

Lenovo ThinkSystem SR950 V3 Server Product Guide

The Lenovo ThinkSystem SR950 V3 is an 8-socket server that features an 8U rack design, with two 4U units cabled together for ease of installation. The server offers technology advances, including 4th Gen Intel Xeon Scalable processors, and scale-up capacity of up to 32TB of system memory, up to 14x PCIe slots (6x front, 8x rear), and up to 16x 2.5-inch or 16x E3.S EDSFF drive bays.

The ThinkSystem SR950 V3 is designed for the most demanding, mission-critical workloads, such as in-memory databases, large transactional databases, real-time analytics, ERP, CRM, and virtualized server workloads.



Figure 1. Lenovo ThinkSystem SR950 V3 (with the security bezel attached)

Did you know?

The Lenovo ThinkSystem SR950 V3 provides the ultimate in scale-up performance with eight 4th Gen Intel Xeon processors and 32TB of DDR5 memory. The capability of the in-memory processing power offered by the SR950 V3 is essential for mission critical database and SAP HANA installations.

Key features

The flexible ThinkSystem SR950 V3 server supports eight 4th Gen Intel Xeon Scalable Platinum processors. Built for mission-critical workloads like SAP HANA, databases, Big Data, business analytics, ERP & CRM, business logic, and virtualization. With the support of 8x 350W processors, up to 32TB of memory, and 14 PCIe slots, the SR950 V3 provides unmatched features and capabilities in a 8U rack-mount design.

Scalability and performance

The SR950 V3 offers numerous features to boost performance, improve scalability and reduce costs:

- Supports eight 4th Gen Intel Xeon Processor Scalable processors, up to 480 total cores and 960 total threads, to maximize the concurrent execution of multithreaded applications
- Supports Platinum processors in the Intel Xeon Processor Scalable Family. Processors supported:
 - Up to 60 cores
 - Core speeds of up to 2.9 GHz
 - TDP ratings of up to 350W
- Support for embedded Intel accelerators:
 - Up to 4x Intel QuickAssist Technology (QAT)
 - Up to 4x Intel Dynamic Load Balancer (DLB)
 - 4x Intel In-Memory Analytics Accelerator (IAA)
 - 4x Intel Data Streaming Accelerator (DSA)
- Enhanced inter-processor communications with four UPI 2.0 connections between adjacent processors ensures increased CPU I/O throughput.
- Support for up to 128 TruDDR5 memory DIMMs operating at up to 4800 MHz means you have the fastest available memory subsystem and memory capacity of up to 32 TB with 128x 256 GB 3DS RDIMMs.
- Supports configurations of 2 DIMMs per channel to operate at the 4400 MHz rated speed of the memory DIMMs.
- Up to 16TB SAP HANA Appliance or 32TB SAP HANA TDI
- Up to 16x E3.S EDSFF hot-swap PCIe 5.0 NVMe drive bays, or up to 16x 2.5-inch drive bays supporting SAS or SATA SSDs. The E3.S NVMe drives maximize drive I/O performance in terms of throughput, bandwidth, and latency.
- 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.
- Up to 14 PCIe slots in addition to the OCP 3.0 Ethernet slot to maximize I/O capabilities.
- The server is Compute Express Link (CXL) v1.1 Ready. With CXL 1.1 for next-generation workloads, you can reduce compute latency in the data center and lower TCO. CXL is a protocol that runs across the standard PCIe physical layer and can support both standard PCIe devices as well as CXL devices on the same link.
- High-speed RAID controllers provide 12 Gb SAS connectivity to the drive backplanes. Supports 8-port and 16-port adapters with cache up to 4GB.
- The server supports an one or two M.2 NVMe drives, with integrated RAID support, for convenient operating system boot functions.
- Supports Intel VROC (Virtual RAID on CPU) which enables basic RAID functionality on the onboard NVMe ports of the server, with no additional adapter needed. This feature enables RAID on NVMe drives without the need for a separate RAID controller.

Availability and serviceability

The SR950 V3 provides many features to simplify serviceability and increase system uptime:

- Designed to run 24 hours a day, 7 days a week
- The server offers Single Device Data Correction (SDDC, also known as Chipkill), Adaptive Double-Device Data Correction (ADDDC, also known as Redundant Bit Steering or RBS) and memory mirroring for redundancy in the event of a non-correctable memory failure.
- The server offers hot-swap drives, supporting RAID redundancy for data protection and greater system uptime.
- Support for an M.2 adapter with integrated RAID-1 for enhanced data protection of boot drives
- The server has 12x hot-swap redundant power supplies supporting N+N redundancy, and 12x N+2 redundant simple-swap fans to provide availability for business-critical applications.
- Proactive Platform Alerts (including PFA and SMART alerts): Processors, voltage regulators, memory, internal storage (SAS/SATA HDDs and SSDs, NVMe SSDs, M.2 storage, flash storage adapters), fans, power supplies, RAID controllers, server ambient and subcomponent temperatures. Alerts can be surfaced through the XClarity Controller to managers such as Lenovo XClarity Administrator, VMware vCenter, and Microsoft System Center. These proactive alerts let you take appropriate actions in advance of possible failure, thereby increasing server uptime and application availability.
- Solid-state drives (SSDs) offer more reliability than traditional mechanical HDDs for greater uptime.
- The built-in XClarity Controller continuously monitors system parameters, triggers alerts, and performs recovery actions in case of failures, to minimize downtime.
- Built-in diagnostics in UEFI, using Lenovo XClarity Provisioning Manager, speed up troubleshooting tasks to reduce service time.
- Lenovo XClarity Provisioning Manager collects and saves service data to USB key drive or remote CIFS share folder, for troubleshooting and to reduce service time.
- Auto restart in the event of a momentary loss of AC power (based on the power policy setting in the XClarity Controller service processor)
- Offers a diagnostics port on the front of the server to allow you to attach an external diagnostics handset for enhanced systems management capabilities.
- Support for the XClarity Administrator Mobile app running on a supported smartphone or tablet and connected to the server through the front USB 2.0 port, enables additional local systems management functions.
- 3-year or 1-year customer-replaceable unit and onsite limited warranty, 9 x 5 next business day. Optional service upgrades are available.

Manageability and security

Powerful systems management features simplify local and remote management of the SR950 V3:

- Lenovo XClarity Controller 2 (XCC2) monitors server availability and performs remote management. XCC Platinum is standard, which enables remote KVM, the mounting of remote media files (ISO and IMG image files), boot capture, and power capping.
- Lenovo XClarity Administrator offers comprehensive hardware management tools that help to increase uptime, reduce costs and improve productivity through advanced server management capabilities.
- UEFI-based Lenovo XClarity Provisioning Manager, accessible from F1 during boot, provides system inventory information, graphical UEFI Setup, platform update function, RAID Setup wizard, operating system installation function, and diagnostic functions.
- Support for Lenovo XClarity Energy Manager, which captures real-time power and temperature data from the server and provides automated controls to lower energy costs.
- Root of Trust (RoT) module includes Platform Firmware Resiliency (PFR) and Trusted Platform Module (TPM) 2.0, which further enhances key platform subsystem protections by detecting unauthorized firmware updates, recovering corrupted images to a known-safe image, and monitoring firmware to ensure it has not been compromised. Secures and authenticates system to prevent unauthorized access.
- Integrated Trusted Platform Module (TPM) 2.0 support enables advanced cryptographic methods, such as digital signatures and remote attestation.
- Supports Secure Boot to ensure only a digitally signed operating system can be used. Supported with HDDs and SSDs, as well as M.2 drives.
- Industry-standard Advanced Encryption Standard (AES) NI support for faster, stronger encryption.
- Intel Execute Disable Bit functionality can prevent certain classes of malicious buffer overflow attacks when combined with a supported operating system.
- Intel Trusted Execution Technology provides enhanced security through hardware-based resistance to malicious software attacks, allowing an application to run in its own isolated space, protected from all other software running on a system.

Energy efficiency

The SR950 V3 offers the following energy-efficiency features to save energy, reduce operational costs, and increase energy availability:

- Energy-efficient planar components help lower operational costs.
- High-efficiency power supplies with 80 PLUS Titanium certifications
- Intel Intelligent Power Capability turns individual processor elements on and off as needed to reduce power draw.
- Low-voltage 1.1 V DDR5 memory offers energy savings compared to 1.2 V DDR4 DIMMs.
- Solid-state drives (SSDs) consume as much as 80% less power than traditional spinning 2.5-inch HDDs.
- The server uses hexagonal ventilation holes, which can be grouped more densely than round holes, providing more efficient airflow through the system and thus keeping your system cooler.
- Optional Lenovo XClarity Energy Manager provides advanced data center power notification, analysis, and policy-based management to help achieve lower heat output and reduced cooling needs.

Comparing the SR950 V3 to the SR950

The ThinkSystem SR950 V3 improves on the previous generation SR950, as summarized in the following table.

Table 1. Comparing the SR950 V3 to the SR950

Feature	SR950	SR950 V3	Benefits
Processor	<ul style="list-style-type: none"> Up to 8x 2nd Gen Intel Xeon Scalable Processors "Cascade Lake" "Purley" platform Up to 28 cores (224 cores with 8S) TDP ratings up to 205W 48x PCIe 3.0 lanes per processor 	<ul style="list-style-type: none"> 8x 4th Gen Intel Xeon Scalable Processors "Sapphire Rapids" "Eagle Stream" platform Up to 60 cores (480 cores with 8S) TDP ratings up to 350W 80x PCIe 5.0 lanes per processor 	<ul style="list-style-type: none"> More than double the number of processor cores Significant increase in cores per processor Increased performance Consolidation of more apps on same number of servers, reducing costs New PCIe 5.0 support means higher performance networking and NVMe storage
GPU	<ul style="list-style-type: none"> No support 	<ul style="list-style-type: none"> No support 	
Memory	<ul style="list-style-type: none"> DDR4 memory operating up to 2933 MHz 6 channels per CPU 96 DIMMs (12 per processor), 2 DIMMs per channel Supports RDIMMs and 3DS RDIMMs Up to 24TB of system memory 	<ul style="list-style-type: none"> DDR5 memory operating up to 4800 MHz 8 channels per CPU 128 DIMMs (16 per processor), 2 DIMMs per channel Supports RDIMMs and 3DS RDIMMs Up to 32TB of system memory 	<ul style="list-style-type: none"> Increased memory capacity New DDR5 memory offers significant performance improvements over DDR4 More memory channels means greater memory bandwidth
Internal storage	<ul style="list-style-type: none"> Up to 24x 2.5-inch hot-swap drives, 12 of which can be NVMe drives Up to 12x NVMe drives (PCIe Gen 3) Supports SATA, AnyBay or NVMe backplanes 12x direct connections Internal 2x M.2 SATA drives (HW RAID) 	<ul style="list-style-type: none"> Up to 16x 2.5-inch hot-swap SAS or SATA SSDs Up to 16x E3.S EDSFF hot-swap PCIe 5.0 NVMe SSDs 16x direct connections Internal 2x M.2 NVMe drives (HW RAID) 	<ul style="list-style-type: none"> Performance improvement with PCIe Gen5 NVMe Support for new E3.S NVMe drives All NVMe drives have a direct onboard connections, meaning no NVMe retimer or switch adapters needed
RAID	<ul style="list-style-type: none"> SAS/SATA RAID adapters with up to 8GB flash Support for Gen3 and Gen4 Broadcom adapters Storage HBAs available VROC for NVMe 	<ul style="list-style-type: none"> SAS/SATA RAID adapters with up to 4GB flash Support for Gen4 Broadcom adapters Storage HBAs available VROC for NVMe 	<ul style="list-style-type: none"> Consistent RAID/HBA support Flexible config solution PCIe Gen 5 allows for greater storage performance

Feature	SR950	SR950 V3	Benefits
Networking	<ul style="list-style-type: none"> • 1x LOM slot with PCIe Gen 3 x16 interface for 1Gb and 10Gb adapters • Optional 2x ML2 slots for ML2 adapter support • Additional PCIe adapters supported up to 200 GbE • 1GbE dedicated Management port 	<ul style="list-style-type: none"> • Optional OCP slot with PCIe Gen4 x16 interface for 1Gb, 10Gb or 25Gb adapters • Additional PCIe adapters supported up to 400 GbE • 1GbE dedicated Management port 	<ul style="list-style-type: none"> • Improved performance with PCIe Gen 5 • Support for 25GbE OCP adapter in a dedicated slot • Supports 400 GbE or InfiniBand NDR for high-speed networking
PCIe	<ul style="list-style-type: none"> • Supports PCIe 3.0 • Up to 17x slots (all Gen3) depending on the configuration • 5 onboard slots; others via riser cards • 1x LOM slot, 1-2x ML2 slots (PCIe Gen3) 	<ul style="list-style-type: none"> • Supports PCIe 5.0 • Up to 14x PCIe slots • 6x Front FHHL x16 Gen5 slots • Up to 8x Rear FHHL x16 Gen4 slots • 1x OCP slot (PCIe Gen4) 	<ul style="list-style-type: none"> • Supports PCIe Gen5 allowing for greater I/O performance • Front PCIe slots
Management and security	<ul style="list-style-type: none"> • XClarity Controller • Support for full XClarity toolset including XClarity Administrator 	<ul style="list-style-type: none"> • Integrated XClarity Controller 2 • Support for full XClarity toolset including XClarity Administrator • Platform Firmware Resiliency (PFR) hardware Root of Trust (RoT) • Tamper Switch security solution (intrusion switch) • Supports optional external diagnostics handset 	<ul style="list-style-type: none"> • New XCC2 offers improved management capabilities • Same system management tool with previous generation • Platform Firmware Resiliency is an advanced security solution with a silicon-based to guard against corruption and unauthorized firmware updates • Intrusion detection when the top cover or front cover is removed • External Diagnostics Handset with LCD panel offers quick access to system status, firmware, network, and health information
Power	<ul style="list-style-type: none"> • Up to 4 hot-swap power supplies • Choice of 1100W-2000W AC hot-swap power supplies • Platinum efficiency levels • N+N redundancy 	<ul style="list-style-type: none"> • Up to 12 hot-swap power supplies • 1800W AC hot-swap power supplies • Titanium power efficiency level • N+N redundancy 	<ul style="list-style-type: none"> • More power supplies offers greater redundancy • Titanium efficiency • ErP Lot 9-compliant offerings

Components and connectors

The following figure shows the front of the SR950 V3. The server is an 8U server comprised of two 4U chassis (primary and secondary) that are cabled together using 8x UPI cables and 2x sideband cables.

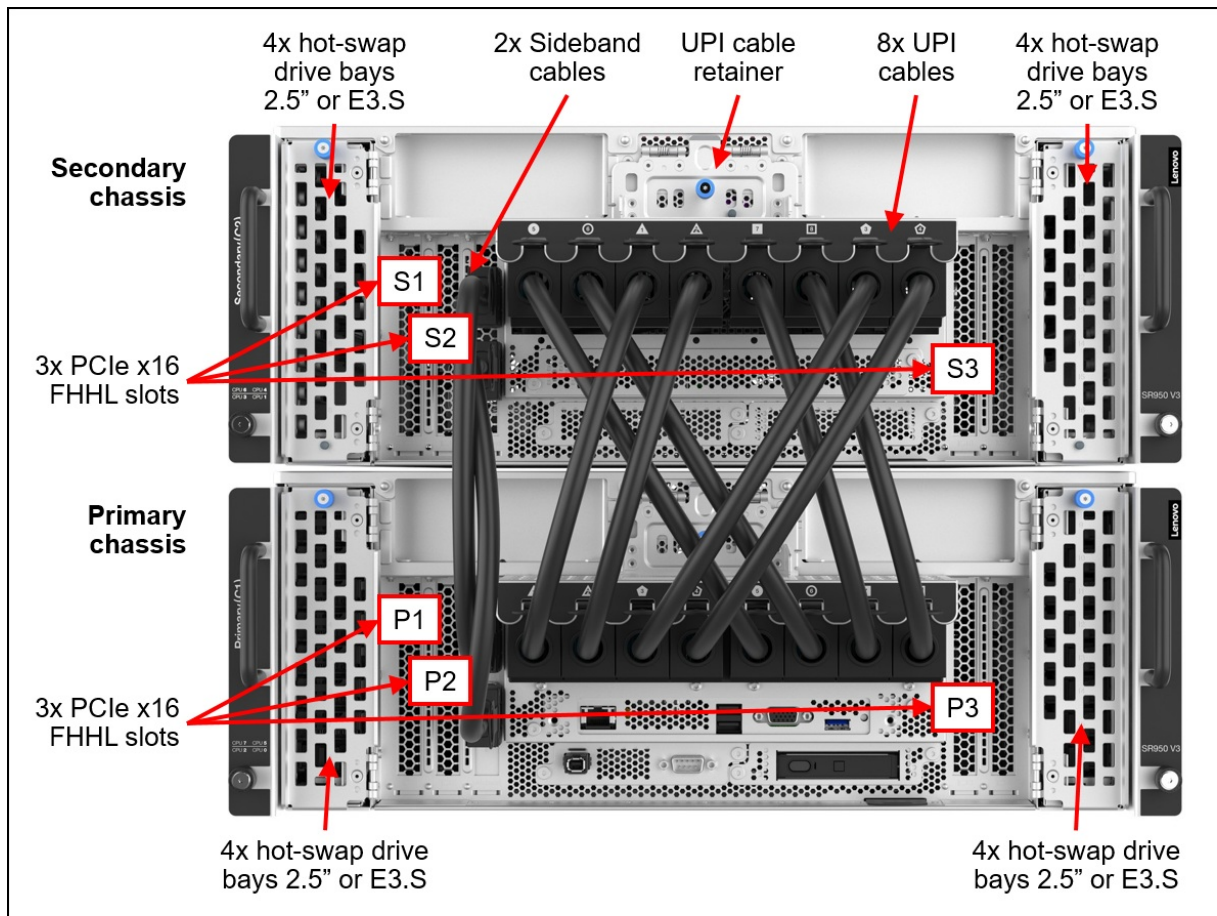


Figure 2. Front view of the ThinkSystem SR950 V3

The following figure shows the ports at the front of the in the lower (Primary) chassis.

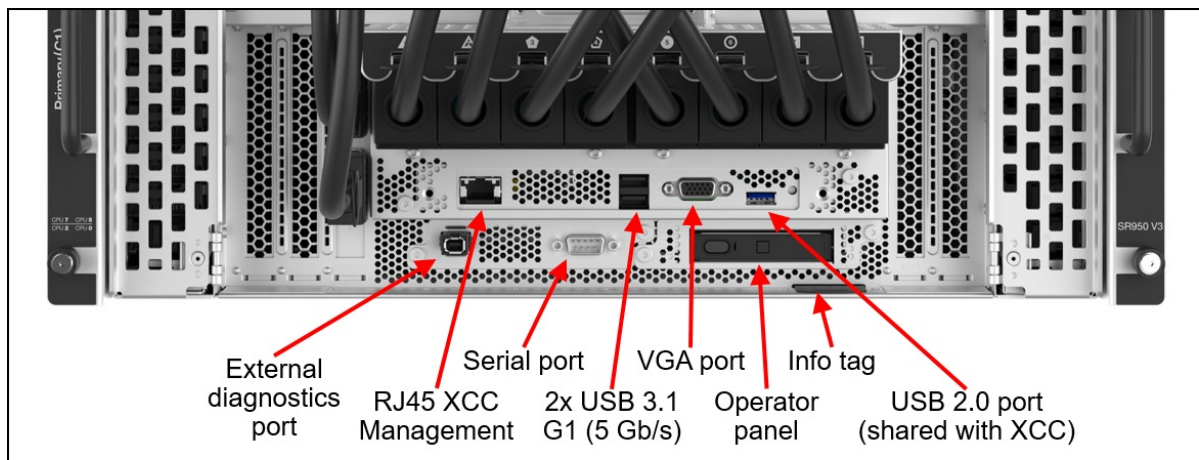


Figure 3. Front ports of the ThinkSystem SR950 V3

The following figure shows the rear of the server.

