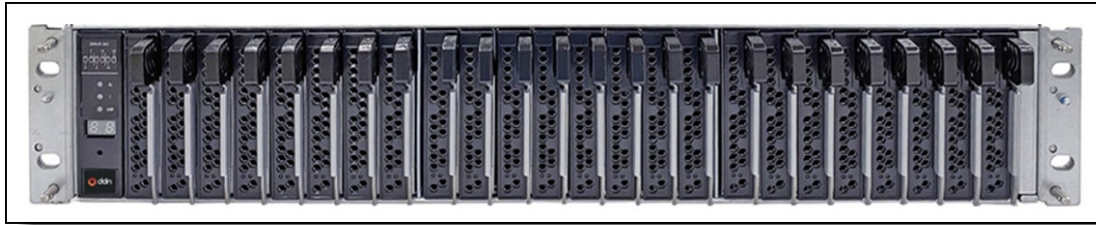


Figure 11. The DSSG - QLC enclosure unit front bezel

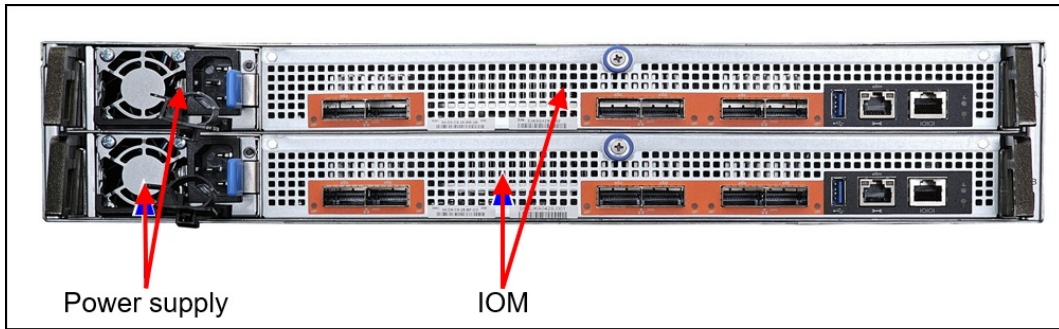


Figure 12. The DSSG - QLC enclosure unit rear view

Note: Due to the numerous rack variations, Lenovo cannot guarantee its equipment will fit all non-Lenovo -provided racks.

IO Modules

The two I/O modules are hot-swappable and provide a redundant path to the drives. Each IOM provides six 200GbE QSFP56 data links.

There are LEDs mounted on the IOM to indicate the status of the module.

The USB, Factory Config, and Debug Serial ports are only used for debugging and factory configurations. Do **NOT**

use these ports during normal operations.

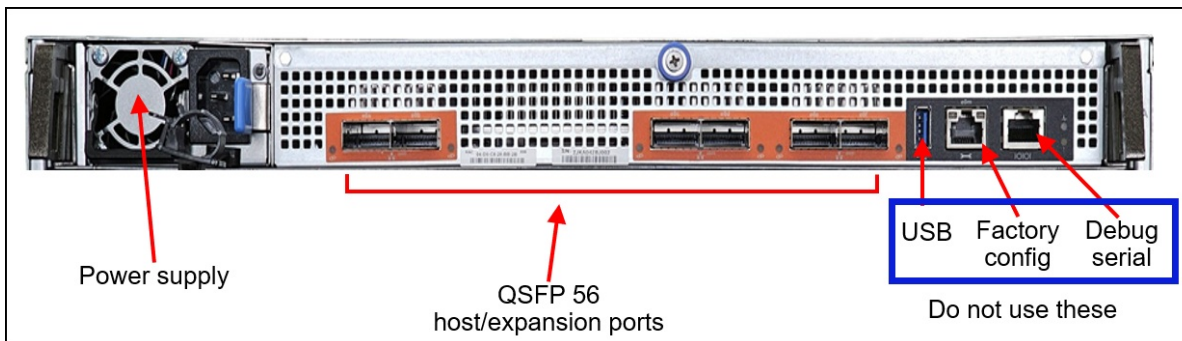


Figure 13. The DSSG - QLC IOM module rear view

Fans inside IO Modules

There are six sets of fans installed inside each IOM.

