Lenovo

ThinkSystem D2 Enclosure, Modular Enclosure, Modular enclosure for 6U configuration and ThinkSystem SD530 Compute Node
Setup Guide

Machine Type: 7X20, 7X21, 7X22 and 7X85

Note

Before using this information and the product it supports, be sure to read and understand the safety information and the safety instructions, which are available at:
https://pubs.lenovo.com/safety_documentation/

In addition, be sure that you are familiar with the terms and conditions of the Lenovo warranty for your solution, which can be found at:
http://datacentersupport.lenovo.com/warrantylookup

Seventeenth Edition (March 2023)

Contents

Chapter 1. Introduction

The Product_name is a 2U/6U solution designed for high-volume network transaction processing. This solution includes a single enclosure that can contain up to four SD530 compute nodes, which are designed to deliver a dense, scalable platform for distributed enterprise and hyperconverged solutions.

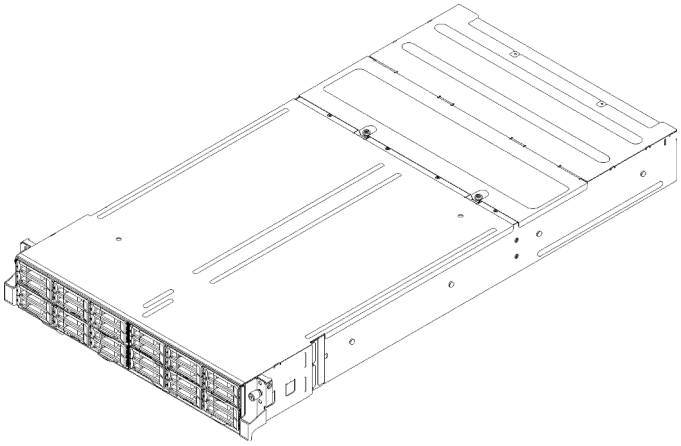


Figure 1. D2 Enclosure 7X20 and Modular Enclosure 7X22

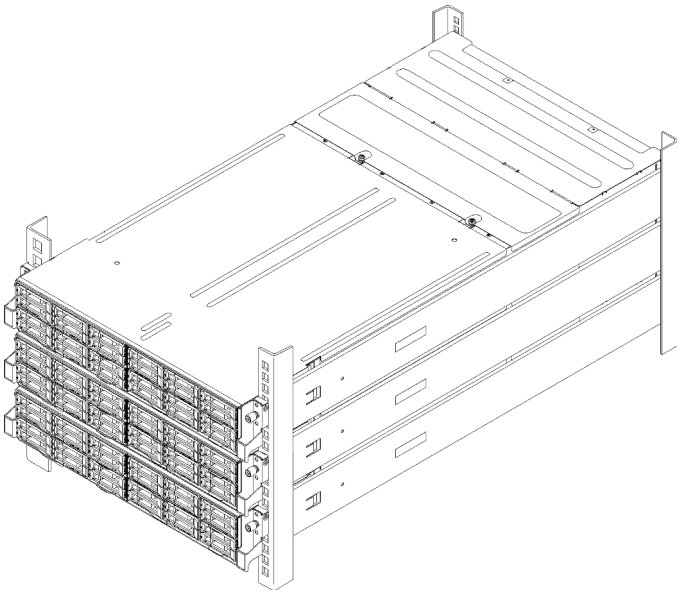


Figure 2. Modular 6U Configuration 7X85

The solution comes with a limited warranty. For details about the warranty, see:
https://support.lenovo.com/us/en/solutions/ht503310

For details about your specific warranty, see:
http://datacentersupport.lenovo.com/warrantylookup

Each SD530 supports up to six 2.5-inch hot-swap Serial Attached SCSI (SAS), Serial ATA (SATA) or Non-Volatile Memory express (NVMe) hard disk drives.

Note: The illustrations in this document might differ slightly from your model.

The enclosure machine type, model number and serial number are on the ID label that can be found on the front of the enclosure, as shown in the following illustration.

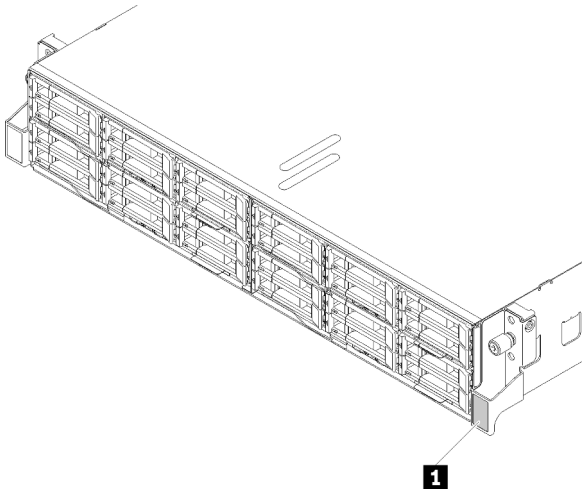


Figure 3. ID label on the front of the enclosure

Table 1. ID label on the front of the enclosure

1 ID label

The network access tag can be found on the front of the node. You can pull way the network access tag to paste your own label for recording some information such as the hostname, the system name and the inventory bar code. Please keep the network access tag for future reference.

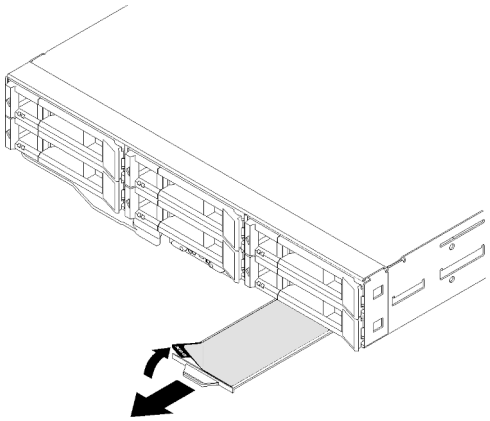


Figure 4. Network access tag on the front of the node

The node model number and serial number are on the ID label that can be found on the front of the node (on the underside of the network access tag), as shown in the following illustration.

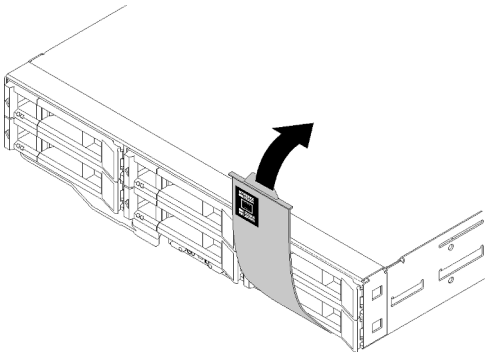


Figure 5. ID label on the front of the node

The system service label, which is on the top of the enclosure, provides a QR code for mobile access to service information. You can scan the QR code using a QR code reader and scanner with a mobile device and get quick access to the Lenovo Service Information website. The Lenovo Service Information website provides additional information for parts installation and replacement videos, and error codes for solution support.

The following illustration shows QR codes for the enclosure and the node.

- **Enclosure:**

  http://datacentersupport.lenovo.com/products/servers/thinksystem/d2-enclosure/7X20

  Figure 6. D2 enclosure 7X20 QR code

  http://datacentersupport.lenovo.com/products/servers/thinksystem/modular-enclosure/7X22

  Figure 7. Modular enclosure 7X22 QR code

- **Node:** http://datacentersupport.lenovo.com/products/servers/thinksystem/sd530/7X21

Figure 8. Compute node QR code

Solution package contents

When you receive your solution, verify that the shipment contains everything that you expected to receive.

The solution package includes the following items:

Note: Some of the items listed are available on select models only.

- Compute node(s)
- Enclosure
- Shuttle
- Rail installation kit (optional). Detailed instructions for installing the rail installation kit are provided in the package with the rail installation kit.
- Cable management arm or cable management bar.
- Material box, including items such as power cords, rack installation template, and accessory kit.

Features

Performance, ease of use, reliability, and expansion capabilities were key considerations in the design of your solution. These design features make it possible for you to customize the system hardware to meet your needs today and provide flexible expansion capabilities for the future.

Enclosure:

- **Redundant cooling and optional power capabilities**

  The enclosure supports a maximum of two 1100-watt , 1600-watt or 2000-watt hot-swap power supplies and five dual-motor hot-swap fans, which provide redundancy for a typical configuration. The redundant cooling by the fans in the enclosure enables continued operation if one of the fails.

  Note: You cannot mix 1100-watt , 1600-watt and 2000-watt power supplies in the enclosure.

- **PCI adapter capabilities**

  The enclosure supports up to eight low-profile PCIe x8 cards (two per node, from processor 1) or four low-profile PCIe x16 cards (one per node, from processor 1).

- **Network support**

  The enclosure supports 10Gb 8-port EIOM SFP+ or 10Gb 8-port EIOM Base-T (RJ45) EIOM cards, which provides either 10Gb or 1Gb Ethernet to each node in the enclosure. The minimum networking speed requirement for the EIOM card is 1Gbps.

- **Redundant networking connection**

  The Lenovo XClarity Controller provides failover capability to a redundant Ethernet connection with the applicable application installed. If a problem occurs with the primary Ethernet connection, all Ethernet traffic that is associated with the primary connection is automatically switched to the optional redundant

Ethernet connection. If the applicable device drivers are installed, this switching occurs without data loss and without user intervention.

- **Systems-management capabilities**

  The enclosure comes with the System Management Module. When the SMM is used with the systems-management software that comes with the solution, you can manage the functions of the solution locally and remotely. The SMM also provides system monitoring, event recording, and network alert capability. For additional information, see the User Guide: *System Management Module User's Guide* at the http://datacentersupport.lenovo.com.

- **Features on Demand**

  If a Features on Demand feature is integrated in the solution or in an optional device that is installed in the solution, you can purchase an activation key to activate the feature. For information about Features on Demand, see:

  https://fod.lenovo.com/lkms

- **Mobile access to Lenovo Service Information website**

  The enclosure provides a QR code on the system service label, which is on the cover of the enclosure, that you can scan using a QR code reader and scanner with a mobile device to get quick access to the Lenovo Service Information website. The Lenovo Service Information website provides additional information for parts installation, replacement videos, and error codes for solution support.

Node:

- **Multi-core processing**

  The compute node supports Intel Xeon E5-26xx v4 series multi-core processors. The compute node comes with one processor installed.

- **Large data-storage capacity and hot-swap capability (6 drive bays per node)**

  The solution supports a maximum of twenty-four 2.5-inch hot-swap Serial Attached SCSI (SAS), Serial ATA (SATA) or Non-Volatile Memory express (NVMe) drives.

- **Active Memory**

  The Active Memory feature improves the reliability of memory through memory mirroring. Memory mirroring mode replicates and stores data on two pairs of DIMMs within two channels simultaneously. If a failure occurs, the memory controller switches from the primary pair of memory DIMMs to the backup pair of DIMMs.

- **Large system-memory capacity**

  This solution supports up to maximum of 1,024 GB of system memory (2 TB with DCPMM and RDIMMs in Memory Mode). The memory controller supports error correcting code (ECC) for up to 4 industry-standard PC4-19200 (DDR4-2400), DDR4 (fourth-generation double-data-rate). For more information about the specific types and maximum amount of memory, see “Compute node specifications” on page 9.

- **RAID support**

  The ThinkSystem RAID adapter provides hardware redundant array of independent disks (RAID) support to create configurations. The standard RAID adapter provides RAID levels 0, 1, 5, and 10. An optional RAID adapter is available for purchase.

  Note: During RAID rebuild process, HDD is considered as non-useable. HDD tray Yellow LED will blink and Global HDD status LED will be on. This EVENT will be logged in Lenovo XClarity Controller. When the rebuild process is completed, HDD tray Amber LED and Global HDD status LED will be off. User can refer to HBA utility to confirm current HDD/RAID status.

- **Integrated Trusted Platform Module (TPM)**

This integrated security chip performs cryptographic functions and stores private and public secure keys. It provides the hardware support for the Trusted Computing Group (TCG) specification. You can download the software to support the TCG specification, when the software is available.

Note: For customers in the People's Republic of China, TPM is not supported. However, customers in the People's Republic of China can install a Trusted Cryptographic Module (TCM) adapter (sometimes called a daughter card).

- **Lenovo XClarity Administrator**

  Lenovo XClarity Administrator is a centralized resource-management solution that enables administrators to deploy infrastructure faster and with less effort. The solution seamlessly integrates into System x, ThinkServer, and NeXtScale servers, as well as the Flex System converged infrastructure platform.

  Lenovo XClarity Administrator provides:

  – Automated discovery
  – Agent-free hardware management
  – Monitoring

  Administrators are able to find the right information and accomplish critical tasks faster through an uncluttered, dashboard-driven graphical user interface (GUI). Centralizing and automating foundational infrastructure deployment and lifecycle management tasks across large pools of systems frees up administrator time, and makes resources available to end-users faster.

  Lenovo XClarity is easily extended into the leading virtualization management platforms from Microsoft and VMware using software plug-ins, called Lenovo XClarity Integrators. The solution improves workload uptime and service-level assurance by dynamically relocating workloads from affected hosts in the cluster during rolling solution reboots or firmware updates, or during predicted hardware failures.

  For more information about Lenovo XClarity Administrator, see the http://shop.lenovo.com/us/en/systems/software/systems-management/xclarity/ and the http://pic.dhe.ibm.com/infocenter/flexsys/information/topic/com.lenovo.lxca.doc/aug_product_page.html.

- **Lenovo XClarity Controller (XCC)**

  The Lenovo XClarity Controller is the common management controller for Lenovo ThinkSystem solution hardware. The Lenovo XClarity Controller consolidates multiple management functions in a single chip on the node system board.

  Some of the features that are unique to the Lenovo XClarity Controller are enhanced performance, higher-resolution remote video, and expanded security options. For additional information about the Lenovo XClarity Controller, see:

  https://pubs.lenovo.com/lxcc-overview/

  Important: Lenovo XClarity Controller (XCC) supported version varies by product. All versions of Lenovo XClarity Controller are referred to as Lenovo XClarity Controller and XCC in this document, unless specified otherwise. To see the XCC version supported by your server, go to https://pubs.lenovo.com/lxcc-overview/.

- **UEFI-compliant server firmware**

  Lenovo ThinkSystem firmware is Unified Extensible Firmware Interface (UEFI) compliant. UEFI replaces BIOS and defines a standard interface between the operating system, platform firmware, and external devices.

  Lenovo ThinkSystem servers are capable of booting UEFI-compliant operating systems, BIOS-based operating systems, and BIOS-based adapters as well as UEFI-compliant adapters.

  Note: The solution does not support Disk Operating System (DOS).

- **Features on Demand**

  If a Features on Demand feature is integrated in the solution or in an optional device that is installed in the solution, you can purchase an activation key to activate the feature. For information about Features on Demand, see:

  https://fod.lenovo.com/lkms

- **Light path diagnostics**

  Light path diagnostics provides LEDs to help you diagnose problems. For more information about the light path diagnostics, see Light path diagnostics panel and Light path diagnostics LEDs.

- **Mobile access to Lenovo Service Information website**

  The node provides a QR code on the system service label, which is on the cover of the node, that you can scan using a QR code reader and scanner with a mobile device to get quick access to the Lenovo Service Information website. The Lenovo Service Information website provides additional information for parts installation, replacement videos, and error codes for solution support.

Specifications

The following information is a summary of the features and specifications of the solution. Depending on the model, some features might not be available, or some specifications might not apply.

Enclosure specifications

Features and specifications of the enclosure.

Table 2. Enclosure specifications

Specification	Description
PCI expansion slots (depending on the enclosure model)	• PCIe 3.0 x8 shuttle: – Supports up to eight low-profile PCIe 3.0 x8 adapters One node supports up to two low-profile PCIe 3.0 x8 adapters from processor 1 • PCIe 3.0 x16 shuttle: – Supports up to four low-profile PCIe 3.0 x16 adapters One node supports one low-profile PCIe 3.0 x16 adapters from processor 1 **Notes:** 1. PCIe 3.0 x16 shuttle supports PCIe cassettes that can be installed and removed without removing the shuttle from the enclosure. 2. Ensure to power off the node before unseating the PCIe cassette from the shuttle.
Hot-swap fans	• Three 60x60x56mm fans • Two 80x80x80mm fans
Power supply (depending on the model)	Supports up to two hot-swap power supplies for redundancy support. (Except for the application of 240V DC applied through C14 input connect) • 1100-watt ac power supply • 1600-watt ac power supply • 2000-watt ac power supply **Important:** Power supplies and redundant power supplies in the enclosure must be with the same power rating, wattage or level.
System Management Module (SMM)	• Hot-swappable • Equipped with ASPEED controller • Offers RJ45 port for management of nodes and SMM over 1G Ethernet

Table 2. Enclosure specifications (continued)

Specification	Description
Ethernet I/O ports	Access to a pair of on-board 10Gb connections through two types of optional enclosure level EIOM cards. • Two optional EIOM cards: – 10Gb 8-port EIOM SFP+ – 10Gb 8-port EIOM Base-T (RJ45) • Minimum networking speed requirement for the EIOM card: 1Gbps **Notes:** 1. The EIOM card is installed in the enclosure and it provides direct access to LAN functions provided by each node. 2. iSCSI external storage devices are not supported when shared PCIe dual adapters are installed.
Size	2U enclosure • Height: 87.0 mm (3.5 inches) • Depth: 891.5 mm (35.1 inches) • Width: 488.0 mm (19.3 inches) • Weight: – Minimum configuration (with one minimal configuration node): 22.4 kg (49.4 lbs) – Maximum configuration (with four maximal configuration nodes): 55.0 kg (121.2 lbs)
Acoustical noise emissions	With the maximum configuration of four nodes with two processors installed, full memory installed, full drives installed, and two 2000-watt power supplies installed: • Operation: 6.8 bels • Idle: 6.2 bels
Heat output (based on two 2000-watt power supplies)	Approximate heat output: • Minimum configuration (with one minimal configuration node): 604.1 BTU per hour (177 watts) • Maximum configuration (with four maximal configuration nodes): 7564.4 BTU per hour (2610 watts)

Table 2. Enclosure specifications (continued)

Specification	Description
Electrical input	• Sine-wave input (50-60 Hz) required • Input voltage low range: 1100W is limited to 1050W – Minimum: 100 V AC – Maximum: 127 V AC • Input voltage high range: 1100W/1600W/2000W – Minimum: 200 V AC – Maximum: 240 V AC • Input kilovolt-amperes (kVA), approximately: – Minimum: 0.153 kVA – Maximum: 2.61 kVA **CAUTION:** **1. 240 V dc input (input range: 180-300 V dc) is ONLY supported in Chinese Mainland.** **2. Power supplies with 240 V dc are not hot-swappable. To remove the power cord, ensure you have turned off the server or disconnected the dc power sources at the breaker panel.** **3. In order for the ThinkSystem products to operate error free in both a DC or AC electrical environment, a TN-S earthing system which complies to 60364-1 IEC 2005 standard has to be present or installed.**
Minimal configuration for debugging	• One D2 enclosure • One SD530 compute node • One processor in processor socket 1 • One DIMM in slot 6 in the compute node • One CFF v3 power supply • One drive with hardware/software RAID and backplane (if OS is needed for debugging)

Modular 6U configuration specifications

Table 3. Modular enclosure for 6U configuration specifications

Specification	Description
Size	Each modular enclosure for 6U configuration is of the following dimension: • Height: 87.0 mm (3.5 inches) • Depth: 891.5 mm (35.1 inches) • Width: 488.0 mm (19.3 inches) Weight: • Minimum configuration (with one minimal configuration node): 67.2 kg (148.2 lbs) • Maximum configuration (with four maximal configuration nodes): 165.0 kg (363.6 lbs)
Acoustical noise emissions	With the maximum configuration of twelve nodes with two processors installed, full memory installed, full drives installed, and two 2000W power supplies installed: • Operation: 6.8 bels • Idle: 6.2 bels
Heat output (based on two 2000-Watt power supplies)	Approximate heat output: • Minimum configuration (with one minimal configuration node): 604.1 BTU per hour (177 watts) • Maximum configuration (with four maximal configuration nodes): 7564.4 BTU per hour (2610 watts)

Compute node specifications

Features and specifications of the compute node.

Table 4. Compute node specifications

Specification	Description
Size	Node • Height: 41.0 mm (1.7 inches) • Depth: 562.0 mm (22.2 inches) • Width: 222.0 mm (8.8 inches) • Weight: – Minimum weight: 3.5 kg (7.7 lb) – Maximum weight: 7.5 kg (16.6 lb)
Processor (depending on the model)	• Supports up to two Intel Xeon series multi-core processors (one installed) • Level-3 cache **Notes:** 1. Use the Setup utility to determine the type and speed of the processors in the node. 2. For a list of supported processors, see https://serverproven.lenovo.com/. 3. Due to lower operational processor temperature requirements, full performance cannot be guaranteed and processor throttling may occur when the ambient temperature is above 27°C or when a fan failure event occurs for the following processor SKUs: • 6248R • 6258R 4. Processor 6248R comes with the following limitations: • Supported quantity of drives goes up to two. • PCIe expansion nodes are not supported when 6248R processors are installed in the compute node. • Only the following PCIe adapters are supported: – ThinkSystem M.2 Enablement Kit – ThinkSystem M.2 with Mirroring Enablement Kit – Intel OPA 100 Series Single-port PCIe 3.0 x16 HFA – Intel OPA 100 Series Single-port PCIe 3.0 x8 HFA – ThinkSystem Mellanox ConnectX-6 HDR100 QSFP56 1-port PCIe InfiniBand Adapter

Table 4. Compute node specifications (continued)

Specification	Description
Memory	See "Memory module installation order" on page 66 for detailed information about memory configuration and setup. • Minimum: 8 GB (single TruDDR4 DRAM DIMM with one processor) • Maximum: – 512 GB with 16 x 32 GB RDIMM – 1,024 GB with 16 x 64 GB LRDIMM – 2 TB with DC Persistent Memory Module (DCPMM) and RDIMMs in Memory Mode • Memory module types: – Double-data-rate 4 (TruDDR4) error correcting code (ECC) 2666 MT/s registered DIMM (RDIMM) or load reduced DIMM (LRDIMM) – DC Persistent Memory Module (DCPMM) • Capacity (depending on the model): – 8 GB, 16 GB, and 32 GB RDIMM – 64 GB LRDIMM – 128 GB, 256 GB, and 512 GB DCPMM **Note:** DCPMM can be mixed with DRAM DIMMs with capacity of more than 16 GB. See "DC Persistent Memory Module (DCPMM) setup" on page 104 for more information. • Slots: 16 DIMM slots that support up to – 16 DRAM DIMMs – Four DCPMMs and 12 DRAM DIMMs For a list of supported memory modules, see https://serverproven.lenovo.com/. **Note:** List of supported memory module is different for 1st generation (Skylake) and 2nd generation (Cascade Lake) Intel Xeon processors. Make sure to install compatible memory modules to avoid system error.
Drive bays	Supports up to six 2.5-inch hot-swap SAS/SATA/NVMe drive bays. **Attention:** As a general consideration, do not mix standard 512-byte and advanced 4-KB format drives in the same RAID array because it might lead to potential performance issues. Supports the following 2.5-inch hot-swap drive backplanes: • Four 2.5-inch hot-swap SAS/SATA backplane • Four 2.5-inch NVMe backplane • Six 2.5-inch hot-swap SAS/SATA backplane • Six 2.5-inch hot-swap SAS/SATA/NVMe backplane **Important:** Do not mix nodes with the four-drive backplane and six-drive backplanes in the same enclosure, as it may cause unbalanced cooling.
RAID adapters (depending on the model)	• Software RAID supports for RAID levels 0, 1, 5, and 10 • Hardware RAID supports for RAID levels 0, 1, 5, and 10
Video controller (integrated into Lenovo XClarity Controller)	• ASPEED • SVGA compatible video controller • Avocent Digital Video Compression • Video memory is not expandable **Note:** Maximum video resolution is 1920 x 1200 at 60 Hz.

Table 4. Compute node specifications (continued)

Specification	Description
Ethernet I/O port	Access to a pair of on-board 10Gb connections through two types of optional enclosure level EIOM cards. • Two optional EIOM cards: – 10Gb 8-port EIOM SFP+ – 10Gb 8-port EIOM Base-T (RJ45) • Minimum networking speed requirement for the EIOM card: 1Gbps **Note:** The EIOM card is installed in the enclosure and it provides direct access to LAN functions provided by each node.
Operating System	Supported and certified operating systems include: • Microsoft Windows Server • VMware ESXi • Red Hat Enterprise Linux • SUSE Linux Enterprise Server References: • Complete list of available operating systems: https://lenovopress.lenovo.com/osig. • OS deployment instructions: “Deploy the operating system” on page 152.

Table 4. Compute node specifications (continued)

Specification	Description
Environment	The ThinkSystem SD530 complies with ASHRAE class A2 specifications. Depending on the hardware configuration, some solution models comply with ASHRAE Class A3 or Class A4 specifications. System performance may be impacted when operating temperature is outside ASHRAE A2 specification or fan failed condition. To comply with ASHRAE Class A3 and Class A4 specifications, the ThinkSystem SD530 needs to meet the following hardware configuration requirements: • Lenovo supported processors. For unsupported processors, see the following attention for details[1]. • Lenovo supported PCIe adapters. For unsupported PCIe adapters, see the following attention for details[2]. • Two power supplies installed for redundancy. 1100-watt power supplies are not supported. The ThinkSystem SD530 is supported in the following environment: • Air temperature: Power on[3]: – ASHRAE Class A2: 10°C - 35°C (50°F - 95°F); Above 900 m (2,953 ft), de-rated maximum air temperature 1°C / 300m (984 ft) – ASHRAE Class A3: 5°C - 40°C (41°F - 104°F); Above 900 m (2,953 ft), de-rated maximum air temperature 1°C / 175m (574 ft) – ASHRAE Class A4: 5°C - 45°C (41°F - 113°F); Above 900 m (2,953 ft), de-rated maximum air temperature 1°C / 125m (410 ft) Power off[4]: 5°C to 45°C (41°F to 113°F) • Maximum altitude: 3,050 m (10,000 ft) • Relative Humidity (non-condensing):Power on[3]: – ASHRAE Class A2: 8% - 80%, maximum dew point : 21°C (70°F) – ASHRAE Class A3: 8% - 85%, maximum dew point : 24°C (75°F) – ASHRAE Class A4: 8% - 90%, maximum dew point : 24°C (75°F) Shipment/storage: 8% - 90% • Particulate contamination: Airborne particulates and reactive gases acting alone or in combination with other environmental factors such as humidity or temperature might pose a risk to the solution. For information about the limits for particulates and gases, see *Particulate contamination* .
Power rating	12 V DC, 60 A

Attention:

1. The following processors are not supported with ASHRAE Class A3 and Class A4 specifications:
   - 165W processor, 28-core, 26-core or 18-core (Intel Xeon 8176, 8176M, 8170, 8170M, and 6150)
   - 150W processor, 26-core, 24-core, 20-core, 16-core or 12-core (Intel Xeon 8164, 8160, 8160M, 8158, 6148, 6142, 6142M, and 6136)
   - 140W processor, 22-core or 18-core (Intel Xeon 6152, 6140, and 6140M)
   - 140W processor, 14-core (Intel Xeon 6132)
   - 130W processor, 8-core (Intel Xeon 6134 and 6134M)
   - 125W processor, 20-core, 16-core or 12-core (Intel Xeon 6138, 6138T, 6130T, 6126)

- 115W processor, 6-core (Intel Xeon 6128)
- 105W processor, 14-core or 4-core (Intel Xeon 8156, 5122, and 5120T)
- 70W processor, 8-core (Intel Xeon 4109T)

Note: The listed processors are included but not limited to the above list only.

2. The following processors are not supported with ASHRAE Class A2, Class A3 and Class A4 specifications. The following processors are provided for special bid configuration only and need customer's acceptance on the limitation consequence. The limitation includes experiencing power capping and a slight drop in performance when ambient is above 27°C.
   - 205W processor, 28-core or 24-core (Intel Xeon 8180, 8180M and 8168)
   - 200W processor, 18-core (Intel Xeon 6154)
   - 165W processor, 12-core (Intel Xeon 6146)
   - 150W processor, 24-core (Intel Xeon 8160T)
   - 150W processor, 8-core (Intel Xeon 6144)
   - 125W processor, 12-core (Intel Xeon 6126T)

   Note: The listed processors are included but not limited to the above list only.
3. The following PCIe adapters are not supported with ASHRAE Class A3 and Class A4 specifications:
   - Mellanox NIC with active optical cable
   - PCIe SSD
   - GPGPU card

   Note: The listed PCIe adapters are included but not limited to the above list only.

PCIe expansion node specifications

Features and specifications of the PCIe expansion node.

PCIe expansion node specifications

Table 5. PCIe expansion node specifications

Specification	Description
Size	PCIe expansion node • Height: 41.0 mm (1.7 inches) • Depth: 562.0 mm (22.2 inches) • Width: 222.0 mm (8.8 inches) • Weight: – Minimum weight: 2.1 kg (4.6 lb)
PCI expansion slots	Supports up to two PCIe adapters with the following requirements: 1. When a compute-expansion node assembly is installed in an enclosure: • Two 2000-watt ac power supplies are required. • The other two node bays in the same enclosure must be installed with either of the following: – Another compute-expansion node assembly with one four-drive backplane installed in the compute node – Two node fillers 2. In the compute node that comes with the PCIe expansion node assembly: • No RAID adapter should be installed in the compute node. • Only four-drive backplanes are supported. • No more than 12 DIMMs should be installed in the compute node. • When two GPU adapters are installed: a. Two processors are required in the compute node. b. Four-drive NVMe backplane is not supported. 3. Concerning the GPU adapters installed in the node assembly: • Up to two 300 W passive GPU adapters (without fans) are supported. • The two GPU adapters must be of the same type. • When only one GPU adapter is installed, it has to be installed in the rear riser slot.
Power rating	12 V DC, 60 A

Particulate contamination

Attention: 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 pose a risk to the device that is described in this document.