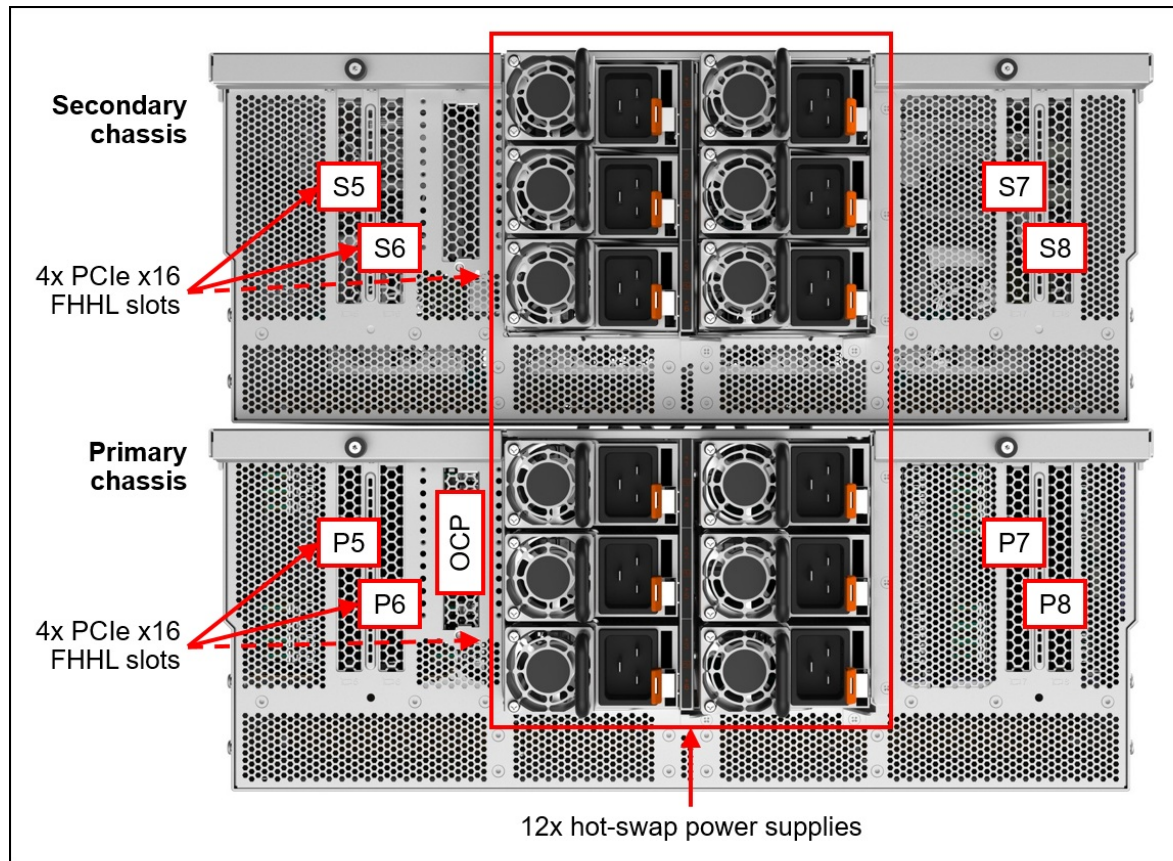


Figure 4. Rear view of the ThinkSystem SR950 V3

Power supplies: The above image shows power supplies with C19 connectors, however the SR950 V3 currently only supports 1800W power supplies which have C13 connectors. See the [Power supplies](#) section for details.

In each chassis, the server is comprised of a main board (with two processors and 32 DIMM slots), a CPU board (also with two processors and 32 DIMM slots), and a power distribution board. Both the main board and CPU board get power from the power distribution board, and the main board and CPU board are connected together via UPI cables at the front of the server.

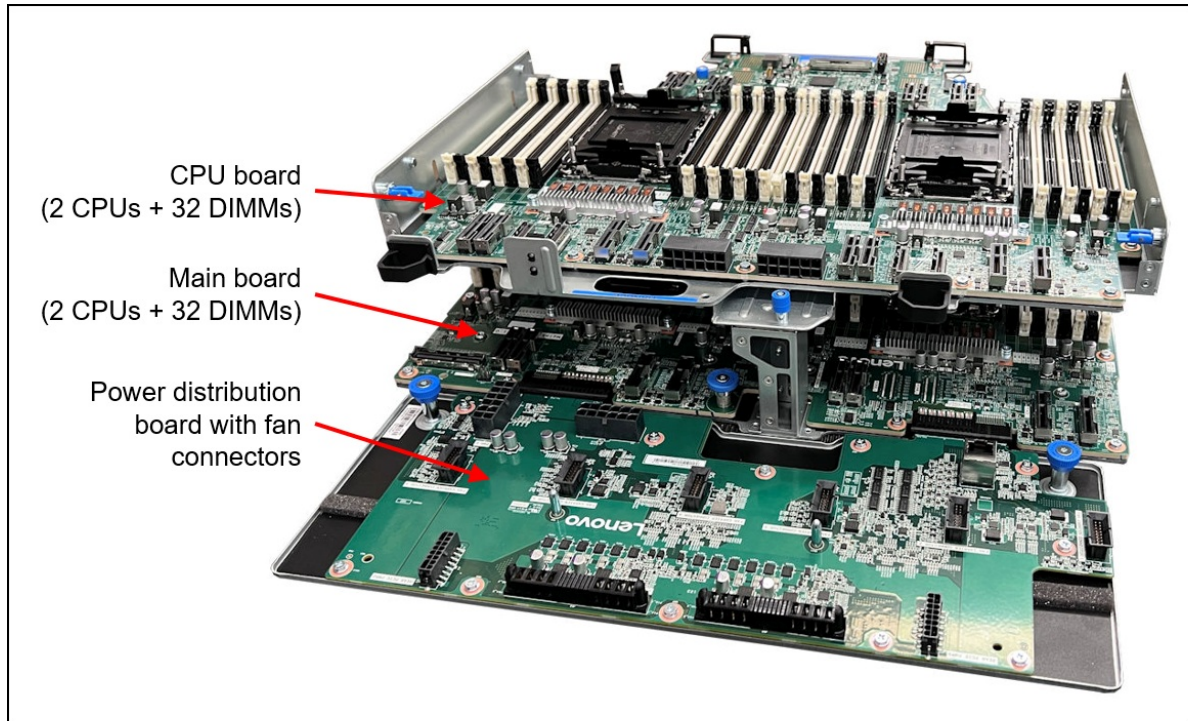


Figure 5. View from the rear, showing the main board, CPU board and power distribution board in each 4U chassis

The following figure shows the locations of key components inside the server.

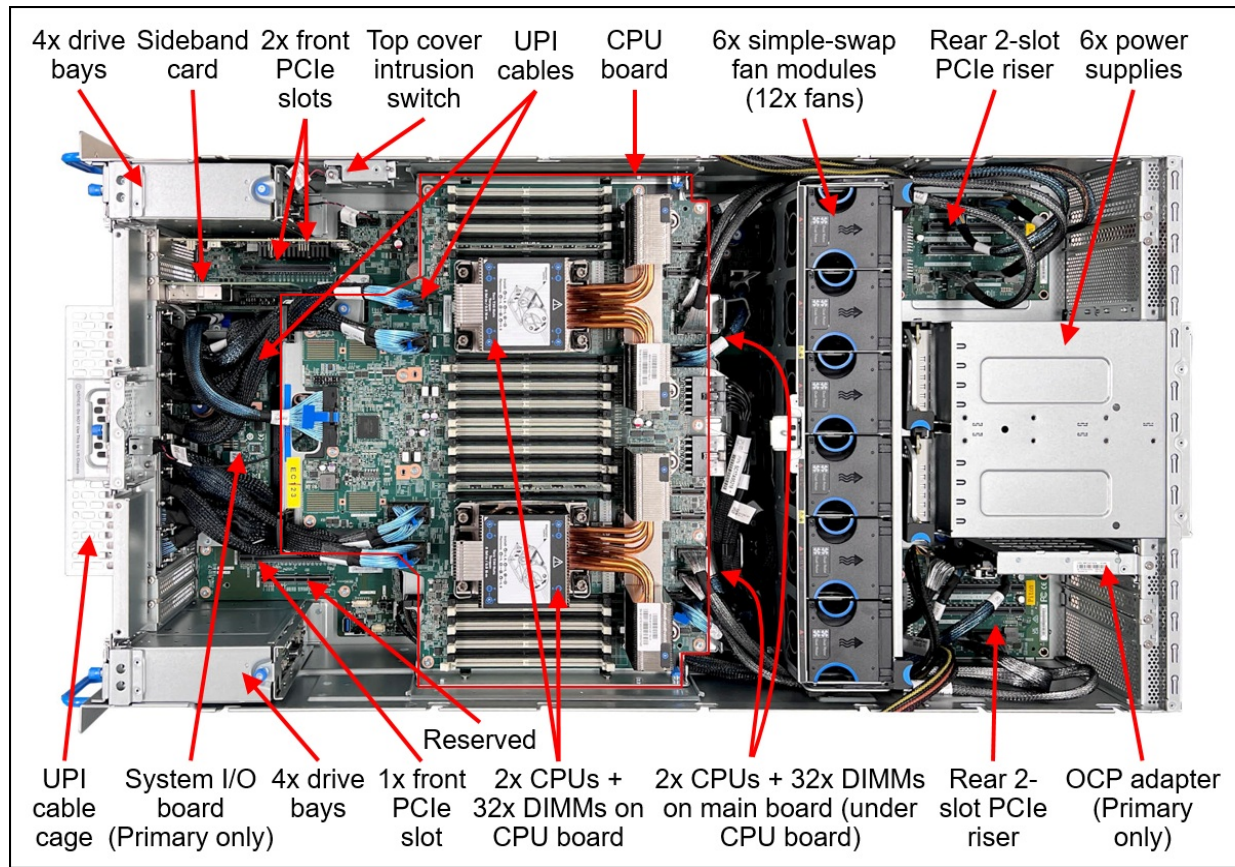


Figure 6. Internal view of the ThinkSystem SR950 V3 (each 4U chassis)

System architecture

The eight processors of the SR950 V3 are connected together using a mesh topology using 4 UPI links. The following figure shows the UPI connectivity between processors. Each processor is either directly connected or only 1 hop away to every other processor.

As shown, each processor has two UPI links to processors internal to the chassis, and two UPI links to processors in the other chassis.

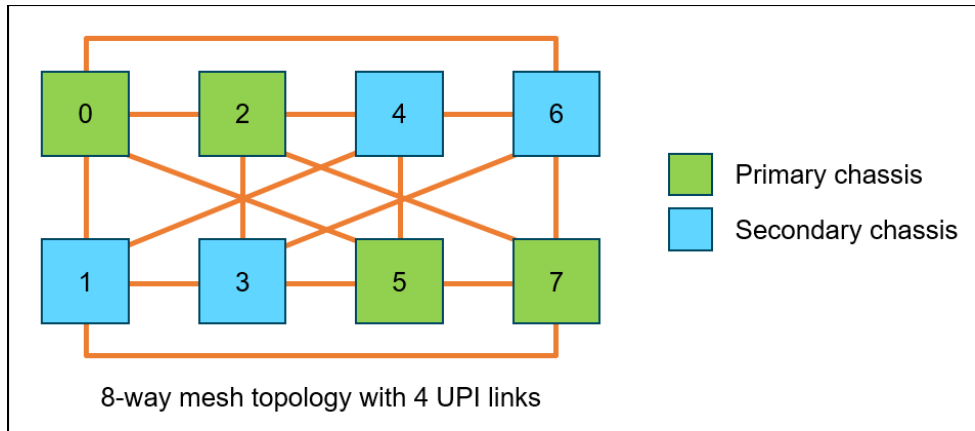


Figure 7. UPI connectivity between processors

The next two figures show the architectural block diagram of the SR950 V3, showing the major components and their connections.

The following figure shows the primary chassis. The primary chassis contains the Intel Platform Controller Hub (PCH) used to connect the M.2 adapter plus all the front ports.

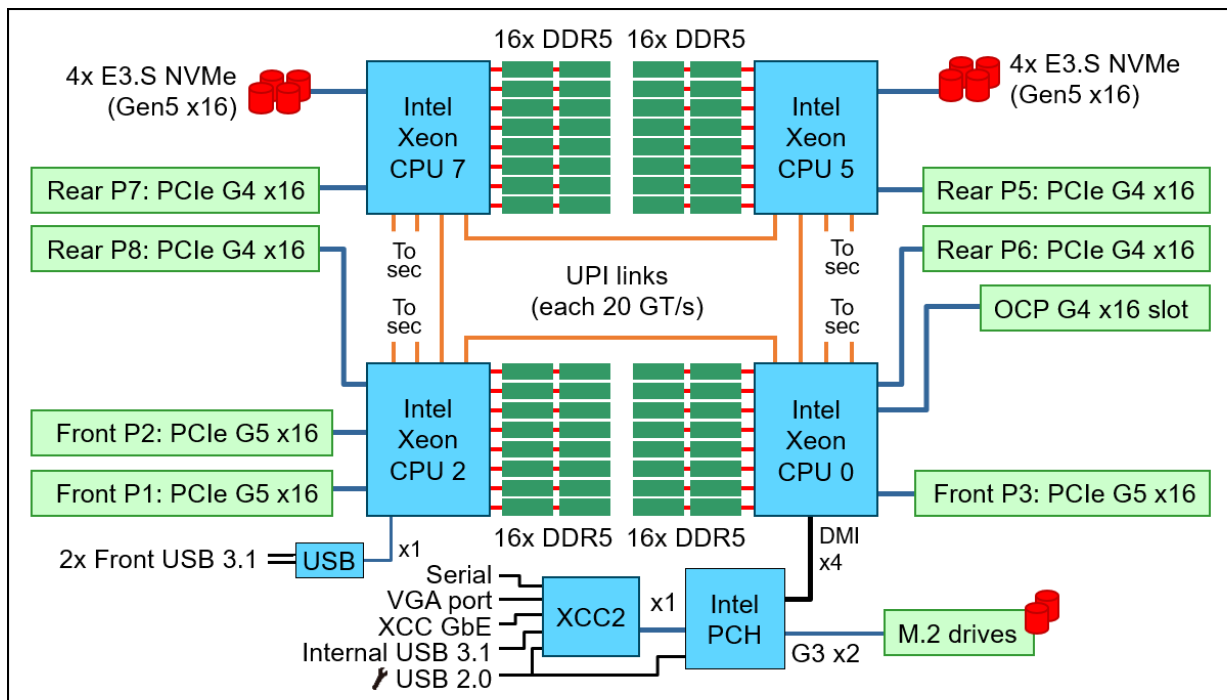


Figure 8. SR950 V3 block diagram - Primary chassis

The following figure shows the secondary chassis.

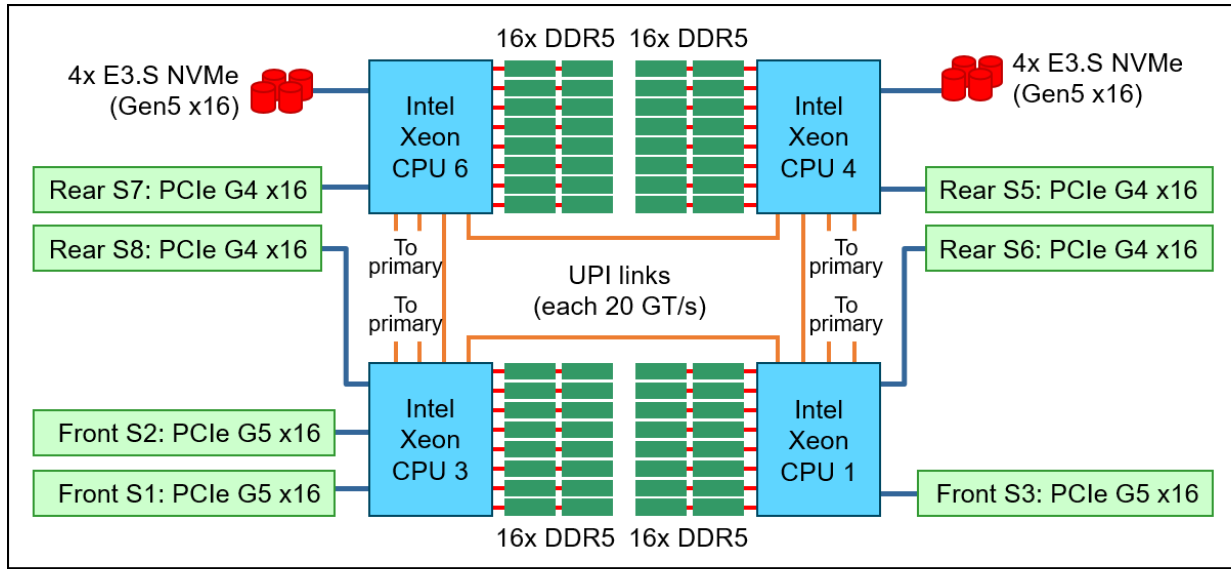


Figure 9. SR950 V3 block diagram - Secondary chassis

Standard specifications

The following table lists the standard specifications.

Table 2. Standard specifications

Components	Specification
Machine types	7DC4 - 3-year warranty 7DC5 - 1-year warranty 7DC6 - SAP HANA configurations with 3-year warranty
Form factor	8U rack (two 4U chassis that are cabled together)
Processor	8x 4th Gen Intel Xeon Scalable Platinum processors (formerly codename "Sapphire Rapids" or SPR). Supports processors up to 60 cores, core speeds up to 2.9 GHz, and TDP ratings up to 350W. Four Intel Ultra Path Interconnect (UPI) links at 16 GT/s each. Eight processors are connected in a mesh topology. Support for up to four Intel embedded accelerators: QAT, DLB, IAA, and DSA.
Chipset	Intel C741 "Emmitsburg" chipset, part of the platform codenamed "Eagle Stream" (EGS)
Memory	Up to 128 DIMM slots (16 DIMMs per processor). Each processor has 8 memory channels, with 2 DIMMs per channel. Lenovo TruDDR5 RDIMMs and 3DS RDIMMs are supported. DIMMs operate at up to 4800 MHz at 1 DPC and 4400 MHz at 2 DPC.
Persistent memory	No support.
Memory maximums	Up to 32TB with 128x 256GB 3DS RDIMMs and eight processors (4.0TB per processor).
Memory protection	ECC, SDDC (for x4-based memory DIMMs), ADDDC (for x4-based memory DIMMs), memory mirroring.