These fans are redundant. If one fan fails, the other fans will maintain sufficient cooling inside the enclosure. The presence of the faulty fan ensures proper air flow inside the IOM so do not remove it until a new fan module is available for replacement.

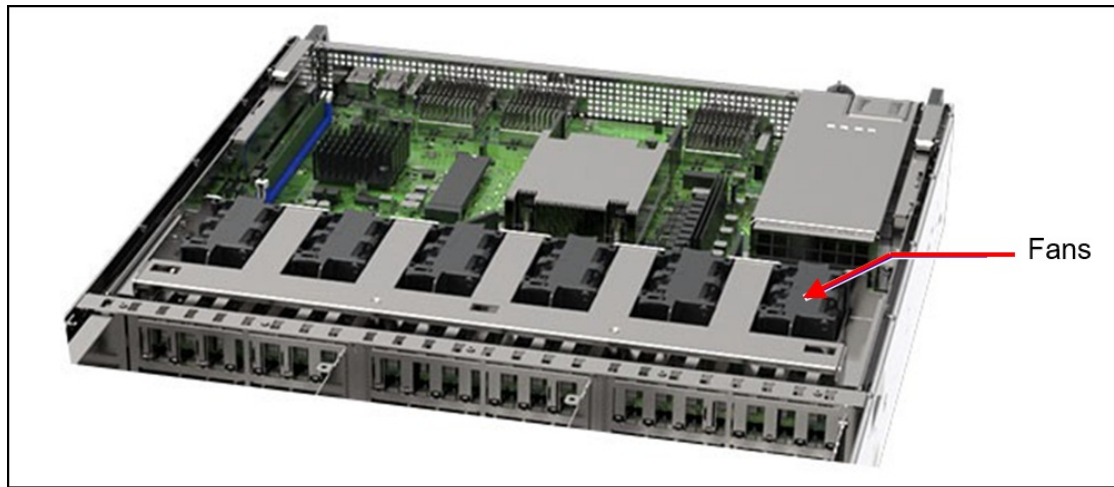


Figure 14. Fans view inside controller

Drive Modules

A drive module comprises an SSD and an interposer mounted in a carrier. Each drive slot can house a single low profile 2.5-inch small form factor disk drive in its carrier. A fully loaded enclosure contains 24 drive modules.

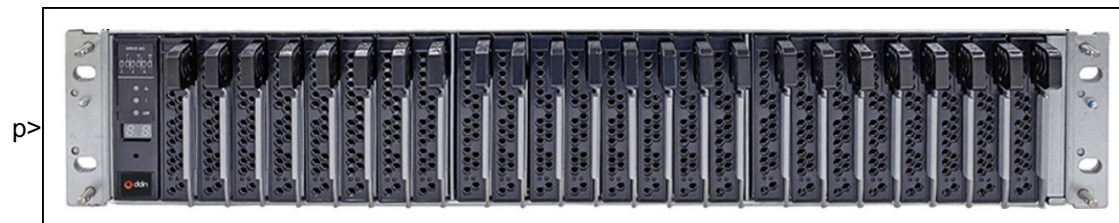


Figure 15. Drive slots front view

The module handle provides the following functions:

- Camming of the module into and out of drive bays
- Positive “spring loading” of the drive/baseplane connector

Each module has a green Status LED and an amber Fault LED.



Figure 16. Drive module and LEDs

Power supply units

Each enclosure includes two power supply units (PSU).

- These modules are redundant and hot-swappable. If one PSU fails, the other PSU will maintain sufficient power to the enclosure. The presence of the faulty PSU ensures proper air flow for the enclosure so do not remove it until a replacement unit is available for replacement.
- There is a bi-color LED mounted on each PSU to indicate the status of the module.

The PSU inlet is an IEC 320 C-14 connector. Only use the power cables that are provided with the system.