Risks that are posed by the presence of excessive particulate levels or concentrations of harmful gases include damage that might cause the device to malfunction or cease functioning altogether. This specification sets forth limits for particulates and gases that are intended to avoid such damage. The limits must not be viewed or used as definitive limits, because numerous other factors, such as temperature or moisture content of the air, can influence the impact of particulates or environmental corrosives and gaseous contaminant transfer. In the absence of specific limits that are set forth in this document, you must implement practices that maintain particulate and gas levels that are consistent with the protection of human health and safety. If Lenovo determines that the levels of particulates or gases in your environment have

caused damage to the device, Lenovo may condition provision of repair or replacement of devices or parts on implementation of appropriate remedial measures to mitigate such environmental contamination. Implementation of such remedial measures is a customer responsibility.

Table 6. Limits for particulates and gases

Contaminant	Limits
Reactive gases	Severity level G1 as per ANSI/ISA 71.04-1985[1]: • The copper reactivity level shall be less than 200 Angstroms per month (Å/month ≈ 0.0035 μg/cm^2-hour weight gain).[2] • The silver reactivity level shall be less than 200 Angstroms per (Å/month ≈ 0.0035 μg/cm^2-hour weight gain).[3] • The reactive monitoring of gaseous corrosivity must be conducted approximately 5 cm (2 in.) in front of the rack on the air inlet side at one-quarter and three-quarter frame height off the floor or where the air velocity is much higher.
Airborne particulates	Data centers must meet the cleanliness level of ISO 14644-1 class 8. For data centers without airside economizer, the ISO 14644-1 class 8 cleanliness might be met by choosing one of the following filtration methods: • The room air might be continuously filtered with MERV 8 filters. • Air entering a data center might be filtered with MERV 11 or preferably MERV 13 filters. For data centers with airside economizers, the choice of filters to achieve ISO class 8 cleanliness depends on the specific conditions present at that data center. • The deliquescent relative humidity of the particulate contamination should be more than 60% RH.[4] • Data centers must be free of zinc whiskers.[5]

[1] ANSI/ISA-71.04-1985. *Environmental conditions for process measurement and control systems: Airborne contaminants*. Instrument Society of America, Research Triangle Park, North Carolina, U.S.A.

[2] The derivation of the equivalence between the rate of copper corrosion growth in the thickness of the corrosion product in Å/month and the rate of weight gain assumes that Cu_2S and Cu_2O grow in equal proportions.

[3] The derivation of the equivalence between the rate of silver corrosion growth in the thickness of the corrosion product in Å/month and the rate of weight gain assumes that Ag_2S is the only corrosion product.

[4] The deliquescent relative humidity of particulate contamination is the relative humidity at which the dust absorbs enough water to become wet and promote ionic conduction.

[5] Surface debris is randomly collected from 10 areas of the data center on a 1.5 cm diameter disk of sticky electrically conductive tape on a metal stub. If examination of the sticky tape in a scanning electron microscope reveals no zinc whiskers, the data center is considered free of zinc whiskers.

Management options

The XClarity portfolio and other system management options described in this section are available to help you manage the servers more conveniently and efficiently.

Overview

Options	Description
Lenovo XClarity Controller	Baseboard management controller. (BMC) Consolidates the service processor functionality, Super I/O, video controller, and remote presence capabilities into a single chip on the server system board. **Interface** • CLI application • Web GUI interface • Mobile application • REST API **Usage and downloads** https://pubs.lenovo.com/lxcc-overview/
Lenovo XClarity Administrator	Centralized interface for multi-server management. **Interface** • Web GUI interface • Mobile application • REST API **Usage and downloads** http://sysmgt.lenovofiles.com/help/topic/com.lenovo.lxca.doc/aug_product_page.html
Lenovo XClarity Essentials toolset	Portable and light toolset for server configuration, data collection, and firmware updates. Suitable both for single-server or multi-server management contexts. **Interface** • **OneCLI**: CLI application • **Bootable Media Creator**: CLI application, GUI application • **UpdateXpress**: GUI application **Usage and downloads** https://pubs.lenovo.com/lxce-overview/

Options	Description
Lenovo XClarity Provisioning Manager	UEFI-based embedded GUI tool on a single server that can simplify management tasks. **Interface** • Web interface (BMC remote access) • GUI application **Usage and downloads** https://pubs.lenovo.com/lxpm-overview/ **Important:** Lenovo XClarity Provisioning Manager (LXPM) supported version varies by product. All versions of Lenovo XClarity Provisioning Manager are referred to as Lenovo XClarity Provisioning Manager and LXPM in this document, unless specified otherwise. To see the LXPM version supported by your server, go to https://pubs.lenovo.com/lxpm-overview/.
Lenovo XClarity Integrator	Series of applications that integrate the management and monitoring functionalities of the Lenovo physical servers with the software used in a certain deployment infrastructure, such as VMware vCenter, Microsoft Admin Center, or Microsoft System Center while delivering additional workload resiliency. **Interface** GUI application **Usage and downloads** https://pubs.lenovo.com/lxci-overview/
Lenovo XClarity Energy Manager	Application that can manage and monitor server power and temperature. **Interface** • Web GUI Interface **Usage and downloads** https://datacentersupport.lenovo.com/solutions/lnvo-lxem
Lenovo Capacity Planner	Application that supports power consumption planning for a server or rack. **Interface** • Web GUI Interface **Usage and downloads** https://datacentersupport.lenovo.com/solutions/lnvo-lcp

Functions

Options		Functions							
		Multi-system mgmt	**OS deploy-ment**	**System configu-ration**	**Firm-ware up-dates[1]**	**Event-s/alert moni-toring**	**Inven-tory/ logs**	**Pow-er mgmt**	**Power planning**
Lenovo XClarity Controller				√	√[2]	√	√[4]		
Lenovo XClarity Administrator		√	√	√	√[2]	√	√[4]		
Lenovo XClarity Essen-tials toolset	OneCLI	√		√	√[2]	√	√[4]		
	Bootable Media Creator			√	√[2]		√[4]		
	UpdateXpress			√	√[2]				
Lenovo XClarity Provisioning Manager			√	√	√[3]		√[5]		
Lenovo XClarity Integrator		√	√[6]	√	√	√	√	√[7]	
Lenovo XClarity Energy Manager		√				√		√	
Lenovo Capacity Planner									√[8]

Notes:

1. Most options can be updated through the Lenovo tools. Some options, such as GPU firmware or Omni-Path firmware require the use of supplier tools.
2. The server UEFI settings for option ROM must be set to **Auto** or **UEFI** to update firmware using Lenovo XClarity Administrator, Lenovo XClarity Essentials, or Lenovo XClarity Controller.
3. Firmware updates are limited to Lenovo XClarity Provisioning Manager, Lenovo XClarity Controller, and UEFI updates only. Firmware updates for optional devices, such as adapters, are not supported.
4. The server UEFI settings for option ROM must be set to **Auto** or **UEFI** for detailed adapter card information, such as model name and firmware levels, to be displayed in Lenovo XClarity Administrator, Lenovo XClarity Controller, or Lenovo XClarity Essentials.
5. Limited inventory.
6. The Lenovo XClarity Integrator deployment check for System Center Configuration Manager (SCCM) supports Windows operating system deployment.
7. Power management function is supported only by Lenovo XClarity Integrator for VMware vCenter.
8. It is highly recommended that you check the power summary data for your server using Lenovo Capacity Planner before purchasing any new parts.

Chapter 2. Solution components

Use the information in this section to learn about each of the components associated with your solution.

When you contact Lenovo for help, the machine type, model, and serial number information help support technicians to identify your solution and provide faster service.

Each SD530 supports up to six 2.5-inch hot-swap Serial Attached SCSI (SAS), Serial ATA (SATA) or Non-Volatile Memory express (NVMe) drives.

Note: The illustrations in this document might differ slightly from your model.

The enclosure machine type, model number and serial number are on the ID label that can be found on the front of the enclosure, as shown in the following illustration.

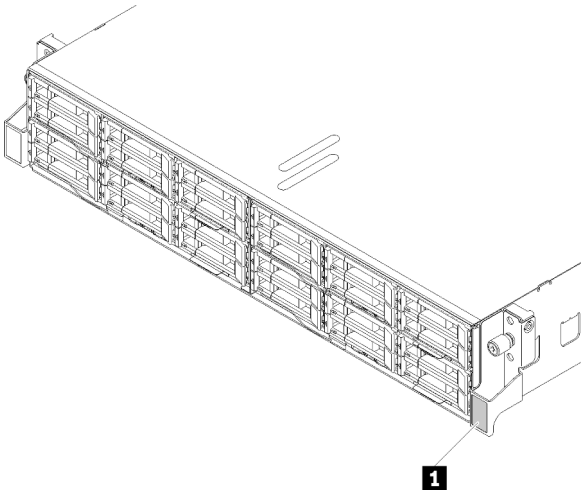


Figure 9. ID label on the front of the enclosure

Table 7. ID label on the front of the enclosure

1 ID label

The network access tag can be found on the front of the node. You can pull way the network access tag to paste your own label for recording some information such as the hostname, the system name and the inventory bar code. Keep the network access tag for future reference.

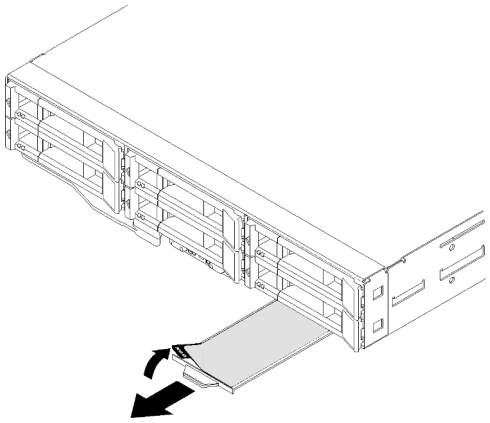


Figure 10. Network access tag on the front of the node

The node model number and serial number are on the ID label that can be found on the front of the node (on the underside of the network access tag), as shown in the following illustration.

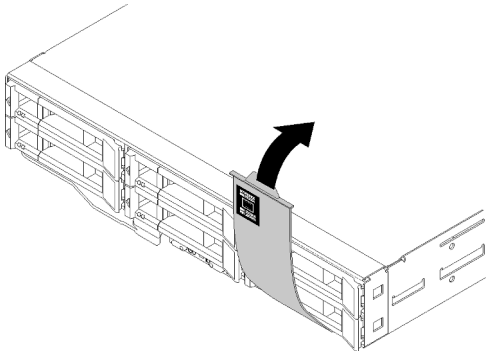


Figure 11. ID label on the front of the node

The system service label, which is on the top of the enclosure, provides a QR code for mobile access to service information. You can scan the QR code using a QR code reader and scanner with a mobile device and get quick access to the Lenovo Service Information website. The Lenovo Service Information website provides additional information for parts installation and replacement videos, and error codes for solution support.

The following illustration shows QR codes for the enclosure and the node.

- **Enclosure:**

  http://datacentersupport.lenovo.com/products/servers/thinksystem/d2-enclosure/7X20

  Figure 12. D2 enclosure 7X20 QR code

  http://datacentersupport.lenovo.com/products/servers/thinksystem/modular-enclosure/7X22

Figure 13. Modular enclosure 7X22 QR code

- **Node:** http://datacentersupport.lenovo.com/products/servers/thinksystem/sd530/7X21

Figure 14. Compute node QR code

Front view

The following illustration shows the controls, LEDs, and connectors on the front of the server.

Enclosure

The following illustration shows the controls, LEDs, and connectors on the front of the enclosure.

Notes:

1. The illustrations in this document might differ slightly from your hardware.
2. For proper cooling, every empty node bay has to be installed with either a node or a node filler before the solution is powered on.

The enclosure supports the following configurations:

Up to **four compute nodes**.

The following illustration shows the node bays in the enclosure.

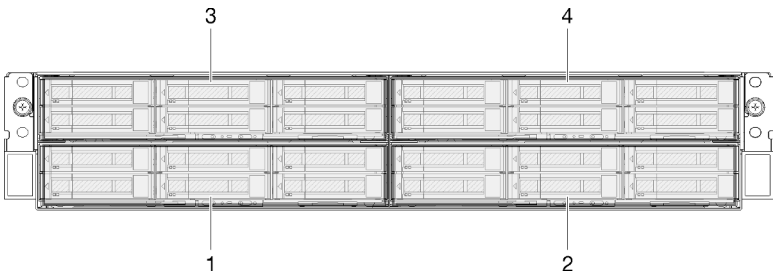


Figure 15. Enclosure front view with compute nodes and node bay numbering

Up to **two PCIe expansion node assemblies**.

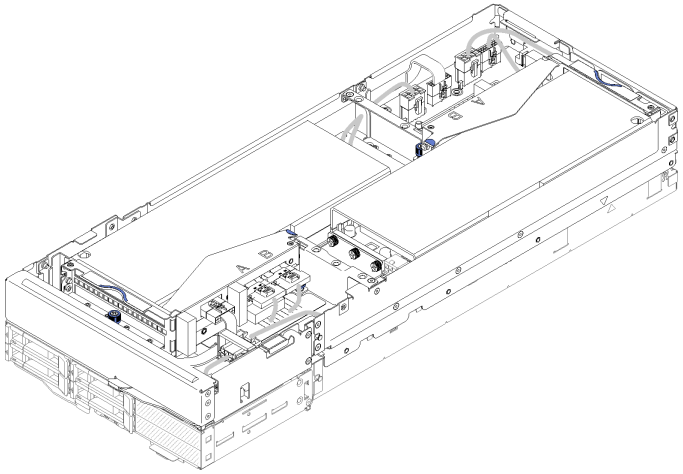


Figure 16. Compute-expansion node assembly

A compute-expansion node assembly consists of a PCIe expansion node and a compute node, to which the expansion node is installed. The node assembly takes two vertically adjacent node bays in an enclosure. See "PCIe expansion node specifications" on page 15 for detailed PCIe expansion node requirements.

Note: Do not mix a compute-expansion node assembly with compute nodes in the same enclosure. When a a compute-expansion node assembly is installed in an enclosure, fill the other two node bays with either two node fillers or another unit of compute-expansion node assembly.

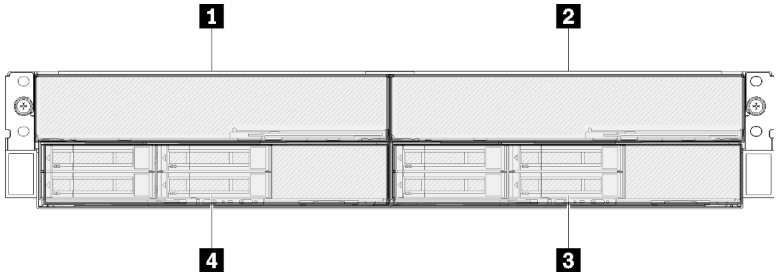


Figure 17. Enclosure front view with PCIe expansion node assemblies

Table 8. Enclosure front view with PCIe expansion node assemblies

1 PCIe expansion node	3 Compute node
2 PCIe expansion node	4 Compute node

Compute node

The following illustration shows the controls, LEDs, and connectors on the front of the compute node.

Six 2.5-inch drive configuration

See the following illustration for components, connectors and drive bay numbering in six 2.5-inch drive configuration.

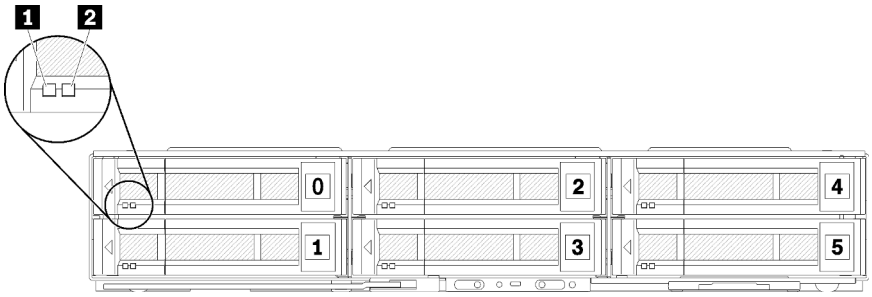


Figure 18. Six 2.5-inch drive configuration and drive bay numbering

Table 9. Components in six 2.5-inch drive configuration

1 Activity LED (green)	2 Status LED (yellow)

Drive LEDs:

1 Activity LED (green): Green LEDs are on all hot swap drives. When this green LED is lit, it indicates that there is activity on the associated hard disk drive or solid-state drive.

- When this LED is flashing, it indicates that the drive is actively reading or writing data.
- For SAS and SATA drives, this LED is off when the drive is powered but not active.
- For NVMe (PCIe) SSDs, this LED is on solid when the drive is powered but not active.

Note: The drive activity LED might be in a different location on the front of the drive, depending on the drive type that is installed.

2 Status LED (yellow): The state of this yellow LED indicates an error condition or the RAID status of the associated hard disk drive or solid-state drive:

- When the yellow LED is lit continuously, it indicates that an error has occurred with the associated drive. The LED turns off only after the error is corrected. You can check event logs to determine the source of the condition.
- When the yellow LED flashes slowly, it indicates that the associated drive is being rebuilt.
- When the yellow LED flashes rapidly, it indicates that the associated drive is being located.

Note: The hard disk drive status LED might be in a different location on the front of the hard disk drive, depending on the drive type that is installed.

Five 2.5-inch drive configuration with KVM breakout module

See the following illustration for components, connectors and drive bay numbering in five 2.5-inch drive configuration with KVM breakout module.

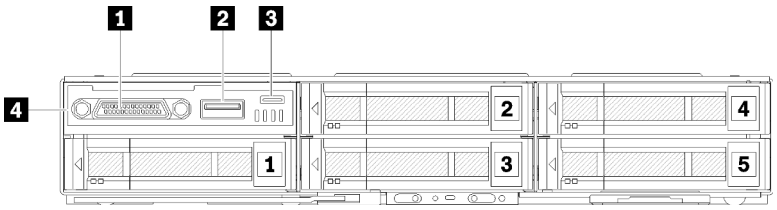


Figure 19. Five 2.5-inch drive configuration with KVM breakout module and drive bay numbering

Table 10. Components in five 2.5-inch drive configuration with the KVM breakout module

1 KVM connector	3 Micro USB connector for Lenovo XClarity Controller management
2 USB 3.0 connector	4 KVM breakout module

KVM breakout module comes with the following connectors:

1 **KVM connector:** Connect the console breakout cable to this connector (see "KVM breakout cable" on page 35 more information).

2 **USB 3.0 connector:** Connect a USB device to this USB 3.0 connector.

3 **Micro USB connector for Lenovo XClarity Controller management:** The connector provides direct access to Lenovo XClarity Controller by allowing you to connect a mobile device to the system and manage it with Lenovo XClarity Controller. For more details, see https://pubs.lenovo.com/lxcc-overview/ and http://sysmgt.lenovofiles.com/help/topic/com.lenovo.lxca.doc/aug_product_page.html for more information.

Notes:

1. Ensure that you use a high-quality OTG cable or a high-quality converter when connecting a mobile device. Be aware that some cables that are supplied with mobile devices are only for charging purposes.
2. Once a mobile device is connected, it indicates it is ready to use and no further action is required.

Four 2.5-inch drive configuration with KVM breakout module

See the following illustration for components, connectors and drive bay numbering in four 2.5-inch drive configuration with KVM breakout module.

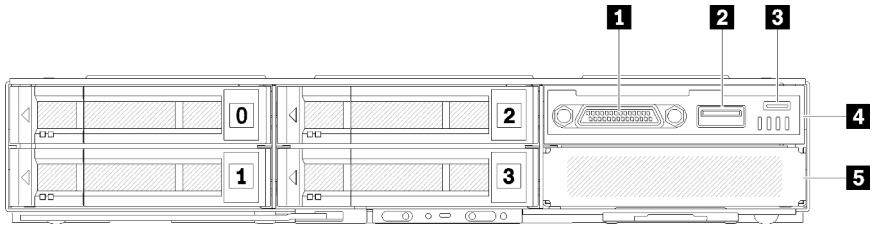


Figure 20. Four 2.5-inch drive configuration with KVM breakout module and drive bay numbering

Table 11. Components in four 2.5-inch drive configuration with the KVM breakout module

1 KVM connector	4 KVM breakout module
2 USB 3.0 connector	5 Drive bay filler
3 Micro USB connector for Lenovo XClarity Controller management	

Node operator panel

The following illustration shows the controls and LEDs on the node operator panel.

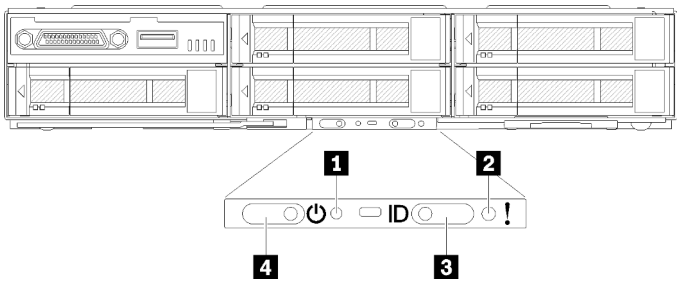


Figure 21. Node operator panel

Table 12. Node operator panel

1 NMI pinhole	3 Identification button/LED
2 System error LED	4 Power button/LED

1 NMI pinhole: Insert the tip of a straightened paper clip into this pinhole to force a non-maskable interrupt (NMI) upon the node, and consequent memory dump would take place. Only use this function while advised by Lenovo support representative.

2 System error LED: When this LED (yellow) is lit, it indicates that at least one system error has occurred. Check the event log for additional information.

3 Identification button/LED: This LED (blue) serves to visually locate the compute node, and can be turned on with pressing on the identification button or the following commands.

- Command to turn Identification LED on:

  ```
  ipmitool.exe -I lanplus -H <XCC's IP> -U USERID -P PASSWORD raw 0x3a 0x08 0x01 0x01
  ```

- Command to turn Identification LED off:

  ```
  ipmitool.exe -I lanplus -H <XCC's IP> -U USERID -P PASSWORD raw 0x3a 0x08 0x01 0x00
  ```

  Notes:

  1. Default XCC's IP address is 192.168.70.125
  2. The behavior of this LED is determined by the SMM ID LED when SMM ID LED is turned on or blinking. For the exact location of SMM ID LED, see "System Management Module (SMM)" on page 29.

  Table 13. Different SMM ID LED modes and Node ID LED behavior

SMM identification LED	Node identification LEDs
Off	All node ID LEDs are turned off when this mode is activated. Afterwards, SMM ID LED enters accept mode, while node ID LEDs determine the behavior of SMM ID LEDs (see "Enclosure rear overview" in *System Management Module User's Guide* for more information).
On	All the node ID LEDs are on except the blinking ones, which remain blinking.
Blink	All the node ID LEDs are blinking regardless of previous status.

4 Power button/LED: When this LED is lit (green), it indicates that the node has power. This green LED indicates the power status of the compute node:

- Flashing rapidly: The LED flashes rapidly for the following reasons:

  - The node has been installed in an enclosure. When you install the compute node, the LED flashes rapidly for up to 90 seconds while the Lenovo XClarity Controller in the node is initializing.
  - The power source is not sufficient to turn on the node.
  - The Lenovo XClarity Controller in the node is not communicating with the System Management Module.
- Flashing slowly: The node is connected to the power through the enclosure and ready to turn on.
- Lit continuously: The node is connected to the power through the enclosure.
- Not lit continuously: No power on node.

Rear view

The following illustration shows the connectors and LEDs on the rear of the enclosure.

The following illustration shows the rear view of the entire system.

- Shuttle with eight low profile PCIe x8 slots

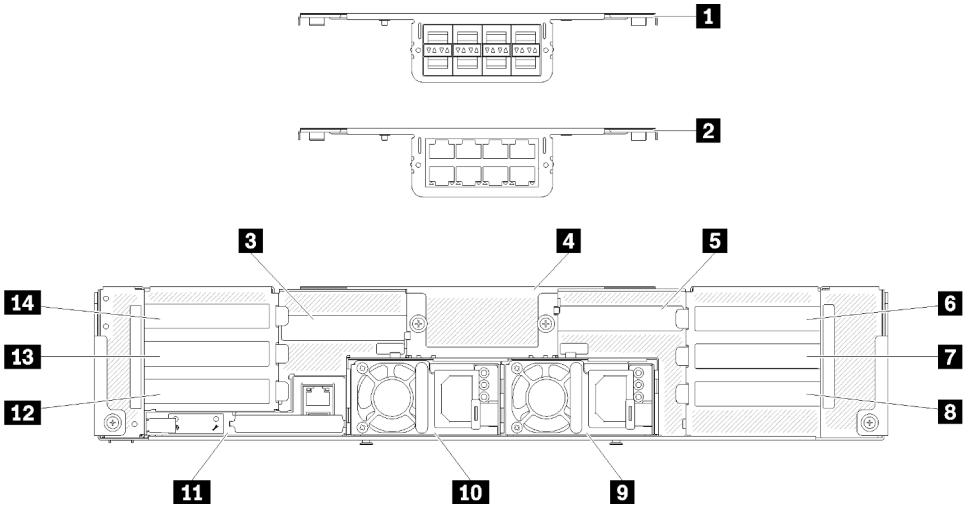


Figure 22. Rear view - The enclosure with x8 shuttle installed

Table 14. Components on x8 shuttle

1 10Gb 8-port EIOM cage (SFP+)	8 PCIe slot 1-B
2 10Gb 8-port EIOM cage (RJ45)	9 Power supply 2
3 PCIe slot 4-B	10 Power supply 1
4 10Gb 8-port EIOM cage filler	11 System Management Module
5 PCIe slot 3-B	12 PCIe slot 2-B
6 PCIe slot 3-A	13 PCIe slot 2-A
7 PCIe slot 1-A	14 PCIe slot 4-A

Note: Make sure the power cord is properly connected to every power supply unit installed.

- Shuttle with four low profile PCIe x16 cassette bays

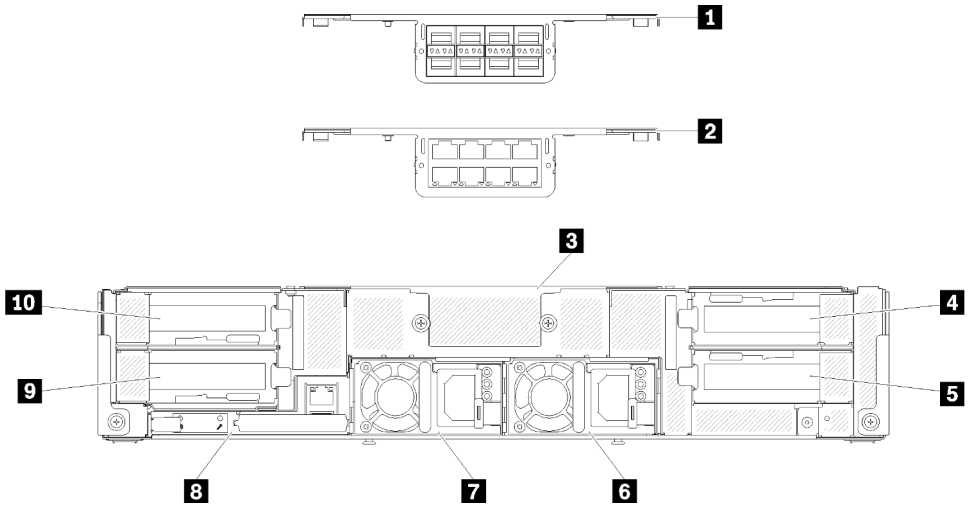


Figure 23. Rear view - The enclosure with x16 shuttle installed

Table 15. Components on x16 shuttle

1 10Gb 8-port EIOM cage (SFP+)	6 Power supply 2
2 10Gb 8-port EIOM cage (RJ45)	7 Power supply 1
3 10Gb 8-port EIOM cage filler	8 System Management Module
4 PCIe slot 3	9 PCIe slot 2
5 PCIe slot 1	10 PCIe slot 4

Note: Make sure the power cord is properly connected to every power supply unit installed.

System Management Module (SMM)

The following section includes information about the connectors and LEDs on the rear of the System Management Module (SMM).

Two types of SMM are supported in this solution. See the following illustrations to discern the type of SMM that you have.

Single Ethernet port SMM

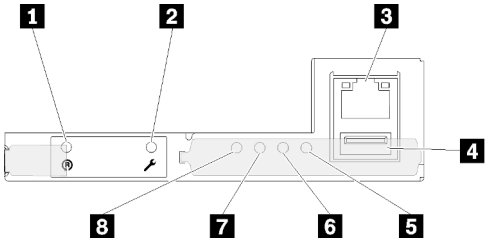


Figure 24. Rear view - Single Ethernet port SMM

Table 16. Single Ethernet port SMM

1 Reset pinhole	5 System error LED (yellow)
2 USB port service mode button	6 Identification LED (blue)

Table 16. Single Ethernet port SMM (continued)

3 Ethernet connector	7 Status LED (green)
4 USB connector	8 System power LED (green)

You can access the dedicated XCC network port of the four nodes via the Ethernet connector on the Single Ethernet port SMM. Go to website and use IP to access XCC. For more details, see *System Management Module User's Guide*.