Components	Specification
Disk drive bays	<p>Up to 16x hot-swap drive bays:</p> <ul style="list-style-type: none"> Up to 16x 2.5-inch SAS/SATA drive bays Up to 16x E3.S EDSFF PCIe 5.0 NVMe drive bays <p>Support for two M.2 NVMe drives using an M.2 adapter with integrated Marvell 88NR2241 NVMe RAID controller</p>
Maximum internal storage	<ul style="list-style-type: none"> 2.5-inch drives: <ul style="list-style-type: none"> 491.52TB using 16x 30.72TB 2.5-inch SAS/SATA SSDs EDSFF drives <ul style="list-style-type: none"> 245.76TB using 16x 15.36TB EDSFF PCIe 5.0 NVMe SSDs
Storage controller	<ul style="list-style-type: none"> Up to 16x Onboard PCIe 5.0 NVMe ports (RAID functions provided using Intel VROC) 12 Gb SAS/SATA RAID adapters 12 Gb SAS/SATA HBA (non-RAID)
Optical drive bays	No internal optical drive
Tape drive bays	No internal backup drive
Network interfaces	One dedicated OCP 3.0 SFF slot with PCIe 4.0 x16 host interface. Supports network adapters up to 25 GbE. One port can optionally be shared with the XClarity Controller (XCC) management processor for Wake-on-LAN and NC-SI support.
PCI Expansion slots	<p>Up to 14 PCIe slots, plus one OCP 3.0 Gen4 slot. Slot are located on the primary and secondary chassis system boards.</p> <ul style="list-style-type: none"> 6x Front FHHL PCIe 5.0 x16 slots Up to 8x Rear FHHL PCIe 4.0 x16 slots <p>See the I/O expansion options section for details.</p>
GPU support	No GPU support
Ports	<p>Front: One VGA video port. 2x USB 3.2 G1 (5 Gb/s) port, 1x USB 2.0 port, one VGA video port, one DB-9 serial port, and one RJ-45 XClarity Controller (XCC) systems management port. The serial port can be shared with the XCC for serial redirection functions. The USB 2.0 port can be configured to support local systems management by using the XClarity Administrator mobile app on a mobile device connected via a USB cable.</p> <p>Rear: No ports</p> <p>Internal: Onboard dedicated slots for M.2 drives (for OS boot support, including hypervisor support). 1x USB 3.1 (5 Gb/s) port.</p>
Cooling	24x simple-swap dual-rotor 60 mm fans (all standard). 12 fans installed in each 4U chassis, and are N+2 rotor redundant (which means that the server can tolerate two rotor failures in each of the two 4U chassis and continue full operation). One additional fan integrated in each of the power supplies.
Power supply	8x or 12x hot-swap redundant 1800W AC power supplies, depending on the configuration, with 4x or 6x installed in each chassis. Power supplies are 80 PLUS Titanium certified. Power supplies require 220V power (110V not supported). Power supplies are N+N redundant within each chassis.
Video	Embedded video graphics with 16 MB memory with 2D hardware accelerator, integrated into the XClarity Controller. Maximum resolution is 1920x1200 32bpp at 60Hz.

Components	Specification
Hot-swap parts	Drives and power supplies.
Systems management	Operator panel with status LEDs. Optional External Diagnostics Handset with LCD display. 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 a PCIe slot. XClarity Administrator for centralized infrastructure management, XClarity Integrator plugins, and XClarity Energy Manager centralized server power management. XCC Platinum is included which enables remote control functions and other features.
Security features	Chassis intrusion on the top cover and front UPI cable retainer of each chassis, Power-on password, administrator's password, Root of Trust module supporting TPM 2.0 and Platform Firmware Resiliency (PFR).
Operating systems supported	Red Hat Enterprise Linux, SUSE Linux Enterprise Server, VMware ESXi. See the Operating system support section for specifics.
Limited warranty	3-year or 1-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. Actual offering may depend on the region where the server is installed and is subject to change.
Dimensions	Width: 443 mm (17.4 in.), height: 175 mm (6.9 in.), depth: 973 mm (38.3 in.). See Physical and electrical specifications for details.
Weight	50 kg (110.23 lb) maximum per 4U chassis (100 kg total)

The SR950 V3 servers are shipped with the following items:

- Documentation flyer
- Rail kit

Models

ThinkSystem SR950 V3 models can be configured by using the [Lenovo Data Center Solution Configurator \(DCSC\)](#).

Configure-to-order (CTO) models are used to create models with factory-integrated server customizations. For CTO models, two types of base CTO models are available for the SR950 V3 as listed in the columns in the following table:

- General purpose base CTO models are for general business (non-HPC) and is selectable by choosing **General Purpose** mode in DCSC.
- HPC and AI base models are intended for High Performance Computing (HPC) and Artificial Intelligence (AI) configurations and solutions, including configurations for Lenovo Scalable Infrastructure (LeSI), and is enabled using either the **HPC & AI LeSI Solutions** mode or **HPC & AI Hardware** mode in DCSC. These configurations can also be built using [System x and Cluster Solutions Configurator \(x-config\)](#). **Tip:** Some HPC and AI models are not be listed in DCSC and can only be configured in x-config.

Preconfigured server models may also be available for the SR950 V3, however these are region-specific; that is, each region may define their own server models, and not all server models are available in every region.

The following table lists the base CTO models of the ThinkSystem SR950 V3 server.

Table 3. Base CTO models

Machine Type/Model General purpose	Machine Type/Model for HPC and AI	Description
7DC4CTO1WW	7DC4CTOLWW	ThinkSystem SR950 V3 – 3-year warranty
7DC5CTO1WW	7DC5CTOLWW	ThinkSystem SR950 V3 – 1-year warranty
7DC6CTO1WW	None	ThinkSystem SR950 V3 – SAP HANA configurations with 3-year warranty

Processors

The SR950 V3 supports eight Platinum level processors in the 4th Gen Intel Xeon Scalable Processor family. The server requires that all eight processors be installed.

Each processor is attached to 2U heatsink plus two satellite heatsinks as shown in the following figure.

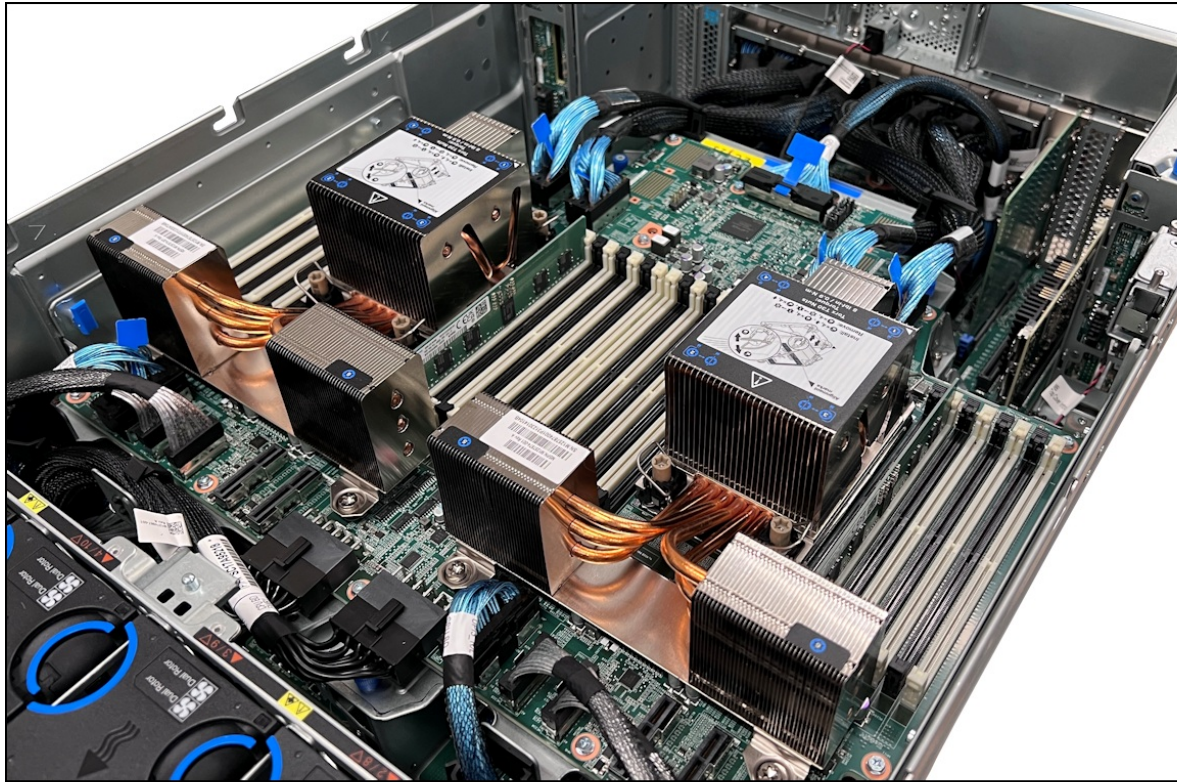


Figure 10. Two of the eight processors in the SR950 V3

Topics in this section:

- [Processor options](#)
- [Processor features](#)
- [UEFI operating modes](#)

Processor options

All supported processors have the following characteristics:

- 8 DDR5 memory channels at 2 DIMMs per channel
- 4 UPI links between processors at 16 GT/s
- 80 PCIe 5.0 I/O lanes

The following table lists the 4th Gen processors that are currently supported by the SR950 V3.

Table 4. 4th Gen Intel Xeon Processor support

Part number	Feature code	SKU	Description	Maximum quantity
CTO only	BPPH	8444H	Intel Xeon Platinum 8444H 16C 270W 2.9GHz Processor	8
CTO only	BPPG	8450H	Intel Xeon Platinum 8450H 28C 250W 2.0GHz Processor	8
CTO only	BPPF	8454H	Intel Xeon Platinum 8454H 32C 270W 2.1GHz Processor	8
CTO only	BPPN	8460H	Intel Xeon Platinum 8460H 40C 330W 2.2GHz Processor	8
CTO only	BPPE	8468H	Intel Xeon Platinum 8468H 48C 330W 2.1GHz Processor	8
CTO only	BPPS	8490H	Intel Xeon Platinum 8490H 60C 350W 1.9GHz Processor	8

Configuration notes:

- 8 processors are required and all processors must be identical

Processor features

Processors supported by the SR950 V3 introduce new embedded accelerators to add even more processing capability:

- **QuickAssist Technology (Intel QAT)**
Help reduce system resource consumption by providing accelerated cryptography, key protection, and data compression with Intel QuickAssist Technology (Intel QAT). By offloading encryption and decryption, this built-in accelerator helps free up processor cores and helps systems serve a larger number of clients.
- **Intel Dynamic Load Balancer (Intel DLB)**
Improve the system performance related to handling network data on multi-core Intel Xeon Scalable processors. Intel Dynamic Load Balancer (Intel DLB) enables the efficient distribution of network processing across multiple CPU cores/threads and dynamically distributes network data across multiple CPU cores for processing as the system load varies. Intel DLB also restores the order of networking data packets processed simultaneously on CPU cores.
- **Intel Data Streaming Accelerator (Intel DSA)**
Drive high performance for storage, networking, and data-intensive workloads by improving streaming data movement and transformation operations. Intel Data Streaming Accelerator (Intel DSA) is designed to offload the most common data movement tasks that cause overhead in data center-scale deployments. Intel DSA helps speed up data movement across the CPU, memory, and caches, as well as all attached memory, storage, and network devices.
- **Intel In-Memory Analytics Accelerator (Intel IAA)**
Run database and analytics workloads faster, with potentially greater power efficiency. Intel In-Memory Analytics Accelerator (Intel IAA) increases query throughput and decreases the memory footprint for in-memory database and big data analytics workloads. Intel IAA is ideal for in-memory databases, open source databases and data stores like RocksDB, Redis, Cassandra, and MySQL.
- **Intel Advanced Matrix Extensions (Intel AMX)**
Intel Advanced Matrix Extensions (Intel AMX) is a built-in accelerator in all Silver, Gold, and Platinum processors that significantly improves deep learning training and inference. With Intel AMX, you can fine-tune deep learning models or train small to medium models in just minutes. Intel AMX offers discrete accelerator performance without added hardware and complexity.

The processors also support a separate and encrypted memory space, known as the SGX Enclave, for use by Intel Software Guard Extensions (SGX). The size of the SGX Enclave supported varies by processor model. Intel SGX offers hardware-based memory encryption that isolates specific application code and data in memory. It allows user-level code to allocate private regions of memory (enclaves) which are designed to be protected from processes running at higher privilege levels.

The following table summarizes the key features of all supported 4th Gen processors in the SR950 V3.

Table 5. 4th Gen Intel Xeon Processor features

CPU model	Cores/ threads	Core speed (Base / TB max†)	L3 cache*	Max memory speed	UPI 2.0 links & speed	TDP	Accelerators				SGX Enclave Size
							QAT	DLB	DSA	IAA	
8444H	16 / 32	2.9 / 4.0 GHz	45 MB*	4800 MHz	4 / 16 GT/s	270W	0	0	4	4	512GB
8450H	28 / 56	2.0 / 3.5 GHz	75 MB*	4800 MHz	4 / 16 GT/s	250W	0	0	4	4	512GB
8454H	32 / 64	2.1 / 3.4 GHz	82.5 MB*	4800 MHz	4 / 16 GT/s	270W	4	4	4	4	512GB
8460H	40 / 80	2.2 / 3.8 GHz	105 MB*	4800 MHz	4 / 16 GT/s	330W	0	0	4	4	512GB
8468H	48 / 96	2.1 / 3.8 GHz	105 MB*	4800 MHz	4 / 16 GT/s	330W	4	4	4	4	512GB
8490H	60 / 120	1.9 / 3.5 GHz	112.5 MB	4800 MHz	4 / 16 GT/s	350W	4	4	4	4	512GB

† The maximum single-core frequency at with the processor is capable of operating

* L3 cache is 1.875 MB per core or larger. Processors with a larger L3 cache per core are marked with an *

UEFI operating modes

The SR950 V3 offers preset operating modes that affect energy consumption and performance. These modes are a collection of predefined low-level UEFI settings that simplify the task of tuning the server to suit your business and workload requirements.

The following table lists the feature codes that allow you to specify the mode you wish to preset in the factory for CTO orders.

Table 6. UEFI operating mode presets in DCSC

Feature code	Description
BFYB	Operating mode selection for: "Maximum Performance Mode"
BFYC	Operating mode selection for: "Minimal Power Mode"
BFYD	Operating mode selection for: "Efficiency Favoring Power Savings Mode"
BFYE	Operating mode selection for: "Efficiency - Favoring Performance Mode"

The preset modes for the SR950 V3 are as follows:

- **Maximum Performance Mode** (feature BFYB): Achieves maximum performance but with higher power consumption and lower energy efficiency.
- **Minimal Power Mode** (feature BFYC): Minimize the absolute power consumption of the system.
- **Efficiency Favoring Power Savings Mode** (feature BFYD): Maximize the performance/watt efficiency with a bias towards power savings. This is the favored mode for SPECpower benchmark testing, for example.
- **Efficiency Favoring Performance Mode** (feature BFYE): Maximize the performance/watt efficiency with a bias towards performance. This is the favored mode for Energy Star certification, for example.

For details about these preset modes, and all other performance and power efficiency UEFI settings offered in the SR950 V3, see the paper "Tuning UEFI Settings for Performance and Energy Efficiency on Intel Xeon Scalable Processor-Based ThinkSystem Servers", available from <https://lenovopress.lenovo.com/lp1477>.

Memory options

The SR950 V3 uses Lenovo TruDDR5 memory operating at up to 4800 MHz. The server supports up to 128 DIMMs with 8 processors. The processors have 8 memory channels and support 2 DIMMs per channel (DPC). The server supports up to 32TB of memory using 128x 256GB 3DS RDIMMs and eight processors. DIMMs operate at 4800 MHz at 1 DPC and 4400 MHz at 2 DPC.

Lenovo TruDDR5 memory uses the highest quality components that are sourced from Tier 1 DRAM suppliers and only memory that meets the strict requirements of Lenovo is selected. It is compatibility tested and tuned to maximize performance and reliability. From a service and support standpoint, Lenovo TruDDR5 memory automatically assumes the system warranty, and Lenovo provides service and support worldwide.

The following table lists the 4800 MHz memory options that are currently supported by the SR950 V3.

Table 7. 4800 MHz memory options

Part number	Feature code	Description	DRAM technology
10x4 RDIMMs - 4800 MHz			
4X77A94004	C0W6	ThinkSystem SR950 V3 32GB TruDDR5 4800MHz (1Rx4) 10x4 RDIMM	16Gb
4X77A94006	C0W8	ThinkSystem SR950 V3 64GB TruDDR5 4800MHz (2Rx4) 10x4 RDIMM	16Gb
4X77A87034	BZC2	ThinkSystem 96GB TruDDR5 4800MHz (2Rx4) RDIMM	24Gb
3DS RDIMMs - 4800 MHz			
4X77A77034	BNFC	ThinkSystem 128GB TruDDR5 4800MHz (4Rx4) 3DS RDIMM v2	16Gb
CTO only	BY8F	ThinkSystem 128GB TruDDR5 4800MHz (4Rx4) 3DS RDIMM v1	16Gb
CTO only	BZPM	ThinkSystem 256GB TruDDR5 4800MHz (8Rx4) 3DS RDIMM v1	16Gb
4X77A77035	BNF8	ThinkSystem 256GB TruDDR5 4800MHz (8Rx4) 3DS RDIMM v2	16Gb

For more information on DDR5 memory, see the Lenovo Press paper, *Introduction to DDR5 Memory*, available from <https://lenovopress.com/lp1618>.

The following rules apply when selecting the memory configuration:

- The SR950 V3 only supports quantities of 1, 2, 4, 6, 8, 12, or 16 DIMMs per processor; other quantities not supported
- DIMMs operate at up to 4800 MHz at 1 DIMM per channel and up to 4400 MHz at 2 DIMMs per channel
- The server supports two types of DIMMs: RDIMMs and 3DS RDIMMs; 9x4 RDIMMs, UDIMMs and LRDIMMs are not supported
- Mixing of DIMM types (RDIMMs with 3DS RDIMMs) is not supported
- The mixing of 128GB 3DS RDIMMs and 256GB 3DS RDIMMs is supported, however all DIMM slots must be populated evenly: 8x 128GB DIMMs and 8x 256GB DIMMs per processor
- Mixing of DIMM rank counts is supported. Follow the required installation order installing the DIMMs with the higher rank counts first.
- Mixing of DIMM capacities is supported, however only two different capacities are supported across all channels of the processor. Follow the required installation order installing the larger DIMMs first.
- Mixing DIMMs with 16Gb and 24Gb DRAM is not supported; this means the 96GB DIMM (feature BZC2) cannot be mixed with any other DIMM

For best performance, consider the following:

- Ensure the memory installed is at least the same speed as the memory bus of the selected processor.
- Populate all 8 memory channels.

The following memory protection technologies are supported:

- ECC detection/correction
- Bounded Fault detection/correction
- SDDC (for x4-based memory DIMMs; look for "x4" in the DIMM description)
- ADDDC (for 10x4-based memory DIMMs, not supported with 9x4 DIMMs)
- Memory mirroring

See the Lenovo Press article "RAS Features of the Lenovo ThinkSystem Intel Servers" for more information about memory RAS features: <https://lenovopress.lenovo.com/lp1711-ras-features-of-the-lenovo-thinksystem-intel-servers>

If memory channel mirroring is used, then DIMMs must be installed in pairs (minimum of one pair per processor), and both DIMMs in the pair must be identical in type and size. 50% of the installed capacity is available to the operating system. Memory rank sparing is not supported.

Internal storage

The SR950 V3 supports up to 16x 2.5-inch SAS/SATA drive bays, or up to 16x E3.S EDSFF PCIe 5.0 NVMe drive bays. All drive bays are hot-swap and all front-accessible.

The server also supports two internal M.2 NVMe drives for OS boot functions. The M.2 drives are mounted on an M.2 adapter that is installed in the lower (primary) chassis.

In this section:

- [NVMe drive support](#)
- [Drive bays](#)
- [M.2 drives](#)

NVMe drive support

The SR950 V3 supports up to 16x E3.S NVMe drives to maximize storage performance, each with a direct connection to the processors. All connections are made using onboard connectors; no NVMe retimer adapters are needed or supported. There is no oversubscription: each x4 drive has a full x4 (four PCIe Gen4 lanes) connection to the processor.

Drive bays

All drive bays are located at the front of the server. Drive bays are configured using four 4-drive backplanes. The two available backplanes are:

- 4-bay 2.5-inch hot-swap SAS/SATA backplane
- 4-bay E3.S 1T EDSFF hot-swap PCIe 5.0 NVMe backplane

Tip: The SR950 V3 does not support 2.5-inch NVMe drive bays.

The locations of the drive bays is shown in the following two figures.