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 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.
- 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 DSSG-NVX2 deployments that provide exceptional performance and low latency, along with cost savings, and are designed to perform seamlessly with other vendors' upstream switches.
- 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 DSSG-NVX2 can also be supplied for installation into an existing customer rack (called a rackless 7X74 solution). When supplied as part of a Lenovo EveryScale HPC cluster, the system 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.

Other specifications

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

- [Rack cabinet specifications](#)

Rack cabinet specifications

The DSSG-NVX2 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 4. Rack cabinet specifications

Components	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	

Components	42U EveryScale Heavy Duty Rack Cabinet	48U EveryScale Heavy Duty Rack Cabinet
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

Power Supply Table:

For more information about the EveryScale Heavy Duty Rack Cabinets, see the [Lenovo Heavy Duty Rack Cabinets product guide](#)

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.

Models

Lenovo DSSG-NVX2 is available in the bundled configurations listed in the following table. Each configuration is installed in a 42U rack, although multiple DSSG-NVX2 configurations can share the same rack.

DDN-NVX2 /Turbo/ QLC Expansion (All Products Come with 3 Years Premium hardware & software support

Table 5. Bundled configurations

Feature code	Description
C4KA	TLC/NVMe Solution with 1x GS400NVX2 Turbo-NDR200, 24x 15.36TB NVMe drives
C4K9	TLC/NVMe Solution with 1x GS400NVX2 Turbo-NDR200, 24x 30.72TB NVMe drives
C5W5	TLC/NVMe Solution with 1x GS400NVX2-NDR200, 24x 15.36TB NVMe drives
C5VR	TLC/NVMe Solution with 2x GS400NVX2-NDR200, 48x 15.36TB NVMe drives
C5VQ	TLC/NVMe Solution with 4x GS400NVX2-NDR200, 96x 15.36TB NVMe drives
C5VP	TLC/NVMe Solution with 8x GS400NVX2-NDR200, 192x 15.36TB NVMe drives
C5VN	TLC/NVMe Solution with 1x GS400NVX2-NDR200, 24x 30.72TB NVMe drives
C5VM	TLC/NVMe Solution with 2x GS400NVX2-NDR200, 48x 30.72TB NVMe drives
C5VL	TLC/NVMe Solution with 4x GS400NVX2-NDR200, 96x 30.72TB NVMe drives
C5VK	TLC/NVMe Solution with 8x GS400NVX2-NDR200, 192x 30.72TB NVMe drives
C5VJ	TLC/NVMe Solution with 1x GS400NVX2-NDR200, 24x 7.68TB NVMe drives
C5VH	TLC/NVMe Solution with 2x GS400NVX2-NDR200, 48x 7.68TB NVMe drives
C5VG	TLC/NVMe Solution with 4x GS400NVX2-NDR200, 96x 7.68TB NVMe drives
C5VF	TLC/NVMe Solution with 8x GS400NVX2-NDR200, 192x 7.68TB NVMe drives
C5VC	QLC/NVMe Solution with 1x GS400NVX2-NDR200-SE, 12x 3.84TB NVMe drives, 48x 30.72TB QLC drives plus 2 enclosures
C5VB	QLC/NVMe Solution with 1x GS400NVX2-NDR200-SE, 12x 3.84TB NVMe drives, 96x 30.72TB QLC drives plus 4 enclosures