The following four LEDs on the single Ethernet port SMM provide information about SMM operating status.

5 System error LED (yellow):

When this LED is lit, it indicates that a system error has occurred. Check the event log for additional information.

6 Identification LED (blue):

This LED could be lit to determine the physical location the specific enclosure in which the SMM is installed. Use the following commands to control the identification LED and locate the enclosure.

- Command to turn Identification LED on:

  ```
  ipmitool.exe -I lanplus -H <SMM's IP> -U USERID -P PASSWORD raw 0x32 0x97 0x01 0x01
  ```

- Command to turn Identification LED off:

  ```
  ipmitool.exe -I lanplus -H <SMM's IP> -U USERID -P PASSWORD raw 0x32 0x97 0x01 0x00
  ```

  Note: The default SMM IP address is 192.168.70.100

To identify the solution from the front side, see "Node operator panel" on page 26 for more information.

7 Status LED (green):

This LED indicates the operating status of the SMM.

- Continuously on: the SMM has encountered one or more problems.
- Off: when the enclosure power is on, it indicates the SMM has encountered one or more problems.
- Flashing: the SMM is working.
  - During pre-boot process, the LED flashes rapidly (about four times per second).
  - When the pre-boot process is completed and the SMM is working correctly, the LED flashes at a slower speed (about once per second).

8 System power LED (green):

When this LED is lit, it indicates that the SMM power is on.

Dual Ethernet port SMM

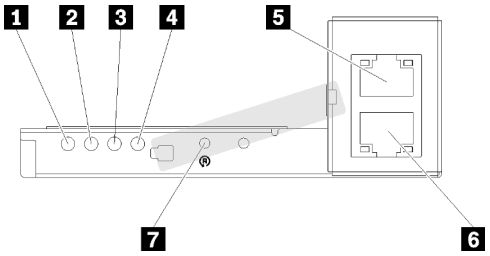


Figure 25. Rear view - Dual Ethernet port SMM

Table 17. Dual Ethernet port SMM

1 System power LED (green)	5 Ethernet connector
2 Status LED (green)	6 Ethernet connector
3 Identification LED (blue)	7 Reset pinhole
4 System error LED (yellow)	

You can access the dedicated XCC network port of the four nodes via either of the SMM Ethernet connector. Go to SMM website and use IP to access XCC. For more details, see *System Management Module User's Guide*.

The following four LEDs on the dual Ethernet port SMM provide information about SMM operating status.

1 System power LED (green):

When this LED is lit, it indicates that the SMM power is on.

2 Status LED (green):

This LED indicates the operating status of the SMM.

- Continuously on: the SMM has encountered one or more problems.
- Off: when the enclosure power is on, it indicates the SMM has encountered one or more problems.
- Flashing: the SMM is working.
  - During pre-boot process, the LED flashes rapidly (about four times per second).
  - When the pre-boot process is completed and the SMM is working correctly, the LED flashes at a slower speed (about once per second).

3 Identification LED (blue):

This LED could be lit to determine the physical location the specific enclosure in which the SMM is installed. Use the following commands to control the identification LED and locate the enclosure.

- Command to turn Identification LED on:

  ```
  ipmitool.exe -I lanplus -H <SMM's IP> -U USERID -P PASSWORD raw 0x32 0x97 0x01 0x01
  ```

- Command to turn Identification LED off:

  ```
  ipmitool.exe -I lanplus -H <SMM's IP> -U USERID -P PASSWORD raw 0x32 0x97 0x01 0x00
  ```

  Note: The default SMM IP address is 192.168.70.100

To identify the solution from the front side, see “Node operator panel” on page 26 for more information.

4 System error LED (yellow):

When this LED is lit, it indicates that a system error has occurred. Check the event log for additional information.

For web interface and error messages, see https://thinksystem.lenovofiles.com/help/topic/mgt_tools_smm/r_smm_users_guide.html.

PCIe slot LEDs

The following illustration shows the LEDs on the rear of PCIe 3.0 x16 shuttle.

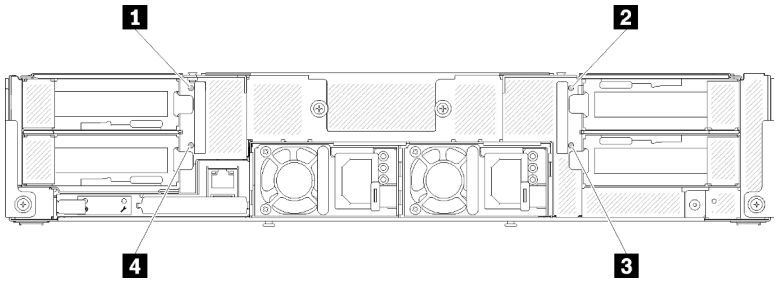


Figure 26. Rear view - PCIe 3.0 x16 LEDs

Table 18. PCIe slot LEDs

1 PCIe slot 4 LED	3 PCIe slot 1 LED
2 PCIe slot 3 LED	4 PCIe slot 2 LED

These four LEDs provide the operating status of PCIe 3.0 x16 adapters.

There are two colors of LEDs you might see:

- **Green:** It indicates the PCIe adapter is working normally.
- **Yellow (orange):** It indicates the PCIe adapter has encountered one or more problems.

Modular 6U configuration

The following illustration shows modular 6U configuration.

A modular 6U configuration 7X85 consists of three units of modular Enclosure 7X22, which are connected with Ethernet cables through SMM. For installation and replacement procedures of components in modular 6U configuration 7X85, see “Replace components in the enclosure” in *Maintenance Manual*. For data backup and restore of dual Ethernet port SMM in modular 6U configuration 7X85, see “MicroSD card removal and installation for dual Ethernet port SMM” in *Maintenance Manual*.

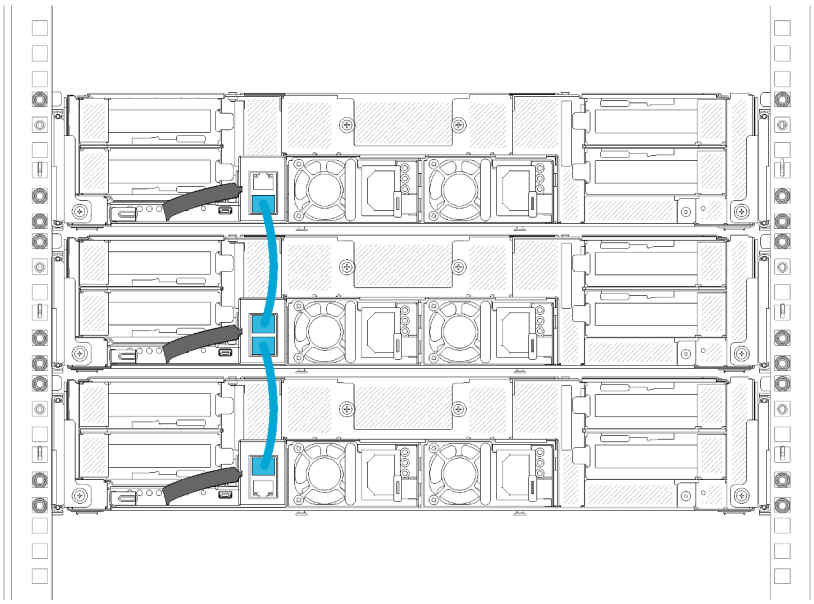


Figure 27. Rear view - Modular 6U configuration

System board layout

The illustrations in this section provide information about the connectors and switches that are available on the compute node system board.

System-board internal connectors

The following illustration shows the internal connectors on the system board.

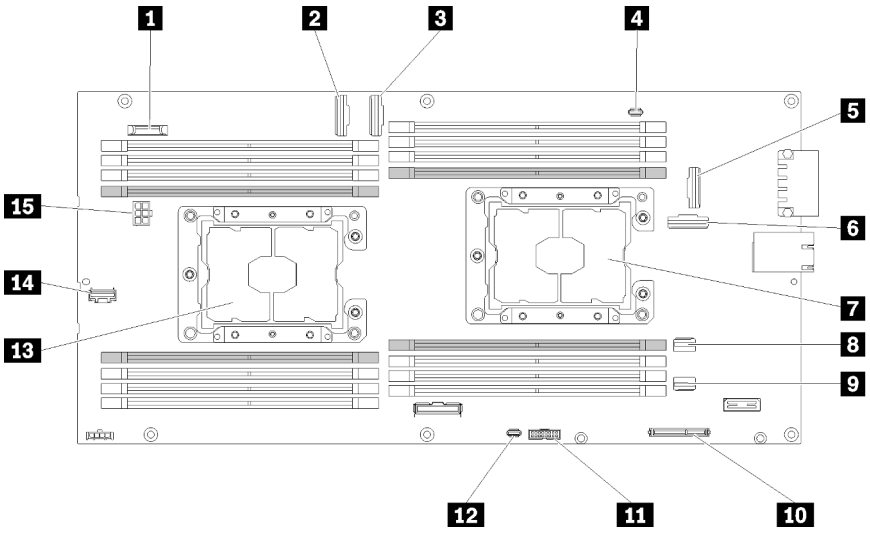


Figure 28. Internal connectors on the system board

Table 19. Internal connectors on the system board

1 CMOS battery (CR2032)	9 SATA 2 connector
2 PCIe slot 3 connector	10 M.2 connector

Table 19. Internal connectors on the system board (continued)

3 PCIe slot 4 connector	11 Trusted cryptographic module (TCM) connector
4 KVM breakout cable connector	12 KVM breakout module USB connector
5 PCIe slot 1 connector (for RAID adapter)	13 Processor 2
6 PCIe slot 2 connector	14 Backplane miscellaneous signal connector
7 Processor 1	15 Backplane power connector
8 SATA 1 connector	

The following illustration shows the location of the DIMM connectors on the system board.

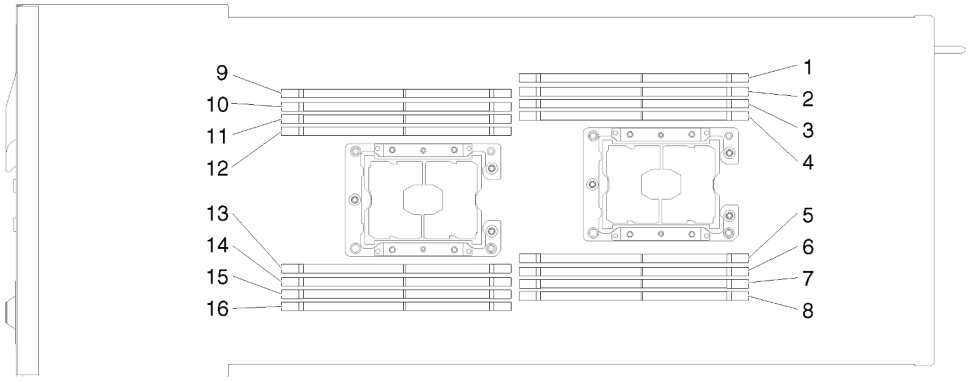


Figure 29. The location of the DIMM connectors on the system board

System-board switches

The following illustration shows the location and description of the switches.

Important:

1. If there is a clear protective sticker on the switch blocks, you must remove and discard it to access the switches.
2. Any system-board switch or jumper block that is not shown in the illustrations in this document are reserved.

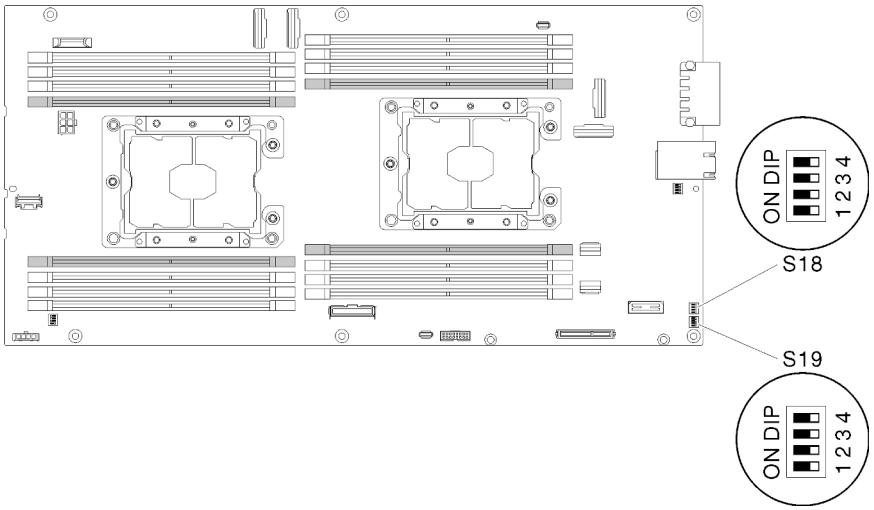


Figure 30. Location of the switches, jumpers, and buttons on the system board

The following table describes the jumpers on the system board.

Table 20. Jumper definition

Switch block	Switch	Switch name	Usage description	
			Open	Close
S18	2	XClarity Controller boot backup	Normal (default)	The compute node will boot by using a backup of the XClarity Controller firmware.
	3	XClarity Controller force update	Normal (default)	Enables XClarity Controller force update
	4	TPM physical presence	Normal (default)	Indicates a physical presence to the system TPM
S19	1	System UEFI backup	Normal (default)	Enables system BIOS backup
	2	Password override jumper	Normal (default)	Overrides the power-on password
	3	CMOS clear jumper	Normal (default)	Clears the real-time clock (RTC) registry

Important:

1. Before you change any switch settings or move any jumpers, turn off the solution; then, disconnect all power cords and external cables. Review the information in https://pubs.lenovo.com/safety_documentation/, “Installation Guidelines” on page 64, “Handling static-sensitive devices” on page 66, and “Power off the compute node” on page 139.
2. Any system-board switch or jumper block that is not shown in the illustrations in this document are reserved.

KVM breakout cable

Use this information for details about the KVM breakout cable.

Use the KVM breakout cable to connect external I/O devices to the compute node. The KVM breakout cable connects through the KVM connector (see "System-board internal connectors" on page 33). The KVM breakout cable has connectors for a display device (video), two USB 2.0 connectors for a USB keyboard and mouse, and a serial interface connector.

The following illustration identifies the connectors and components on the KVM breakout cable.

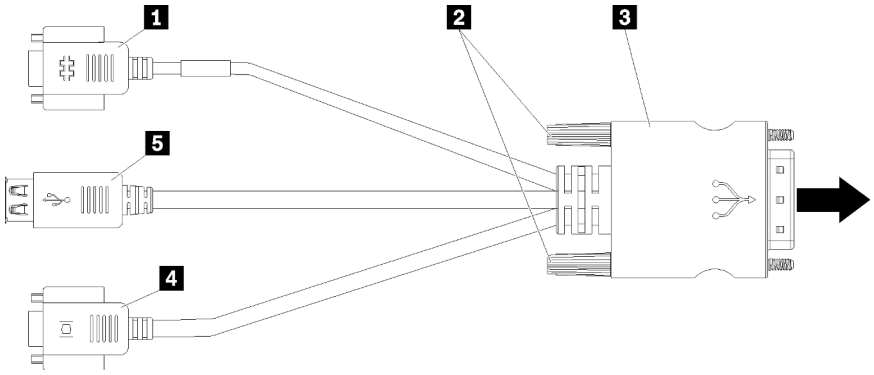


Figure 31. Connectors and components on the KVM breakout cable

Table 21. Connectors and components on the console breakout cable

1 Serial connector	4 Video connector (blue)
2 Captive screws	5 USB 2.0 connectors (2)
3 to KVM connector	

2.5-inch drive backplanes

The following illustration shows the respective 2.5-inch drive backplanes.

Important: Do not mix nodes with the four-drive backplane and six-drive backplanes in the same enclosure. Mixing the four-drive backplane and six-drive backplanes may cause unbalanced cooling.

- Four 2.5-inch SAS/SATA backplane

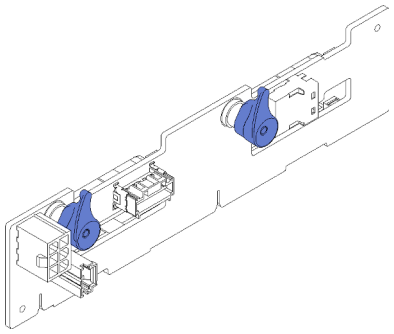


Figure 32. Four 2.5-inch SAS/SATA backplane

- Four 2.5-inch NVMe backplane

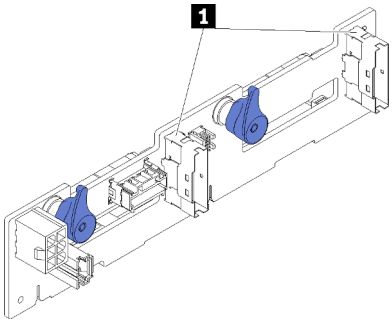


Figure 33. Four 2.5-inch NVMe backplane

1 NVMe connectors

Note: This backplane requires that two processors be installed in the compute node.

- Six 2.5-inch SAS/SATA backplane

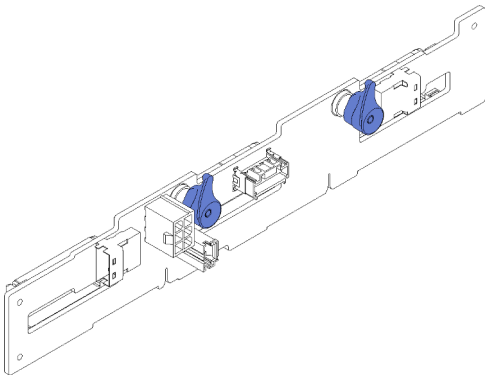


Figure 34. Six 2.5-inch SAS/SATA backplane

- Six 2.5-inch hot-swap SAS/SATA/NVMe backplane

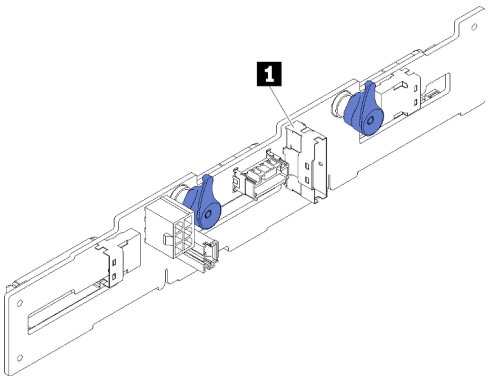


Figure 35. Six 2.5-inch hot-swap SAS/SATA/NVMe backplane

1 NVMe connector

Parts list

Use the parts list to identify each of the components that are available for your solution.

Note: Depending on the model, your solution might look slightly different from in the following illustrations.

Enclosure components

This section includes the components that come with the enclosure.

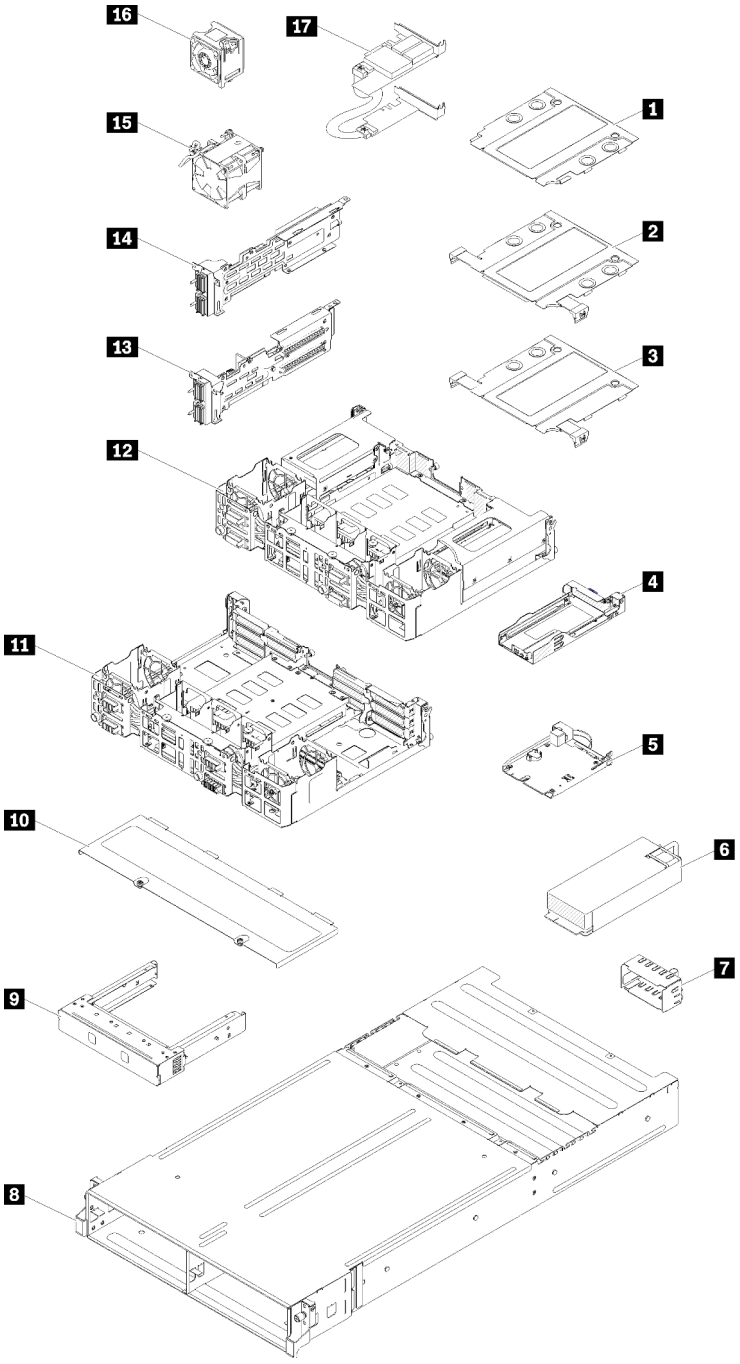


Figure 36. Enclosure components

The parts listed in the following table are identified as one of the following:

- **Tier 1 customer replaceable unit (CRU):** Replacement of Tier 1 CRUs is your responsibility. If Lenovo installs a Tier 1 CRU at your request with no service agreement, you will be charged for the installation.
- **Tier 2 customer replaceable unit (CRU):** You may install a Tier 2 CRU yourself or request Lenovo to install it, at no additional charge, under the type of warranty service that is designated for your server.

- **Field replaceable unit (FRU):** FRUs must be installed only by trained service technicians.
- **Consumable and Structural parts:** Purchase and replacement of consumable and structural parts (components, such as a cover or bezel) is your responsibility. If Lenovo acquires or installs a structural component at your request, you will be charged for the service.

Table 22. Parts list, enclosure

Index	Description	Tier 1 CRU	Tier 2 CRU	FRU	Consumable and Structural part
For more information about ordering the parts shown in Figure 36 “enclosure components” on page 39: https://datacentersupport.lenovo.com/products/servers/thinksystem/d2-enclosure/7X20/parts It is highly recommended that you check the power summary data for your server using Lenovo Capacity Planner before purchasing any new parts.					
1	10Gb 8-port EIOM cage filler				√
2	10Gb 8-port EIOM cage (SFP+)		√		
3	10Gb 8-port EIOM Base-T cage (RJ45)		√		
4	Cassette (for PCIe x16 shuttle)				√
5	System Management Module	√			
6	Power supply	√			
7	Power supply filler panel	√			
8	Enclosure				√
9	Node filler panel				√
10	Fan cover				√
11	PCIe x8 shuttle			√	
12	PCIe x16 shuttle			√	
13	PCIe I/O riser (PIOR) right (viewed from the front)			√	
14	PCIe I/O riser (PIOR) left (viewed from the front)			√	
15	80x80x80mm fan			√	
16	60x60x56mm fan		√		
17	Shared PCIe dual adapters			√	

Compute node components

This section includes the components that come with the compute node.

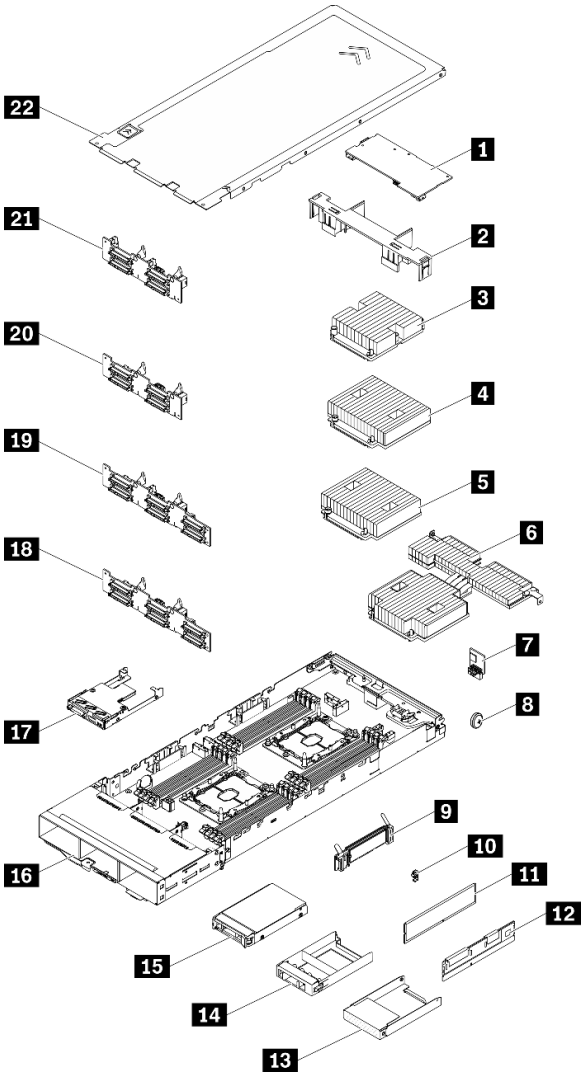


Figure 37. Compute node components

Table 23. Parts list, compute node

Index	Description	Tier 1 CRU	Tier 2 CRU	FRU	Consumable and Structural part
For more information about ordering the parts shown in Figure 37 “compute node components” on page 41: https://datacentersupport.lenovo.com/products/servers/thinksystem/sd530/7x21/parts It is highly recommended that you check the power summary data for your server using Lenovo Capacity Planner before purchasing any new parts.					
1	PCIe adapter	√			
2	Air baffle				√
3	Processor and heat sink assembly (85mm heat sink)			√	
4	Processor and heat sink assembly (108mm heat sink)			√	

Table 23. Parts list, compute node (continued)

Index	Description	Tier 1 CRU	Tier 2 CRU	FRU	Consumable and Structural part
5	Processor and heat sink assembly (108mm heat sink)			√	
6	Processor and heat sink assembly (T-shaped heat sink)			√	
7	Trusted Cryptographic Module			√	
8	CMOS battery (CR2032)				√
9	M.2 backplane	√			
10	M.2 retainer clip	√			
11	DRAM DIMM	√			
12	DC Persistent Memory Module (DCPMM)	√			
13	2.5-inch drive bay blank (for empty bays next to the backplane)				√
14	2.5-inch drive bay blank panel (for drive bays on the backplane)	√			
15	2.5-inch hot-swap drive	√			
16	Compute node tray			√	
17	KVM breakout module	√			
18	2.5-inch 6-drive hot-swap SAS/SATA backplane			√	
19	2.5-inch 6-drive hot-swap SAS/SATA/NVMe backplane			√	
20	2.5-inch 4-drive hot-swap SAS/SATA backplane			√	
21	2.5-inch 4-drive hot-swap NVMe backplane			√	
22	Compute node cover	√			

PCIe expansion node components

This section includes the components that come with the PCIe expansion node.

Note: PCIe expansion node has to be installed to a compute node before being installed into the enclosure. See “compute-expansion node assembly replacement” in *Maintenance Manual* for detailed installation procedure and requirements.

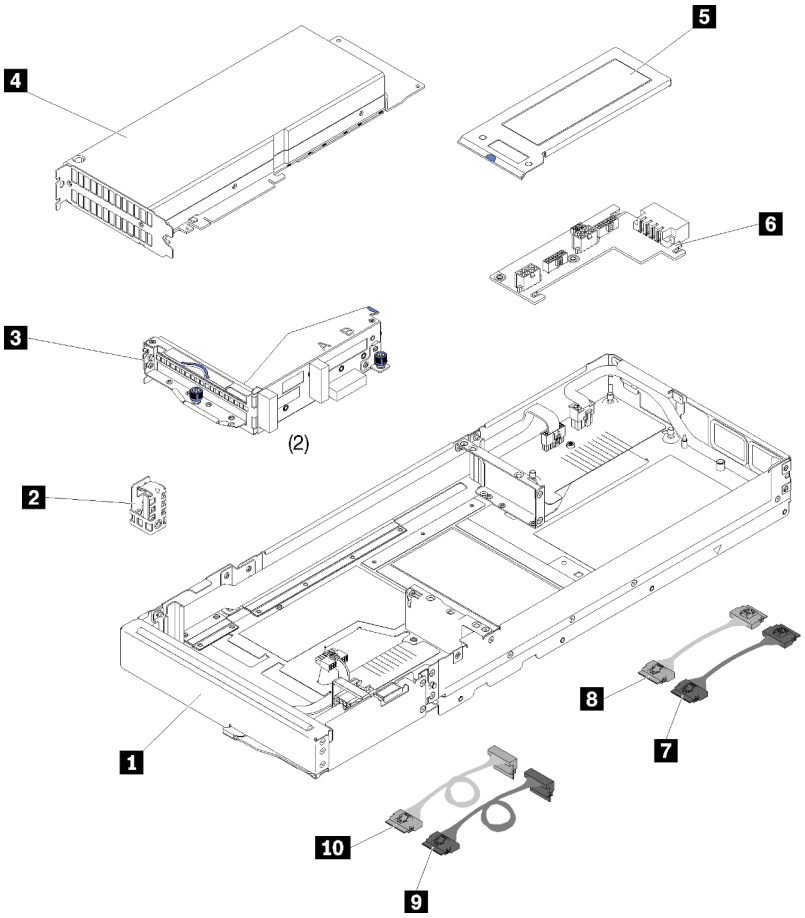


Figure 38. PCIe expansion node components

Table 24. Parts list, PCIe expansion node

Index	Description	Tier 1 CRU	Tier 2 CRU	FRU	Structural
For more information about ordering the parts shown in Figure 38 “PCIe expansion node components” on page 43: https://datacentersupport.lenovo.com/products/servers/thinksystem/sd530/7x21/parts It is highly recommended that you check the power summary data for your server using Lenovo Capacity Planner before purchasing any new parts.					
1	PCIe expansion node				√
2	Cable bracket		√		
3	Risers, front and rear	√			
4	PCIe adapter **Notes:** 1. This component is not included in the PCIe expansion node option kit. 2. The illustration might differ slightly from your hardware.	√			
5	Rear cable cover	√			
6	PCIe expansion node power board	√			

Table 24. Parts list, PCIe expansion node (continued)

Index	Description	Tier 1 CRU	Tier 2 CRU	FRU	Structural
7	PCIe#1-A cable	√			
8	PCIe#2-B cable	√			
9	PCIe#3-A cable	√			
10	PCIe#4-B cable	√			

Power cords

Several power cords are available, depending on the country and region where the server is installed.