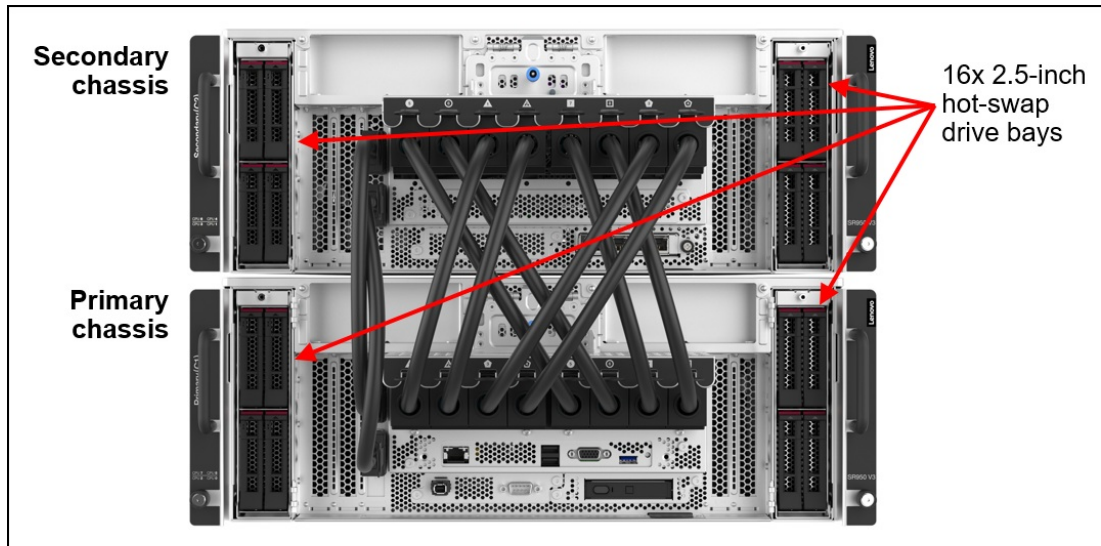


Figure 11. 2.5-inch drive bays (with the drive bay doors removed)

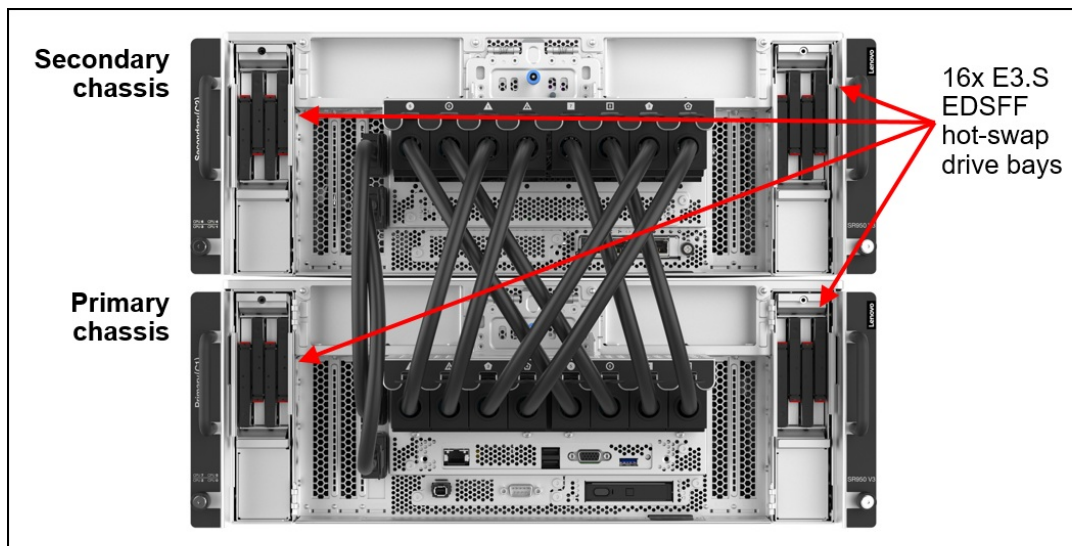


Figure 12. E3.S 1T EDSFF drive bays (with the drive bay doors removed)

Ordering information for the backplanes is listed in the following table.

Table 8. Backplanes for front drive bays

Part number	Feature code	Description	Max qty
4XB7A90110	B8LV	ThinkSystem SR950 V3 4x 2.5" SAS/SATA Backplane Option Kit	4
4XB7A90111	BV2J	ThinkSystem SR950 V3 4x E3.S EDSFF NVMe PCIe 5.0 Backplane Option Kit	4

Configuration rules:

- 1, 2, 3, or 4 drive backplanes are supported
- The two backplanes types can be mixed however only combinations of 1+2, 2+1 and 2+2 are supported (1+3 and 3+1 are not supported)

M.2 drives

The SR950 V3 supports one or two M.2 form-factor NVMe drives for use as an operating system boot solution or as additional storage.

The M.2 drives are installed on an M.2 adapter that is installed in the lower (primary) chassis. This adapter supports NVMe drives and supports RAID-1 and RAID-0 with an integrated Marvell 88NR2241 NVMe RAID Controller.

Note: The SR950 V3 also has four discrete onboard M.2 connectors, two in each chassis, however these connectors are reserved and are not supported.

The supported M.2 adapter is listed in the following table. For field upgrades see the [M.2 field upgrades](#) section below.

Table 9. M.2 adapter

Part number	Feature code	Description	SATA drives	NVMe drives	RAID	Maximum supported
4Y37A09750	B8P9	ThinkSystem M.2 NVMe 2-Bay RAID Adapter	No	Yes (x1 lane)	Integrated	1

The ThinkSystem M.2 NVMe 2-Bay RAID Adapter (4Y37A09750) has the following features:

- Supports one or two NVMe M.2 drives
- Support 42mm, 60mm, 80mm and 110mm drive form factors (2242, 2260, 2280 and 22110)
- RAID support via an onboard Marvell 88NR2241 NVMe RAID Controller
- With 1 drive, supports single-drive RAID-0
- With 2 drives, supports 2-drive RAID-0, 2-drive RAID-1, or two single-drive RAID-0 arrays
- PCIe 3.0 x2 host interface; PCIe 3.0 x1 connection to each drive
- Management and configuration support via UEFI and OS-based tools
- Supports monitoring and reporting of events and temperature through I2C
- Firmware update via Lenovo firmware update tools

M.2 field upgrades

For field upgrades, the SR950 V3 also requires an M.2 cable kit in addition to the M.2 adapter. Ordering information is listed in the following table.

Table 10. M.2 cable kit for ThinkSystem M.2 NVMe 2-Bay RAID Adapter (4Y37A09750)

Part number	Feature code	Description
4XH7A91520	BYAR	ThinkSystem SR950 V3 M.2 NVMe Cable Option Kit

Controllers for internal storage

The SR950 V3 supports offers a variety of controller options for internal drives:

- For 2.5-inch drives: RAID adapters and HBAs for SAS/SATA drives
- For E3.S drives: Onboard NVMe ports (RAID support provided using Intel VROC NVMe RAID)

The onboard NVMe support has the following features:

- Controller integrated into the Intel processor
- Supports up to 16 NVMe drives
- Each drive has PCIe Gen5 x4 host interface
- Supports JBOD - Intel and non-Intel NVMe SSDs
- No RAID support
- Supports RAID-0, 1, 10 on Intel and non-Intel NVMe SSDs - Intel VROC Standard
- VROC Premium adds RAID-5 support on Intel and non-Intel NVMe SSDs

The following table lists the controllers and adapters used for the internal 2.5-inch drive bays of the SR950 V3 server.

Table 11. Controllers for internal storage

Part number	Feature code	Description	Maximum supported	Slots supported*
Onboard NVMe - Intel VROC NVMe RAID				
None	BR9B	Intel VROC (VMD NVMe RAID) Standard (supports RAID 0, 1, 10 for all brands of drives)	1	Not applicable
4L47A39164	B96G	Intel VROC (VMD NVMe RAID) Premium (license upgrade - to enable RAID-5 support)	1	Not applicable
SAS HBA - PCIe 4.0				
4Y37A78601	BM51	ThinkSystem 440-8i SAS/SATA PCIe Gen4 12Gb HBA	2	P1, S1
RAID Adapter - PCIe 4.0				
4Y37A09728	B8NY	ThinkSystem RAID 940-8i 4GB Flash PCIe Gen4 12Gb Adapter	2	P1, S1
4Y37A78600	BM35	ThinkSystem RAID 940-16i 4GB Flash PCIe Gen4 12Gb Adapter	2	P1, S1

* P slots are in the primary (lower) chassis; S slots are in the secondary (upper) chassis

Configuration notes:

- A supercap is required for each RAID 940 adapter and is installed in a dedicated area in the CPU board air baffle. No additional mounting components are required.
- For field upgrades, the RAID 9xx adapter part numbers include both the supercap and the supercap cable.

Intel VROC onboard RAID

Intel VROC (Virtual RAID on CPU) is a feature of the Intel processor that enables RAID support.

There are two separate functions of VROC in the SR950 V3:

- Intel VROC SATA RAID, formerly known as Intel RSTe
- Intel VROC NVMe RAID

VROC SATA RAID (RSTe) is available and supported with all SATA drives, both SATA SSDs and SATA HDDs. It offers a 6 Gb/s connection to each drive and on the SR950 V3 implements RAID levels 0, 1, 5, and 10. RAID 1 is limited to 2 drives per array, and RAID 10 is limited to 4 drives per array. Hot-spare functionality is also supported.

VROC NVMe RAID offers RAID support for any NVMe drives directly connected to the ports on the server's system board or via adapters such as NVMe retimers or NVMe switch adapters. On the SR950 V3, RAID levels implemented are based on the VROC feature selected as indicated in the following table. RAID 1 is limited to 2 drives per array, and RAID 10 is limited to 4 drives per array. Hot-spare functionality is also supported.

Performance tip: For best performance with VROC NVMe RAID, the drives in an array should all be connected to the same processor. Spanning processors is possible however performance will be unpredictable and should be evaluated based on your workload.

The SR950 V3 supports the VROC NVMe RAID offerings listed in the following table.

Tip: These feature codes and part numbers are only for VROC RAID using NVMe drives, not SATA drives

Table 12. Intel VROC NVMe RAID ordering information and feature support

Part number	Feature code	Description	Intel NVMe SSDs	Non-Intel NVMe SSDs	RAID 0	RAID 1	RAID 10	RAID 5
4L47A83669	BR9B	Intel VROC (VMD NVMe RAID) Standard	Yes	Yes	Yes	Yes	Yes	No
4L47A39164	B96G	Intel VROC (VMD NVMe RAID) Premium	Yes	Yes	Yes	Yes	Yes	Yes

Configuration notes:

- If a feature code is ordered in a CTO build, the VROC functionality is enabled in the factory. For field upgrades, order a part number and it will be fulfilled as a Feature on Demand (FoD) license which can then be activated via the XCC management processor user interface.

Virtualization support: Virtualization support for Intel VROC is as follows:

- **VROC SATA RAID (RSTe):** VROC SATA RAID is not supported by virtualization hypervisors such as ESXi, KVM, Xen, and Hyper-V. Virtualization is only supported on the onboard SATA ports in AHCI (non-RAID) mode.
- **VROC (VMD) NVMe RAID :** VROC (VMD) NVMe RAID is supported by ESXi, KVM, Xen, and Hyper-V. ESXi support is limited to RAID 1 only; other RAID levels are not supported. Windows and Linux OSes support VROC RAID NVMe, both for host boot functions and for guest OS function, and RAID-0, 1, 5, and 10 are supported. On ESXi, VROC is supported with both boot and data drives.

For specifications about the RAID adapters and HBAs supported by the SR950 V3, see the ThinkSystem RAID Adapter and HBA Comparison, available from:

<https://lenovopress.com/lp1288-lenovo-thinksystem-raid-adapter-and-hba-reference#sr960-v3-support=SR950%2520V3>

For details about these adapters, see the relevant product guide:

- SAS HBAs: <https://lenovopress.com/servers/options/hba>
- RAID adapters: <https://lenovopress.com/servers/options/raid>

Internal drive options

The following tables list the drive options for internal storage of the server.

2.5-inch hot-swap drives:

- [2.5-inch hot-swap 24 Gb SAS SSDs](#)
- [2.5-inch hot-swap 6 Gb SATA SSDs](#)

EDSFF hot-swap drives:

- [E3.S EDSFF hot-swap PCIe 5.0 NVMe SSDs](#)

M.2 drives:

- [M.2 PCIe 4.0 NVMe drives](#)

M.2 drive support: The use of M.2 drives requires an additional adapter as described in the [M.2 drives](#) subsection.

SED support: The tables include a column to indicate which drives support SED encryption. The encryption functionality can be disabled if needed. Note: Not all SED-enabled drives have "SED" in the description.

Table 13. 2.5-inch hot-swap 24 Gb SAS SSDs

Part number	Feature code	Description	SED support	Max Qty
2.5-inch hot-swap SSDs - 24 Gb SAS - Mixed Use/Mainstream (3-5 DWPD)				
4XB7A80341	BNW9	ThinkSystem 2.5" PM1655 1.6TB Mixed Use SAS 24Gb HS SSD	Support	16
4XB7A80342	BNW6	ThinkSystem 2.5" PM1655 3.2TB Mixed Use SAS 24Gb HS SSD	Support	16
4XB7A80343	BP3K	ThinkSystem 2.5" PM1655 6.4TB Mixed Use SAS 24Gb HS SSD	Support	16
2.5-inch hot-swap SSDs - 24 Gb SAS - Read Intensive/Entry/Capacity (<3 DWPD)				
4XB7A80320	BNWF	ThinkSystem 2.5" PM1653 3.84TB Read Intensive SAS 24Gb HS SSD	Support	16
4XB7A80321	BP3E	ThinkSystem 2.5" PM1653 7.68TB Read Intensive SAS 24Gb HS SSD	Support	16
4XB7A80322	BP3J	ThinkSystem 2.5" PM1653 15.36TB Read Intensive SAS 24Gb HS SSD	Support	16
4XB7A80323	BP3D	ThinkSystem 2.5" PM1653 30.72TB Read Intensive SAS 24Gb HS SSD	Support	16

Table 14. 2.5-inch hot-swap 6 Gb SATA SSDs

Part number	Feature code	Description	SED support	Max Qty
2.5-inch hot-swap SSDs - 6 Gb SATA - Mixed Use/Mainstream (3-5 DWPD)				
4XB7A82289	BQ21	ThinkSystem 2.5" 5400 MAX 480GB Mixed Use SATA 6Gb HS SSD	Support	16
4XB7A17125	BA7Q	ThinkSystem 2.5" S4620 480GB Mixed Use SATA 6Gb HS SSD	No	16
2.5-inch hot-swap SSDs - 6 Gb SATA - Read Intensive/Entry (<3 DWPD)				
4XB7A82258	BQ1Q	ThinkSystem 2.5" 5400 PRO 240GB Read Intensive SATA 6Gb HS SSD	Support	16
4XB7A17072	B99D	ThinkSystem 2.5" S4520 240GB Read Intensive SATA 6Gb HS SSD	No	16

Table 15. E3.S EDSFF hot-swap PCIe 5.0 NVMe SSDs

Part number	Feature code	Description	SED support	Max Qty
E3.S hot-swap SSDs - PCIe 5.0 NVMe - Mixed Use/Mainstream (3-5 DDPD)				
4XB7A13974	BVTG	ThinkSystem E3.S PM1745 1.6TB Mixed Use NVMe PCIe 5.0 x4 HS SSD	Support	16
4XB7A83764	BVTF	ThinkSystem E3.S PM1745 3.2TB Mixed Use NVMe PCIe 5.0 x4 HS SSD	Support	16
4XB7A83763	BVTE	ThinkSystem E3.S PM1745 6.4TB Mixed Use NVMe PCIe 5.0 x4 HS SSD	Support	16
4XB7A84039	BNER	ThinkSystem E3.S PM1745 12.8TB Mixed Use NVMe PCIe 5.0 x4 HS SSD	Support	16
E3.S hot-swap SSDs - PCIe 5.0 NVMe - Read Intensive/Entry (<3 DDPD)				
4XB7A84129	BVTD	ThinkSystem E3.S PM1743 1.92TB Read Intensive NVMe PCIe 5.0 x4 HS SSD	Support	16
4XB7A84130	BVEJ	ThinkSystem E3.S PM1743 3.84TB Read Intensive NVMe PCIe 5.0 x4 HS SSD	Support	16
4XB7A84131	BVEK	ThinkSystem E3.S PM1743 7.68TB Read Intensive NVMe PCIe 5.0 x4 HS SSD	Support	16
4XB7A84132	BVEL	ThinkSystem E3.S PM1743 15.36TB Read Intensive NVMe PCIe 5.0 x4 HS SSD	Support	16

Table 16. M.2 PCIe 4.0 NVMe drives

Part number	Feature code	Description	SED support	Max Qty
M.2 SSDs - PCIe 4.0 NVMe - Read Intensive/Entry (<3 DDPD)				
4XB7A90102	BXMH	ThinkSystem M.2 PM9A3 960GB Read Intensive NVMe PCIe 4.0 x4 NHS SSD	Support	2
4XB7A82636	BS2P	ThinkSystem M.2 7450 PRO 480GB Read Intensive NVMe PCIe 4.0 x4 NHS SSD	Support	2
4XB7A13999	BKSR	ThinkSystem M.2 7450 PRO 960GB Read Intensive NVMe PCIe 4.0 x4 NHS SSD	Support	2

USB memory key

For general portable storage needs, the server also supports the USB memory key option that is listed in the following table.

Table 17. USB memory key

Part number	Feature	Description
4X77A77065	BNWN	ThinkSystem USB 32GB USB 3.0 Flash Drive

Internal backup units

The server does not support any internal backup units, such as tape drives or RDX drives.

Optical drives

The server does not support an internal optical drive.

An external USB optical drive is available, listed in the following table.

Table 18. External optical drive

Part number	Feature code	Description
7XA7A05926	AVV8	ThinkSystem External USB DVD RW Optical Disk Drive

I/O expansion

The SR950 V3 supports up to 14 PCIe slots plus one OCP 3.0 slot:

- 6x Front FHHL PCIe 5.0 x16 slots, all standard
- Up to 8x Rear FHHL PCIe 4.0 x16 slots, all optional
- One rear OCP slot with PCIe 4.0 x16 interface, optional

Topics in this section:

- [Slots and risers](#)
- [Riser ordering information](#)
- [OCP adapter cage](#)

Slots and risers

The following figures show the location of the PCIe slots at the front of the server. All slots are FHHL PCIe 5.0 x16 slots. All front slots are standard and located on the system board in each chassis.