Feature code	Description
C5VA	QLC/NVMe Solution with 1x GS400NVX2-NDR200-SE, 12x 7.68TB NVMe drives, 120x 30.72TB QLC drives plus 5 enclosures
C5V9	QLC/NVMe Solution with 1x GS400NVX2-NDR200-SE, 12x 3.84TB NVMe drives, 48x 61.44TB QLC drives plus 2 enclosures
C5V8	QLC/NVMe Solution with 1x GS400NVX2-NDR200-SE, 12x 7.68TB NVMe drives, 96x 61.44TB QLC drives plus 4 enclosures
C5V7	QLC/NVMe Solution with 1x GS400NVX2-NDR200-SE, 12x 7.68TB NVMe drives, 120x 61.44TB QLC drives plus 5 enclosures
C5V6	MD/HDD Solution with 1x GS400NVX2-NDR200-S, 180x 20TB HDD drives plus 2 enclosures
C5V5	MD/HDD Solution with 1x GS400NVX2-NDR200-S, 360x 20TB HDD drives plus 4 enclosures
C5V4	MD/HDD Solution with 1x GS400NVX2-NDR200-S, 450x 20TB HDD drives plus 5 enclosures
C5V3	MD/HDD Solution with 1x GS400NVX2-NDR200-S, 720x 20TB HDD drives plus 8 enclosures
C5V2	MD/HDD Solution with 1x GS400NVX2-NDR200-S, 900x 20TB HDD drives plus 10 enclosures
C5VE	MD/HDD Solution with 1x GS400NVX2-NDR200-S, 180x 22TB HDD drives plus 2 enclosures
C5WG	MD/HDD Solution with 1x GS400NVX2-NDR200-S, 360x 22TB HDD drives plus 4 enclosures
C5WF	MD/HDD Solution with 1x GS400NVX2-NDR200-S, 450x 22TB HDD drives plus 5 enclosures
C5WE	MD/HDD Solution with 1x GS400NVX2-NDR200-S, 720x 22TB HDD drives plus 8 enclosures
C5WD	MD/HDD Solution with 1x GS400NVX2-NDR200-S, 900x 22TB HDD drives plus 10 enclosures
C5WC	MD/TLC Solution with 1x GS400NVX2-NDR200-S, 12x 3.84TB NVMe drives, 180x 20TB HDD drives plus 2 enclosures
C5WB	MD/TLC Solution with 1x GS400NVX2-NDR200-S, 12x 7.68TB NVMe drives, 360x 20TB HDD drives plus 4 enclosures
C5WA	MD/TLC Solution with 1x GS400NVX2-NDR200-S, 12x 7.68TB NVMe drives, 450x 20TB HDD drives plus 5 enclosures
C5W9	MD/TLC Solution with 1x GS400NVX2-NDR200-S, 12x 15.36TB NVMe drives, 720x 20TB HDD drives plus 8 enclosures
C5W8	MD/TLC Solution with 1x GS400NVX2-NDR200-S, 12x 30.72TB NVMe drives, 900x 20TB HDD drives plus 10 enclosures
C5W7	MD/TLC Solution with 1x GS400NVX2-NDR200-S, 12x 3.84TB NVMe drives, 180x 22TB HDD drives plus 2 enclosures
C5W6	MD/TLC Solution with 1x GS400NVX2-NDR200-S, 12x 7.68TB NVMe drives, 360x 22TB HDD drives plus 4 enclosures
C5VS	MD/TLC Solution with 1x GS400NVX2-NDR200-S, 12x 7.68TB NVMe drives, 450x 22TB HDD drives plus 5 enclosures
C5W4	MD/TLC Solution with 1x GS400NVX2-NDR200-S, 12x 15.36TB NVMe drives, 720x 22TB HDD drives plus 8 enclosures
C5W3	MD/TLC Solution with 1x GS400NVX2-NDR200-S, 12x 30.72TB NVMe drives, 900x 22TB HDD drives plus 10 enclosures
BZ52	TLC/NVMe 1x GS400NVX2, 24x 15.36TB NVMe drives
BZ51	TLC/NVMe 2x GS400NVX2, 48x 15.36TB NVMe drives
BZ5D	TLC/NVMe 4x GS400NVX2, 96x 15.36TB NVMe drives
BZ5C	TLC/NVMe 8x GS400NVX2, 192x 15.36TB NVMe drives
BZ5B	TLC/NVMe 16x GS400NVX2, 384x 15.36TB NVMe drives
BZ5A	TLC/NVMe 1x GS400NVX2, 24x 30.72TB NVMe drives
BZ59	TLC/NVMe 2x GS400NVX2, 48x 30.72TB NVMe drives