To view the power cords that are available for the server:

1. Go to:

   http://dcsc.lenovo.com/#/

2. Click **Preconfigured Model** or **Configure to order**.
3. Enter the machine type and model for your server to display the configurator page.
4. Click **Power → Power Cables** to see all line cords.

Notes:

- For your safety, a power cord with a grounded attachment plug is provided to use with this product. To avoid electrical shock, always use the power cord and plug with a properly grounded outlet.
- Power cords for this product that are used in the United States and Canada are listed by Underwriter's Laboratories (UL) and certified by the Canadian Standards Association (CSA).
- For units intended to be operated at 115 volts: Use a UL-listed and CSA-certified cord set consisting of a minimum 18 AWG, Type SVT or SJT, three-conductor cord, a maximum of 15 feet in length and a parallel blade, grounding-type attachment plug rated 15 amperes, 125 volts.
- For units intended to be operated at 230 volts (U.S. use): Use a UL-listed and CSA-certified cord set consisting of a minimum 18 AWG, Type SVT or SJT, three-conductor cord, a maximum of 15 feet in length and a tandem blade, grounding-type attachment plug rated 15 amperes, 250 volts.
- For units intended to be operated at 230 volts (outside the U.S.): Use a cord set with a grounding-type attachment plug. The cord set should have the appropriate safety approvals for the country in which the equipment will be installed.
- Power cords for a specific country or region are usually available only in that country or region.

Internal cable routing

Some of the components in the node have internal cable connectors.

Notes:

- Disengage all latches, release tabs, or locks on cable connectors when you disconnect cables from the system board. Failing to release them before removing the cables will damage the cable sockets on the system board, which are fragile. Any damage to the cable sockets might require replacing the system board.
- If you are installing KVM module in a compute node, make sure to route the cables in the following order.
  1. NVMe signal cables (if there is any)
  2. KVM breakout module cable
  3. SATA/SAS signal cable (if there is any)

Some options, such as RAID adapter and backplanes, might require additional internal cabling. See the documentation that is provided for the option to determine any additional cabling requirements and instructions.

Four 2.5-inch-drive model

Use this section to understand how to route cables for four 2.5-inch-drive model.

Four 2.5-inch-drive model

- Four 2.5-inch hot-swap SAS/SATA backplane

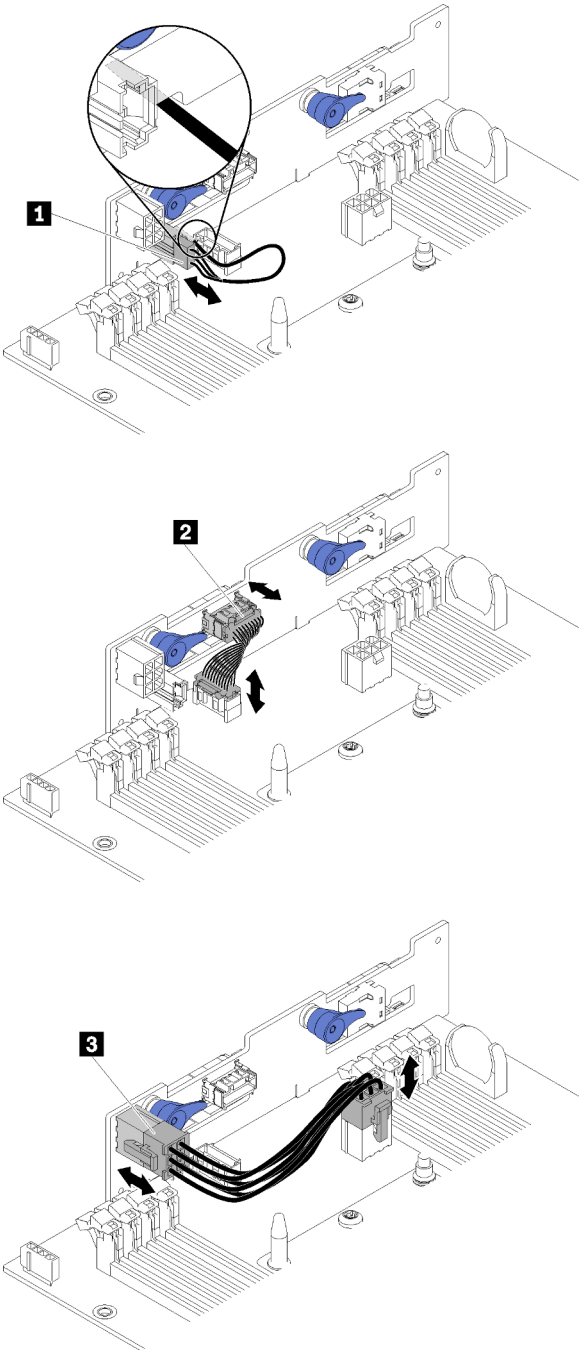


Figure 39. Four 2.5-inch hot-swap SAS/SATA backplane

Table 25. Components on the four 2.5-inch hot-swap SAS/SATA backplane

1 Ambient sensor cable	3 Backplane power cable
2 miscellaneous signal cable	

- Four 2.5-inch drive cable routing

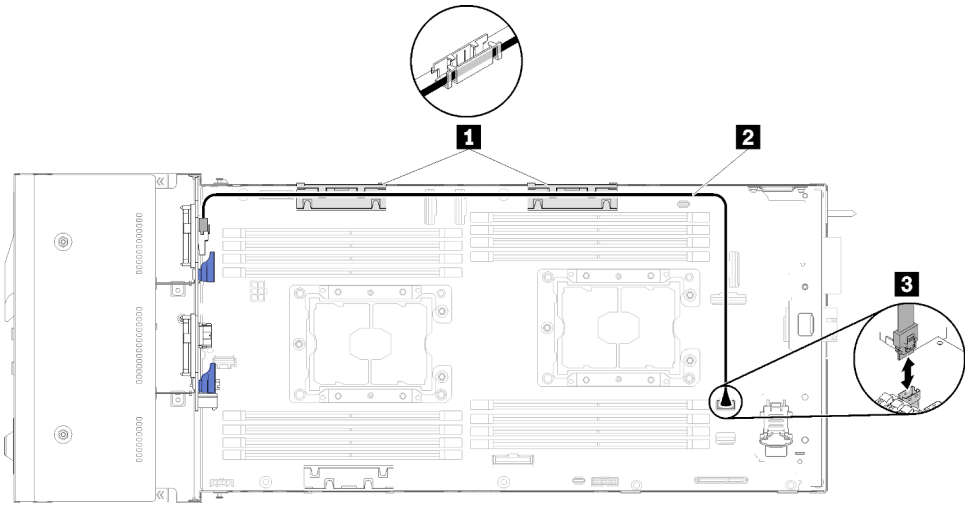


Figure 40. Four 2.5-inch drive cable routing

Table 26. Components on the four 2.5-inch drive cable routing

1 Internal cable management baskets	3 SATA 1 connecotr
2 SAS/SATA cable	

- Four 2.5-inch drive with hardware RAID cable routing

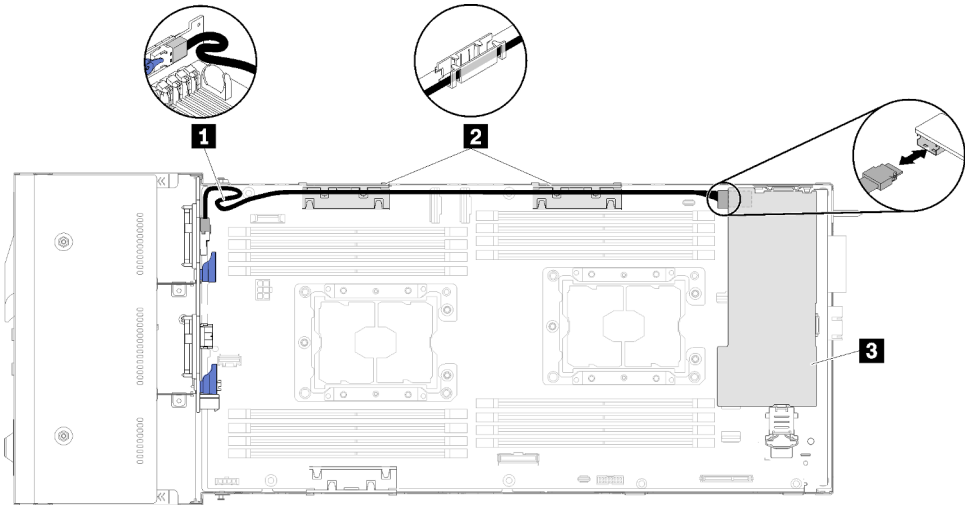


Figure 41. Four 2.5-inch drive with hardware RAID cable routing

Table 27. Components on the four 2.5-inch drive with hardware RAID cable routing

1 SAS/SATA cable	3 RAID adapter
2 Internal cable management baskets	

Four 2.5-inch-drive NVMe model

Use this section to understand how to route cables for four 2.5-inch-drive NVMe model.

Four 2.5-inch-drive NVMe model

Note: If you are installing NVMe drives and KVM breakout module in the same compute node, make sure to route the KVM breakout module cable on top of the PCIe signal cable.

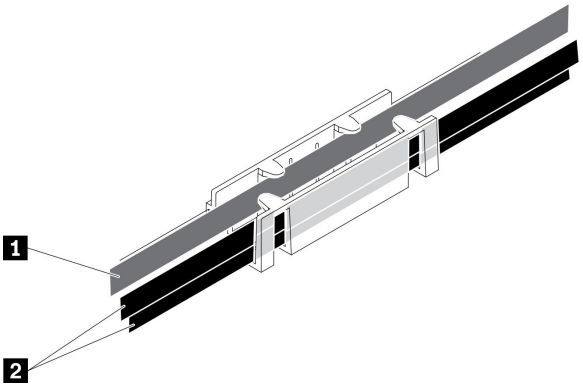


Figure 42. NVMe and KVM breakout module cable routing

Table 28. NVMe and KVM breakout module cable routing

1 KVM breakout module cable (routed to left side)	2 NVMe signal cables

- Four 2.5-inch NVMe backplane

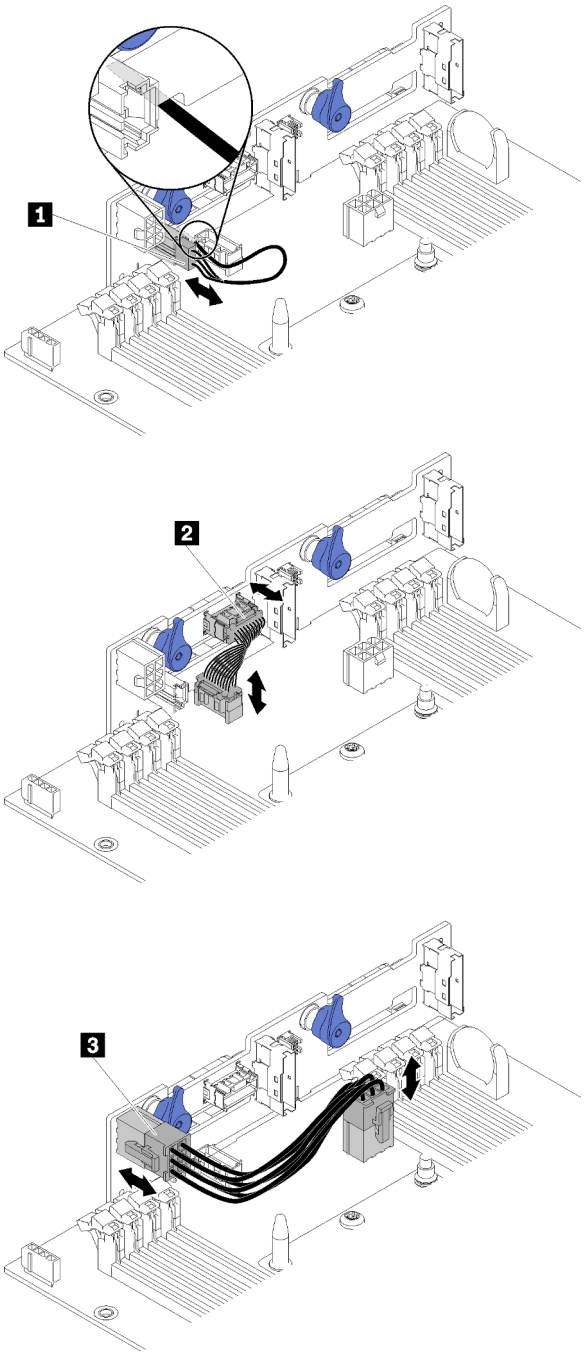


Figure 43. Four 2.5-inch NVMe backplane

Table 29. Components on the four 2.5-inch NVMe backplane

1 Ambient sensor cable	3 Backplane power cable
2 miscellaneous signal cable	

- Four 2.5-inch drive cable routing

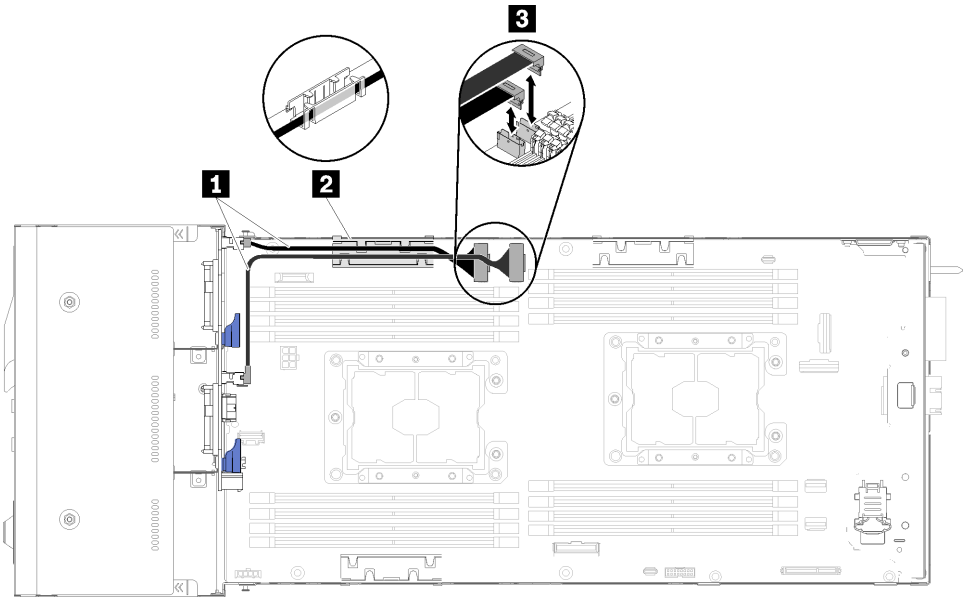


Figure 44. Four 2.5-inch drive cable routing (with NVMe)

Table 30. Components on the four 2.5-inch drive cable routing (with NVMe)

1 NVMe cable	3 PCIe slot 3 and 4 connector
2 Internal cable management baskets	

Six 2.5-inch-drive model

Use this section to understand how to route cables for six 2.5-inch-drive model.

Six 2.5-inch-drive model

- Six 2.5-inch hot-swap SAS/SATA backplane

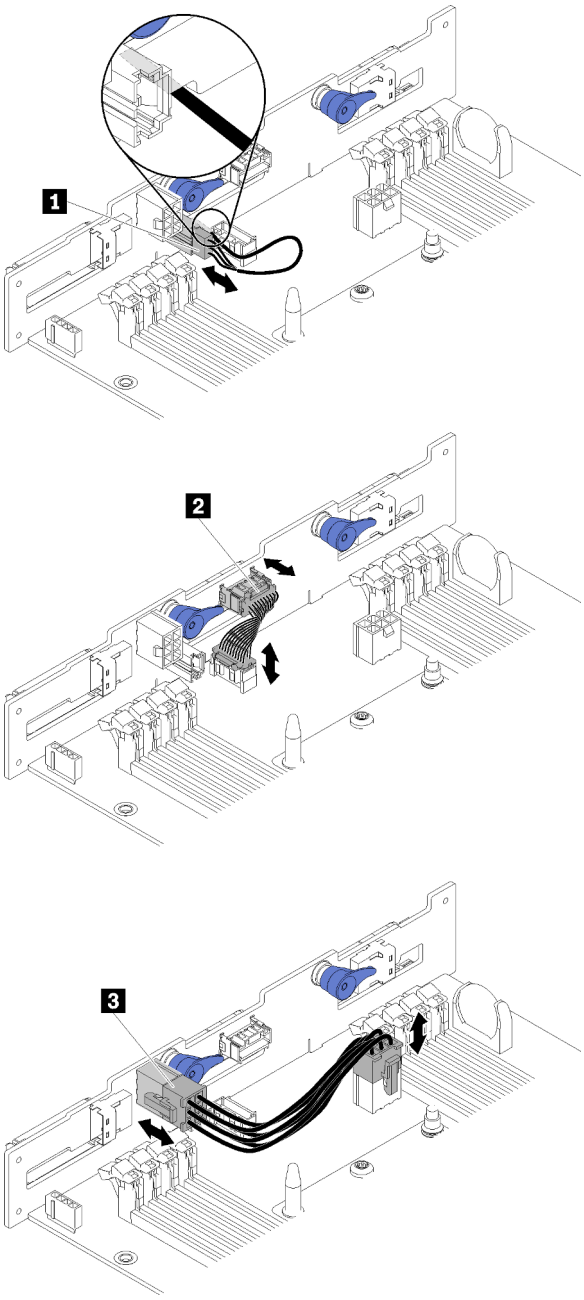


Figure 45. Six 2.5-inch hot-swap SAS/SATA backplane

Table 31. Components on the six 2.5-inch hot-swap SAS/SATA backplane

1 Ambient sensor cable	3 Backplane power cable
2 miscellaneous signal cable	

- Six 2.5-inch drive cable routing

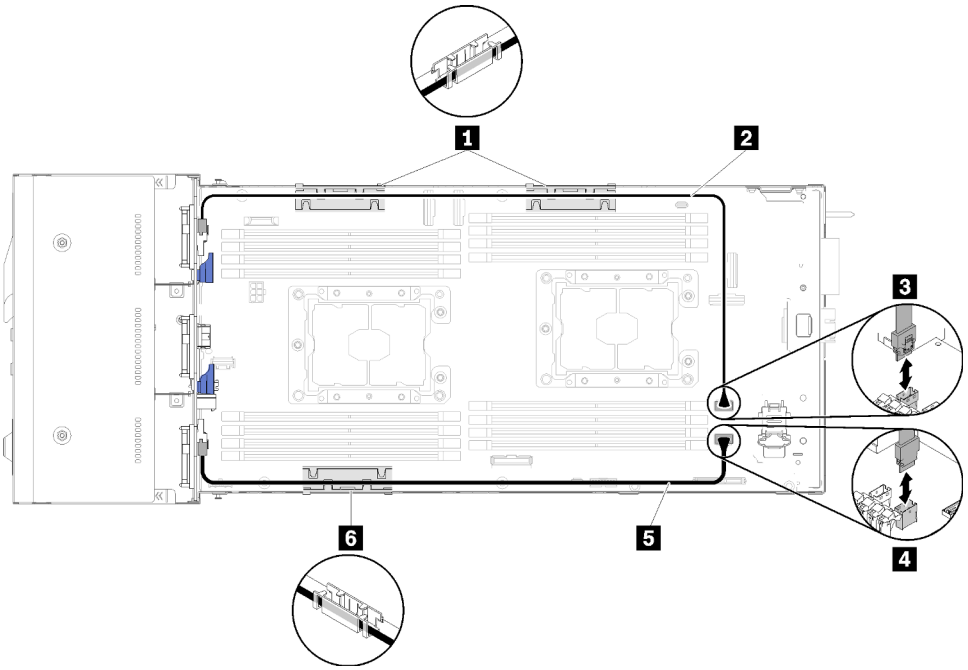


Figure 46. Six 2.5-inch drive cable routing

Table 32. Components on the six 2.5-inch drive cable routing

1 6 Internal cable management basket	3 SATA 1 connector
2 5 SAS/SATA cable	4 SATA 2 connector

- Six 2.5-inch drive with hardware RAID cable routing

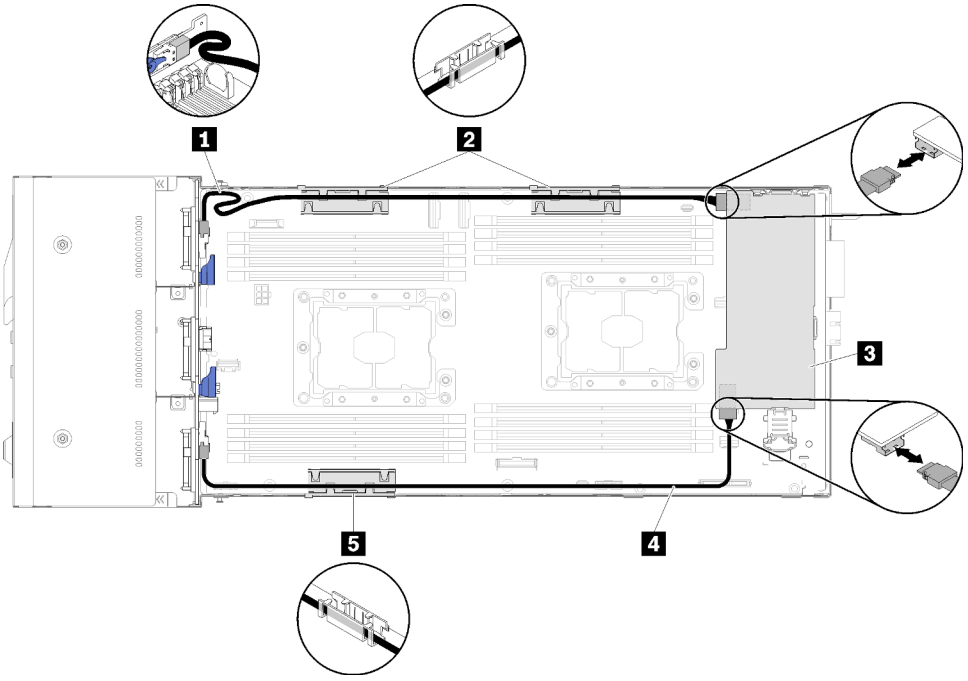


Figure 47. Six 2.5-inch drive with hardware RAID cable routing

Note: Route the 1 SAS/SATA cable as shown in the illustration to avoid cable slack.

Table 33. Components on the six 2.5-inch drive with hardware RAID cable routing

1 4 SAS/SATA cable	3 RAID adapter
2 5 Internal cable management basket	

Six 2.5-inch-drive model (with NVMe)

Use this section to understand how to route cables for Six 2.5-inch-drive model (with NVMe).

Six 2.5-inch-drive model (with NVMe)

Note: If you are installing NVMe drives and KVM breakout module in the same compute node, make sure to route the KVM breakout module cable on top of the PCIe signal cable.

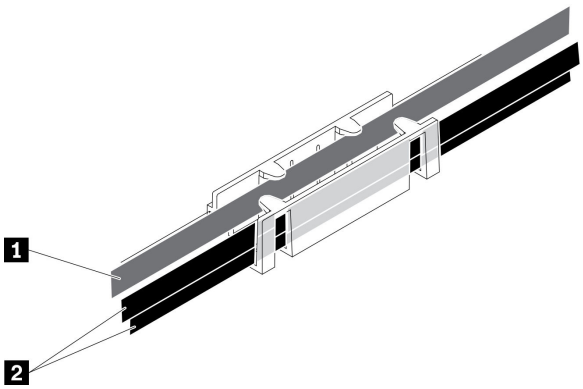


Figure 48. NVMe and KVM breakout module cable routing

Table 34. NVMe and KVM breakout module cable routing

1 KVM breakout module cable (routed to left side)	2 NVMe signal cables

- Six 2.5-inch hot-swap SAS/SATA/NVMe backplane

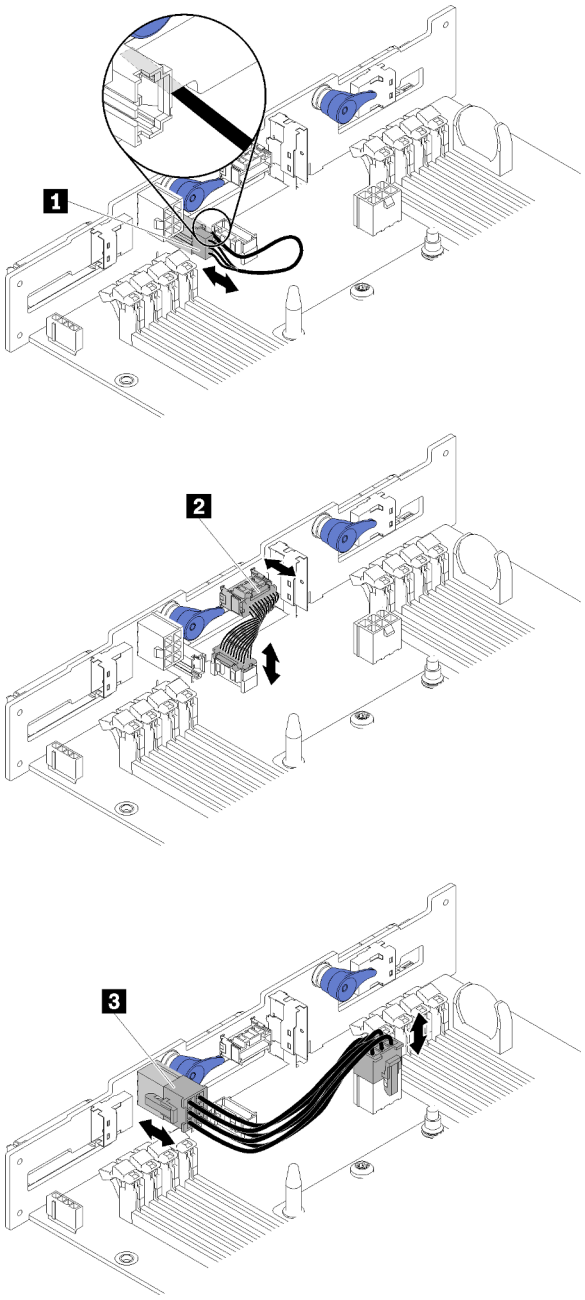


Figure 49. Six 2.5-inch hot-swap SAS/SATA/NVMe backplane

Table 35. Components on the six 2.5-inch hot-swap SAS/SATA/NVMe backplane

1 Ambient sensor cable	3 Backplane power cable
2 miscellaneous signal cable	

- Six 2.5-inch drive cable routing (with NVMe)

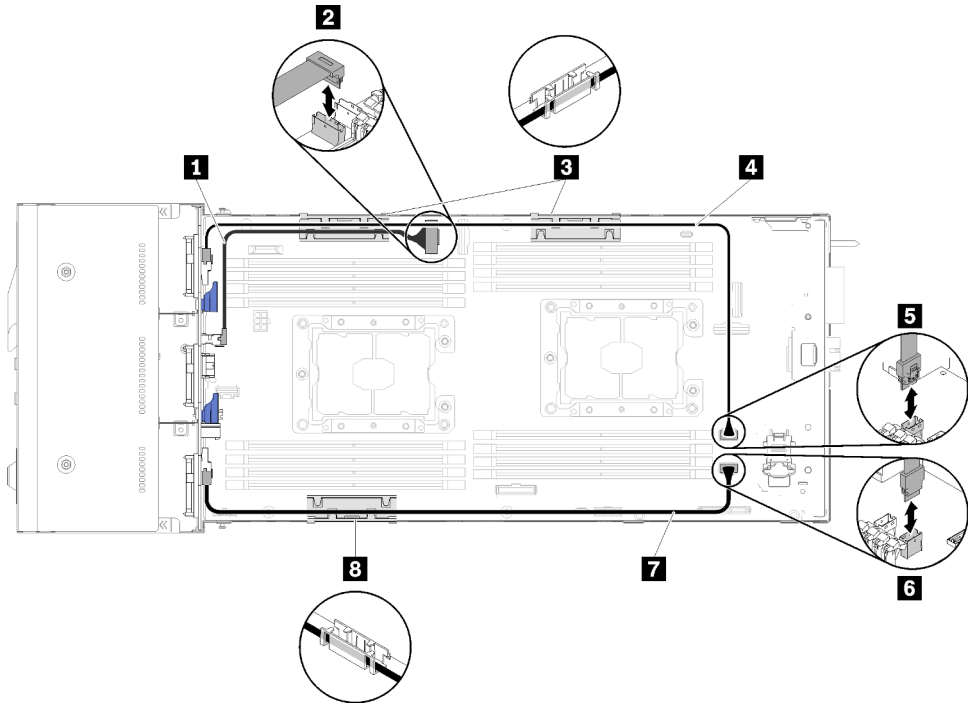


Figure 50. Six 2.5-inch drive cable routing (with NVMe)

Table 36. Components on the six 2.5-inch drive cable routing (with NVMe)

1 NVMe cable	4 7 SAS/SATA cable
2 PCIe slot 3 connector	5 SATA 1 connector
3 8 Internal cable management basket	6 SATA 2 connector

- Six 2.5-inch drive (with NVMe) with hardware RAID cable routing

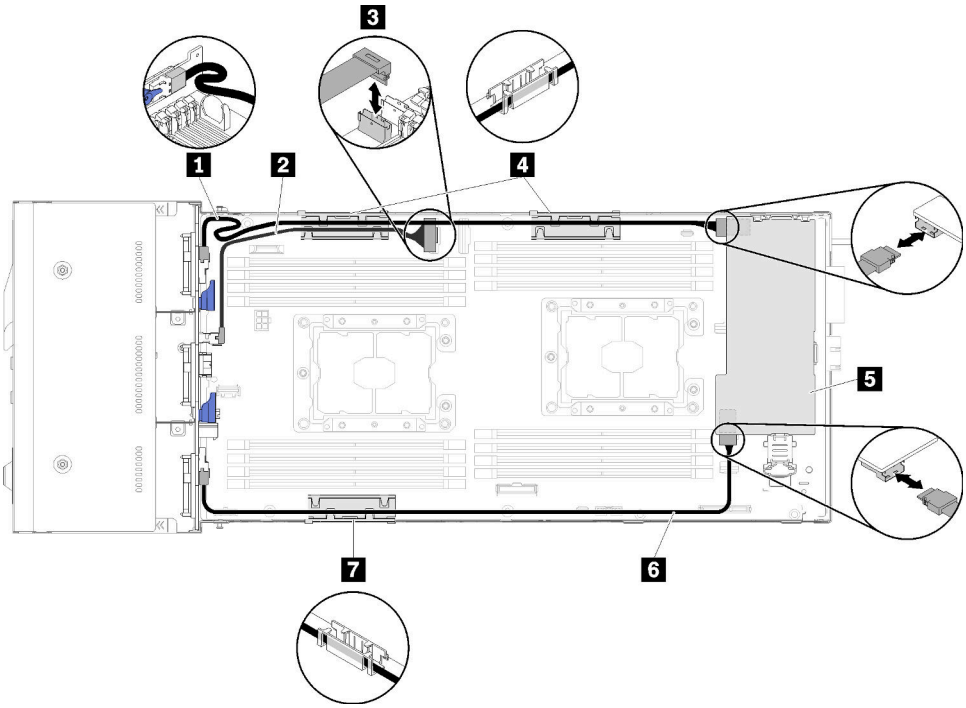


Figure 51. Six 2.5-inch drive (with NVMe) with hardware RAID cable routing

Note: Route the 1 SAS/SATA cable as shown in the illustration to avoid cable slack.