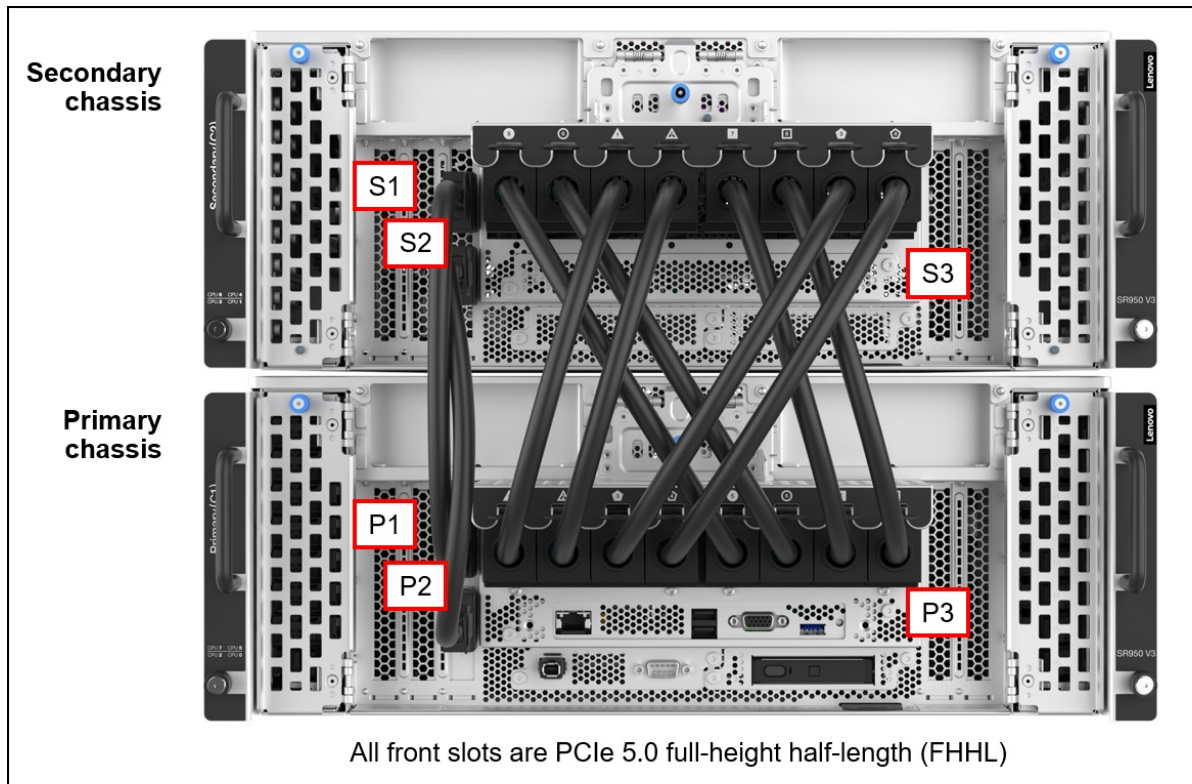


Figure 13. Slots in the front of the SR950 V3

The following figures show the location of the PCIe slots at the rear of the server. All regular slots are FHHL PCIe 4.0 x16 slots. The OCP 3.0 slot is PCIe 4.0 x16. The OCP adapter is optional and is installed in a cage that is cabled to the processor board. The rear PCIe slots are optional and are located on four 2-slot risers.

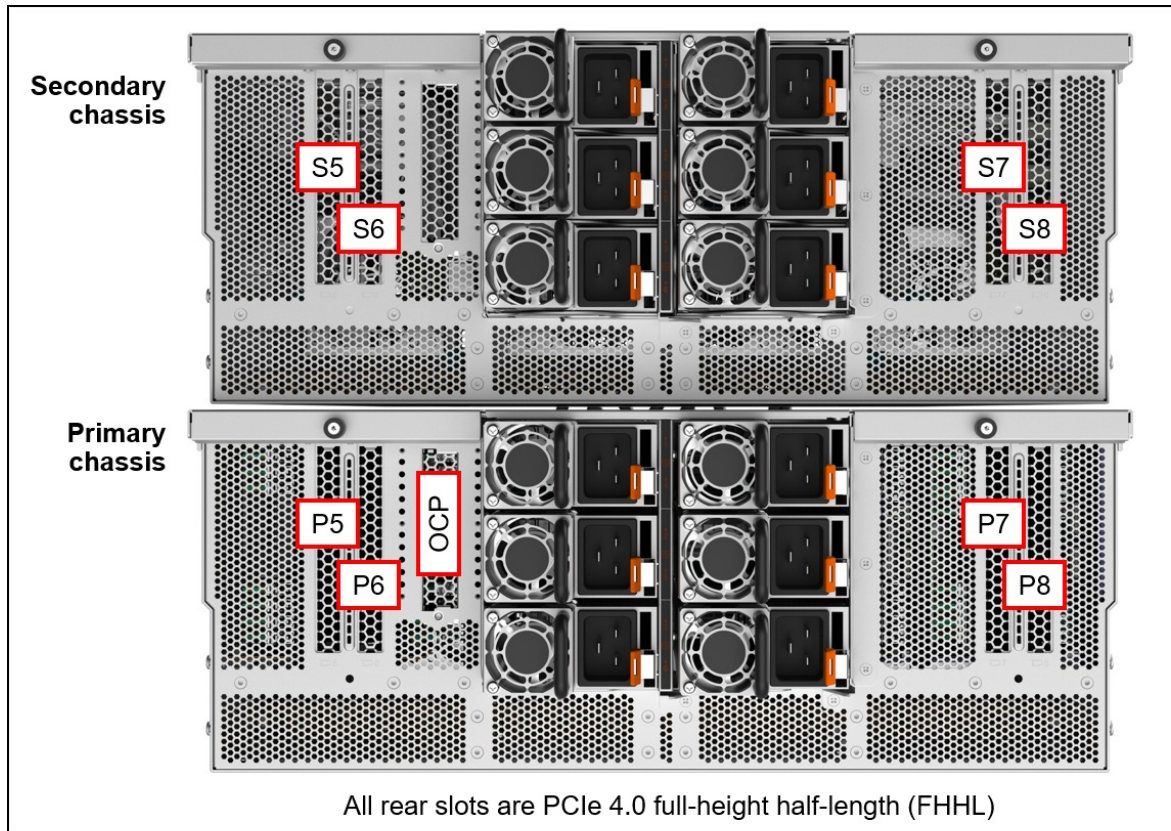


Figure 14. Slots in the rear of the SR950 V3

Riser ordering information

Slots at the rear of the server are implemented with the use of four riser cards, each with two PCIe slots. The riser cards supported are listed in the following table. All riser slots are PCIe 4.0 x16 with a physical x16 connector.

Table 19. Riser cards

Part number	Feature code	Description	Quantity supported
4XC7A90109	BV2P	ThinkSystem SR950 V3 x16/x16 G4 Riser Option Kit	0 - 4

Configuration rules:

- All riser cards are optional
- Riser cards are installed in the following order: (P7 & P8), (P5 & P6), (S7 & S8), (S5 & S6)
- When the 2nd XCC Management port is installed, slot P5 is no longer available. See the [Remote management](#) section for details.

OCP adapter cage

The user of an OCP adapter requires an OCP adapter cage. Ordering information is in the following table.

Table 20. OCP adapter cage

Part number	Feature code	Description	Quantity supported
4XC7A90107	BV2Q	ThinkSystem SR950 V3 OCP Adapter Enablement Kit	1

Network adapters

The server has a dedicated OCP 3.0 SFF slot with PCIe 4.0 x16 host interface.

Note: The use of the OCP adapter requires the OCP cage be installed. See the [I/O expansion](#) section for information.

The following table lists the supported OCP adapters. One port can optionally be shared with the XCC management processor for Wake-on-LAN and NC-SI support.

Table 21. OCP adapters

Part number	Feature code	Description	Max qty
Gigabit Ethernet			
4XC7A08235	B5T1	ThinkSystem Broadcom 5719 1GbE RJ45 4-port OCP Ethernet Adapter	1
4XC7A08277	B93E	ThinkSystem Intel I350 1GbE RJ45 4-port OCP Ethernet Adapter	1
10Gb Ethernet			
4XC7A80268	BPPY	ThinkSystem Intel X710-T4L 10GBase-T 4-Port OCP Ethernet Adapter	1
25Gb Ethernet			
4XC7A62582	BE4T	ThinkSystem Mellanox ConnectX-6 Lx 10/25GbE SFP28 2-Port OCP Ethernet Adapter	1

The following table lists additional supported network adapters that can be installed in the regular PCIe slots.

Table 22. PCIe network adapters

Part number	Feature code	Description	Maximum supported	Slots supported
25Gb Ethernet				
4XC7A80566	BNWM	ThinkSystem Broadcom 57504 10/25GbE SFP28 4-Port PCIe Ethernet Adapter	14	All slots
4XC7A80267	BP8M	ThinkSystem Intel E810-DA4 10/25GbE SFP28 4-Port PCIe Ethernet Adapter	14	All slots
4XC7A62580	BE4U	ThinkSystem Mellanox ConnectX-6 Lx 10/25GbE SFP28 2-Port PCIe Ethernet Adapter	14	All slots
100Gb Ethernet				
4XC7A08297	BK1J	ThinkSystem Broadcom 57508 100GbE QSFP56 2-port PCIe 4 Ethernet Adapter	14	All slots
4XC7A08248	B8PP	ThinkSystem Mellanox ConnectX-6 Dx 100GbE QSFP56 2-port PCIe 4 Ethernet Adapter	14	All slots
200Gb Ethernet / NDR200				
4XC7A81883	BQBN	ThinkSystem NVIDIA ConnectX-7 NDR200/200GbE QSFP112 2-port PCIe Gen5 x16 InfiniBand Adapter	14	All slots
400Gb Ethernet / NDR				
4XC7A80289	BQ1N	ThinkSystem NVIDIA ConnectX-7 NDR OSFP400 1-Port PCIe Gen5 x16 InfiniBand Adapter	14	All slots

For details about these adapters, see the relevant product guide:

- Ethernet adapters: <https://lenovopress.com/servers/options/ethernet>
- InfiniBand adapters: <https://lenovopress.com/servers/options/infiniband>

Fibre Channel host bus adapters

The following table lists the Fibre Channel HBAs supported by the server.

Table 23. Fibre Channel HBAs

Part number	Feature code	Description	Maximum supported	Slots supported
32Gb Fibre Channel				
4XC7A76525	BJ3H	ThinkSystem Emulex LPe35002 32Gb 2-port PCIe Fibre Channel Adapter V2	18	All slots
4XC7A08276	BA1F	ThinkSystem QLogic QLE2772 32Gb 2-Port PCIe Fibre Channel Adapter	18	All slots
64Gb Fibre Channel				
4XC7A77485	BLC1	ThinkSystem Emulex LPe36002 64Gb 2-port PCIe Fibre Channel Adapter	18	All slots

For more information, see the list of Lenovo Press Product Guides in the Host bus adapters category: <https://lenovopress.com/servers/options/hba>

SAS adapters for external storage

The SR950 V3 does not support SAS adapters for external storage.

Flash storage adapters

The SR950 V3 does not support PCIe Flash Storage adapters.

GPU adapters

The SR950 V3 does not support GPUs.

Cooling

The server has 24x simple-swap dual-rotor 60 mm fans, 12x fans in each 4U chassis, and all are standard. Fans are N+2 rotor redundant, which means that the server can tolerate two rotor failures in each of the two 4U chassis and continue full operation.

Each power supply also includes an integrated fan.

In each chassis, the 12 front fans are installed in a 4U-high unit as shown in the following figure. The 12 fans are installed in six modules in vertical bays, each of which comprise of 2 fans.

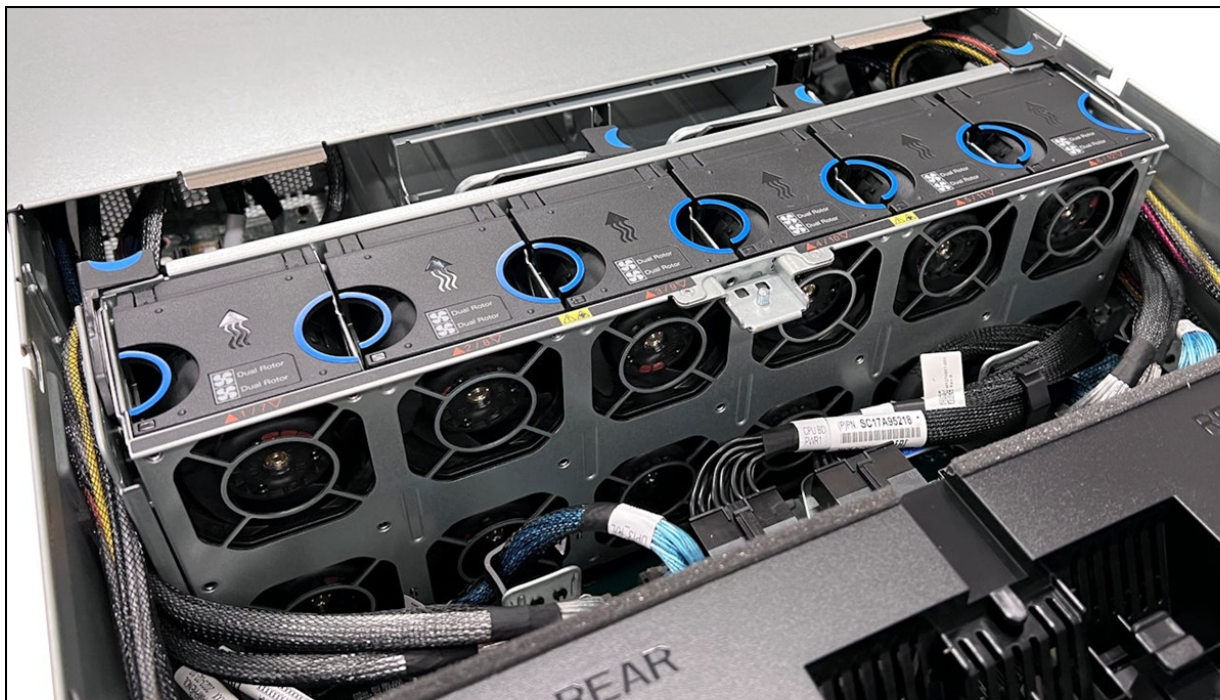


Figure 15. SR950 V3 cooling fan modules in each chassis

The following table lists the CTO ordering information for the fan modules.

Table 24. Cooling

Feature code	Description	Max Qty
BV21	ThinkSystem SR950 V3 Fan Module (contains two fans)	12

Power supplies

The server supports 8x or 12x hot-swap redundant 1800W AC power supplies (80 PLUS Titanium certification), 6x in each 4U chassis. When 8x are installed, they are installed in the upper 4 power supply bays in each chassis. See [Figure 4](#) for locations.

Power supplies require 220V power (110V not supported). Power supplies are N+N redundant within each chassis.

Tip: Use Lenovo Capacity Planner to determine exactly what power your server needs:
<https://datacentersupport.lenovo.com/us/en/products/solutions-and-software/software/lenovo-capacity-planner/solutions/ht504651>

Table 25. Power supplies for SR950 V3

Part number	Feature code	Description	Connector	Supported quantities	110V support
4P57A78359	BPK9	ThinkSystem 1800W 230V Titanium Hot-Swap Gen2 Power Supply	C13	8 or 12	No

Configuration notes:

- Power supply options do not include a line cord. For server configurations, the inclusion of a power cord is model dependent. Configure-to-order models can be configured without a power cord if desired.

Power supply LEDs

The supported hot-swap power supplies have the following LEDs:

- Power input LED:
 - Green: The power supply is connected to the AC power source
 - Off: The power supply is disconnected from the AC power source or a power problem has occurred
- Power output LED:
 - Green: The server is on and the power supply is working normally
 - Off: The server is powered off, or the power supply is not working properly
- Power supply error LED:
 - Off: The power supply is working normally
 - Yellow: The power supply has failed

Note: The SR950 V3 does not support Zero-output mode (also known as Standby mode) with power supplies.

Power cords

Line cords and rack power cables with C13 connectors can be ordered as listed in the following table.

Table 26. Power cords

Part number	Feature code	Description
Rack cables		
00Y3043	A4VP	1.0m, 10A/100-250V, C13 to C14 Jumper Cord
4L67A08367	B0N5	1.0m, 13A/100-250V, C13 to C14 Jumper Cord
39Y7937	6201	1.5m, 10A/100-250V, C13 to C14 Jumper Cord
4L67A08368	B0N6	1.5m, 13A/100-250V, C13 to C14 Jumper Cord

Part number	Feature code	Description
4L67A08365	B0N4	2.0m, 10A/100-250V, C13 to IEC 320-C14 Rack Power Cable
4L67A08369	6570	2.0m, 13A/100-250V, C13 to C14 Jumper Cord
4L67A08366	6311	2.8m, 10A/100-250V, C13 to C14 Jumper Cord
4L67A08370	6400	2.8m, 13A/100-250V, C13 to C14 Jumper Cord
39Y7932	6263	4.3m, 10A/100-250V, C13 to C14 Jumper Cord
4L67A08371	6583	4.3m, 13A/100-250V, C13 to C14 Jumper Cord
Line cords		
39Y7930	6222	2.8m, 10A/250V, C13 to IRAM 2073 (Argentina) Line Cord
81Y2384	6492	4.3m, 10A/250V, C13 to IRAM 2073 (Argentina) Line Cord
39Y7924	6211	2.8m, 10A/250V, C13 to AS/NZS 3112 (Australia/NZ) Line Cord
81Y2383	6574	4.3m, 10A/250V, C13 to AS/NZS 3112 (Australia/NZ) Line Cord
69Y1988	6532	2.8m, 10A/250V, C13 to NBR 14136 (Brazil) Line Cord
81Y2387	6404	4.3m, 10A/250V, C13 to NBR 14136 (Brazil) Line Cord
39Y7928	6210	2.8m, 10A/220V, C13 to GB 2099.1 (China) Line Cord
81Y2378	6580	4.3m, 10A/250V, C13 to GB 2099.1 (China) Line Cord
39Y7918	6213	2.8m, 10A/250V, C13 to DK2-5a (Denmark) Line Cord
81Y2382	6575	4.3m, 10A/250V, C13 to DK2-5a (Denmark) Line Cord
39Y7917	6212	2.8m, 10A/250V, C13 to CEE 7/7 (Europe) Line Cord
81Y2376	6572	4.3m, 10A/250V, C13 to CEE 7/7 (Europe) Line Cord
39Y7927	6269	2.8m, 10A/250V, C13 to IS 6538 (India) Line Cord
81Y2386	6567	4.3m, 10A/250V, C13 to IS 6538 (India) Line Cord
39Y7920	6218	2.8m, 10A/250V, C13 to SI 32 (Israel) Line Cord
81Y2381	6579	4.3m, 10A/250V, C13 to SI 32 (Israel) Line Cord
39Y7921	6217	2.8m, 10A/250V, C13 to CEI 23-16 (Italy) Line Cord
81Y2380	6493	4.3m, 10A/250V, C13 to CEI 23-16 (Italy) Line Cord
4L67A08362	6495	4.3m, 12A/200V, C13 to JIS C-8303 (Japan) Line Cord
39Y7922	6214	2.8m, 10A/250V, C13 to SABS 164-1 (South Africa) Line Cord
81Y2379	6576	4.3m, 10A/250V, C13 to SANS 164-1 (South Africa) Line Cord
39Y7925	6219	2.8m, 12A/220V, C13 to KSC 8305 (S. Korea) Line Cord
81Y2385	6494	4.3m, 12A/250V, C13 to KSC 8305 (S. Korea) Line Cord
39Y7919	6216	2.8m, 10A/250V, C13 to SEV 1011-S24507 (Swiss) Line Cord
81Y2390	6578	4.3m, 10A/250V, C13 to SEV 1011-S24507 (Swiss) Line Cord
81Y2375	6317	2.8m, 10A/250V, C13 to CNS 10917 (Taiwan) Line Cord
81Y2389	6531	4.3m, 10A/250V, C13 to CNS 10917 (Taiwan) Line Cord
39Y7923	6215	2.8m, 10A/250V, C13 to BS 1363/A (UK) Line Cord
81Y2377	6577	4.3m, 10A/250V, C13 to BS 1363/A (UK) Line Cord
46M2592	A1RF	2.8m, 10A/250V, C13 to NEMA 6-15P (US) Line Cord
4L67A08361	6373	4.3m, 10A/250V, C13 to NEMA 6-15P (US) Line Cord

Systems management

The SR950 V3 contains an integrated service processor, XClarity Controller 2 (XCC), which provides advanced control, monitoring, and alerting functions. The XCC2 is based on the AST2600 baseboard management controller (BMC) using a dual-core ARM Cortex A7 32-bit RISC service processor running at 1.2 GHz.

Topics in this section:

- [System I/O Board](#)
- [Local management](#)
- [System status with XClarity Mobile](#)
- [Remote management](#)
- [XCC2 Platinum](#)
- [Lenovo XClarity Provisioning Manager](#)
- [Lenovo XClarity Administrator](#)
- [Lenovo XClarity Integrators](#)
- [Lenovo XClarity Essentials](#)
- [Lenovo XClarity Energy Manager](#)
- [Lenovo Capacity Planner](#)

System I/O Board

The SR950 V3 implements a separate System I/O Board that connects to the Processor Board via an Interposer board. The location of the System I/O Board is shown in the [Components and connectors](#) section. The System I/O Board contains all the connectors visible at the front of the server as shown in the following figure.