Feature code	Description
BZ5E	TLC/NVMe 4x GS400NVX2, 96x 30.72TB NVMe drives
BZ58	TLC/NVMe 8x GS400NVX2, 192x 30.72TB NVMe drives
BZ57	TLC/NVMe 16x GS400NVX2, 384x 30.72TB NVMe drives
C1TY	TLC/NVMe Solution with 1x GS400NVX2, 24x 7.68TB NVMe drives
C1TQ	TLC/NVMe Solution with 2x GS400NVX2, 48x 7.68TB NVMe drives
C1TR	TLC/NVMe Solution with 4x GS400NVX2, 96x 7.68TB NVMe drives
C1TS	TLC/NVMe Solution with 8x GS400NVX2, 192x 7.68TB NVMe drives
C1TT	TLC/NVMe Solution with 16x GS400NVX2, 384x 7.68TB NVMe drives
BZ56	QLC/NVMe 1x GS400NVX2-SE, 12x 3.84TB NVMe, 48x 30.72TB QLC, 2 enclosures
BZ55	QLC/NVMe 1x GS400NVX2-SE, 12x 3.84TB NVMe, 96x 30.72TB QLC, 4 enclosures
BZ54	QLC/NVMe 1x GS400NVX2-SE, 12x 7.68TB NVMe, 120x 30.72TB QLC, 5 enclosures
BZ53	QLC/NVMe 1x GS400NVX2-SE, 12x 3.84TB NVMe, 48x 61.44TB QLC, 2 enclosures
BZ65	QLC/NVMe 1x GS400NVX2-SE, 12x 7.68TB NVMe, 96x 61.44TB QLC, 4 enclosures
BZ66	QLC/NVMe 1x GS400NVX2-SE, 12x 7.68TB NVMe, 120x 61.44TB QLC, 5 enclosures
BZ67	MD/HDD 1x GS400NVX2-S, 180x 20TB HDD, 2 enclosures
BZ68	MD/HDD 1x GS400NVX2-S, 360x 20TB HDD, 4 enclosures
BZ69	MD/HDD 1x GS400NVX2-S, 450x 20TB HDD, 5 enclosures
BZ6A	MD/HDD 1x GS400NVX2-S, 720x 20TB HDD, 8 enclosures
BZ6B	MD/HDD 1x GS400NVX2-S, 900x 20TB HDD, 10 enclosures
C1TU	MD/HDD Solution with 1x GS400NVX2-S, 180x 22TB HDD drives plus 2 enclosures
C1TV	MD/HDD Solution with 1x GS400NVX2-S, 360x 22TB HDD drives plus 4 enclosures
C1TW	MD/HDD Solution with 1x GS400NVX2-S, 450x 22TB HDD drives plus 5 enclosures
C1TX	MD/HDD Solution with 1x GS400NVX2-S, 720x 22TB HDD drives plus 8 enclosures
C1TP	MD/HDD Solution with 1x GS400NVX2-S, 900x 22TB HDD drives plus 10 enclosures
BZ6C	MD/TLC 1x GS400NVX2-S, 12x 3.84TB NVMe, 180x 20TB HDD, 2 enclosures
BZ6D	MD/TLC 1x GS400NVX2-S, 12x 7.68TB NVMe, 360x 20TB HDD, 4 enclosures
BZ6E	MD/TLC 1x GS400NVX2-S, 12x 7.68TB NVMe, 450x 20TB HDD, 5 enclosures
BZ6F	MD/TLC 1x GS400NVX2-S, 12x 15.36TB NVMe, 720x 20TB HDD, 8 enclosures
BZ64	MD/TLC 1x GS400NVX2-S, 12x 30.72TB NVMe, 900x 20TB HDD, 10 enclosures
C1TZ	MD/TLC Solution with 1x GS400NVX2-S, 12x 3.84TB NVMe drives, 180x 22TB HDD drives plus 2 enclosures
C1U0	MD/TLC Solution with 1x GS400NVX2-S, 12x 7.68TB NVMe drives, 360x 22TB HDD drives plus 4 enclosures
C1U1	MD/TLC Solution with 1x GS400NVX2-S, 12x 7.68TB NVMe drives, 450x 22TB HDD drives plus 5 enclosures
C1U2	MD/TLC Solution with 1x GS400NVX2-S, 12x 15.36TB NVMe drives, 720x 22TB HDD drives plus 8 enclosures
C1U3	MD/TLC Solution with 1x GS400NVX2-S, 12x 30.72TB NVMe drives, 900x 22TB HDD drives plus 10 enclosures