Table 37. Components on six 2.5-inch drive with hardware RAID cable routing

1 6 SAS/SATA cable	4 7 Internal cable management basket
2 NVMe cable	5 RAID adapter
3 PCIe slot 3 connector	

KVM breakout module

Use this section to understand how to route cables for your KVM breakout module.

Note: If you are installing NVMe drives and KVM breakout module in the same compute node, make sure to route the KVM breakout module cable on top of the PCIe signal cable.

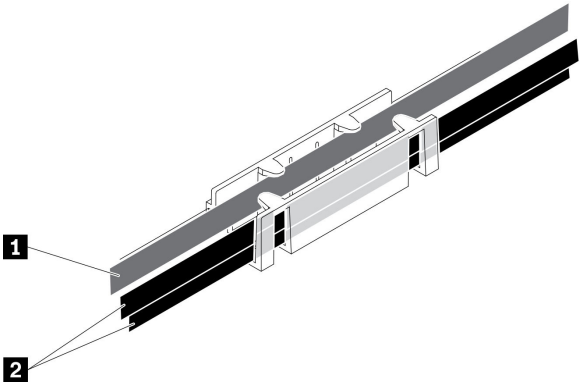


Figure 52. NVMe and KVM breakout module cable routing

Table 38. NVMe and KVM breakout module cable routing

1 KVM breakout module cable (routed to left side)	2 NVMe signal cables

- The right KVM breakout module (for four 2.5-inch-drive model)

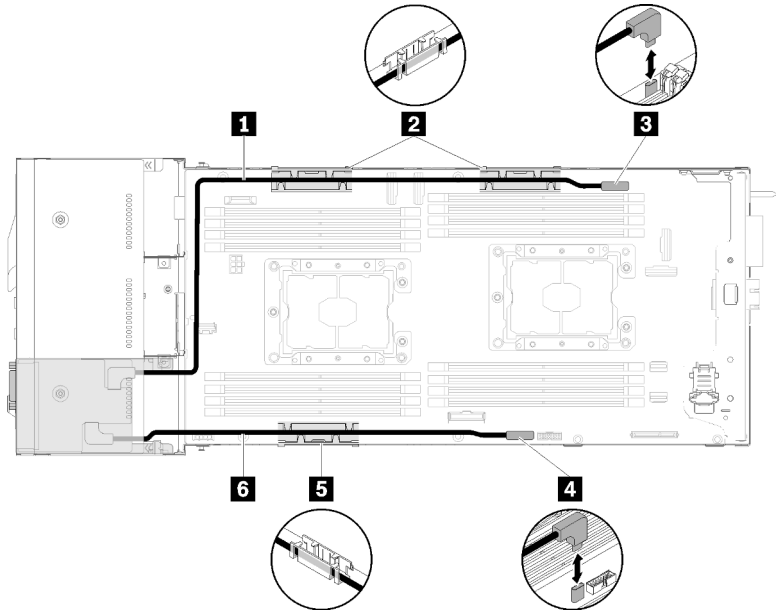


Figure 53. KVM breakout module installed in drive bay 4

Table 39. Components on the KVM breakout module installed in drive bay 4

1 Long signal cable	3 KVM breakout cable connector
2 5 Internal cable management basket	4 USB connector
6 Short signal cable	

- The left KVM breakout module (for six 2.5-inch-drive model)

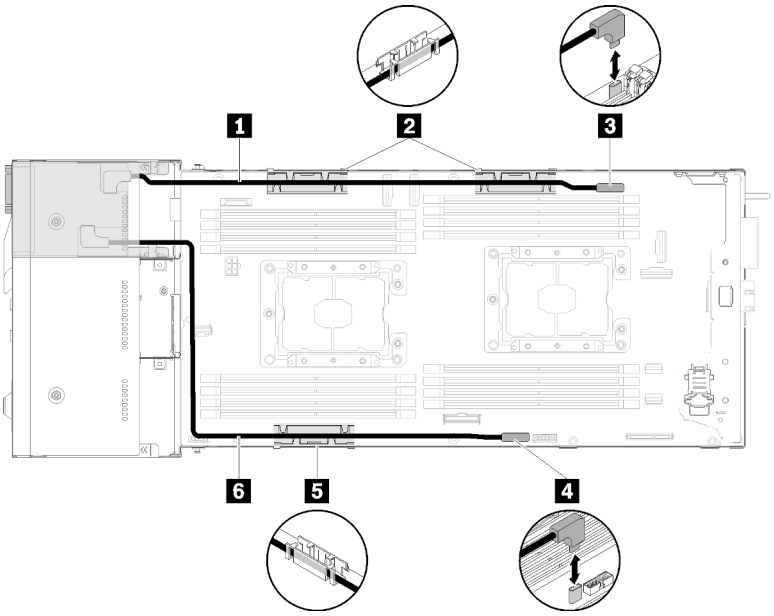


Figure 54. KVM breakout module installed in drive bay 0

Table 40. Components on the KVM breakout module installed in drive bay 0

1 Short signal cable	3 KVM breakout cable connector
2 5 Internal cable management basket	4 USB connector
6 Long signal cable	

PCIe expansion node

Use this section to understand how to route cables for a PCIe expansion node.

Following are the cables that come with a PCIe expansion node:

- Front PCIe riser assembly

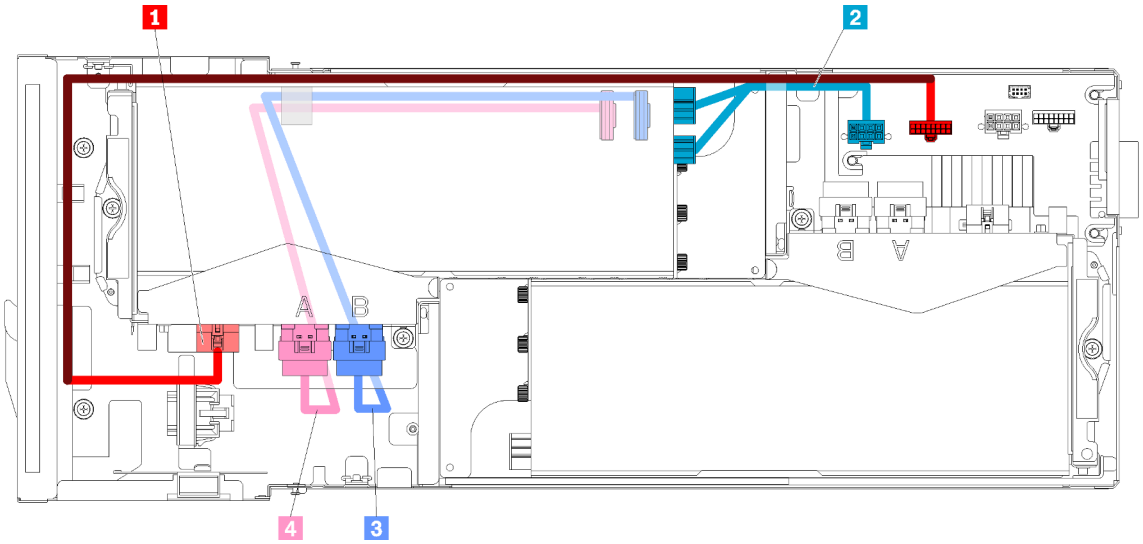


Figure 55. Front riser assembly cables

Table 41. Front riser assembly cables

1 Riser miscellaneous cable for the front riser assembly	3 PCIe#4-B cable
2 Auxiliary power cable for the PCIe adapter in the front riser assembly	4 PCIe#3-A cable

- Rear riser assembly

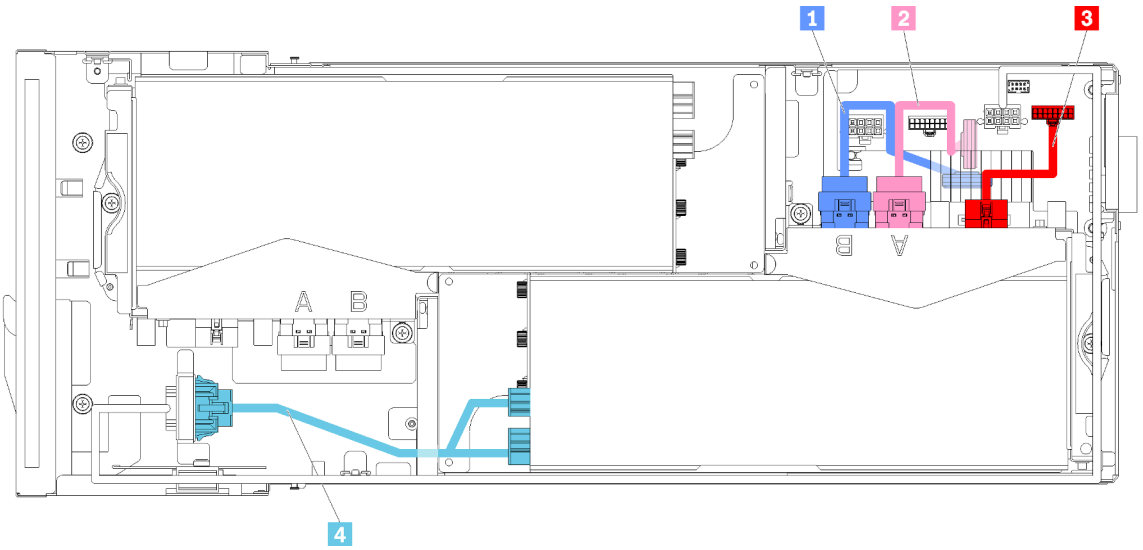


Figure 56. Rear riser assembly cables

Table 42. Rear riser assembly cables

1 PCIe#2-B cable	3 Riser miscellaneous cable for the rear riser assembly
2 PCIe#1-A cable	4 Auxiliary power cable for the PCIe adapter in the rear riser assembly

Notes: Make sure the following conditions are met before installing the rear riser cable cover.

1. If the PCIe#2-B cable is connected to the rear riser assembly, make sure it is routed under the PCIe#1-A cable through the gap between the two front riser power connectors.
2. If the PCIe#1-A cable is connected to the rear riser assembly, make sure it is routed above the PCIe#2-B cable through the gap between the two front riser power connectors.
3. When both riser assemblies are installed, make sure the front riser auxiliary power cable is looped back into the gap between the two front riser power connectors, and routed above the PCIe#2-B cable.

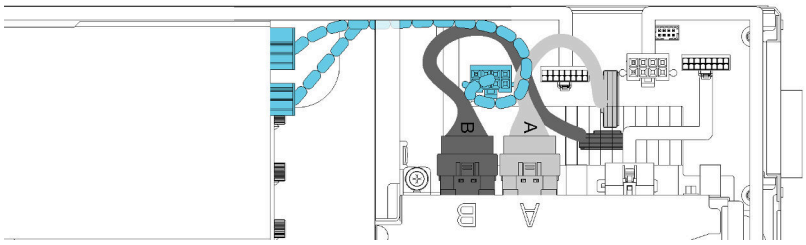


Figure 57. Routing PCIe#1-A, PCIe#2-B and the front riser auxiliary power cable

Modular enclosure for 6U configuration

See this section to learn how to route cables for modular enclosures for 6U configuration.

Modular enclosures for 6U configuration could be connected with Ethernet cables as illustrated.

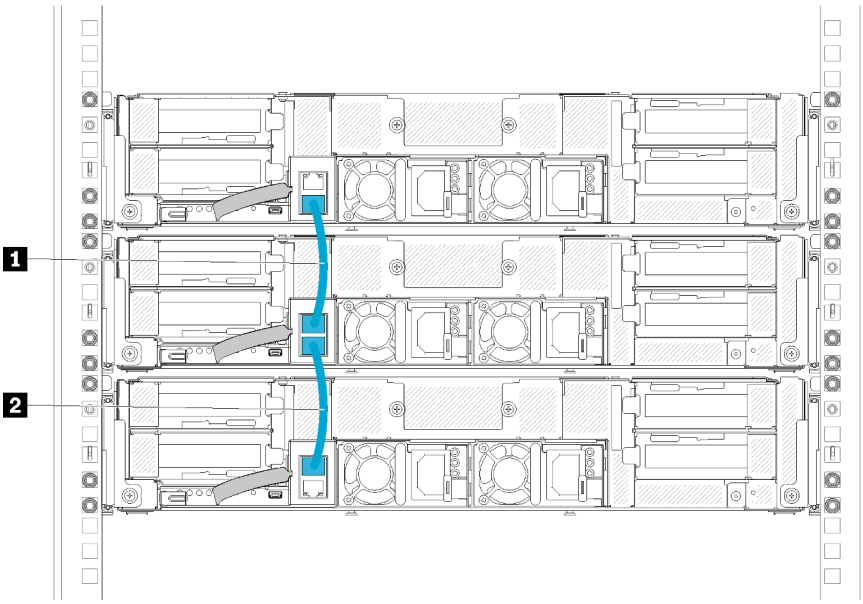


Figure 58. Cable routing for modular enclosures for 6U configuration

Table 43. Cable routing for modular enclosures for 6U configuration

1 Ethernet cable	2 Ethernet cable

Note:

1. Despite 6U configuration consists of three 2U modular enclosures, it is technically feasible to connect more than three modular enclosures with Ethernet cables. However, according to spanning tree protocol (STP) defined by IEEE 802.1D standard, it is strongly suggested that no more than six modular

enclosures are connected in a rack if STP is implemented with default parameters. The chained enclosures do not necessarily have to be installed in the same rack, and could be connected cross-rack via rack switch. See the illustration for an example.

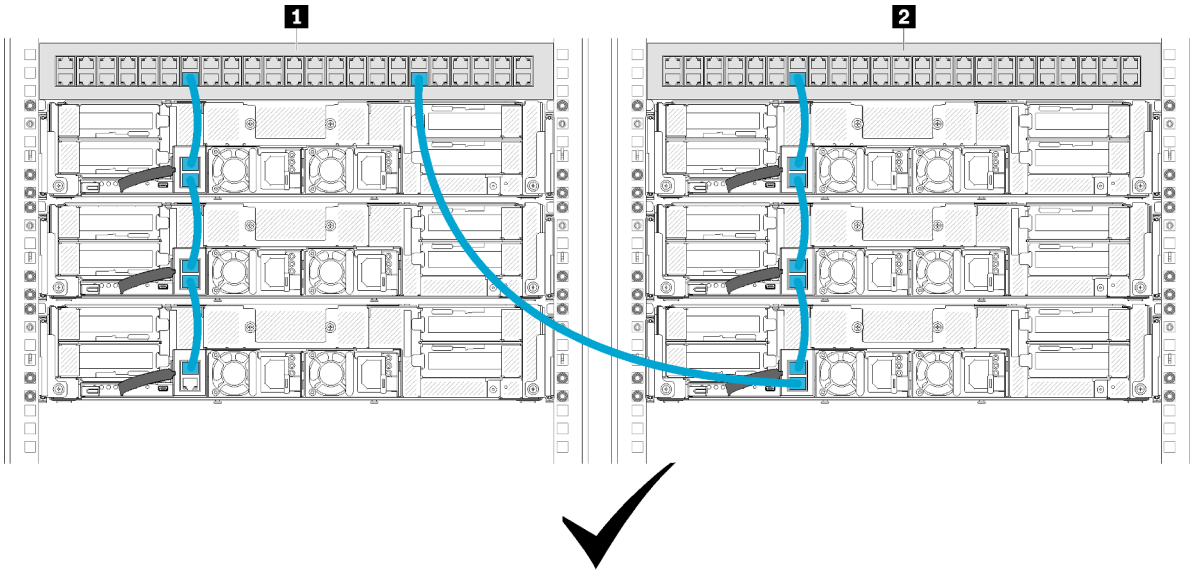


Figure 59. An example of cross-rack enclosure chain

Table 44. Devices in the cross-rack enclosure chain

1 Rack switch 1	2 Rack switch 2

2. Do not create any switch loop by connecting the last port of a group of connected enclosures to the same switch or local area network (LAN) the first port of the group of connected enclosures is already connected to. See the illustration of an example of a switch loop that should be avoided.

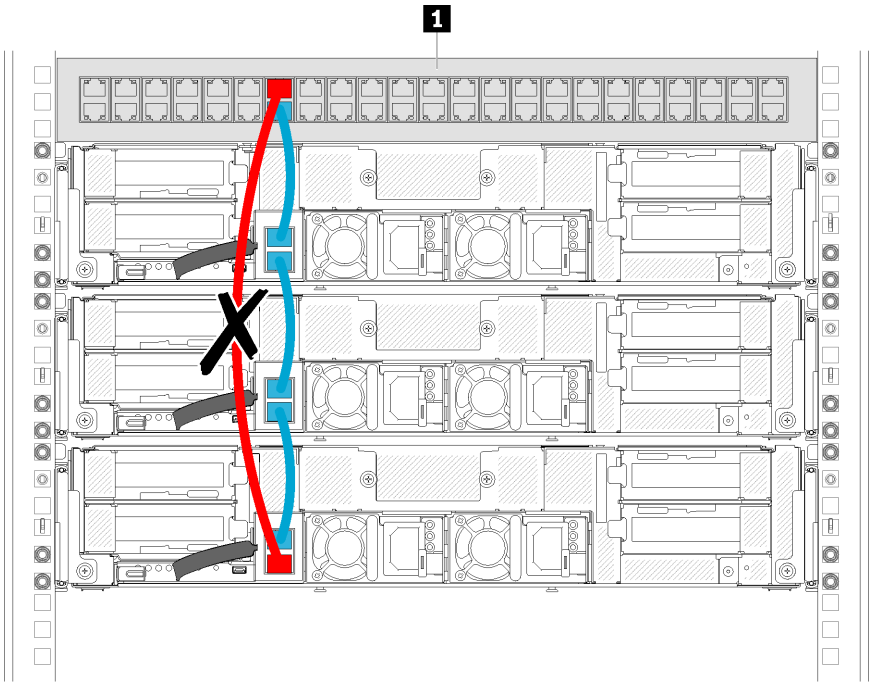


Figure 60. An example of enclosure chain switch loop that should be avoided

Table 45. Device in the enclosure chain switch loop

1 Rack switch

Chapter 3. Solution hardware setup

To set up the solution, install any options that have been purchased, cable the solution, configure and update the firmware, and install the operating system.

Solution setup checklist

Use the solution setup checklist to ensure that you have performed all tasks that are required to set up your solution.

The solution setup procedure varies depending on the configuration of the solution when it was delivered. In some cases, the solution is fully configured and you just need to connect the solution to the network and an ac power source, and then you can power on the solution. In other cases, the solution needs to have hardware options installed, requires hardware and firmware configuration, and requires an operating system to be installed.

The following steps describe the general procedure for setting up a solution:

1. Unpack the solution package. See “Solution package contents” on page 4.
2. Set up the solution hardware.
   a. Install any required hardware or solution options. See the related topics in “Install solution hardware options” on page 75.
   b. If necessary, install the solution into a standard rack cabinet by using the rail kit shipped with the solution. See the *Rack Installation Instructions* that comes with optional rail kit.
   c. Connect the Ethernet cables and power cords to the solution. See “Rear view” on page 28 to locate the connectors. See “Cable the solution” on page 138 for cabling best practices.
   d. Power on the solution. See “Power on the compute node” on page 138.

      Note: You can access the management processor interface to configure the system without powering on the solution. Whenever the solution is connected to power, the management processor interface is available. For details about accessing the management node processor, see:

      “Opening and Using the XClarity Controller Web Interface” section in the XCC documentation version compatible with your server at https://pubs.lenovo.com/lxcc-overview/.
   e. Validate that the solution hardware was set up successfully. See “Validate solution setup” on page 138.
3. Configure the system.
   a. Connect the Lenovo XClarity Controller to the management network. See “Set the network connection for the Lenovo XClarity Controller” on page 141.
   b. Update the firmware for the solution, if necessary. See “Update the firmware” on page 142.
   c. Configure the firmware for the solution. See “Configure the firmware” on page 146.

      The following information is available for RAID configuration:

      - https://lenovopress.com/lp0578-lenovo-raid-introduction
      - https://lenovopress.com/lp0579-lenovo-raid-management-tools-and-resources
   d. Install the operating system. See “Deploy the operating system” on page 152.
   e. Back up the solution configuration. See “Back up the solution configuration” on page 153.
   f. Install the applications and programs for which the solution is intended to be used.

Installation Guidelines

Use the installation guidelines to install components in your solution.

Before installing optional devices, read the following notices carefully:

Attention: Prevent exposure to static electricity, which might lead to system halt and loss of data, by keeping static-sensitive components in their static-protective packages until installation, and handling these devices with an electrostatic-discharge wrist strap or other grounding system.

- Read the safety information and guidelines to ensure that you work safely.
  - A complete list of safety information for all products is available at:

    https://pubs.lenovo.com/safety_documentation/
  - The following guidelines are available as well: "Handling static-sensitive devices" on page 66 and "Working inside the solution with the power on" on page 65.
- Make sure the components you are installing are supported by the solution. For a list of supported optional components for the solution, see https://serverproven.lenovo.com/.
- When you install a new solution, download and apply the latest firmware. This will help ensure that any known issues are addressed, and that your solution is ready to work with optimal performance. Go to Product_name Drivers and Software to download firmware updates for your solution.

  Important: Some cluster solutions require specific code levels or coordinated code updates. If the component is part of a cluster solution, verify the latest Best Recipe code level menu for cluster supported firmware and driver before you update the code.
- It is good practice to make sure that the solution is working correctly before you install an optional component.
- Keep the working area clean, and place removed components on a flat and smooth surface that does not shake or tilt.
- Do not attempt to lift an object that might be too heavy for you. If you have to lift a heavy object, read the following precautions carefully:
  - Make sure that you can stand steadily without slipping.
  - Distribute the weight of the object equally between your feet.
  - Use a slow lifting force. Never move suddenly or twist when you lift a heavy object.
  - To avoid straining the muscles in your back, lift by standing or by pushing up with your leg muscles.
- Make sure that you have an adequate number of properly grounded electrical outlets for the solution, monitor, and other devices.
- Back up all important data before you make changes related to the disk drives.
- Have a small flat-blade screwdriver, a small Phillips screwdriver, and a T8 torx screwdriver available.
- To view the error LEDs on the system board and internal components, leave the power on.
- You do not have to turn off the solution to remove or install hot-swap power supplies, hot-swap fans, or hot-plug USB devices. However, you must turn off the solution before you perform any steps that involve removing or installing adapter cables, and you must disconnect the power source from the solution before you perform any steps that involve removing or installing a riser card.
- Blue on a component indicates touch points, where you can grip to remove a component from or install it in the solution, open or close a latch, and so on.
- Terra-cotta on a component or an Terra-cotta label on or near a component indicates that the component can be hot-swapped if the solution and operating system support hot-swap capability, which means that you can remove or install the component while the solution is still running. (Terra-cotta can also indicate

touch points on hot-swap components.) See the instructions for removing or installing a specific hot-swap component for any additional procedures that you might have to perform before you remove or install the component.

- The Red strip on the drives, adjacent to the release latch, indicates that the drive can be hot-swapped if the solution and operating system support hot-swap capability. This means that you can remove or install the drive while the solution is still running.

  Note: See the system specific instructions for removing or installing a hot-swap drive for any additional procedures that you might need to perform before you remove or install the drive.
- After finishing working on the solution, make sure you reinstall all safety shields, guards, labels, and ground wires.

System reliability guidelines

Review the system reliability guidelines to ensure proper system cooling and reliability.

Make sure the following requirements are met:

- When the server comes with redundant power, a power supply must be installed in each power-supply bay.
- Adequate space around the server must be spared to allow server cooling system to work properly. Leave approximately 50 mm (2.0 in.) of open space around the front and rear of the server. Do not place any object in front of the fans.
- For proper cooling and airflow, refit the server cover before you turn the power on. Do not operate the server for more than 30 minutes with the server cover removed, for it might damage server components.
- Cabling instructions that come with optional components must be followed.
- A failed fan must be replaced within 48 hours since malfunction.
- A removed hot-swap fan must be replaced within 30 seconds after removal.
- A removed hot-swap drive must be replaced within two minutes after removal.
- A removed hot-swap power supply must be replaced within two minutes after removal.
- Every air baffle that comes with the server must be installed when the server starts (some servers might come with more than one air baffle). Operating the server with a missing air baffle might damage the processor.
- All processor sockets must contain either a socket cover or a processor with heat sink.
- When more than one processor is installed, fan population rules for each server must be strictly followed.
- Do not operate the enclosure without the SMM assembly installed. Operating the solution without the SMM assembly might cause the system to fail. Replace the System Management Module (SMM) assembly as soon as possible after removal to ensure proper operation of the system.

Working inside the solution with the power on

Guidelines to work inside the solution with the power on.

Attention: The solution might stop and loss of data might occur when internal solution components are exposed to static electricity. To avoid this potential problem, always use an electrostatic-discharge wrist strap or other grounding systems when working inside the solution with the power on.

- Avoid loose-fitting clothing, particularly around your forearms. Button or roll up long sleeves before working inside the solution.
- Prevent your necktie, scarf, badge rope, or long hair from dangling into the solution.
- Remove jewelry, such as bracelets, necklaces, rings, cuff links, and wrist watches.

- Remove items from your shirt pocket, such as pens and pencils, in case they fall into the solution as you lean over it.
- Avoid dropping any metallic objects, such as paper clips, hairpins, and screws, into the solution.

Handling static-sensitive devices

Use this information to handle static-sensitive devices.

Attention: Prevent exposure to static electricity, which might lead to system halt and loss of data, by keeping static-sensitive components in their static-protective packages until installation, and handling these devices with an electrostatic-discharge wrist strap or other grounding system.

- Limit your movement to prevent building up static electricity around you.
- Take additional care when handling devices during cold weather, for heating would reduce indoor humidity and increase static electricity.
- Always use an electrostatic-discharge wrist strap or other grounding system, particularly when working inside the solution with the power on.
- While the device is still in its static-protective package, touch it to an unpainted metal surface on the outside of the solution for at least two seconds. This drains static electricity from the package and from your body.
- Remove the device from the package and install it directly into the solution without putting it down. If it is necessary to put the device down, put it back into the static-protective package. Never place the device on the solution or on any metal surface.
- When handling a device, carefully hold it by the edges or the frame.
- Do not touch solder joints, pins, or exposed circuitry.
- Keep the device from others' reach to prevent possible damages.