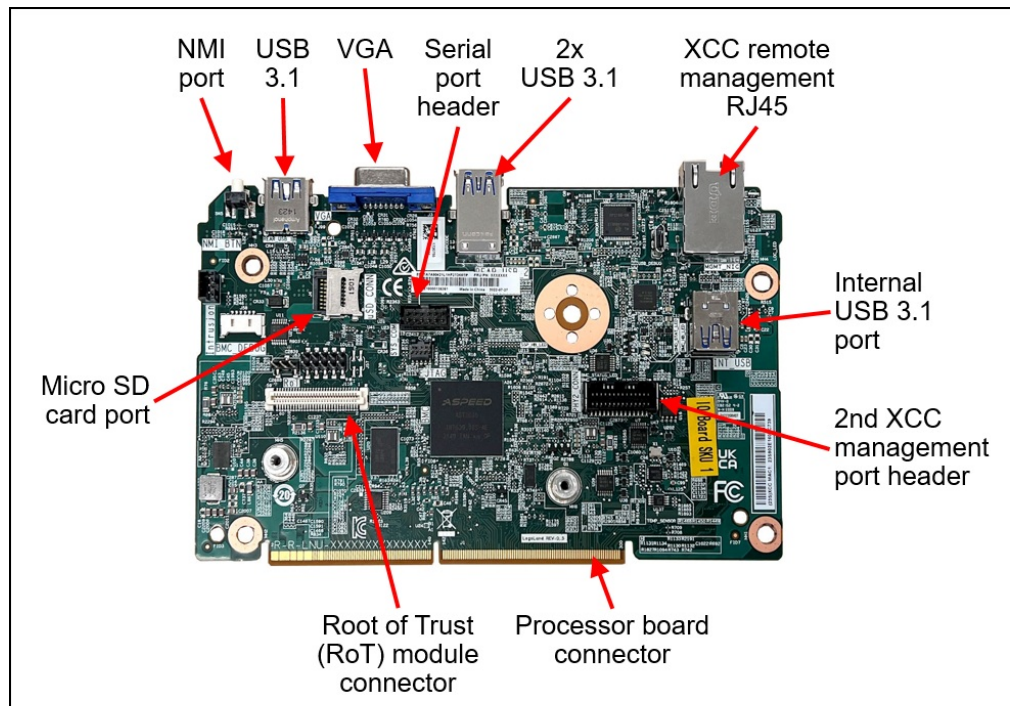


Figure 16. System I/O Board

The board also has the following components:

- XClarity Controller 2, implemented using the ASPEED AST2600 baseboard management controller (BMC).

- Root of Trust (RoT) module - a daughter card that implements Platform Firmware Resiliency (PFR) hardware Root of Trust (RoT) which enables the server to be NIST SP800-193 compliant. For more details about PFR, see the [Security](#) section.
- Connector to enable an additional redundant Ethernet connection to the XCC2 controller. The connector is used in conjunction with the ThinkSystem V3 Management NIC Adapter Kit (4XC7A85319). For details, see the [Remote management](#) section.
- Internal USB port - to allow the booting of an operating system from a USB key. The VMware ESXi preloads use this port for example. Preloads are described in the [Operating system support](#) section.
- MicroSD card port to enable the use of a MicroSD card for additional storage for use with the XCC2 controller. XCC2 can use the storage as a Remote Disc on Card (RDOC) device (up to 4GB of storage). It can also be used to store firmware updates (including N-1 firmware history) for ease of deployment.

Tip: Without a MicroSD card installed, the XCC2 controller will have 100MB of available RDOC storage.

Ordering information for the supported USB drive and Micro SD card are listed in the following table.

Table 27. Media for use with the System I/O Board

Part number	Feature code	Description
4X77A77065	BNWN	ThinkSystem USB 32GB USB 3.0 Flash Drive
4X77A77064	BNWP	ThinkSystem MicroSD 32GB Class 10 Flash Memory Card

Local management

The server offers a front operator panel with key LED status indicators, as shown in the following figure.

Tip: The Network LED only shows network activity of an installed OCP network adapter.

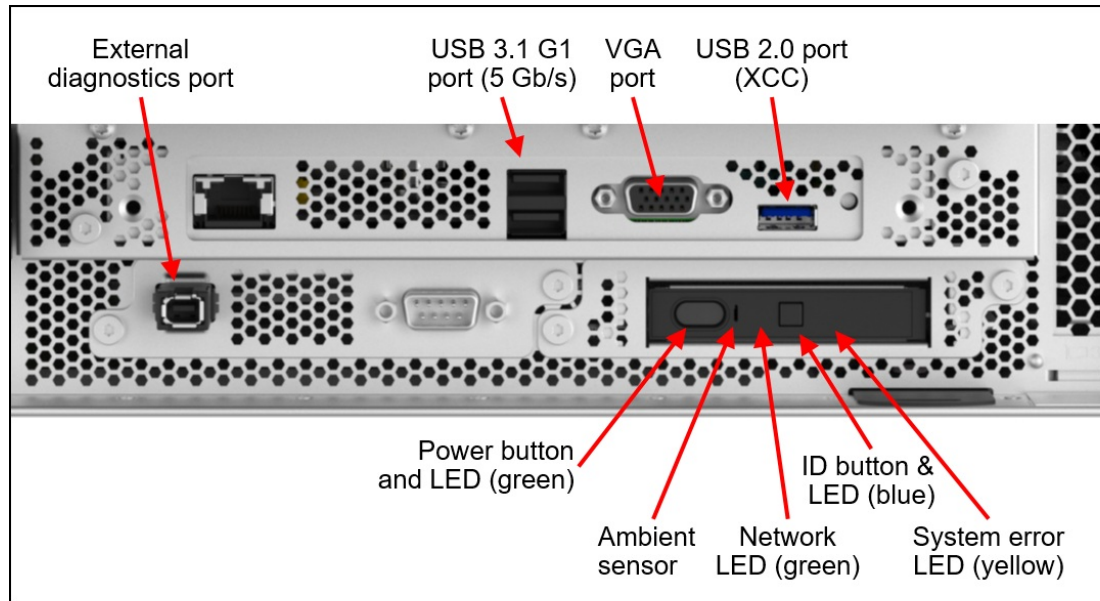


Figure 17. Front operator panel and local management ports

Light path diagnostics

The server offers light path diagnostics. If an environmental condition exceeds a threshold or if a system component fails, XCC lights LEDs inside the server to help you diagnose the problem and find the failing part. The server has fault LEDs next to the following components:

- Each memory DIMM
- Each drive bay
- Each power supply

External Diagnostics Handset

The SR950 V3 has a port to connect an External Diagnostics Handset as described in the preceding section. The handset has a magnet on the back of it to allow you to easily mount it on a convenient place on any rack cabinet.

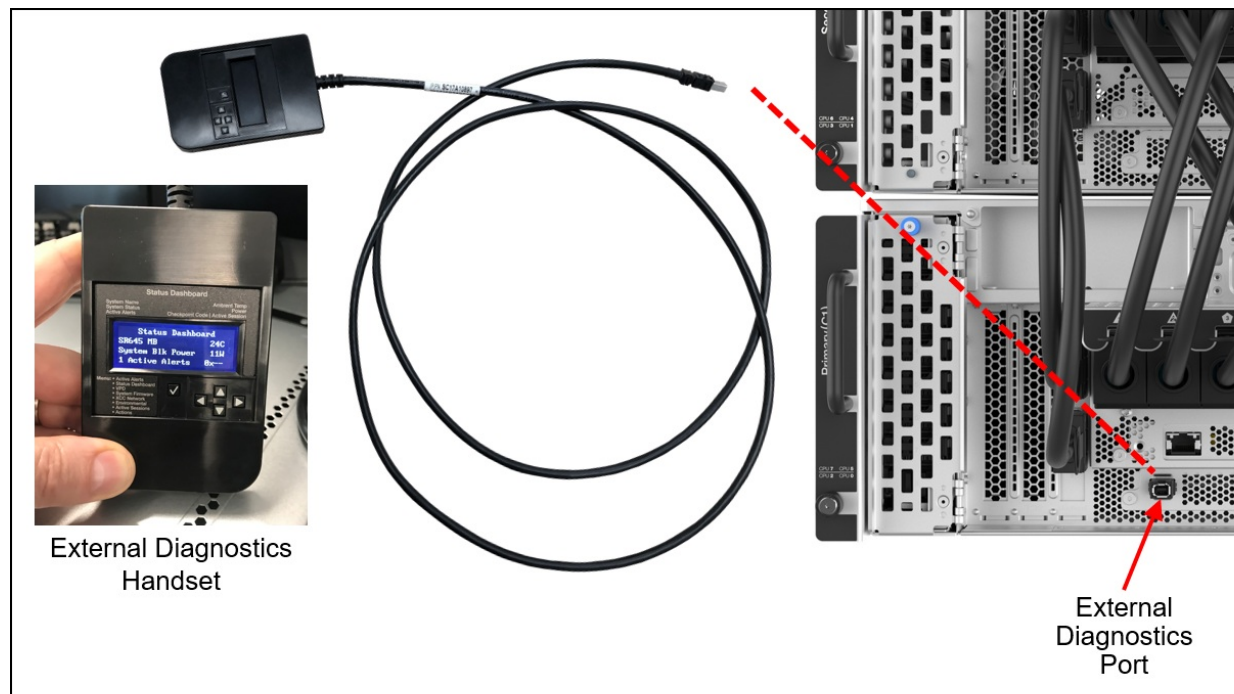


Figure 18. External Diagnostics Handset

Ordering information for the External Diagnostics Handset with is listed in the following table.

Table 28. External Diagnostics Handset ordering information

Part number	Feature code	Description
4TA7A64874	BEUX	ThinkSystem External Diagnostics Handset


Information tab

The front of the server also houses an information pull-out tab (also known as the network access tag). See [Figure 2](#) for the location. A label on the tab shows the network information (MAC address and other data) to remotely access XClarity Controller.

System status with XClarity Mobile

The XClarity Mobile app includes a tethering function where you can connect your Android or iOS device to the server via USB to see the status of the server.

The steps to connect the mobile device are as follows:

1. Enable USB Management on the server, by holding down the ID button for 3 seconds (or pressing the dedicated USB management button if one is present)
2. Connect the mobile device via a USB cable to the server's USB port with the management symbol 
3. In iOS or Android settings, enable Personal Hotspot or USB Tethering
4. Launch the Lenovo XClarity Mobile app

Once connected you can see the following information:

- Server status including error logs (read only, no login required)
- Server management functions (XClarity login credentials required)

Remote management

The server offers a dedicated RJ45 port at the front of the server for remote management via the XClarity Controller management processor. The port supports 10/100/1000 Mbps speeds.

Remote server management is provided through industry-standard interfaces:

- Intelligent Platform Management Interface (IPMI) Version 2.0
- Simple Network Management Protocol (SNMP) Version 3 (no SET commands; no SNMP v1)
- Common Information Model (CIM-XML)
- Representational State Transfer (REST) support
- Redfish support (DMTF compliant)
- Web browser - HTML 5-based browser interface (Java and ActiveX not required) using a responsive design (content optimized for device being used - laptop, tablet, phone) with NLS support

The SR950 V3 also supports an additional redundant Ethernet connection to the XCC2 controller. The adapter installs in slot P5 at the rear of the server - see the [I/O expansion](#) section for the location of the slot.

Tip: The ThinkSystem SR950 V3 Rear Management NIC Adapter Kit is mounted on a PCIe bracket and installed in slot P5, however it does not connect to the PCIe slot and a riser is not needed.

Ordering information is listed in the following table.

Table 29. Redundant System Management Port Adapter

Part number	Feature code	Description	Max qty
4XC7A90108	BV2D	ThinkSystem SR950 V3 Rear Management NIC Adapter Kit	1

The use of this adapter allows concurrent remote access using both the connection on the adapter and the onboard RJ45 remote management port provided by the server. The adapter and onboard port have separate IP addresses.

Configuration rules:

- The adapter is only supported in PCIe slot P5

IPMI via the Ethernet port (IPMI over LAN) is supported, however it is disabled by default. For CTO orders you can specify whether you want the feature enabled or disabled in the factory, using the feature codes listed in the following table.

Table 30. IPMI-over-LAN settings

Feature code	Description
B7XZ	Disable IPMI-over-LAN (default)
B7Y0	Enable IPMI-over-LAN

XCC2 Platinum

In the SR950 V3, XCC2 has the Platinum level of features built into the server. Compared to the XCC functions of ThinkSystem V2 and earlier systems, Platinum offers the same features as Enterprise and Advanced levels in ThinkSystem V2, plus additional features.

DCSC tip: Even though XCC2 Platinum is a standard feature of the SR950 V3, it does *not* appear in the list of feature codes for the configuration in DCSC.

XCC2 Platinum includes the following Enterprise and Advanced functions:

- Remotely viewing video with graphics resolutions up to 1600x1200 at 75 Hz with up to 23 bits per pixel, regardless of the system state
- Remotely accessing the server using the keyboard and mouse from a remote client
- International keyboard mapping support
- Syslog alerting
- Redirecting serial console via SSH
- Component replacement log (Maintenance History log)
- Access restriction (IP address blocking)
- Lenovo SED security key management
- Displaying graphics for real-time and historical power usage data and temperature
- Boot video capture and crash video capture
- Virtual console collaboration - Ability for up to 6 remote users to be log into the remote session simultaneously
- Remote console Java client
- Mapping the ISO and image files located on the local client as virtual drives for use by the server
- Mounting the remote ISO and image files via HTTPS, SFTP, CIFS, and NFS
- Power capping
- System utilization data and graphic view
- Single sign on with Lenovo XClarity Administrator
- Update firmware from a repository
- License for XClarity Energy Manager

XCC2 Platinum also includes the following features that are new to XCC2:

- System Guard - Monitor hardware inventory for unexpected component changes, and simply log the event or prevent booting
- Enterprise Strict Security mode - Enforces CNSA 1.0 level security
- Neighbor Group - Enables administrators to manage and synchronize configurations and firmware level across multiple servers

With XCC2 Platinum, for CTO orders, you can request that System Guard be enabled in the factory and the first configuration snapshot be recorded. To add this to an order, select feature code listed in the following table. The selection is made in the Security tab of the DCSC configurator.

Table 31. Enable System Guard in the factory (CTO orders)

Feature code	Description
BUT2	Install System Guard

For more information about System Guard, see https://pubs.lenovo.com/xcc2/NN1ia_c_systemguard

Lenovo XClarity Provisioning Manager

Lenovo XClarity Provisioning Manager (LXPM) is a UEFI-based application embedded in ThinkSystem servers and accessible via the F1 key during system boot.

LXPM provides the following functions:

- Graphical UEFI Setup
- System inventory information and VPD update
- System firmware updates (UEFI and XCC)
- RAID setup wizard
- OS installation wizard (including unattended OS installation)
- Diagnostics functions

Lenovo XClarity Administrator

Lenovo XClarity Administrator is a centralized resource management solution designed to reduce complexity, speed response, and enhance the availability of Lenovo systems and solutions. It provides agent-free hardware management for ThinkSystem servers, in addition to ThinkServer, System x, and Flex System servers. The administration dashboard is based on HTML 5 and allows fast location of resources so tasks can be run quickly.

Because Lenovo XClarity Administrator does not require any agent software to be installed on the managed endpoints, there are no CPU cycles spent on agent execution, and no memory is used, which means that up to 1GB of RAM and 1 - 2% CPU usage is saved, compared to a typical managed system where an agent is required.

Lenovo XClarity Administrator is an optional software component for the SR950 V3. The software can be downloaded and used at no charge to discover and monitor the SR950 V3 and to manage firmware upgrades.

If software support is required for Lenovo XClarity Administrator, or premium features such as configuration management and operating system deployment are required, Lenovo XClarity Pro software subscription should be ordered. Lenovo XClarity Pro is licensed on a per managed system basis, that is, each managed Lenovo system requires a license.

The following table lists the Lenovo XClarity software license options.

Table 32. Lenovo XClarity Pro ordering information

Part number	Feature code	Description
00MT201	1339	Lenovo XClarity Pro, per Managed Endpoint w/1 Yr SW S&S
00MT202	1340	Lenovo XClarity Pro, per Managed Endpoint w/3 Yr SW S&S
00MT203	1341	Lenovo XClarity Pro, per Managed Endpoint w/5 Yr SW S&S
7S0X000HWW	SAYV	Lenovo XClarity Pro, per Managed Endpoint w/6 Yr SW S&S
7S0X000JWW	SAYW	Lenovo XClarity Pro, per Managed Endpoint w/7 Yr SW S&S

Lenovo XClarity Administrator offers the following standard features that are available at no charge:

- Auto-discovery and monitoring of Lenovo systems
- Firmware updates and compliance enforcement
- External alerts and notifications via SNMP traps, syslog remote logging, and e-mail
- Secure connections to managed endpoints
- NIST 800-131A or FIPS 140-2 compliant cryptographic standards between the management solution and managed endpoints
- Integration into existing higher-level management systems such as cloud automation and orchestration tools through REST APIs, providing extensive external visibility and control over hardware resources
- An intuitive, easy-to-use GUI
- Scripting with Windows PowerShell, providing command-line visibility and control over hardware resources

Lenovo XClarity Administrator offers the following premium features that require an optional Pro license:

- Pattern-based configuration management that allows to define configurations once and apply repeatedly without errors when deploying new servers or redeploying existing servers without disrupting the fabric
- Bare-metal deployment of operating systems and hypervisors to streamline infrastructure provisioning

For more information, refer to the Lenovo XClarity Administrator Product Guide:

<http://lenovopress.com/tips1200>

Lenovo XClarity Integrators

Lenovo also offers software plug-in modules, Lenovo XClarity Integrators, to manage physical infrastructure from leading external virtualization management software tools including those from Microsoft and VMware.

These integrators are offered at no charge, however if software support is required, a Lenovo XClarity Pro software subscription license should be ordered.

Lenovo XClarity Integrators offer the following additional features:

- Ability to discover, manage, and monitor Lenovo server hardware from VMware vCenter or Microsoft System Center
- Deployment of firmware updates and configuration patterns to Lenovo x86 rack servers and Flex System from the virtualization management tool
- Non-disruptive server maintenance in clustered environments that reduces workload downtime by dynamically migrating workloads from affected hosts during rolling server updates or reboots
- Greater service level uptime and assurance in clustered environments during unplanned hardware events by dynamically triggering workload migration from impacted hosts when impending hardware failures are predicted

For more information about all the available Lenovo XClarity Integrators, see the Lenovo XClarity Administrator Product Guide: <https://lenovopress.com/tips1200-lenovo-xclarity-administrator>

Lenovo XClarity Essentials

Lenovo offers the following XClarity Essentials software tools that can help you set up, use, and maintain the server at no additional cost:

- **Lenovo Essentials OneCLI**
OneCLI is a collection of server management tools that uses a command line interface program to manage firmware, hardware, and operating systems. It provides functions to collect full system health information (including health status), configure system settings, and update system firmware and drivers.
- **Lenovo Essentials UpdateXpress**
The UpdateXpress tool is a standalone GUI application for firmware and device driver updates that enables you to maintain your server firmware and device drivers up-to-date and help you avoid unnecessary server outages. The tool acquires and deploys individual updates and UpdateXpress System Packs (UXSPs) which are integration-tested bundles.
- **Lenovo Essentials Bootable Media Creator**
The Bootable Media Creator (BOMC) tool is used to create bootable media for offline firmware update.