Configurations are built using the x-config configurator tool:

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

The configuration process includes the following steps:

- Select the System and drive enclosure, as listed in the previous table.
- Node configuration, as described in the next subsections:
 - Memory
 - Network adapter
 - Red Hat Enterprise Linux (RHEL) premium subscription
 - Enterprise Software Support (ESS) subscription
- Confluent management network selection (may or may not be needed depending on client environment)
- IBM Storage Scale license selection
- Power distribution infrastructure selection
- 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 <https://lenovopress.lenovo.com/lp1556> for more information on preferred orientation of Lenovo rack PDUs.

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.

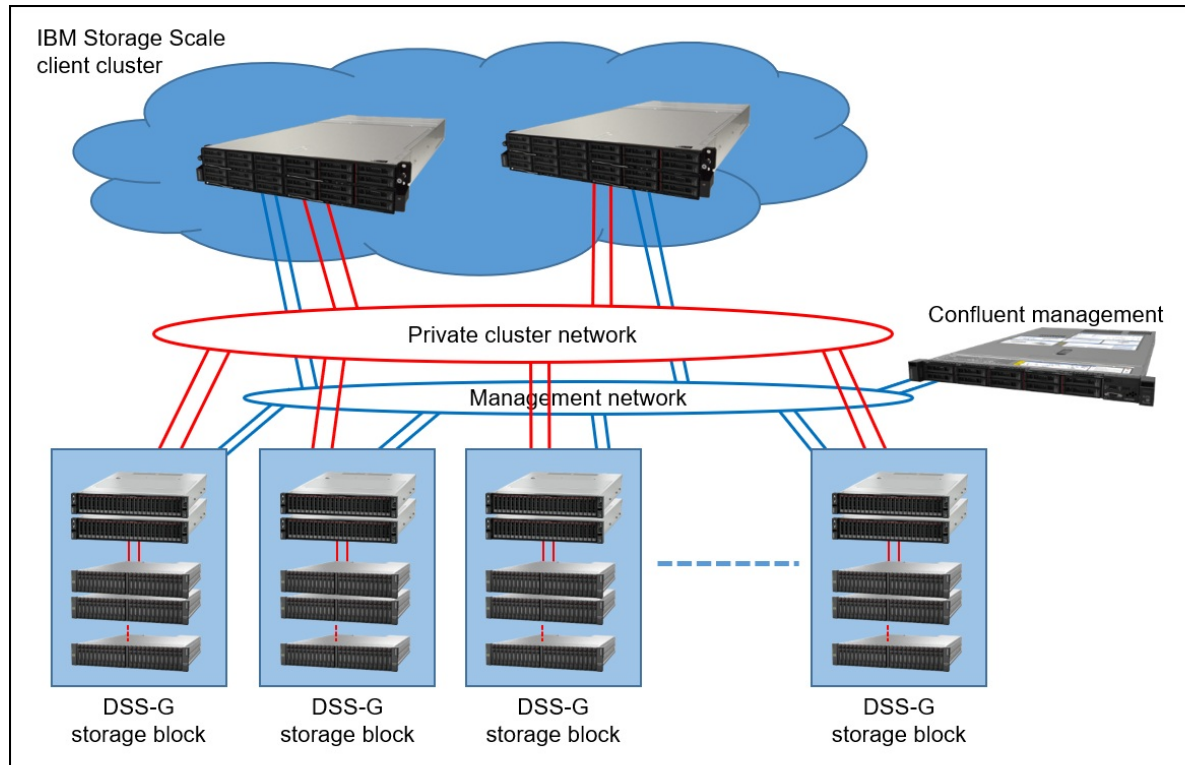


Figure 17. Lenovo DSS-G storage blocks in a Storage Scale client network

Red Hat Enterprise Linux

The Lenovo DSSG-NVX2 system runs on Red Hat Linux

IBM Storage Scale licensing

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

- 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

Addition years of support can be found in the Storage Scale Licensing table. Or can be configured through x-config.