Memory module installation order

Memory modules must be installed in a specific order based on the memory configuration that you implement on your node.

Note: List of supported memory module is different for 1st generation (Skylake) and 2nd generation (Cascade Lake) Intel Xeon processors. Make sure to install compatible memory modules to avoid system error. For a list of supported DIMMs, see: https://serverproven.lenovo.com/.

See the following table for channel information of DIMMs around a processor.

Integrated Memory Controller (iMC)	Controller 1				Controller 0			
Channel	Channel 2	Channel 1	Channel 0	Channel 0	Channel 0	Channel 0	Channel 1	Channel 2
DIMM connector (Processor 1)	1	2	3	4	5	6	7	9
DIMM connector (Processor 2)	9	10	11	12	13	14	15	16

DRAM DIMM installation order

DRAM DIMMs must be installed in a specific order based on the memory configuration that you implement on your node.

The following memory configurations are available for DRAM DIMMs:

- "Memory mirroring population sequence" on page 67
- "Memory rank sparing population sequence" on page 67
- "Independent Memory Mode population sequence" on page 67

Independent Memory Mode population sequence

Table 46. DRAM DIMM installation sequence (Independent mode/normal mode)

Number of processor	Installation sequence (connectors)
Processor 1 installed	6, 3, 7, 2, 8, 1, 5, 4
Processor 1 and 2 installed	6, 14, 3, 11, 7, 15, 2, 10, 8, 16, 1, 9, 5, 13, 4, 12

Notes: In addition, the following slot combinations are available with optimal performance when three or six identical DIMMs (the same Lenovo part number) are installed:

- One processor and three DRAM DIMMs: slot 6, 7, and 8.
- Two processors and six DRAM DIMMs: slot 6, 7, 8, 14, 15, and 16.

Memory mirroring population sequence

Table 47. DRAM DIMM installation sequence (mirror mode/lockstep mode)

Number of processors	Installation sequence (connectors)
Processor 1 installed	(6, 7), (2, 3), (8, 1)
Processor 1 and 2 installed	(6, 7, 14, 15), (2, 3), (10, 11), (1,8), (9, 16)

If you are installing 3, 6, 9 or 12 identical DIMMs for the mirroring mode, comply with the following installation sequence to achieve the best performance.

Table 48. DRAM DIMM installation sequence (mirror mode/lockstep mode for 3, 6, 9 and 12 identical DIMMs)

Number of processors	Installation sequence (connectors)
Processor 1 installed	(6, 7, 8), (1, 2, 3)
Processor 1 and 2 installed	(6, 7, 8), (14, 15, 16), (1, 2, 3), (9, 10, 11)

Memory rank sparing population sequence

Table 49. DRAM DIMM installation sequence (sparing mode)

Note: Single-rank RDIMM is not supported by sparing. If you install single-rank RDIMM, it switches to the independent mode automatically.

Number of processors	Installation sequence (connectors)
Processor 1 installed	6, 3, 7, 2, 8, 1, 5, 4
Processor 1 and 2 installed	6, 14, 3, 11, 7, 15, 2, 10, 8, 16, 1, 9, 5, 13, 4, 12

PMEM and DRAM DIMM installation order

This section contains information of how to install PMEMs and DRAM DIMMs properly.

When PMEMs and DRAM DIMMs are mixed in the system, the following modes are supported:

- "DCPMM installation: App Direct Mode" on page 72
- DCPMM installation: Memory Mode

See the following topics to learn how to set up and configure PMEMs.

- "PMEM rules" on page 68
- "Setting up the system for PMEM for the first time" on page 68
- "PMEM Management options" on page 68
- "Adding or replacing PMEMs in App Direct Mode" on page 71

PMEM rules

Make sure to meet the following requirements when applying PMEMs in the system.

- All the PMEMs that are installed must be of the same part number.
- All the DRAM DIMMs that are installed must be of the same type, rank, and capacity with minimum capacity of 16 GB. It is recommended to use Lenovo DRAM DIMMs with the same part number.
- Supported types of DRAM DIMMs and capacity vary with processors:
  - Processors with model name ending in **H**:
    - DRAM: 32/64 GB RDIMMs
    - PMEM: 128 GB
  - Processors with model name ending in **HL**:
    - DRAM: 128 GB 3DS RDIMMs
    - PMEM: 128, 256 or 512 GB

Setting up the system for PMEM for the first time

Complete the following steps when installing PMEMs to the system for the first time.

1. Consider "PMEM rules" on page 68 and acquire the PMEMs and DRAM DIMMs that meet the requirements.
2. Remove all the memory modules that are presently installed (see "Remove a memory module" in *Maintenance Manual*).
3. Follow the adopted combination to install all the PMEMs and DRAM DIMMs (see "Install a memory module" on page 106).
4. Disable security on all the installed PMEMs (see "PMEM Management options" on page 68).
5. Make sure the PMEM firmware is the latest version. If not, update it to the latest version (see https://sysmgt.lenovofiles.com/help/topic/com.lenovo.lxca.doc/update_fw.html).
6. Configure the PMEMs so that the capacity is available for use (see "PMEM Management options" on page 68).

PMEM Management options

PMEMs can be managed with the following tools:

- **Lenovo XClarity Provisioning Manager (LXPM)**

To open LXPM, power on the system and press the key specified in the on-screen instructions as soon as the logo screen appears. If a password has been set, enter the password to unlock LXPM. For more information, see the “Startup” section in the LXPM documentation compatible with your server at https://pubs.lenovo.com/lxpm-overview/.

Go to **UEFI Setup → System Settings → Intel Optane PMEMs** to configure and manage PMEMs.

For more details, see the “UEFI setup” section in the LXPM documentation compatible with your server at https://pubs.lenovo.com/lxpm-overview/.

Note: If the text-based interface of Setup Utility opens instead of LXPM, go to **System Settings → <F1> Start Control** and select **Tool Suite**. Then, reboot the system, and as soon as the logo screen appears, press the key specified in the on-screen instructions to open LXPM. (For more information, see the “Startup” section in the LXPM documentation compatible with your server at https://pubs.lenovo.com/lxpm-overview/.)

- **Setup Utility**

  To enter Setup Utility:

  1. Power on the system and press the key specified in the on-screen instructions to open LXPM.

     (For more information, see the “Startup” section in the LXPM documentation compatible with your server at https://pubs.lenovo.com/lxpm-overview/.)
  2. Go to **UEFI Settings → System Settings**, click on the pull-down menu on the upper right corner of the screen, and select **Text Setup**.
  3. Reboot the system, and as soon as the logo screen appears, press the key specified in the on-screen instructions.

  Go to **System Configuration and Boot Management → System Settings → Intel Optane PMEMs** to configure and manage PMEMs.

- **Lenovo XClarity Essentials OneCLI**

  Some management options are available in commands that are executed in the path of Lenovo XClarity Essentials OneCLI in the operating system. See https://pubs.lenovo.com/lxce-onecli/download_use_onecli to learn how to download and use Lenovo XClarity Essentials OneCLI.

Following are the available management options:

- **Intel Optane PMEMs details**

  Select this option to view the following details concerning each of the installed PMEMs:

  – Number of Intel Optane PMEMs detected
  – Total raw capacity
  – Total memory capacity
  – Total App Direct capacity
  – Total unconfigured capacity
  – Total inaccessible capacity
  – Total reserved capacity

  Alternatively, view PMEM details with the following command in OneCLI:

  ```
  OneCli.exe config show IntelOptanePMEM --bmc XCC_Account:XCC_Password@XCC_IP
  ```

  Notes:
  – *XCC_Account* stands for XCC user ID.
  – *XCC_Password* stands for XCC user password.
  – *XCC_IP* stands for XCC IP address.

- **Regions**

  After the memory percentage is set and the system is rebooted, regions for the App Direct capacity will be generated automatically. Select this option to view the App Direct regions per processor.

- **Namespaces**

  App Direct capacity of PMEMs requires the following steps before it is truly available for applications.

  1. Namespaces must be created for region capacity allocation.
  2. Filesystem must be created and formatted for the namespaces in the operating system.

  Each App Direct region can be allocated into one namespace. Create namespaces in the following operating systems:

  – Windows: Use *powershell* command. To create a namespace, use Windows Server 2019 or later versions.
  – Linux: Use *ndctl* command.
  – VMware: Reboot the system, and VMware will create namespaces automatically.

  After creating namespaces for App Direct capacity allocation, make sure to create and format filesystem in the operating system so that the App Direct capacity is accessible for applications.

- **Security**

  – Enable Security

    Attention: By default, PMEM security is disabled. Before enabling security, make sure all the country or local legal requirements regarding data encryption and trade compliance are met. Violation could cause legal issues.

    PMEMs can be secured with passphrases. Two types of passphrase protection scope are available for PMEM:

    – **Platform:** Choose this option to run security operation on all the installed PMEM units at once. A platform passphrase is stored and automatically applied to unlock PMEMs before operating system starts running, but the passphrase still has to be disabled manually for secure erase.

      Alternatively, enable/disable platform level security with the following commands in OneCLI:

      - Enable security:
        1. Enable security.
           ```
           onecli.exe config set IntelOptanePMEM.SecurityOperation "Enable Security" --imm
           USERID:PASSWORD@10.104.195.86
           ```
        2. Set the security passphrase.
           ```
           onecli.exe config set IntelOptanePMEM.SecurityPassphrase "123456" --imm
           USERID:PASSWORD@10.104.195.86 --imm USERID:PASSWORD@10.104.195.86
           ```
           Where *123456* stands for the passphrase.
        3. Reboot the system.
      - Disable security:
        1. Disable security.
           ```
           onecli.exe config set IntelOptanePMEM.SecurityOperation "Disable Security" --imm
           USERID:PASSWORD@10.104.195.86
           ```
        2. Enter passphrase.
           ```
           onecli.exe config set IntelOptanePMEM.SecurityPassphrase "123456" --imm
           USERID:PASSWORD@10.104.195.86
           ```
        3. Reboot the system.

– **Single PMEM:** Choose this option to run security operation on one or more selected PMEM units.

Notes:

- Single PMEM passphrases are not stored in the system, and security of the locked units needs to be disabled before the units are available for access or secure erase.
- Always make sure to keep records of the slot number of locked PMEMs and corresponding passphrases. In the case the passphrases are lost or forgotten, the stored data cannot be backed up or restored, but you can contact Lenovo service for administrative secure erase.
- After three failed unlocking attempts, the corresponding PMEMs enter “exceeded” state with a system warning message, and the PMEM unit can only be unlocked after the system is rebooted.

To enable passphrase, go to **Security → Press to Enable Security**.

– Secure Erase

Notes:

– Password is required to perform Secure Erase when security enabled.

– Before executing secure erase, make sure ARS (Address Range Scrub) is done on all PMEMs or on the specific PMEMs selected. Otherwise, secure erase cannot be started on all PMEMs or the specific PMEM selected, and the following text message will pop out:

```
The passphrase is incorrect for single or multiple or all Intel Optane PMEMs selected, or maybe there is
namespace on the selected PMEMs. Secure erase operation is not done on all Intel Optane PMEMs selected.
```

Secure erase cleanses all the data that is stored in the PMEM unit, including encrypted data. This data deletion method is recommended before returning or disposing a malfunctioning unit, or changing PMEM mode. To perform secure erase, go to **Security → Press to Secure Erase**.

Alternatively, perform platform level secure erase with the following command in OneCLI:

```
OneCli.exe config set IntelOptanePMEM.SecurityOperation "Secure Erase Without Passphrase" --bmc
USERID:PASSWORD@10.104.195.86
```

- **PMEM Configuration**

  PMEM contains spared internal cells to stand in for the failed ones. When the spared cells are exhausted to 0%, there will be an error message, and it is advised to back up data, collect service log, and contact Lenovo support.

  There will also be a warning message when the percentage reaches 1% and a selectable percentage (10% by default). When this message appears, it is advised to back up data and run PMEM diagnostics (see the “Diagnostics” section in the LXPM documentation compatible with your server at https://pubs.lenovo.com/lxpm-overview/). To adjust the selectable percentage that the warning message requires, go to **Intel Optane PMEMs → PMEM Configuration**, and input the percentage.

  Alternatively, change the selectable percentage with the following command in OneCLI:

```
onecli.exe config set IntelOptanePMEM.PercentageRemainingThresholds 20 --imm USERID:PASSWORD@10.104.195.86
```

  Where *20* is the selectable percentage.

Adding or replacing PMEMs in App Direct Mode

Complete the following steps before adding or replacing PMEMs in App Direct Mode.

1. Back up stored data in PMEM namespaces.
2. Disable PMEM security with one of the following options:
   - **LXPM**

Go to **UEFI Setup → System Settings → Intel Optane PMEMs → Security → Press to Disable Security**, and input passphrase to disable security.

- **Setup Utility**

  Go to **System Configuration and Boot Management → System Settings → Intel Optane PMEMs → Security → Press to Disable Security**, and input passphrase to disable security.

3. Delete namespaces with command corresponding to the operating system that is installed:
   - **Linux** command:
     `ndctl destroy-namespace all -f`
   - **Windows** Powershell command:
     `Get-PmemDisk | Remove-PmemDisk`
4. Clear Platform Configuration Data (PCD) and Namespace Label Storage Area (LSA) with the following ipmctl command (for both Linux and Windows).
   `ipmctl delete -pcd`

   Notes: See the following links to learn how to download and use impctl in different operating systems:
   - Windows: https://datacentersupport.lenovo.com/us/en/videos/YTV101407
   - Linux: https://datacentersupport.lenovo.com/us/en/solutions/HT508642
5. Reboot the system.

DCPMM installation: App Direct Mode

In this mode, DCPMMs act as independent and persistent memory resources directly accessible by specific applications, and DRAM DIMMs act as system memory.

App Direct Mode - one processor

Table 50. App Direct Mode with one processor

- **D**: DRAM DIMMs
- **P**: DC Persistent Memory Module (DCPMM)

Configuration	Processor 1							
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
1 DCPMM and 6 DIMMs	D	D	D		**P**	D	D	D
2 DCPMMs and 6 DIMMs	D	D	D	**P**	**P**	D	D	D

Table 51. Supported DCPMM capacity in App Direct Mode with one processor

Total DCPMMs	Total DIMMs	Processor Family	128 GB DCPMM	256 GB DCPMM	512 GB DCPMM
1	6	**L**	√	√	√
		M	√	√	√
		Other	√	√	√
2	6	**L**	√	√	
		M	√	√	
		Other	√	√	

App Direct Mode - two processors

Table 52. App Direct Mode with two processors

- **D**: DRAM DIMMs
- **P**: DC Persistent Memory Module (DCPMM)

Configuration	Processor 1								Processor 2							
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**
1 DCPMM and 12 DIMMs	D	D	D		**P**	D	D	D	D	D	D			D	D	D
2 DCPMMs and 12 DIMMs	D	D	D		**P**	D	D	D	D	D	D		**P**	D	D	D
4 DCPMMs and 12 DIMMs	D	D	D	**P**	**P**	D	D	D	D	D	D	**P**	**P**	D	D	D

Table 53. Supported DCPMM capacity in App Direct Mode with two processors

Total DCPMMs	Total DIMMs	Processor Family	128 GB DCPMM	256 GB DCPMM	512 GB DCPMM
1	12	L	√	√	√
		M	√	√	√
		Other	√	√	√
2	12	L	√	√	√
		M	√	√	√
		Other	√	√	
4	12	L	√	√	√
		M	√	√	
		Other	√		

DCPMM installation: Memory Mode

In this mode, DCPMMs act as volatile system memory, while DRAM DIMMs act as cache.

Memory Mode - one processor

Table 54. Memory Mode with one processor

- **D**: DRAM DIMMs
- **P**: DC Persistent Memory Module (DCPMM)

Configuration	Processor 1							
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
2 DCPMMs and 6 DIMMs	D	D	D	**P**	**P**	D	D	D

Table 55. Supported DCPMM capacity in Memory Mode with one processor

Total DCPMMs	Total DIMMs	Processor Family	128 GB DCPMM	256 GB DCPMM	512 GB DCPMM
2	6	L		√	√

Table 55. Supported DCPMM capacity in Memory Mode with one processor (continued)

		M		√	√
		Other		√	

Memory Mode - two processors

Table 56. Memory Mode with two processors

- **D**: DRAM DIMMs
- **P**: DC Persistent Memory Module (DCPMM)

Configuration	Processor 1								Processor 2							
	1	**2**	**3**	**4**	**5**	**6**	**7**	**18**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**
4 DCPMMs and 12 DIMMs	D	D	D	**P**	**P**	D	D	D	D	D	D	**P**	**P**	D	D	D

Table 57. Supported DCPMM capacity in Memory Mode with two processors

Total DCPMMs	**Total DIMMs**	**Processor Family**	**128 GB DCPMM**	**256 GB DCPMM**	**512 GB DCPMM**
4	**12**	**L**		√	√
		M		√	
		Other			

DCPMM installation: Mixed Memory Mode

In this mode, some percentage of DCPMM capacity is directly accessible to specific applications (App Direct), while the rest serves as system memory. The App Direct part of DCPMM is displayed as persistent memory, while the rest of DCPMM capacity is displayed as system memory. DRAM DIMMs act as cache in this mode.

Mixed Memory Mode - one processor

Table 58. Mixed Memory Mode with one processor

- **D**: DRAM DIMMs
- **P**: DC Persistent Memory Module (DCPMM)

Configuration	Processor 1							
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
2 DCPMMs and 6 DIMMs	D	D	D	**P**	**P**	D	D	D

Table 59. Supported DCPMM capacity in Mixed Memory Mode with one processor

Total DCPMMs	**Total DIMMs**	**Processor Family**	**128 GB DCPMM**	**256 GB DCPMM**	**512 GB DCPMM**
2	**6**	**L**			√
		M			√
		Other			

Mixed Memory Mode - two processors

Table 60. Mixed Memory Mode with two processors

- **D**: DRAM DIMMs
- **P**: DC Persistent Memory Module (DCPMM)

Configuration	Processor 1								Processor 2							
	1	**2**	**3**	**4**	**5**	**6**	**7**	**18**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**
4 DCPMMs and 12 DIMMs	D	D	D	**P**	**P**	D	D	D	D	D	D	**P**	**P**	D	D	D

Table 61. Supported DCPMM capacity in Mixed Memory Mode with two processors

Total DCPMMs	Total DIMMs	Processor Family	128 GB DCPMM	256 GB DCPMM	512 GB DCPMM
4	12	**L**			√
		M			
		Other			

Install solution hardware options

This section includes instructions for performing initial installation of optional hardware. Each component installation procedure references any tasks that need to be performed to gain access to the component being replaced.

Installation procedures are presented in the optimum sequence to minimize work.

Attention: To ensure the components you install work correctly without problems, read the following precautions carefully.

- Make sure the components you are installing are supported by the solution. For a list of supported optional components for the solution, see https://serverproven.lenovo.com/.
- Always download and apply the latest firmware. This will help ensure that any known issues are addressed, and that your solution is ready to work with optimal performance. Go to Product_name Drivers and Software to download firmware updates for your solution.
- It is good practice to make sure that the solution is working correctly before you install an optional component.
- Follow the installation procedures in this section and use appropriate tools. Incorrectly installed components can cause system failure from damaged pins, damaged connectors, loose cabling, or loose components.

Install hardware options in the enclosure

Use the following information to remove and install the enclosure options.

Remove the shuttle

Use this information to remove the shuttle.

Before you remove the shuttle:

1. Read the following section(s) to ensure that you work safely.
   - “Installation Guidelines” on page 64

2. Power off all the compute nodes and peripheral devices (see “Power off the compute node” on page 139).
3. Disengage all the compute nodes from the enclosure.
4. Disconnect the power cords and all external cables from the rear of the enclosure.

Attention: Be careful when you are removing or installing the shuttle to avoid damaging the shuttle connectors.

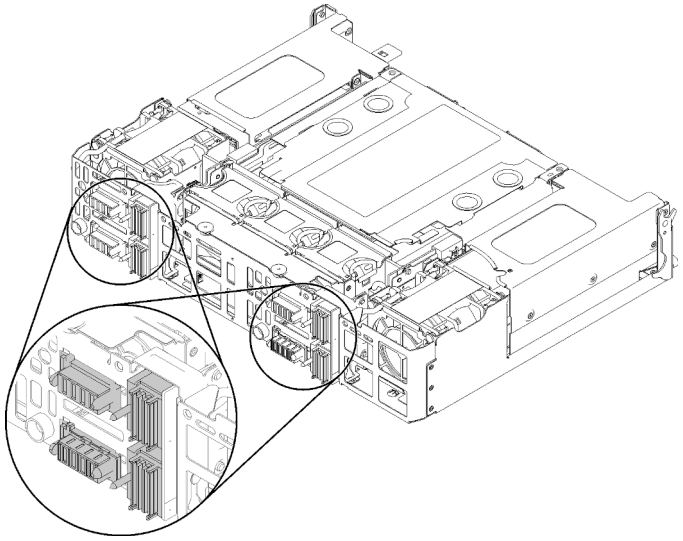


Figure 61. Shuttle connectors

Complete the following steps to remove the shuttle.

Step 1. Turn the two thumbscrews counterclockwise and lift the handles up.

Step 2. Pull the handles and slide the half of the shuttle out of the chassis.

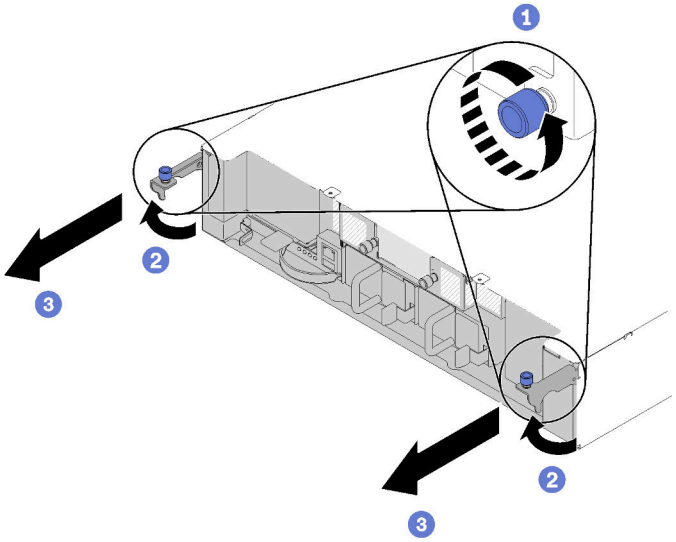


Figure 62. Shuttle removal

Step 3. Push two release latches and slide the whole shuttle out of the chassis.

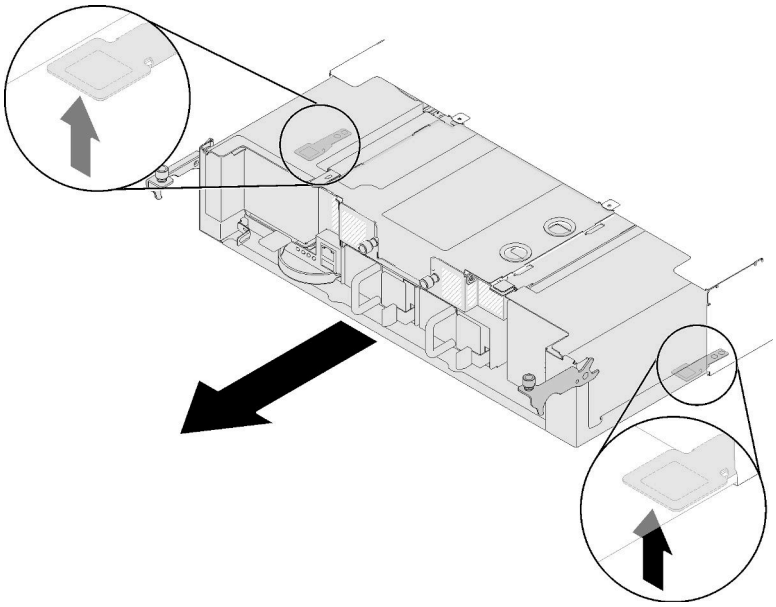


Figure 63. Shuttle removal

Attention: To prevent any damage to the shuttle connectors, make sure that you hold the shuttle properly to put it down as illustrated.

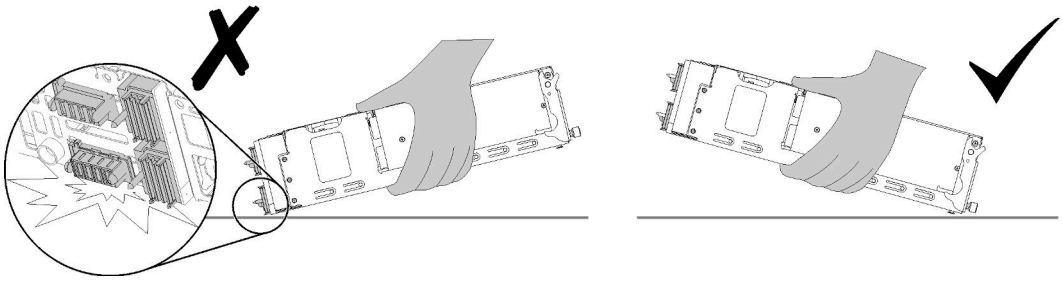


Figure 64. Shuttle connectors

After removing the shuttle from the enclosure:

- If you are instructed to return the component or optional device, follow all packaging instructions, and use any packaging materials for shipping that are supplied to you.

Demo video

Watch the procedure on YouTube

Remove the EIOM

Use this information to remove the EIOM.

Before you remove the EIOM:

1. Read the following section(s) to ensure that you work safely.
   - “Installation Guidelines” on page 64
2. Power off all the compute nodes and peripheral devices (see “Power off the compute node” on page 139).

3. Disengage all the compute nodes from the enclosure.
4. Disconnect the power cords and all external cables from the rear of the enclosure.
5. Remove the shuttle (see “Remove the shuttle” on page 75) and place it on the stable work surface.

Complete the following steps to remove the EIOM.

- For 10GbE cage (SFP+) model

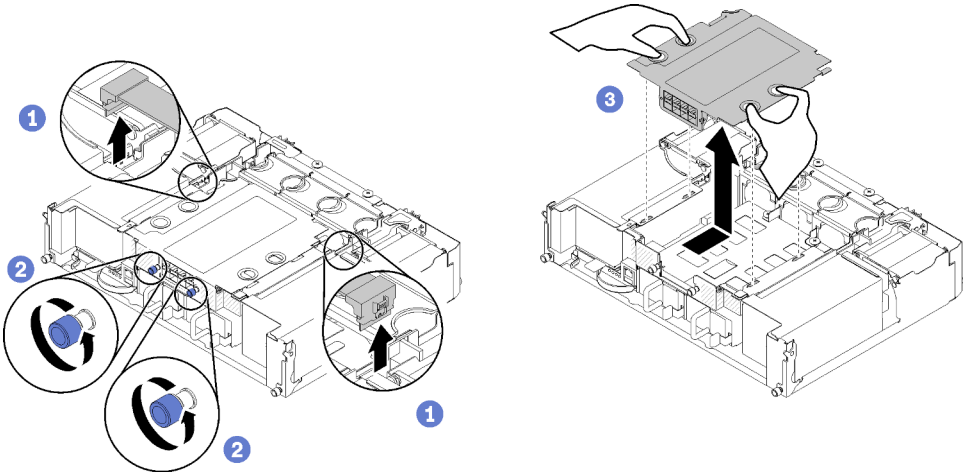


Figure 65. EIOM removal

- For 10GBASE-T cage (RJ-45) model

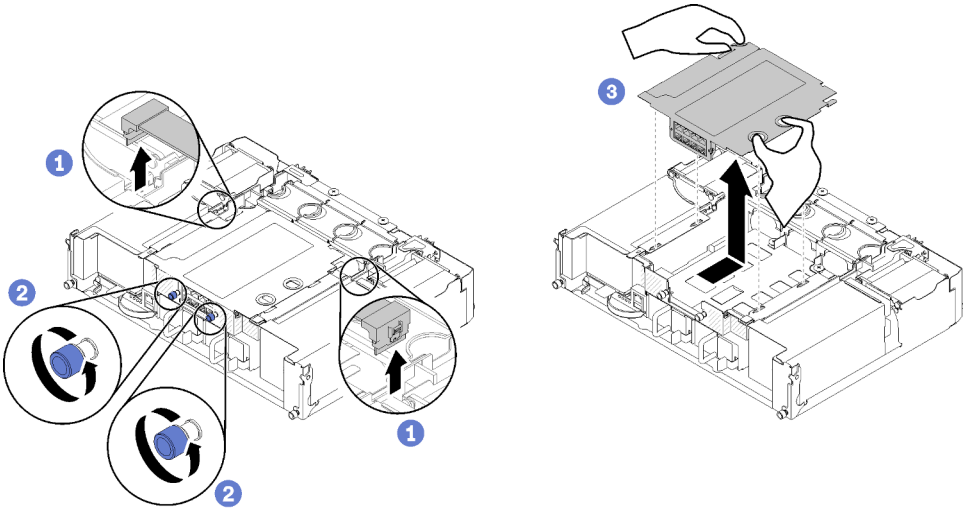


Figure 66. EIOM removal

- For EIOM filler

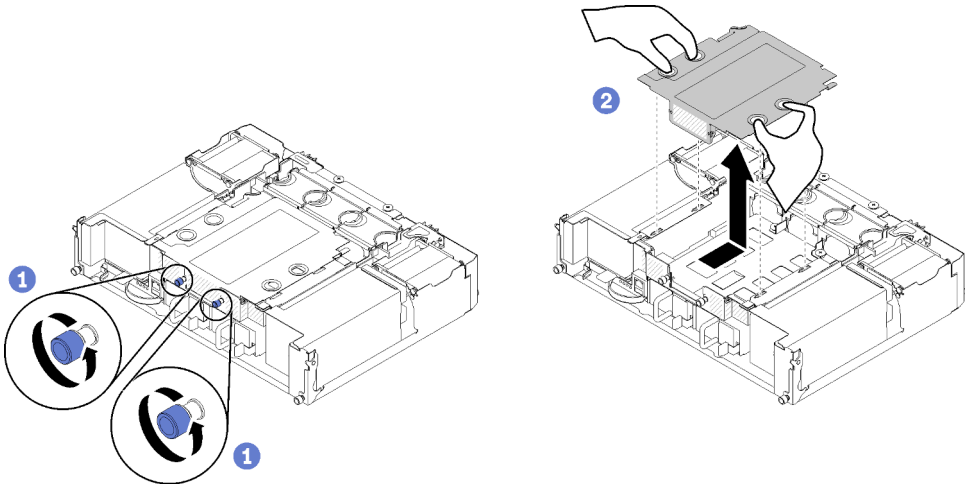


Figure 67. EIOM filler removal

Step 1. Disconnect two cables from the EIOM. (Skip this step for the EIOM filler)

Note: Make sure you push the release latch only when disconnecting the signal cable.