For more information and downloads, visit the Lenovo XClarity Essentials web page: <http://support.lenovo.com/us/en/documents/LNVO-center>

Lenovo XClarity Energy Manager

Lenovo XClarity Energy Manager (LXEM) is a power and temperature management solution for data centers. It is an agent-free, web-based console that enables you to monitor and manage power consumption and temperature in your data center through the management console. It enables server density and data center capacity to be increased through the use of power capping.

LXEM is a licensed product. A single-node LXEM license is included with the XClarity Controller Platinum version. Because the Platinum version of XCC is standard in the SR950 V3, a license for XClarity Energy Manager is included.

For more information about XClarity Energy Manager, see the following resources:

- **Lenovo Support page:**
<https://datacentersupport.lenovo.com/us/en/solutions/Invo-lxem>
- **Lenovo Information Center:**
https://sysmgmt.lenovofiles.com/help/topic/LXEM/lxem_overview.html?cp=4

Lenovo Capacity Planner

Lenovo Capacity Planner is a power consumption evaluation tool that enhances data center planning by enabling IT administrators and pre-sales professionals to understand various power characteristics of racks, servers, and other devices. Capacity Planner can dynamically calculate the power consumption, current, British Thermal Unit (BTU), and volt-ampere (VA) rating at the rack level, improving the planning efficiency for large scale deployments.

For more information, refer to the Capacity Planner web page:
<http://datacentersupport.lenovo.com/us/en/solutions/Invo-lcp>

Security

Topics in this section:

- [Security features](#)
- [Platform Firmware Resiliency - Lenovo ThinkShield](#)
- [Intel Transparent Supply Chain](#)
- [Security standards](#)

Security features

The SR950 V3 server offers the following electronic security features:

- Secure Boot function of the Intel Xeon processor
- Support for Platform Firmware Resiliency (PFR) hardware Root of Trust (RoT) - see the [Platform Firmware Resiliency](#) section
- Firmware signature processes compliant with FIPS and NIST requirements
- Administrator and power-on password
- Integrated Trusted Platform Module (TPM) supporting TPM 2.0
- Self-encrypting drives (SEDs) with support for enterprise key managers - see the [SED encryption key management](#) section

The server is NIST SP 800-147B compliant.

The SR950 V3 server also includes the following physical security features:

- Chassis top cover intrusion switch
- Chassis front intrusion switch
- Front security bezel

The following table lists the ordering information for the security features for the server.

Table 33. Security ordering information

Part number	Feature code	Description
CTO only	BV1S	ThinkSystem SR950 V3 Front Intrusion Switch Cable
CTO only	BV1T	ThinkSystem SR950 V3 Top Cover Intrusion Switch Cable
4B37A91161	BYP7	ThinkSystem SR950 V3 Front Security Bezel

Platform Firmware Resiliency - Lenovo ThinkShield

Lenovo's ThinkShield Security is a transparent and comprehensive approach to security that extends to all dimensions of our data center products: from development, to supply chain, and through the entire product lifecycle.

The ThinkSystem SR950 V3 includes Platform Firmware Resiliency (PFR) hardware Root of Trust (RoT) which enables the system to be NIST SP800-193 compliant. This offering further enhances key platform subsystem protections against unauthorized firmware updates and corruption, to restore firmware to an integral state, and to closely monitor firmware for possible compromise from cyber attacks.

PFR operates upon the following server components:

- UEFI image – the low-level server firmware that connects the operating system to the server hardware
- XCC image – the management “engine” software that controls and reports on the server status separate from the server operating system
- FPGA image – the code that runs the server’s lowest level hardware controller on the motherboard

The Lenovo Platform Root of Trust Hardware performs the following three main functions:

- Detection – Measures the firmware and updates for authenticity
- Recovery – Recovers a corrupted image to a known-safe image
- Protection – Monitors the system to ensure the known-good firmware is not maliciously written

These enhanced protection capabilities are implemented using a dedicated, discrete security processor whose implementation has been rigorously validated by leading third-party security firms. Security evaluation results and design details are available for customer review – providing unprecedented transparency and assurance.

The SR950 V3 includes support for Secure Boot, a UEFI firmware security feature developed by the UEFI Consortium that ensures only immutable and signed software are loaded during the boot time. The use of Secure Boot helps prevent malicious code from being loaded and helps prevent attacks, such as the installation of rootkits. Lenovo offers the capability to enable secure boot in the factory, to ensure end-to-end protection.

The following table lists the relevant feature code(s).

Table 34. Secure Boot options

Part number	Feature code	Description	Purpose
CTO only	BPKQ	TPM 2.0 with Secure Boot	Configure the system in the factory with Secure Boot enabled.

Intel Transparent Supply Chain

Add a layer of protection in your data center and have peace of mind that the server hardware you bring into it is safe authentic and with documented, testable, and provable origin.

Lenovo has one of the world’s best supply chains, as ranked by Gartner Group, backed by extensive and mature supply chain security programs that exceed industry norms and US Government standards. Now we are the first Tier 1 manufacturer to offer Intel® Transparent Supply Chain in partnership with Intel, offering you an unprecedented degree of supply chain transparency and assurance.

To enable Intel Transparent Supply Chain for the Intel-based servers in your order, add the following feature code in the [DCSC configurator](#), under the Security tab.

Table 35. Intel Transparent Supply Chain ordering information

Feature code	Description
BB0P	Intel Transparent Supply Chain

For more information on this offering, see the paper *Introduction to Intel Transparent Supply Chain on Lenovo ThinkSystem Servers*, available from <https://lenovopress.com/lp1434-introduction-to-intel-transparent-supply-chain-on-thinksystem-servers>.

Security standards

The SR950 V3 supports the following security standards and capabilities:

- **Industry Standard Security Capabilities**

- Intel CPU Enablement
 - AES-NI (Advanced Encryption Standard New Instructions)
 - CbT (Converged Boot Guard and Trusted Execution Technology)
 - CET (Control flow Enforcement Technology)
 - Hardware-based side channel attack resilience enhancements
 - MKTME/TME (Multi-Key Total Memory Encryption)
 - SGX (Software Guard eXtensions)
 - SGX-TEM (Trusted Environment Mode)
 - TDX (Trust Domain Extensions)
 - TXT (Trusted eXecution Technology)
 - VT (Virtualization Technology)
 - XD (eXecute Disable)
- Microsoft Windows Security Enablement
 - Credential Guard
 - Device Guard
 - Host Guardian Service
- TCG (Trusted Computing Group) TPM (Trusted Platform Module) 2.0
- UEFI (Unified Extensible Firmware Interface) Forum Secure Boot

- **Hardware Root of Trust and Security**

- Independent security subsystem providing platform-wide NIST SP800-193 compliant Platform Firmware Resilience (PFR)
- Management domain RoT supplemented by the Secure Boot features of XCC

- **Platform Security**

For more information on platform security, see the paper “How to Harden the Security of your ThinkSystem Server and Management Applications” available from <https://lenovopress.com/lp1260-how-to-harden-the-security-of-your-thinksystem-server>.

- Boot and run-time firmware integrity monitoring with rollback to known-good firmware (e.g., “self-healing”)
- Non-volatile storage bus security monitoring and filtering
- Resilient firmware implementation, such as to detect and defeat unauthorized flash writes or SMM (System Management Mode) memory incursions
- Patented IPMI KCS channel privileged access authorization (USPTO Patent# 11,256,810)
- Host and management domain authorization, including integration with CyberArk for enterprise password management

- KMIP (Key Management Interoperability Protocol) compliant, including support for IBM SKLM and Thales KeySecure
- Reduced “out of box” attack surface
- Configurable network services
- FIPS 140-3 (in progress) validated cryptography for XCC
- CNSA Suite 1.0 Quantum-resistant cryptography for XCC
- Lenovo System Guard
- **Standards Compliance and/or Support**
 - NIST SP800-131A rev 2 “Transitioning the Use of Cryptographic Algorithms and Key Lengths”
 - NIST SP800-147B “BIOS Protection Guidelines for Servers”
 - NIST SP800-193 “Platform Firmware Resiliency Guidelines”
 - ISO/IEC 11889 “Trusted Platform Module Library”
 - Common Criteria TCG Protection Profile for “PC Client Specific TPM 2.0”
 - European Union Commission Regulation 2019/424 (“ErP Lot 9”) “Ecodesign Requirements for Servers and Data Storage Products” Secure Data Deletion
 - Optional FIPS 140-2 validated Self-Encrypting Disks (SEDs) with external KMIP-based key management
- **Product and Supply Chain Security**
 - Suppliers validated through Lenovo’s Trusted Supplier Program
 - Developed in accordance with Lenovo’s Secure Development Lifecycle (LSDL)
 - Continuous firmware security validation through automated testing, including static code analysis, dynamic network and web vulnerability testing, software composition analysis, and subsystem-specific testing, such as UEFI security configuration validation
 - Ongoing security reviews by US-based security experts, with attestation letters available from our third-party security partners
 - Digitally signed firmware, stored and built on US-based infrastructure and signed on US-based Hardware Security Modules (HSMs)
 - Manufacturing transparency via Intel Transparent Supply Chain (for details, see <https://lenovopress.com/lp1434-introduction-to-intel-transparent-supply-chain-on-lenovo-thinksystem-servers>)
 - TAA (Trade Agreements Act) compliant manufacturing, by default in Mexico for North American markets with additional US and EU manufacturing options
 - US 2019 NDAA (National Defense Authorization Act) Section 889 compliant

Rack installation

The following table lists the rack installation options that are available for the server.

Table 36. Rack installation options

Option	Feature Code	Description
None*	BV25	ThinkSystem SR950 V3 Rail Kit
4XF7A90112	BXK1	ThinkSystem SR950 V3 Cable Management Arm

* The Rail Kit is included with all systems

The following table summarizes the rail kit features and specifications.

Table 37. Rail kit features and specifications summary

Feature	ThinkSystem SR950 V3 Rail Kit
Part number	Feature BV25
Rail type	Full-out slide rail (ball bearing)
Toolless installation	Yes
Cable Management Arm (CMA) support	Optional (4XF7A90112)
In-rack server maintenance	Yes
1U PDU support	Yes
0U PDU support	Limited*
Rack type	Four-post IBM and Lenovo standard rack, complying with the IEC standard
Mounting holes	Square (9.5mm), round (7.1mm)
Mounting flange thickness	2.0-3.3 mm (0.08 - 0.13 inches)
Distance between front and rear mounting flanges	610-903 mm (24 - 35.75 inches)
Rail length***	960 mm (37.8 inches)

* For 0U PDU support, the rack must be at least 1100 mm (43.31 in.) deep without the CMA, or at least 1200 mm (47.24 in.) deep if the CMA is used.

*** Measured when mounted on the rack, from the front surface of the front mounting flange to the rear most point of the rail.

For additional information, see the document *Rail and supported rack specifications for ThinkSystem servers*, available from:

<https://www.lenovo.com/us/en/resources/data-center-solutions/brochures/thinksystem-rail-support-matrix/>

Operating system support

The server supports the following operating systems:

- Red Hat Enterprise Linux 8.6
- Red Hat Enterprise Linux 8.7
- Red Hat Enterprise Linux 8.8
- Red Hat Enterprise Linux 9.0
- Red Hat Enterprise Linux 9.1
- Red Hat Enterprise Linux 9.2
- SUSE Linux Enterprise Server 15 SP4
- SUSE Linux Enterprise Server 15 SP5
- SUSE Linux Enterprise Server 15 Xen SP4
- SUSE Linux Enterprise Server 15 Xen SP5
- VMware ESXi 7.0 U3
- VMware ESXi 8.0 U1
- VMware ESXi 8.0 U2

For a complete list of supported, certified and tested operating systems, plus additional details and links to relevant web sites, see the Operating System Interoperability Guide:

<https://lenovopress.lenovo.com/osig#servers=sr950-v3-7dc5-7dc4-7dc6>

For configure-to-order configurations, the server can be preloaded with VMware ESXi installed on M.2 drives. Ordering information is listed in the following table.

Table 38. VMware ESXi preload

Feature code	Description
BMEY	VMware ESXi 7.0 U3 (Factory Installed)
BQ8S	VMware ESXi 8.0 U1 (Factory Installed)
BYC7	VMware ESXi 8.0 U2 (Factory Installed)

You can download supported VMware vSphere hypervisor images from the following web page and load it on the M.2 drives using the instructions provided:

https://vmware.lenovo.com/content/custom_iso/

Physical and electrical specifications

The SR950 V3 occupies 8U of rack space and is comprised of two 4U chassis. Each chassis has the following overall physical dimensions, excluding components that extend outside the standard chassis, such as EIA flanges, front security bezel (if any), and power supply handles:

- Width: 443 mm (17.4 inches)
- Height: 175 mm (6.9 inches) (each of the two 4U chassis)
- Depth: 973 mm (38.3 inches)

The following table lists the detailed dimensions. See the figure below for the definition of each dimension.

Table 39. Detailed dimensions

Dimension	Description
483 mm	X_a = Width, to the outsides of the front EIA flanges
435 mm	X_b = Width, to the rack rail mating surfaces
443 mm	X_c = Width, to the outer most chassis body feature
175 mm	Y_a = Height, from the bottom of chassis to the top of the chassis (each 4U chassis)
906 mm	Z_a = Depth, from the rack flange mating surface to the rearmost I/O port surface
936 mm	Z_b = Depth, from the rack flange mating surface to the rearmost feature of the chassis body
972 mm	Z_c = Depth, from the rack flange mating surface to the rearmost feature such as power supply handle
37 mm	Z_d = Depth, from the forwardmost feature on the front of EIA flange to the rack flange mating surface
75 mm	Z_e = Depth, from the UPI cables at the front of the server to the rack flange mating surface

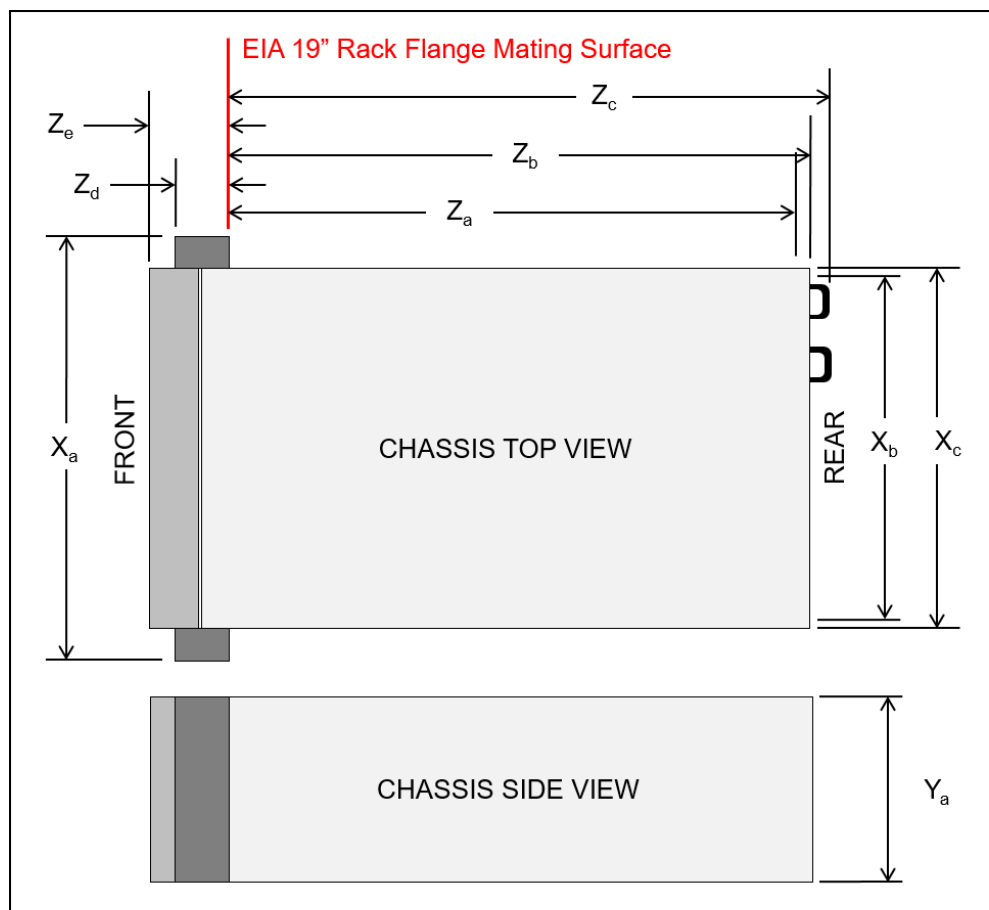


Figure 19. Server dimensions

The shipping dimensions (cardboard packaging) of the SR950 V3 are as follows:

- Width: 600 mm (23.6 inches)
- Height: 587 mm (23.1 inches)
- Depth: 1200 mm (47.2 inches)

The SR950 V3 ships in two separate boxes, one for each 4U enclosure. The above dimensions are for each shipping box.

The server has the following weight:

- Maximum weight: 50 kg (110.23 lb) maximum per 4U chassis (100 kg total)

Electrical specifications for AC input power supplies:

- Input voltage:
 - 200 to 240 (nominal) Vac, 50 Hz or 60 Hz
 - 180 to 300 Vdc (China only)
- Inlet current: See the following table.

Table 40. Maximum inlet current

Part number	Description	100V AC	200V AC	220V AC	240V DC
4P57A78359	ThinkSystem 1800W 230V Titanium Hot-Swap Gen2 Power Supply	No support	9.7A	8.7A	8.3A

Operating environment

The SR950 V3 server complies with ASHRAE Class A2 specifications with most configurations, and depending on the hardware configuration, also complies with ASHRAE Class A3 and A4 specifications. System performance may be impacted when operating temperature is outside ASHRAE A2 specification.

Depending on the hardware configuration, the SR950 V3 server also complies with ASHRAE Class H1 specification. System performance may be impacted when operating temperature is outside ASHRAE H1 specification.

Topics in this section:

- [Temperature and humidity](#)
- [Acoustical noise emissions](#)
- [Shock and vibration](#)
- [Particulate contamination](#)

Temperature and humidity

The server is supported in the following environment:

- Air temperature:
 - Operating
 - ASHRAE Class A2: 10°C to 35°C (50°F to 95°F); the maximum ambient temperature decreases by 1°C for every 300 m (984 ft) increase in altitude above 900 m (2,953 ft).
 - ASHRAE Class A3: 5°C to 40°C (41°F to 104°F); the maximum ambient temperature decreases by 1°C for every 175 m (574 ft) increase in altitude above 900 m (2,953 ft).
 - ASHRAE Class A4: 5°C to 45°C (41°F to 113°F); the maximum ambient temperature decreases by 1°C for every 125 m (410 ft) increase in altitude above 900 m (2,953 ft).
 - ASHRAE Class H1: 5 °C to 25 °C (41 °F to 77 °F); Decrease the maximum ambient temperature by 1°C for every 500 m (1640 ft) increase in altitude above 900 m (2,953 ft).
 - Server off: 5°C to 45°C (41°F to 113°F)
 - Shipment/storage: -40°C to 60°C (-40°F to 140°F)
- Maximum altitude: 3,050 m (10,000 ft)
- Relative Humidity (non-condensing):
 - Operating
 - ASHRAE Class A2: 8% to 80%; maximum dew point: 21°C (70°F)
 - ASHRAE Class A3: 8% to 85%; maximum dew point: 24°C (75°F)

- ASHRAE Class A4: 8% to 90%; maximum dew point: 24°C (75°F)
 - ASHRAE Class H1: 8% to 80%; Maximum dew point: 17°C (63°F)
- Shipment/storage: 8% to 90%

Acoustical noise emissions

The server has the following acoustic noise emissions declaration:

- Sound power level (L_{WAd})
 - Idling: 7.3 Bel
 - Operating: 7.9 Bel
- Sound pressure level (L_{pAm}):
 - Idling: 57.3 dBA
 - Operating: 61.9 dBA

Notes:

- These sound levels were measured in controlled acoustical environments according to procedures specified by ISO7779 and are reported in accordance with ISO 9296.
- Government regulations (such as those prescribed by OSHA or European Community Directives) may govern noise level exposure in the workplace and may apply to you and your server installation. The actual sound pressure levels in your installation depend upon a variety of factors, including the number of racks in the installation; the size, materials, and configuration of the room; the noise levels from other equipment; the room ambient temperature, and employee's location in relation to the equipment. Further, compliance with such government regulations depends on a variety of additional factors, including the duration of employees' exposure and whether employees wear hearing protection. Lenovo recommends that you consult with qualified experts in this field to determine whether you are in compliance with the applicable regulations.