Table 6. IBM Storage Scale licensing

Description	Part number	Feature code
IBM Storage Scale -- licensed per Flash Drive		
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 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
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 Spectrum 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 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 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 7. 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

The following tables provide environmental specifications.

Table 8. Environmental – DSSG-NVX2

Parameter	Operating	Non-Operating
Temperature range	5°C to 35°C ¹ (41°F to 95°F)	-40°C to 60°C (-40°F to 140°F)
Relative humidity	8% to 85% non-condensing	8% to 95% non-condensing
Altitude	3,117 ft @ 35°C (950 m @ 35°C) ² 10,000 ft @ 28°C (3048 m @ 28°C)	39,370 ft (12,000 m)

1. The maximum operating temperature gradient is 20°C per
2. De-rate maximum operating temperature 1°C per 300 m above 950 m altitude

Table 9. Environmental - DSSG- NVX2 (QLC)

Parameter	Operating	Non-Operating
Temperature range	10°C to 35°C(50°F to 95°F) Derate 1°C per 300 m above 950 m altitude	-40°C to 70°C (-40°F to 158°F)
Altitude	3,048 m (10,000 ft)	10,668 m (35,000ft)
Relative humidity (non-condensing; ASHRAE A2)	8% to 90%	10% to 95%

Regulatory compliance

Regulatory Compliance – DSSG-NVX2

EMC Compliance

- CISPR 32 (FCC, EN 55032, VCCI, ICES-003)
- EN 61000-3-2
- EN 61000-3-3
- IEC 61000-4-2
- IEC 61000-4-3
- IEC 61000-4-4
- IEC 61000-4-6
- IEC 61000-4-11

Safety Compliance

- UL 60950-1, 2nd Edition

- CAN/CSA 2 No. 60950-1-07, 2nd Edition
- IEC 60950-1 2012 A2-2013
- EN 60950-1/A12:2011 A2:2013
- IEC/EN/UL62368-1 2nd Edition

Regulatory Compliance – DSSG-QLC

EMC

- CE / UKCA (EU/UK)
- FCC, IC (US, CA)
- VCCI (Japan)
- BSMI (Taiwan)
- RCM (Australia)
- MISIP (South Korea) Safety
- CB UL 3rd Edition USA/Canada (60950-1, 62368-1 3rd)
- IEC 62368-1: 2018
- SII Israel
- BSMI Taiwan (CNS 14336-1)

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 CECP certificate, CQC3135
- China CELP certificate, HJ 2507-2011

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.

The standard warranty terms are customer-replaceable unit (CRU) and onsite (for field-replaceable units FRUs only) with standard call center support during normal business hours and 9x5 Next Business Day Parts Delivered.

Lenovo's additional support services provide a sophisticated, unified support structure for your data center, with an experience consistently ranked number one in customer satisfaction worldwide. Available offerings include:

- **Premier Support**

Premier Support provides a Lenovo-owned customer experience and delivers direct access to technicians skilled in hardware, software, and advanced troubleshooting, in addition to the following:

- Direct technician-to-technician access through a dedicated phone line
- 24x7x365 remote support
- Single point of contact service
- End to end case management
- Third-party collaborative software support
- Online case tools and live chat support
- On-demand remote system analysis

- **Warranty Upgrade (Preconfigured Support)**

Services are available to meet the on-site response time targets that match the criticality of your systems.