Step 2. Turn the thumbscrews counterclockwise.

Step 3. Grasp and push the EIOM slightly towards the front side of the shuttle.

Step 4. Lift the EIOM up to remove the EIOM from the shuttle.

After removing the EIOM:

- If you are instructed to return the component or optional device, follow all packaging instructions, and use any packaging materials for shipping that are supplied to you.

Demo video

Watch the procedure on YouTube

Install a low-profile PCIe x16 adapter

Use this information to install a low-profile PCIe x16 adapter.

Before you install a low-profile PCIe x16 adapter:

1. Read the following section(s) to ensure that you work safely.
   - “Installation Guidelines” on page 64
2. Turn off the corresponding compute node that you are going to perform the task on.
3. Touch the static-protective package that contains the adapter to any unpainted metal surface on the solution; then, remove the adapter from the package.
4. Locate the adapter.

Figure 68. Adapter location

5. Place the adapter, component side up, on a flat, static-protective surface and set any jumpers or switches as described by the adapter manufacturer, if necessary.

Complete the following steps to install a low-profile PCIe x16 adapter.

Step 1. Remove the adapter cassette.

a. Slide the release latch to the open position.

b. Slide the adapter cassette out of the shuttle.

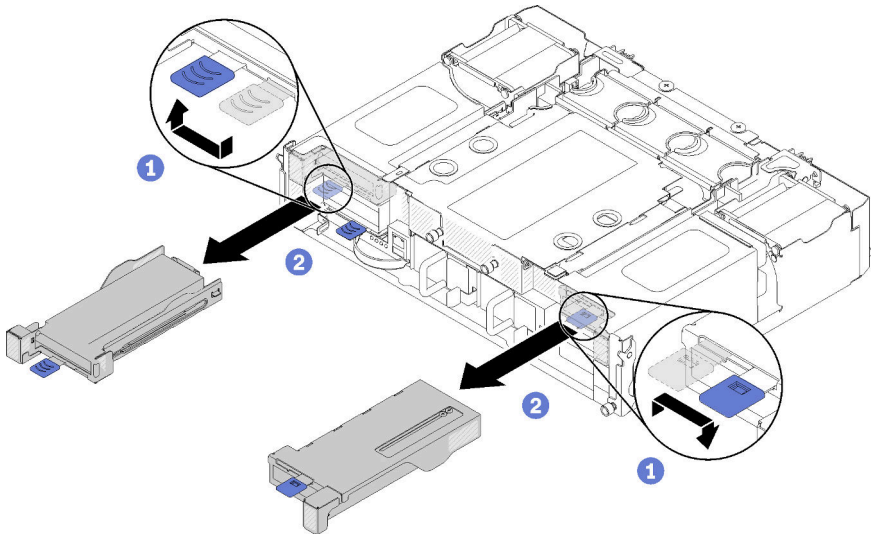


Figure 69. Adapter cassette removal

Step 2. Install the adapter to the adapter cassette.

a. Remove the screws.

b. Slide the expansion-slot cover out.

c. Align the gold finger on the adapter with the cassette, then, insert the adapter into the adapter cassette.

d. Loosen bracket screws for about 1/4 turn to adjust the adapter bracket to secure the adapter according to your adapter length; then, tighten bracket screws.

e. Fasten the screw to secure the adapter to the cassette.

f. Connect any required cables to the adapter.

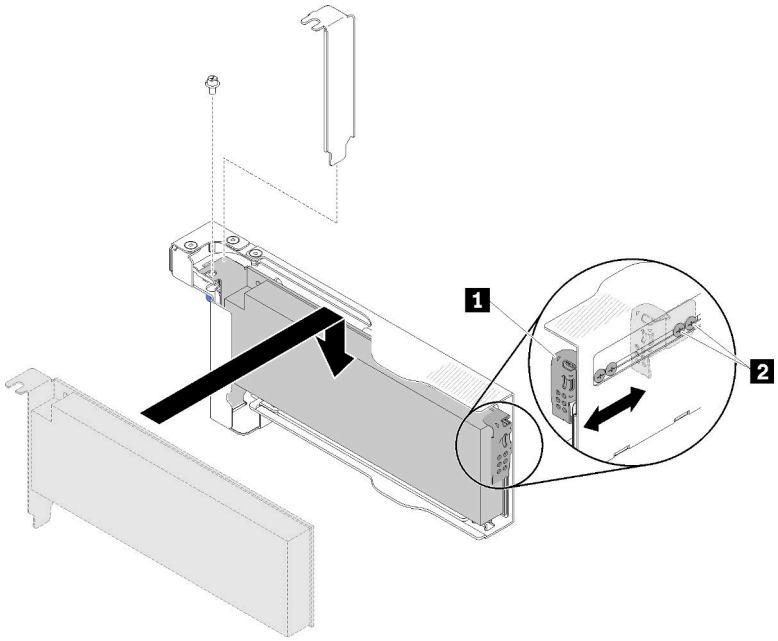


Figure 70. Adapter installation

Step 3. Reinstall the adapter cassette.

a. Slide the release latch to the open position.

Note: Pay attention to the adapter cassette position when you installing it and see the following illustration for the accurate position information.

b. Carefully align the adapter cassette with the guides on the shuttle ; then, slide the adapter cassette into the shuttle and make sure that the cassette is fully seated.

c. Slide the release latch to the close position.

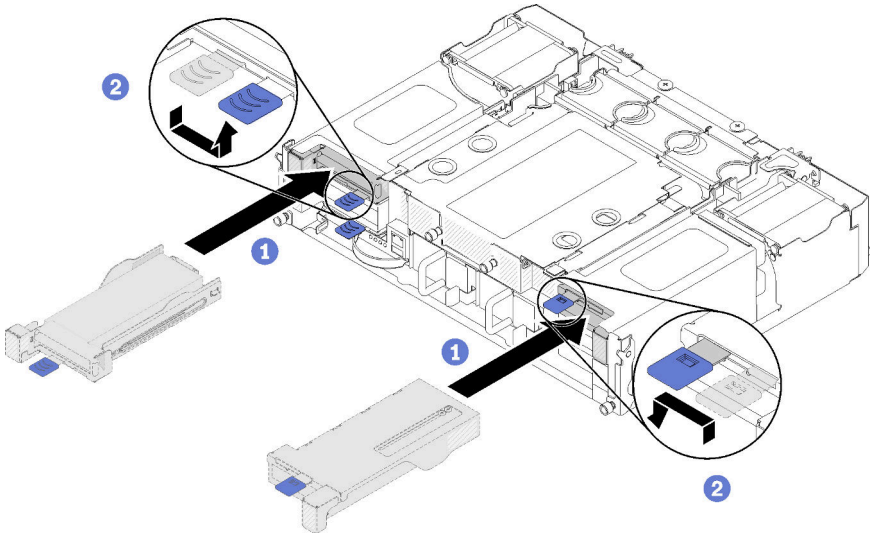


Figure 71. Adapter cassette installation

After you install a low-profile PCIe x16 adapter, complete the following steps.

1. Reseat the corresponding compute node after you remove/add/replace the adapter.

2. Reconnect the power cords and any cables that you removed.
3. Turn on all compute nodes.

Demo video

Watch the procedure on YouTube

Install a low-profile PCIe x8 adapter

Use this information to install a low-profile PCIe x8 adapter.

Before you install a low-profile PCIe x8 adapter:

1. Read the following section(s) to ensure that you work safely.
   - “Installation Guidelines” on page 64
2. Power off all the compute nodes and peripheral devices (see “Power off the compute node” on page 139).
3. Disengage all the compute nodes from the enclosure.
4. Disconnect the power cords and all external cables from the rear of the enclosure.
5. Remove the shuttle from the enclosure (see “Remove the shuttle” on page 75).
6. Locate the adapter.

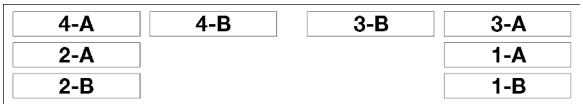


Figure 72. Adapter location

7. Touch the static-protective package that contains the adapter to any unpainted metal surface on the solution; then, remove the adapter from the package.
8. Place the adapter, component side up, on a flat, static-protective surface and set any jumpers or switches as described by the adapter manufacturer.

Complete the following steps to install a low-profile PCIe x8 adapter.

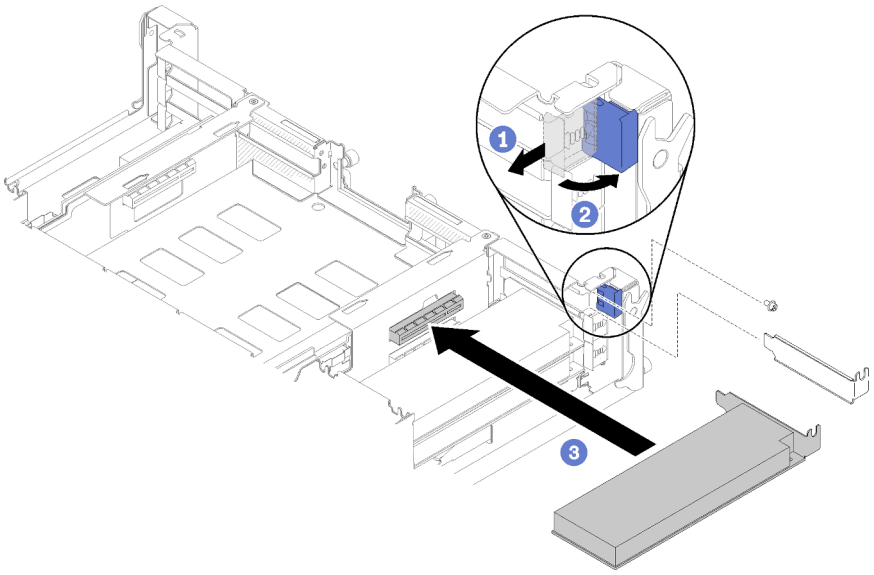


Figure 73. Adapter installation

Step 1. Slide the retention bracket forward and rotate it to the open position.

Step 2. Remove screw (if necessary).

Step 3. Slide the expansion-slot cover out of the shuttle.

Step 4. Align the adapter with the PCI connector on the shuttle and press the adapter firmly into the PCI connector on the shuttle.

Step 5. Rotate the retention bracket and slide toward the rear of the shuttle to the close position.

Step 6. Fasten the screw if necessary.

Note: Fasten the screw if the solution is under vibration environment or you plan to transport the solution.

After you install a low-profile PCIe x8 adapter, complete the following steps.

1. Reinstall the shuttle (see "Install the compute node cover" on page 116).
2. Reconnect the power cords and any cables that you removed.
3. Push all compute nodes back into the enclosure (see "Install a compute node in the enclosure" on page 117).
4. Turn on all compute nodes.

Demo video

Watch the procedure on YouTube

Install a low-profile PCIe x8 adapter in PCIe slot 3-B and 4-B

Use this information to install a low-profile PCIe x8 adapter in PCIe slot 3-B and 4-B.

Before you install a low-profile PCIe x8 adapter in PCIe slot 3-B and 4-B:

1. Read the following section(s) to ensure that you work safely.
   - "Installation Guidelines" on page 64
2. Power off all the compute nodes and peripheral devices (see "Power off the compute node" on page 139).

3. Disengage all the compute nodes from the enclosure.
4. Disconnect the power cords and all external cables from the rear of the enclosure.
5. Remove the shuttle (see “Remove the shuttle” on page 75).
6. Remove the EIOM card (see “Remove the EIOM” on page 77).
7. Touch the static-protective package that contains the adapter to any unpainted metal surface on the solution; then, remove the adapter from the package.
8. Locate the adapter.

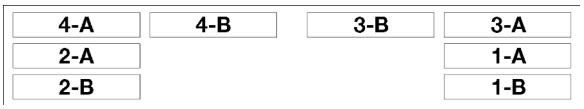


Figure 74. Adapter location

9. Place the adapter, component side up, on a flat, static-protective surface and set any jumpers or switches as described by the adapter manufacturer, if necessary.

Complete the following steps to install a low-profile PCIe x8 adapter in PCIe slot 3-B and 4-B.

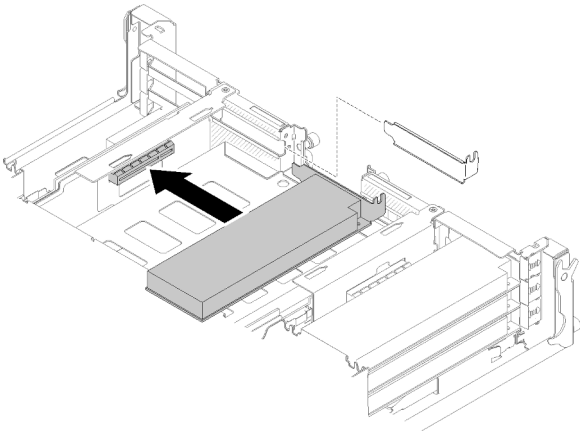


Figure 75. Adapter installation

Step 1. Slide the expansion-slot cover out of the shuttle.

Step 2. Align the adapter with the PCI connector on the shuttle and press the adapter firmly into the PCI connector on the shuttle.

After you install a low-profile PCIe x8 adapter in PCIe slot 3-B and 4-B, complete the following steps.

1. Reinstall the EIOM card (see “Install the EIOM” on page 86).
2. Reinstall the shuttle (see “Install the compute node cover” on page 116).
3. Reconnect the power cords and any cables that you removed.
4. Push all compute nodes back into the enclosure (see “Install a compute node in the enclosure” on page 117).
5. Turn on all compute nodes.

Install a hot-swap power supply

Use this information to install a hot-swap power supply.

To avoid possible danger, read and follow the following safety statement.

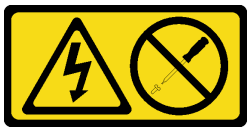
- **S001**

DANGER

Electrical current from power, telephone, and communication cables is hazardous.
To avoid a shock hazard:

- **Connect all power cords to a properly wired and grounded electrical outlet/source.**
- **Connect any equipment that will be attached to this product to properly wired outlets/sources.**
- **When possible, use one hand only to connect or disconnect signal cables.**
- **Never turn on any equipment when there is evidence of fire, water, or structural damage.**
- **The device might have more than one power cord, to remove all electrical current from the device, ensure that all power cords are disconnected from the power source.**

- **S035**



CAUTION:
Never remove the cover on a power supply or any part that has this label attached. Hazardous voltage, current, and energy levels are present inside any component that has this label attached. There are no serviceable parts inside these components. If you suspect a problem with one of these parts, contact a service technician.

Before you install a hot-swap power supply:

Notes:

1. Make sure the devices you are installing are supported. For a list of supported optional devices for the solution, see https://serverproven.lenovo.com/.
2. Do not install two power supply units with different wattages. Related information is available from the following:

- Read the label on top cover for maximum wattage output of installed power supply units. Only replace the existing units with those with the same wattage as marked on the label.
- Check the rear of the node to make sure there is no length difference between the two installed units. If there is visible difference in length, it means the two units come with different wattages, and one of them have to be replaced.

Complete the following steps to install a hot-swap power supply.

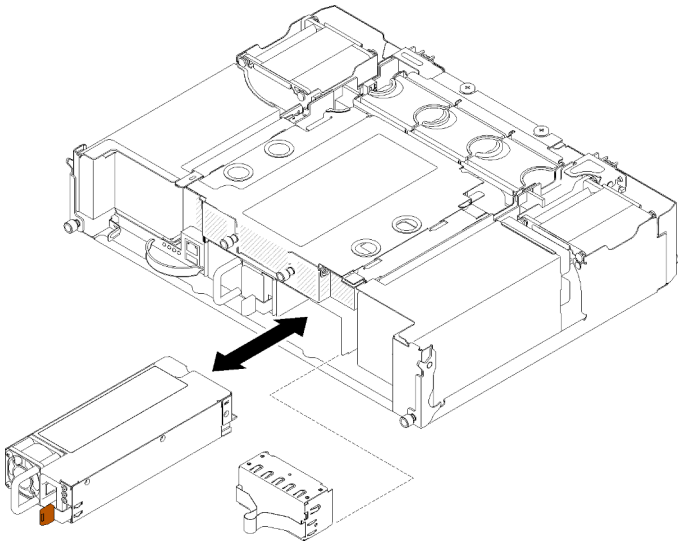


Figure 76. Hot-swap power supply installation

Step 1. Slide the hot-swap power supply into the bay until the release latch clicks into place.

Important: During normal operation, each power-supply bay must contain either a power supply or power-supply filler panel for proper cooling.

Step 2. Connect one end of the power cord for the new power supply into the AC connector on the back of the power supply; then, connect the other end of the power cord into a properly grounded electrical outlet.

Note: Connect the power cord to the power supply unit, and make sure it's properly connected to the power.

Step 3. If the node is turned off, turn on the node.

Step 4. Make sure that the ac power LED on the power supply is lit, indicating that the power supply is operating correctly. If the node is turned on, make sure that the dc power LED on the power supply is lit also.

After you install a hot-swap power supply, complete the following steps:

1. Reconnect the power cords and any cables that you removed.
2. Turn on all compute nodes.

Demo video

Watch the procedure on YouTube

Install the EIOM

Use this information to install the EIOM.

Before you install the EIOM:

1. Read the following section(s) to ensure that you work safely.
   - “Installation Guidelines” on page 64
2. Turn off the server and peripheral devices and disconnect the power cords and all external cables (see “Power off the compute node” on page 139).
3. Disengage all the compute nodes from the enclosure.

4. Remove the shuttle (see “Remove the shuttle” on page 75) and place it on the stable work surface.

Note: The minimum networking speed requirement for the EIOM is 1Gbps.

Complete the following steps to install the EIOM.

Step 1. Grasp the EIOM and align the four EIOM tabs with the slots in the shuttle; then, lower the EIOM into the slots.

- For 10GbE cage (SFP+) model

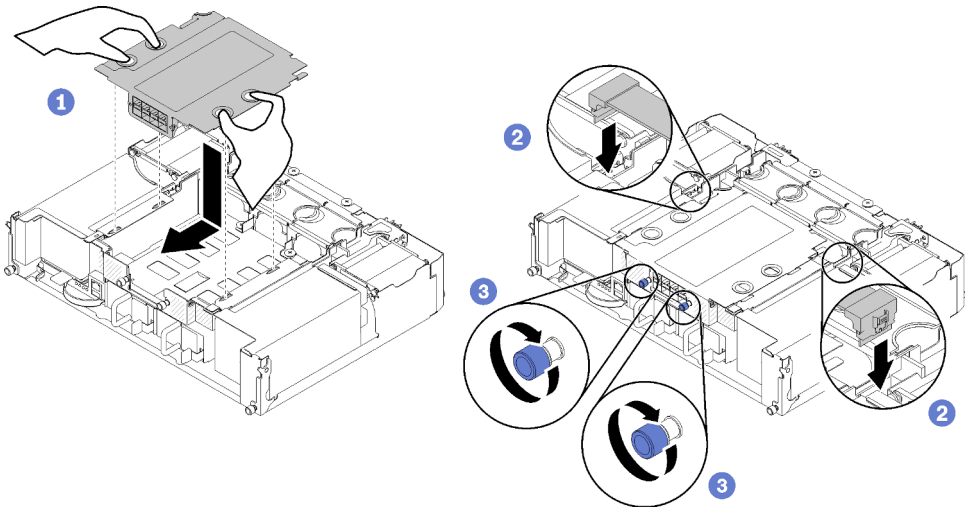


Figure 77. EIOM installation

- For 10GBASE-T cage (RJ-45) model

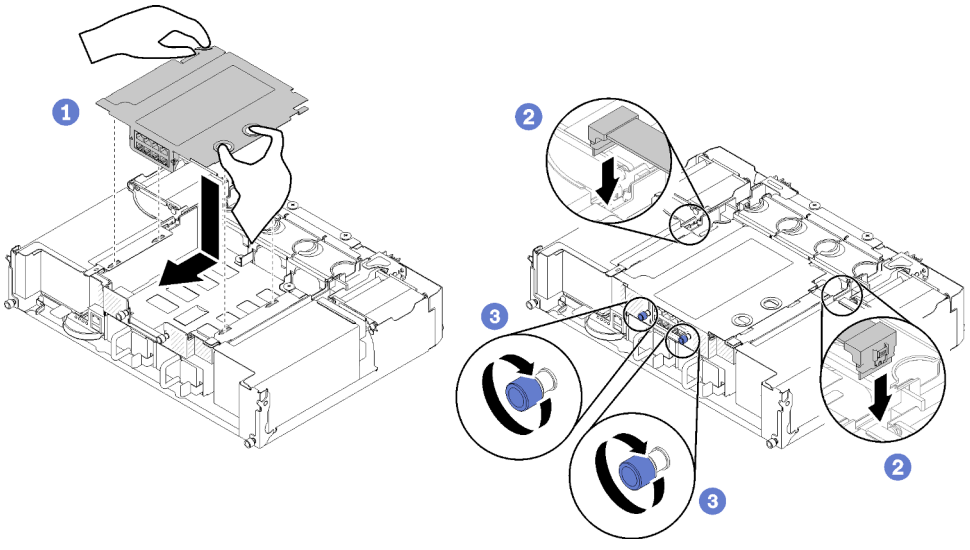


Figure 78. EIOM installation

- For EIOM filler

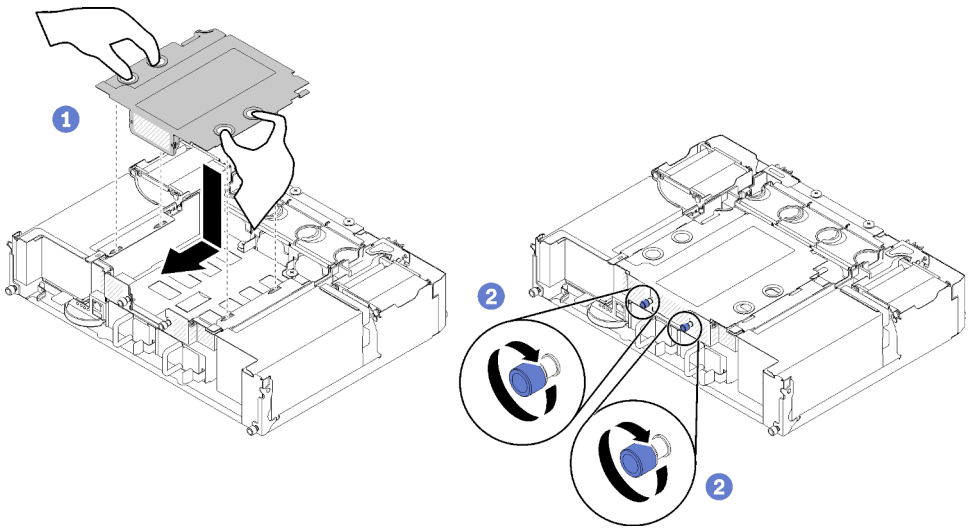


Figure 79. EIOM filler removal

Step 2. Pull the EIOM slightly towards the rear side of the shuttle.

Step 3. Connect required cables to the EIOM. (Skip this step for the EIOM filler)

Step 4. Turn the thumbscrews clockwise.

After you install the EIOM, complete the following steps:

1. Reinstall the shuttle (see "Install the shuttle" on page 88).
2. Reconnect the power cords and any cables that you removed.
3. Push all compute nodes back into the enclosure (see "Install a compute node in the enclosure" on page 117).
4. Turn on all compute nodes.

Demo video

Watch the procedure on YouTube

Install the shuttle

Use this information to install the shuttle.

Before you install the shuttle:

1. Read the following section(s) to ensure that you work safely.
   - "Installation Guidelines" on page 64
2. Power off all the compute nodes and peripheral devices (see "Power off the compute node" on page 139).
3. Disengage all the compute nodes from the enclosure.
4. Disconnect the power cords and all external cables from the rear of the enclosure.

Attention: Be careful when you are removing or installing the shuttle to avoid damaging the shuttle connectors.

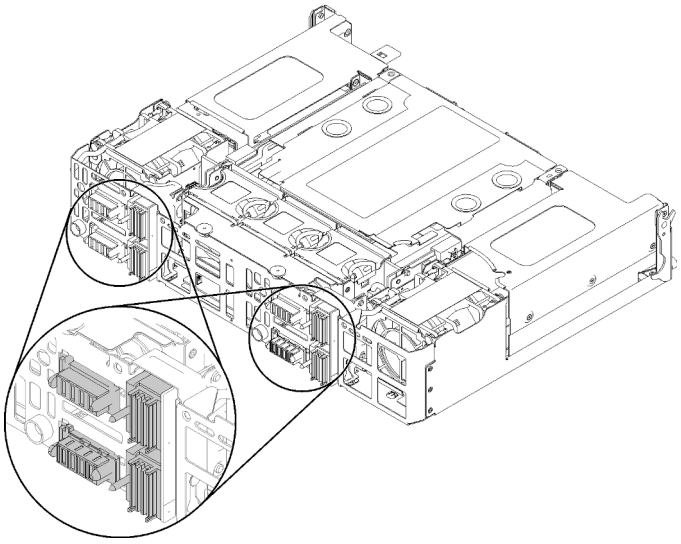


Figure 80. Shuttle connectors

Complete the following steps to install the shuttle.

Step 1. Turn the two thumbscrews counterclockwise to release handles.

Step 2. Align the shuttle with rails and pins; then, slide the shuttle into the enclosure.

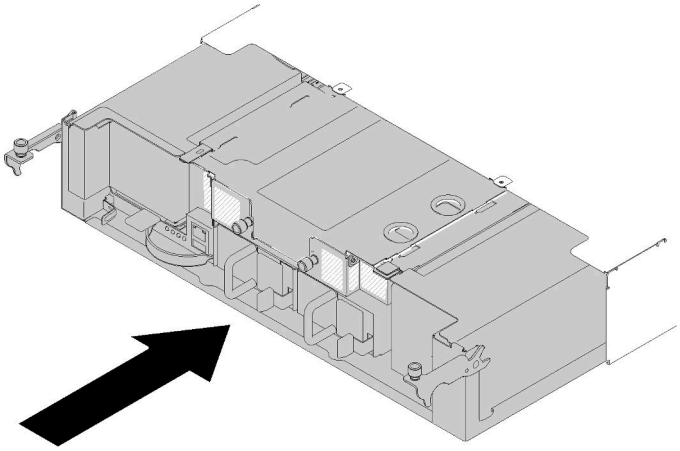


Figure 81. Shuttle installation

Step 3. Make sure the pins on the shuttle are fully seated in the slots.

Step 4. Push the handles down and turn the thumbscrews clockwise.

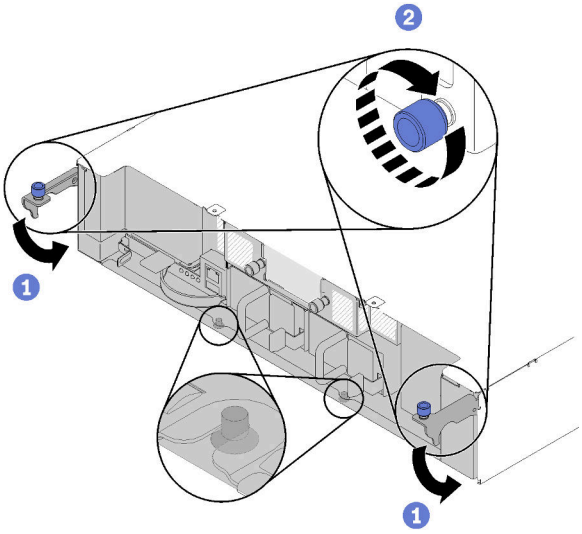


Figure 82. Shuttle installation

After you install the shuttle, complete the following steps:

1. If the cable management arm is removed, install it (see “Install the cable management arm” on page 90).
2. Push all compute nodes back into the enclosure (see “Install a compute node in the enclosure” on page 117).
3. Turn on all compute nodes.

Demo video

Watch the procedure on YouTube

Install the cable management arm

Use this procedure to install the cable management arm.

Before you install the cable management arm:

1. Read the following section(s) to ensure that you work safely.
   - “Installation Guidelines” on page 64
2. Make sure the enclosure is pushed fully into the rack and the thumbscrews are tightened.

Complete the following steps to install the cable management arm.