Shock and vibration

The server has the following vibration and shock limits:

- Vibration:
 - Operating: 0.21 G rms at 5 Hz to 500 Hz for 15 minutes across 3 axes
 - Non-operating: 1.04 G rms at 2 Hz to 200 Hz for 15 minutes across 6 surfaces
- Shock:
 - Operating: 15 G for 3 milliseconds in each direction (positive and negative X, Y, and Z axes)
 - Non-operating:
 - 23 kg - 31 kg: 35 G for 152 in./sec velocity change across 6 surfaces
 - 32 kg - 68 kg: 35 G for 136 in./sec velocity change across 6 surfaces

Particulate contamination

Airborne particulates (including metal flakes or particles) and reactive gases acting alone or in combination with other environmental factors such as humidity or temperature might damage the system that might cause the system to malfunction or stop working altogether.

The following specifications indicate the limits of particulates that the system can tolerate:

- Reactive gases:
 - The copper reactivity level shall be less than 200 Angstroms per month ($\text{Å}/\text{month}$)
 - The silver reactivity level shall be less than 200 $\text{Å}/\text{month}$

- Airborne particulates:
 - The room air should be continuously filtered with MERV 8 filters.
 - Air entering a data center should be filtered with MERV 11 or preferably MERV 13 filters.
 - The deliquescent relative humidity of the particulate contamination should be more than 60% RH
 - Environment must be free of zinc whiskers

For additional information, see the Specifications section of the documentation for the server, available from the Lenovo Documents site, <https://pubs.lenovo.com/>

Warranty and Support

The SR950 V3 has a 1-year or 3-year warranty based on the machine type of the system:

- 7DC5 - 1-year warranty
- 7DC4 - 3-year warranty
- 7DC6 - SAP HANA configurations with 3-year warranty

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://lenovolocator.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>

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.

Regulatory compliance

The SR950 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
- Argentina IEC 60950-1
- Mexico NOM-019
- India BIS 13252 (Part 1)
- Germany GS
- TUV-GS (EN62368-1, and EK1-ITB2000)
- Brazil INMETRO
- South Africa NRCS LOA
- 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
- SGS, VOC Emission
- China CELP certificate, HJ 2507-2011
- China ISCCC, GB40050-2021

External storage systems

Lenovo offers the ThinkSystem DE Series and ThinkSystem DM Series external storage systems for high-performance storage. See the DE Series and DM Series product guides for specific controller models, expansion enclosures and configuration options:

- ThinkSystem DE Series Storage
<https://lenovopress.com/storage/thinksystem/de-series#rt=product-guide>
- ThinkSystem DM Series Storage
<https://lenovopress.com/storage/thinksystem/dm-series#rt=product-guide>
- ThinkSystem DG Series Storage
<https://lenovopress.com/storage/thinksystem/dg-series#rt=product-guide>

Fibre Channel SAN switches

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

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

Uninterruptible power supply units

The following table lists the uninterruptible power supply (UPS) units that are offered by Lenovo.

Table 41. Uninterruptible power supply units

Part number	Description
55941KX	RT1.5kVA 2U Rack or Tower UPS (200-240VAC)
55942KX	RT2.2kVA 2U Rack or Tower UPS (200-240VAC)
55943KX	RT3kVA 2U Rack or Tower UPS (200-240VAC)
55945KX	RT5kVA 3U Rack or Tower UPS (200-240VAC)
55946KX	RT6kVA 3U Rack or Tower UPS (200-240VAC)
55948KX	RT8kVA 6U Rack or Tower UPS (200-240VAC)
55949KX	RT11kVA 6U Rack or Tower UPS (200-240VAC)
55948PX	RT8kVA 6U 3:1 Phase Rack or Tower UPS (380-415VAC)
55949PX	RT11kVA 6U 3:1 Phase Rack or Tower UPS (380-415VAC)
55943KT†	ThinkSystem RT3kVA 2U Standard UPS (200-230VAC) (2x C13 10A, 2x GB 10A, 1x C19 16A outlets)
55943LT†	ThinkSystem RT3kVA 2U Long Backup UPS (200-230VAC) (2x C13 10A, 2x GB 10A, 1x C19 16A outlets)
55946KT†	ThinkSystem RT6kVA 5U UPS (200-230VAC) (2x C13 10A outlets, 1x Terminal Block output)
5594XKT†	ThinkSystem RT10kVA 5U UPS (200-230VAC) (2x C13 10A outlets, 1x Terminal Block output)

† Only available in China and the Asia Pacific market.

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

<https://lenovopress.com/servers/options/ups>

Power distribution units

The following table lists the power distribution units (PDUs) that are offered by Lenovo.

Table 42. Power distribution units

Part number	Feature code	Description	ANZ	ASEAN	Brazil	EET	MEA	RUCIS	WE	HTK	INDIA	JAPAN	LA	NA	PRC
0U Basic PDUs															
00YJ776	ATZY	0U 36 C13/6 C19 24A 1 Phase PDU	N	Y	Y	N	N	N	N	N	N	Y	Y	Y	N
0U Switched and Monitored PDUs															
00YJ783	AU04	0U 12 C13/12 C19 Switched and Monitored 48A 3 Phase PDU	N	N	Y	N	N	N	Y	N	N	Y	Y	Y	N
00YJ781	AU03	0U 20 C13/4 C19 Switched and Monitored 24A 1 Phase PDU	N	N	Y	N	Y	N	Y	N	N	Y	Y	Y	N
1U Switched and Monitored PDUs															
4PU7A81117	BNDV	1U 18 C19/C13 switched and monitored 48A 3P WYE PDU - ETL	N	N	N	N	N	N	N	N	N	N	N	Y	N
4PU7A77467	BLC4	1U 18 C19/C13 Switched and Monitored 80A 3P Delta PDU	N	N	N	N	N	N	N	N	N	Y	N	Y	N
4PU7A77469	BLC6	1U 12 C19/C13 switched and monitored 60A 3P Delta PDU	N	N	N	N	N	N	N	N	N	N	N	Y	N
4PU7A77468	BLC5	1U 12 C19/C13 switched and monitored 32A 3P WYE PDU	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	Y
4PU7A81118	BNDW	1U 18 C19/C13 switched and monitored 48A 3P WYE PDU - CE	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	N	Y
1U Ultra Density Enterprise PDUs (9x IEC 320 C13 + 3x IEC 320 C19 outlets)															
71763NU	6051	Ultra Density Enterprise C19/C13 PDU 60A/208V/3PH	N	N	Y	N	N	N	N	N	N	Y	Y	Y	N
71762NX	6091	Ultra Density Enterprise C19/C13 PDU Module	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
1U C13 Enterprise PDUs (12x IEC 320 C13 outlets)															
39Y8941	6010	DPI C13 Enterprise PDU Module (WW)	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
1U Front-end PDUs (3x IEC 320 C19 outlets)															
39Y8939	6003	DPI Single-phase 30A/208V Front-end PDU (US)	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
39Y8934	6005	DPI Single-phase 32A/230V Front-end PDU (International)	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
39Y8940	6004	DPI Single-phase 60A/208V Front-end PDU (US)	Y	N	Y	Y	Y	Y	Y	N	N	Y	Y	Y	N
39Y8935	6006	DPI Single-phase 63A/230V Front-end PDU (International)	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Line cords for 1U PDUs that ship without a line cord															
40K9611	6504	4.3m, 32A/380-415V, EPDU/IEC 309 3P+N+G 3ph wye (non-US) Line Cord	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
40K9612	6502	4.3m, 32A/230V, EPDU to IEC 309 P+N+G (non-US) Line Cord	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y

Part number	Feature code	Description	ANZ	ASEAN	Brazil	EET	MEA	RUCIS	WE	HTK	INDIA	JAPAN	LA	NA	PRC
40K9613	6503	4.3m, 63A/230V, EPDU to IEC 309 P+N+G (non-US) Line Cord	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
40K9614	6500	4.3m, 30A/208V, EPDU to NEMA L6-30P (US) Line Cord	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
40K9615	6501	4.3m, 60A/208V, EPDU to IEC 309 2P+G (US) Line Cord	N	N	Y	N	N	N	Y	N	N	Y	Y	Y	N
40K9617	6505	4.3m, 32A/230V, Souriau UTG Female to AS/NZ 3112 (Aus/NZ) Line Cord	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
40K9618	6506	4.3m, 32A/250V, Souriau UTG Female to KSC 8305 (S. Korea) Line Cord	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y

For more information, see the Lenovo Press documents in the PDU category:
<https://lenovopress.com/servers/options/pdu>

Rack cabinets

The following table lists the supported rack cabinets.

Table 43. Rack cabinets

Part number	Description
93072RX	25U Standard Rack (1000mm)
93072PX	25U Static S2 Standard Rack (1000mm)
7D6DA007WW	ThinkSystem 42U Onyx Primary Heavy Duty Rack Cabinet (1200mm)
7D6DA008WW	ThinkSystem 42U Pearl Primary Heavy Duty Rack Cabinet (1200mm)
93604PX	42U 1200mm Deep Dynamic Rack
93614PX	42U 1200mm Deep Static Rack
93634PX	42U 1100mm Dynamic Rack
93634EX	42U 1100mm Dynamic Expansion Rack
93074RX	42U Standard Rack (1000mm)
7D6EA009WW	ThinkSystem 48U Onyx Primary Heavy Duty Rack Cabinet (1200mm)
7D6EA00AWW	ThinkSystem 48U Pearl Primary Heavy Duty Rack Cabinet (1200mm)

For specifications about these racks, see the Lenovo Rack Cabinet Reference, available from:
<https://lenovopress.com/lp1287-lenovo-rack-cabinet-reference>

For more information, see the list of Product Guides in the Rack cabinets category:
<https://lenovopress.com/servers/options/racks>

KVM console options

The following table lists the supported KVM consoles.

Table 44. KVM console

Part number	Description
4XF7A84188	ThinkSystem 18.5" LCD Console (with US English keyboard)

The following table lists the available KVM switches and the options that are supported with them.

Table 46. KVM switches and options

Part number	Description
KVM Console switches	
1754D2X	Global 4x2x32 Console Manager (GCM32)
1754D1X	Global 2x2x16 Console Manager (GCM16)
1754A2X	Local 2x16 Console Manager (LCM16)
1754A1X	Local 1x8 Console Manager (LCM8)
Cables for GCM and LCM Console switches	
46M5383	Virtual Media Conversion Option Gen2 (VCO2)
46M5382	Serial Conversion Option (SCO)

For more information, see the list of Product Guides in the KVM Switches and Consoles category:

<http://lenovopress.com/servers/options/kvm>

Lenovo Financial Services

Lenovo Financial Services reinforces Lenovo's commitment to deliver pioneering products and services that are recognized for their quality, excellence, and trustworthiness. Lenovo Financial Services offers financing solutions and services that complement your technology solution anywhere in the world.

We are dedicated to delivering a positive finance experience for customers like you who want to maximize your purchase power by obtaining the technology you need today, protect against technology obsolescence, and preserve your capital for other uses.

We work with businesses, non-profit organizations, governments and educational institutions to finance their entire technology solution. We focus on making it easy to do business with us. Our highly experienced team of finance professionals operates in a work culture that emphasizes the importance of providing outstanding customer service. Our systems, processes and flexible policies support our goal of providing customers with a positive experience.

We finance your entire solution. Unlike others, we allow you to bundle everything you need from hardware and software to service contracts, installation costs, training fees, and sales tax. If you decide weeks or months later to add to your solution, we can consolidate everything into a single invoice.

Our Premier Client services provide large accounts with special handling services to ensure these complex transactions are serviced properly. As a premier client, you have a dedicated finance specialist who manages your account through its life, from first invoice through asset return or purchase. This specialist develops an in-depth understanding of your invoice and payment requirements. For you, this dedication provides a high-quality, easy, and positive financing experience.

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

<https://www.lenovo.com/us/en/landingpage/lenovo-financial-services/>

Seller training courses

The following sales training courses are offered for employees and partners (login required). Courses are listed in date order.

1. Intel Transparent Supply Chain on Lenovo Servers

2024-01-29 | 12 minutes | Employees and Partners

This course introduces the Intel Transparent Supply Chain (TSC) program, explains how the program works, and discusses the benefits of the Intel TSC program to customers. Adding the Intel TSC feature to an order is explained.

Course objectives:

- Describe the Intel® Transparent Supply Chain program
- Explain how the Intel® Transparent Supply Chain program works
- Discuss the benefits of the Intel® Transparent Supply Chain program to Lenovo customers
- Explain how to add Intel® Transparent Supply Chain program feature to an order

Published: 2024-01-29

Length: 12 minutes

Employee link: Grow@Lenovo

Partner link: [Lenovo Partner Learning](#)

Course code: SXXW1230

2. **Family Portfolio: Storage Controller Options**

2024-01-23 | 25 minutes | Employees and Partners

This course covers the storage controller options available for use in Lenovo servers. The classes of storage controller are discussed, along with a discussion of where they are used, and which to choose.

After completing this course, you will be able to:

- Describe the classes of storage controllers
- Discuss where each controller class is used
- Describe the available options in each controller class

Published: 2024-01-23

Length: 25 minutes

Employee link: [Grow@Lenovo](#)

Partner link: [Lenovo Partner Learning](#)

Course code: SXXW1111

3. **Lenovo-Intel Sustainable Solutions QH**

2024-01-22 | 10 minutes | Employees and Partners

This Quick Hit explains how Lenovo and Intel are committed to sustainability, and introduces the Lenovo-Intel joint sustainability campaign. You will learn how to use this campaign to show customers what that level of commitment entails, how to use the campaign's unsolicited proposal approach, and how to use the campaign as a conversation starter which may lead to increased sales.

Published: 2024-01-22

Length: 10 minutes

Employee link: [Grow@Lenovo](#)

Partner link: [Lenovo Partner Learning](#)

Course code: SXXW2524a

4. **FY24Q3 Intel Servers Update**

2023-12-11 | 15 minutes | Employees and Partners

This update is designed to help you discuss the features and customer benefits of Lenovo servers that use the 5th Gen Intel® Xeon® processors. Lenovo has also introduced a new server, the ThinkSystem SD650-N V3, which expands the supercomputer server family. Reasons to call your customer and talk about refreshing their infrastructure are also included as a guideline.

Published: 2023-12-11

Length: 15 minutes

Employee link: [Grow@Lenovo](#)

Partner link: [Lenovo Partner Learning](#)

Course code: SXXW2522a

5. Lenovo Data Center Product Portfolio
2023-07-21 | 15 minutes | Employees and Partners

This course introduces the Lenovo data center portfolio, and covers servers, storage, storage networking, and software-defined infrastructure products. After completing this course about Lenovo data center products, you will be able to identify product types within each data center family, describe Lenovo innovations that this product family or category uses, and recognize when a specific product should be selected.

Published: 2023-07-21
Length: 15 minutes
Employee link: Grow@Lenovo
Partner link: [Lenovo Partner Learning](#)
Course code: SXXW1110r6

6. Partner Technical Webinar - Data Center Limits and ISG TAA Compliance
2023-05-16 | 60 minutes | Employees and Partners

In this 60-minute replay, we had two topics. First Vinod Kamath, Lenovo Distinguished Engineer for Data Center Cooling presented on the Systems Configuration and Data Center Ambient Limits. Second, Shama Patari, Lenovo Trade Council, and Glenn Johnson, Lenovo Principal Engineer for Supply Chain presented on ISG TAA Compliance.

Published: 2023-05-16
Length: 60 minutes
Employee link: Grow@Lenovo
Partner link: [Lenovo Partner Learning](#)
Course code: 051223

7. Introduction to the Intel Xeon Scalable Gen4 Processors
2022-12-30 | 10 minutes | Employees and Partners

When you complete this course, you should be able to define the Gen4 Intel Xeon Scalable processors and the four tiers used in the family. You should also be able to discuss the new features of the Gen4 processors and the family value proposition.

Published: 2022-12-30
Length: 10 minutes
Employee link: Grow@Lenovo
Partner link: [Lenovo Partner Learning](#)
Course code: SXXW2500

8. Lenovo Infrastructure Solutions Launch
2022-09-16 | 8 minutes | Employees and Partners

This Quick Hit introduces a wealth of new products, solutions, and services announced as part of the Lenovo ThinkSystem 30th Anniversary celebration.

Published: 2022-09-16
Length: 8 minutes
Employee link: Grow@Lenovo
Partner link: [Lenovo Partner Learning](#)
Course code: FY23Q2a

9. **Lenovo Sustainable Computing**

2022-09-16 | 4 minutes | Employees and Partners

This Quick Hit describes the Lenovo sustainable computing program, and the many ways in which Lenovo strives to respect and protect the environment.

Published: 2022-09-16

Length: 4 minutes

Employee link: [Grow@Lenovo](#)

Partner link: [Lenovo Partner Learning](#)

Course code: SXXW2504a

10. **Introduction to DDR5 Memory**

2022-08-23 | 10 minutes | Employees and Partners

This course introduces DDR5 memory, describes new features of this memory generation, and discusses the advantages to customers of this new memory generation.

Published: 2022-08-23

Length: 10 minutes

Employee link: [Grow@Lenovo](#)

Partner link: [Lenovo Partner Learning](#)

Course code: SXXW2502

Related publications and links

For more information, see these resources:

- Product web page for the ThinkSystem SR950 V3:
<https://www.lenovo.com/us/en/p/mission-critical/len21ts0023>
- Datasheet for the SR950 V3
<https://lenovopress.lenovo.com/DS0169>
- ThinkSystem SR950 V3 drivers and support
<http://datacentersupport.lenovo.com/products/servers/thinksystem/sr950-v3/7dc4/downloads>
- Lenovo ThinkSystem SR950 V3 product publications:
<http://thinksystem.lenovofiles.com/help/index.jsp>
 - SR950 V3 User Guide
 - SR950 V3 Hardware Maintenance Guide
 - Rail Installation Guide
 - Cable Management Arm Installation Guide
 - Messages and Codes Reference
 - UEFI Manual for ThinkSystem
- ServerProven hardware compatibility:
<https://serverproven.lenovo.com/>

Related product families

Product families related to this document are the following:

- [8-Socket Rack Servers](#)
- [Mission Critical Servers](#)
- [ThinkSystem SR950 V3 Server](#)

Notices

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

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

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

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

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

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

© Copyright Lenovo 2024. All rights reserved.

This document, LP1729, was created or updated on January 29, 2024.

Send us your comments in one of the following ways:

- Use the online Contact us review form found at:
<https://lenovopress.lenovo.com/LP1729>
- Send your comments in an e-mail to:
comments@lenovopress.com

This document is available online at <https://lenovopress.lenovo.com/LP1729>.

Trademarks

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

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

Lenovo®
AnyBay®
Bootable Media Creator
Flex System
Lenovo Services
ServerProven®
System x®
ThinkShield®
ThinkServer®
ThinkSystem®
UpdateXpress System Packs
XClarity®

The following terms are trademarks of other companies:

Intel® and Xeon® are trademarks of Intel Corporation or its subsidiaries.

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

Microsoft®, ActiveX®, Hyper-V®, PowerShell, Windows PowerShell®, and Windows® are trademarks of Microsoft Corporation in the United States, other countries, or both.

SPECpower® is a trademark of the Standard Performance Evaluation Corporation (SPEC).

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