- 3, 4, or 5 years of service coverage
- 1-year or 2-year post-warranty extensions
- **Foundation Service:** 9x5 service coverage with next business day onsite response. YourDrive YourData is an optional extra (see below).
- **Essential Service:** 24x7 service coverage with 4-hour onsite response or 24-hour committed repair (available only in select markets). Bundled with YourDrive YourData.
- **Advanced Service:** 24x7 service coverage with 2-hour onsite response or 6-hour committed repair (available only in select markets). Bundled with YourDrive YourData.

- **Managed Services**

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.

- **Technical Account Management (TAM)**

A Lenovo Technical Account Manager helps you optimize the operation of your data center based on a deep understanding of your business. You gain direct access to your Lenovo TAM, who serves as your single point of contact to expedite service requests, provide status updates, and furnish reports to track incidents over time. In addition, your TAM will help proactively make service recommendations and manage your service relationship with Lenovo to make certain your needs are met.

- **Enterprise Server Software Support**

Enterprise Software Support is an additional support service providing customers with software support on Microsoft, Red Hat, SUSE, and VMware applications and systems. Around the clock availability for critical problems plus unlimited calls and incidents helps customers address challenges fast, without incremental costs. Support staff can answer troubleshooting and diagnostic questions, address product comparability and interoperability issues, isolate causes of problems, report defects to software vendors, and more.

- **YourDrive YourData**

Lenovo's YourDrive YourData is a multi-drive retention offering that ensures your data is always under your control, regardless of the number of drives that are installed in your Lenovo server. In the unlikely event of a drive failure, you retain possession of your drive while Lenovo replaces the failed drive part. Your data stays safely on your premises, in your hands. The YourDrive YourData service can be purchased in convenient bundles and is optional with Foundation Service. It is bundled with Essential Service and Advanced Service.

- **Health Check**

Having a trusted partner who can perform regular and detailed health checks is central to maintaining efficiency and ensuring that your systems and business are always running at their best. Health Check supports Lenovo-branded server, storage, and networking devices, as well as select Lenovo-supported products from other vendors that are sold by Lenovo or a Lenovo-Authorized Reseller.

Examples of region-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 spare parts.

Lenovo Service offerings are region-specific. Not all preconfigured support and upgrade options are available in every region. For information about Lenovo service upgrade offerings that are available in your region, 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://lenovocator.com/>

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

- Lenovo Statement of Limited Warranty for Infrastructure Solutions Group (ISG) 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>

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

Services

Lenovo Services is a dedicated partner to your success. Our goal is to reduce your capital outlays, mitigate your IT risks, and accelerate your time to productivity.

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

Here's a more in-depth look at what we can do for you:

- **Asset Recovery Services**

Asset Recovery Services (ARS) helps customers recover the maximum value from their end-of-life equipment in a cost-effective and secure way. On top of simplifying the transition from old to new equipment, ARS mitigates environmental and data security risks associated with data center equipment disposal. Lenovo ARS is a cash-back solution for equipment based on its remaining market value, yielding maximum value from aging assets and lowering total cost of ownership for your customers. For more information, see the ARS page, <https://lenovopress.com/lp1266-reduce-e-waste-and-grow-your-bottom-line-with-lenovo-ars>.

- **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.

- **Basic Hardware Installation**

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.

- **Deployment Services**

When investing in new IT infrastructures, you need to ensure your business will see quick time to value with little to no disruption. Lenovo deployments are designed by development and engineering teams who know our Products & Solutions better than anyone else, and our technicians own the process from delivery to completion. Lenovo will conduct remote preparation and planning, configure & integrate systems, validate systems, verify and update appliance firmware, train on administrative tasks, and provide post-deployment documentation. Customer's IT teams leverage our skills to enable IT staff to transform with higher level roles and tasks.

- **Integration, Migration, and Expansion Services**

Move existing physical & virtual workloads easily, or determine technical requirements to support increased workloads while maximizing performance. Includes tuning, validation, and documenting ongoing run processes. Leverage migration assessment planning documents to perform necessary migrations.

- **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 SR630 V2 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 SR650 V2 and SR630 V2 servers
 - Red Hat Enterprise Linux on the SR650 V2 and SR630 V2 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 10. 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)
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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