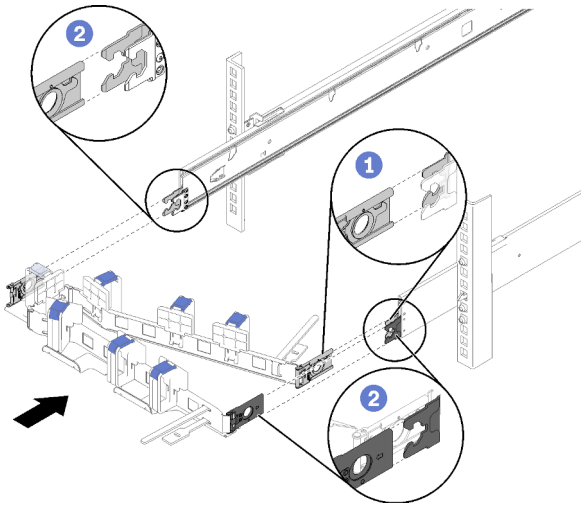


Figure 83. Cable management arm installation

Step 1. Align the inner mounting clip with the inner tab on the slide, then, push it until it snaps into place.

Step 2. Align two outer mounting clips with the outer tabs on the slides; then, push them until they snap into place.

Install hardware options in the compute node

Use the following information to remove and install the options in the compute node.

Remove a compute node from the enclosure

Use this procedure to remove a compute node from the D2 Enclosure.

Attention: Unauthorized personnel should not remove or install the nodes. Only trained or service-related personnel are allowed to perform such actions.

1. Unauthorized personnel should not remove or install the nodes. Only trained or service-related personnel are allowed to perform such actions.
2. If one or more sets of shared PCIe dual adapters are installed in the enclosure, make sure to remove the nodes with auxiliary adapters first (node 2 and 3) and proceed to nodes with primary adapters (node 1 and 4). See the following table for location of primary and auxiliary adapters.

Table 62. Location of shared PCIe dual adapters from the rear

Primary adapter		Auxiliary adapter
- -	4-A 4-B 3-B 3-A	- -
Auxiliary adapter	2-A 1-A	Primary adapter
	2-B 1-B	

Before you remove a compute node:

1. Read the following section(s) to ensure that you work safely.
   - “Installation Guidelines” on page 64
2. Turn off the corresponding compute node that you are going to perform the task on.
3. When you remove the compute node, note the node bay number. Reinstalling a compute node into a different node bay from the one it was removed from can have unintended consequences. Some configuration information and update options are established according to node bay number. If you

reinstall the compute node into a different node bay, you might have to reconfigure the compute node. One way to track node is via the serial number.

Note: The serial number is located on the pull out tab for the each node.

Complete the following steps to remove the compute node from a enclosure.

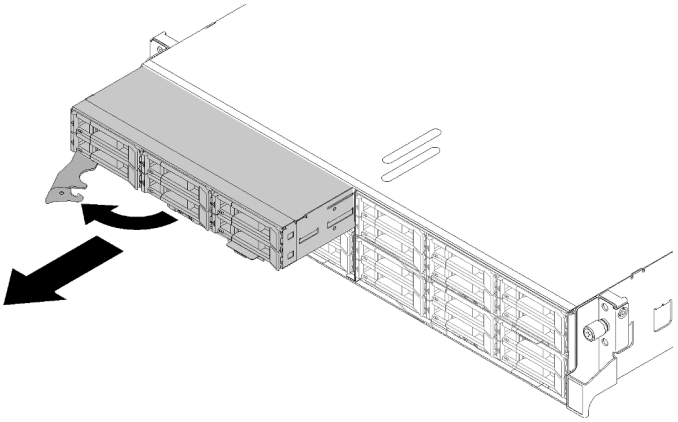


Figure 84. Node removal

Step 1. Release and rotate the front handle as shown in the illustration.

Attention: To maintain proper system cooling, do not operate the D2 Enclosure without a compute node or node bay filler installed in each node bay.

Step 2. Slide the node out about 12 inches (300 mm); then, grip the node with both hands and remove it from the enclosure.

Step 3. Install either a node bay filler or another compute node in the node bay within 1 minute.

If you are instructed to return the component or optional device, follow all packaging instructions, and use any packaging materials for shipping that are supplied to you.

Demo video

Watch the procedure on YouTube

Remove the compute node cover

Use this procedure to remove the compute node cover.

S014

CAUTION:
Hazardous voltage, current, and energy levels might be present. Only a qualified service technician is authorized to remove the covers where the label is attached.

S033

CAUTION:
Hazardous energy present. Voltages with hazardous energy might cause heating when shorted with metal, which might result in spattered metal, burns, or both.

Before you remove the compute node cover:

1. Read the following section(s) to ensure that you work safely.
   - "Installation Guidelines" on page 64
2. Turn off the corresponding compute node that you are going to perform the task on.
3. Remove the node from the enclosure. See "Remove a compute node from the enclosure" on page 91

Complete the following steps to remove the compute node cover.

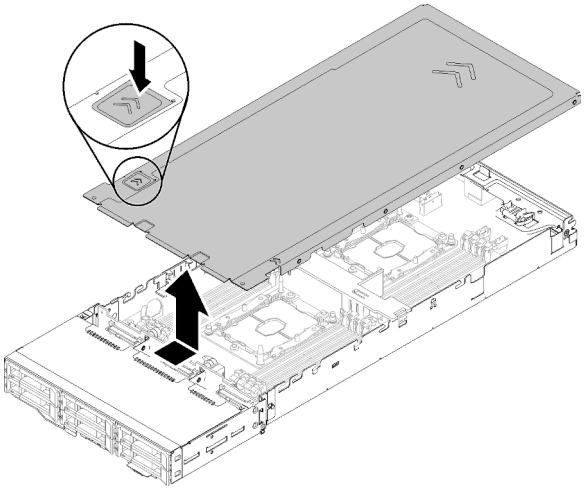


Figure 85. Compute node cover removal

Step 1. Push the cover-release latch on the top of the node cover.

Step 2. Slide the cover toward the rear of the node until the cover has disengaged from the node; then, lift the cover away from the node.

If you are instructed to return the component or optional device, follow all packaging instructions, and use any packaging materials for shipping that are supplied to you.

Demo video

Watch the procedure on YouTube

Remove the air baffle

Use this procedure to remove the air baffle.

Before removing the air baffle:

1. Read the following section(s) to ensure that you work safely.
   - "Installation Guidelines" on page 64

2. Turn off the corresponding compute node that you are going to perform the task on.
3. Remove the compute node (see “Remove a compute node from the enclosure” on page 91).
4. Remove the compute node cover (see “Remove the compute node cover” on page 92).

Complete the following steps to remove the air baffle.

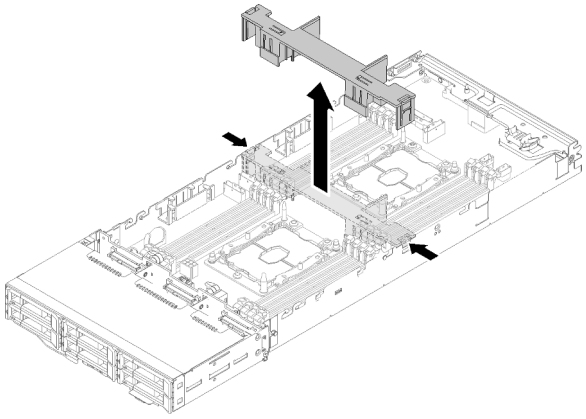


Figure 86. Air baffle removal

Step 1. Slightly push the right and left release latches; then, lift the air baffle out of the node.

Attention: For proper cooling and airflow, replace the air baffle before you turn on the node. Operating the node with the air baffle removed might damage node components.

If you are instructed to return the component or optional device, follow all packaging instructions, and use any packaging materials for shipping that are supplied to you.

Demo video

Watch the procedure on YouTube

Remove the M.2 backplane

Use this information to remove the M.2 backplane.

Before you remove the M.2 backplane:

1. Read the following section(s) to ensure that you work safely.
   - “Installation Guidelines” on page 64
2. Turn off the corresponding compute node that you are going to perform the task on.
3. Remove the compute node (see “Remove a compute node from the enclosure” on page 91).
4. Remove the compute node cover (see “Remove the compute node cover” on page 92).

Complete the following steps to remove the M.2 backplane.

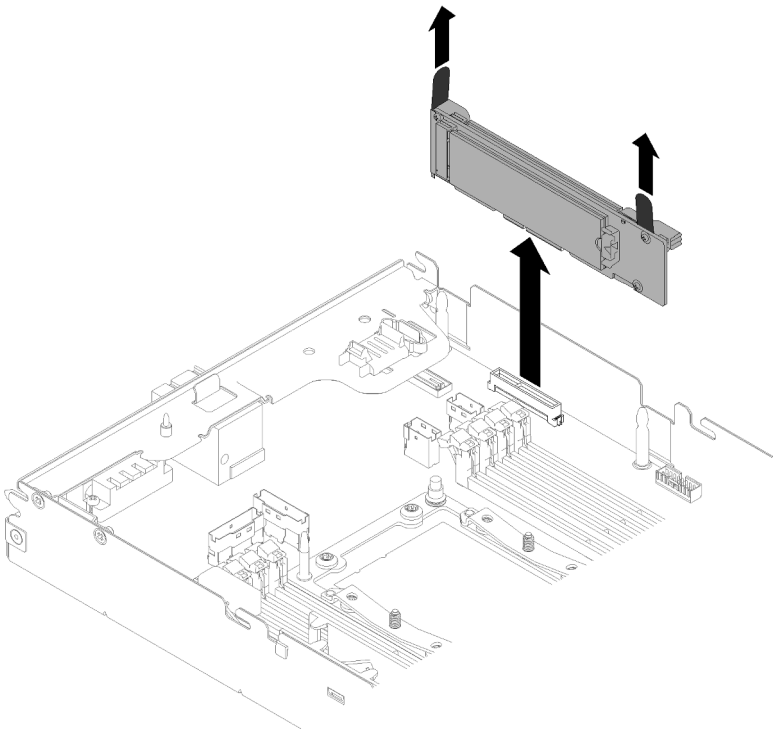


Figure 87. M.2 backplane removal

Step 1. Remove the M.2 backplane from the system board by pulling up on both ends of the backplane at the same time.

If you are instructed to return the component or optional device, follow all packaging instructions, and use any packaging materials for shipping that are supplied to you.

Demo video

Watch the procedure on YouTube

Install an M.2 drive in the M.2 backplane

Use this information to install an M.2 drive in the M.2 backplane.

Before you install an M.2 drive in the M.2 backplane:

1. Read the following section(s) to ensure that you work safely.
   - “Installation Guidelines” on page 64
2. Turn off the corresponding compute node that you are going to perform the task on.
3. Remove the compute node (see “Remove a compute node from the enclosure” on page 91).
4. Remove the compute node cover (see “Remove the compute node cover” on page 92).
5. Remove the M.2 backplane (see “Remove the M.2 backplane” on page 94).

Complete the following steps to install an M.2 drive in the M.2 backplane.

Step 1. Locate the connector on each side of the M.2 backplane.

Notes:

- Some M.2 backplanes support two identical M.2 drives. When two drives are installed, align and support both drives when sliding the retainer forward to secure the drives.
- Install the M.2 drive in slot 0 first.

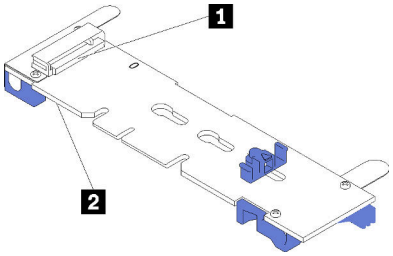


Figure 88. M.2 drive slot

Table 63. M.2 drive slot

1 Slot 0	**2 Slot 1**

Step 2. Insert the M.2 drive at an angle (approximately 30 degrees) into the connector and rotate it until the notch catches on the lip of the retainer; then, slide the retainer forward (toward the connector) to secure the M.2 drive in the M.2 backplane.

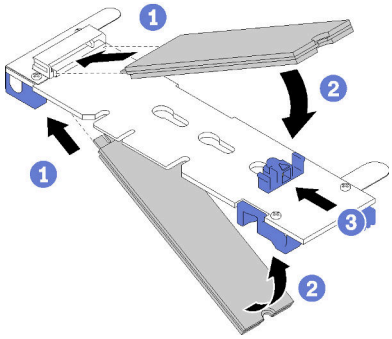


Figure 89. M.2 drive installation

Attention: When sliding the retainer forward, make sure the two nubs on the retainer enter the small holes on the M.2 backplane. Once they enter the holes, you will hear a soft “click” sound.

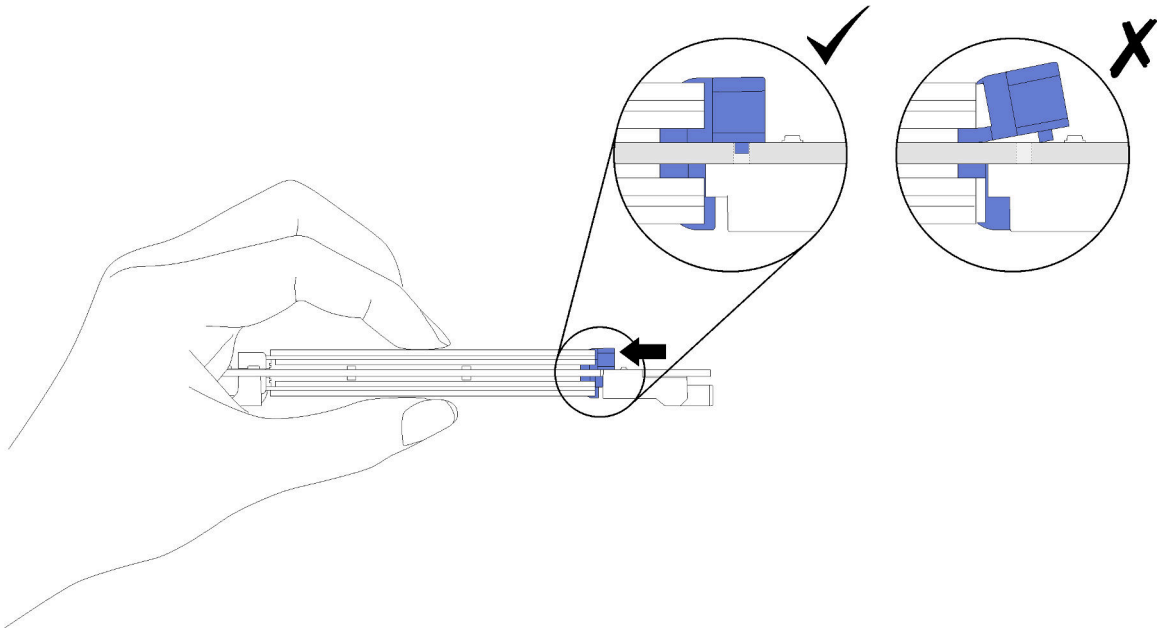


Figure 90. M.2 drive installation

After you install an M.2 drive in the M.2 backplane, complete the following steps:

1. Reinstall the M.2 backplane (see “Install the M.2 backplane” on page 110).
2. Reinstall the compute node cover (see “Install the compute node cover” on page 116).
3. Reinstall the compute node (see “Install a compute node in the enclosure” on page 117).
4. Check the power LED to make sure it transitions between fast blink and slow blink to indicate the node is ready to be powered on.

Demo video

Watch the procedure on YouTube

How to adjust the position of the retainer on the M.2 backplane

Use this information to adjust the position of the retainer on the M.2 backplane.

Before you adjust the position of the retainer on the M.2 backplane, complete the following steps:

1. Read the following section(s) to ensure that you work safely.
   - “Installation Guidelines” on page 64

To adjust the position of the retainer on the M.2 backplane, complete the following steps.

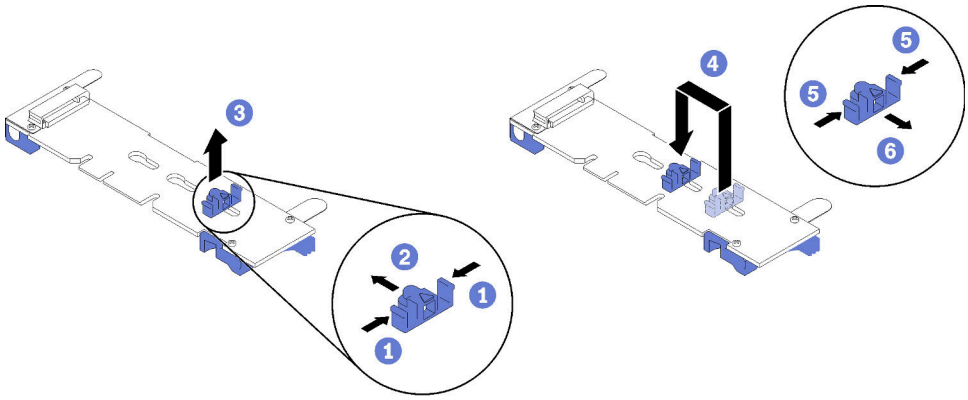
Watch the procedure

A video of the installation and removal process is available at Youtube: https://www.youtube.com/playlist?list=PLYV5R7hVcs-DOlbsCdADcoKQdMB2Uuk-T

Step 1. Locate the correct keyhole that the retainer should be installed into to accommodate the particular size of the M.2 drive you wish to install.

Step 2. Press both sides of the retainer and move it forward until it is in the large opening of the keyhole; then, remove it from the backplane.

Step 3. Insert the retainer into the correct keyhole and slide it backwards until the nubs are in the holes.



Install the KVM breakout module

Use this information to install the KVM breakout module.

Before you install the KVM breakout module:

1. Read the following section(s) to ensure that you work safely.
   - “Installation Guidelines” on page 64
2. Turn off the corresponding compute node that you are going to perform the task on.
3. Remove the node (see “Remove a compute node from the enclosure” on page 91).
4. Remove the compute node cover (see “Remove the compute node cover” on page 92).
5. Remove the air baffle (see “Remove the air baffle” on page 93).

Complete the following steps to install the KVM breakout module.

Step 1. Connect all required cables to the KVM breakout module.

Step 2. Carefully route cables through the drive bay and the drive backplane.

- The right KVM breakout module (for four 2.5-inch-drive model)

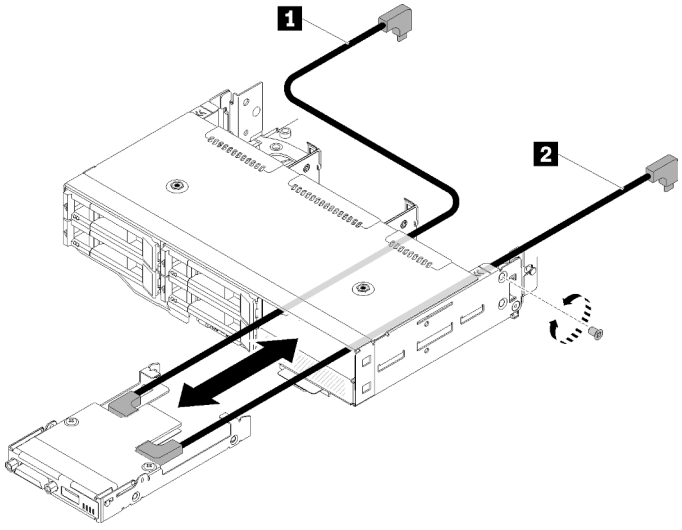


Figure 91. Right KVM breakout module installation

Table 64. Components on the right KVM breakout module installation

1 Long signal cable	2 Short signal cable

Attention: Make sure the USB 3.0 connector is on your right side as illustrated to ensure the correct installation.

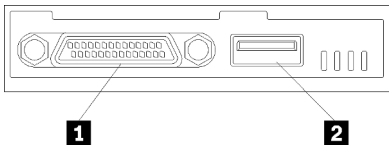


Figure 92. KVM breakout module

Table 65. KVM breakout module

1 KVM connector	2 USB 3.0 connector

- The left KVM breakout module (for six 2.5-inch-drive model)

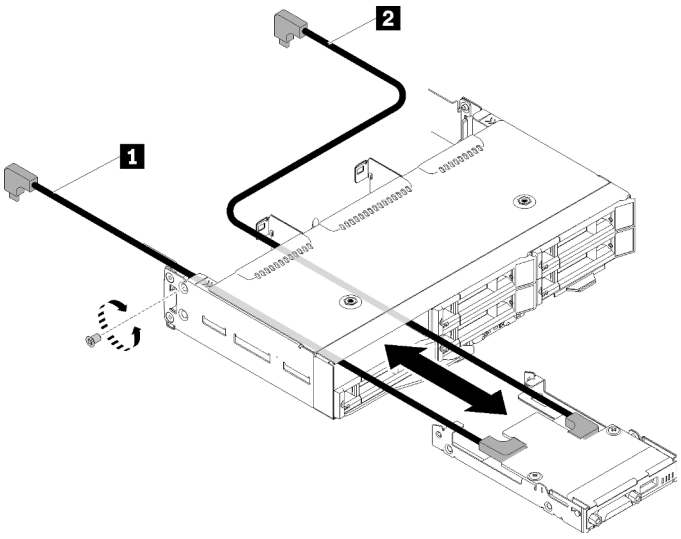


Figure 93. Left KVM breakout module installation

Table 66. Components on the left KVM breakout module installation

1 Short signal cable	2 Long signal cable

Attention: Make sure the USB 3.0 connector is on your right side as illustrated to ensure the correct installation.

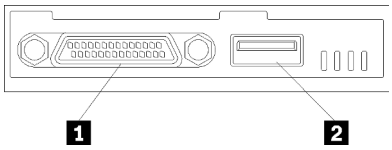


Figure 94. KVM breakout module

Table 67. KVM breakout module

1 KVM connector	2 USB 3.0 connector

Step 3. Insert the KVM breakout module into the node.

Step 4. Fasten the screw.

Step 5. Connect required cables to connectors as shown in the following illustrations.

Note: Manage cables in plastic cable guides located on side of compute node.

- The right KVM breakout module (for four 2.5-inch-drive model)

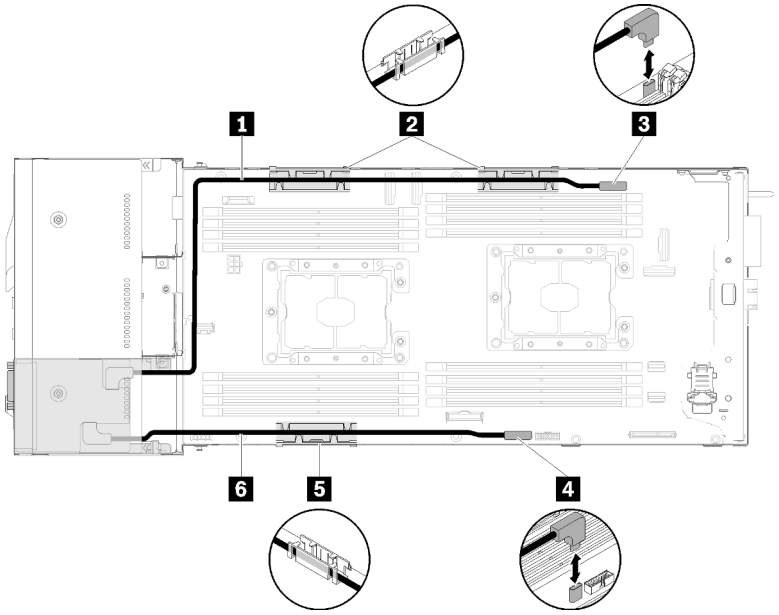


Figure 95. Right KVM breakout module cable routing

Table 68. Components on the right KVM breakout module cable routing

1 Long signal cable	3 KVM breakout cable connector
2 5 Internal cable management basket	4 USB connector
6 Short signal cable	

- The left KVM breakout module (for six 2.5-inch-drive model)

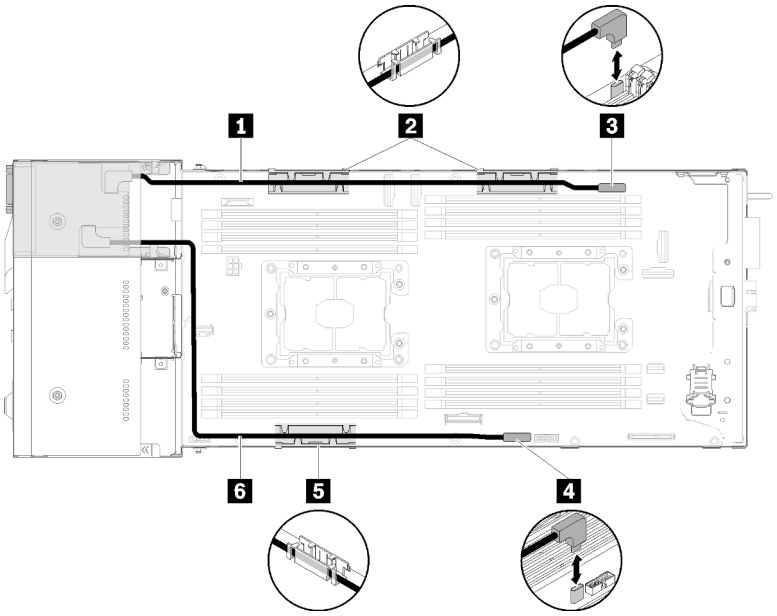


Figure 96. Left KVM breakout module cable routing

Table 69. Components on the left KVM breakout module cable routing

1 Short signal cable	3 KVM breakout cable connector
2 5 Internal cable management basket	4 USB connector
6 Long signal cable	

Note: While KVM breakout cable is connected, the USB key should not be wider than 19 mm.

After you install the KVM breakout module, complete the following steps.

1. Reinstall the air baffle (see "Install the air baffle" on page 115).
2. Reinstall the node cover (see "Install the compute node cover" on page 116).
3. Reinstall the compute node (see "Install a compute node in the enclosure" on page 117).
4. Reconnect the power cords and any cables that you removed.
5. Check the power LED to make sure it transitions between fast blink and slow blink to indicate the node is ready to be powered on.

Demo video

Watch the procedure on YouTube

Install a hot-swap drive

Use this information to install a hard disk drive.

Before you install a drive:

1. Read the following section(s) to ensure that you work safely.
   - "Installation Guidelines" on page 64
2. Remove the drive filler from the empty drive bay. Keep the filler panel in a safe place.

3. Touch the static-protective package that contains the drive to any unpainted metal surface on the solution; then, remove the drive from the package and place it on a static-protective surface.

The following notes describe the type of drives that the node supports and other information that you must consider when you install a drive. For a list of supported drives, see https://serverproven.lenovo.com/.

- Locate the documentation that comes with the drive and follow those instructions in addition to the instructions in this chapter.
- You can install up to six hot-swap SAS/SATA 2.5-inch drives for each node.
- The electromagnetic interference (EMI) integrity and cooling of the solution are protected by having all bays and PCI and PCI Express slots covered or occupied. When you install a drive, PCI, or PCI Express adapter, save the EMC shield and filler panel from the bay or PCI or PCI Express adapter slot cover in the event that you later remove the device.
- For a complete list of supported optional devices for the node, see https://serverproven.lenovo.com/.

Complete the following steps to install a drive:

Note: If you have only one drive, you must install it in the bay 0 (upper-left).

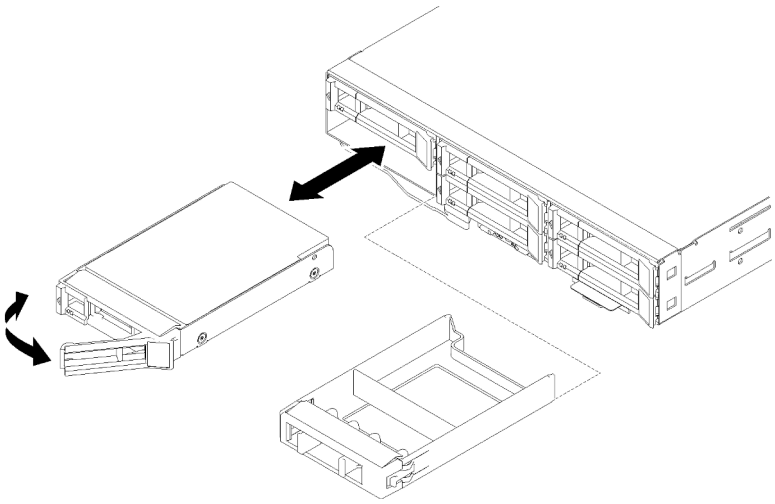


Figure 97. Drive installation

Step 1. Install the drive in the drive bay:

a. Make sure that the tray handle is in the open (unlocked) position.

b. Align the drive with the guide rails in the bay.

c. Gently push the drive into the bay until the drive stops.

d. Rotate the tray handle to the closed (locked) position and you can hear a click.

e. Check the drive status LED to verify that the drive is operating correctly. If the yellow drive status LED of a drive is lit continuously, that drive is faulty and must be replaced. If the green drive activity LED is flashing, the drive is being accessed.

Step 2. If you are installing additional drives, do so now.

After you install all the drives, complete the following step.

1. If the node is configured for RAID operation using a RAID adapter, you will have to reconfigure your disk arrays after you install drives. See the RAID adapter documentation for additional information about RAID operation and complete instructions for using the RAID adapter.

Install a memory module

The following notes describe the types of DIMMs that the node supports and other information that you must consider when you install DIMMs.

See "Memory module installation order" on page 66 for detailed information about memory configuration and setup.

- Confirm that the node supports the DIMM that you are installing (see https://serverproven.lenovo.com/).
- When you install or remove DIMMs, the node configuration information changes. When you restart the node, the system displays a message that indicates that the memory configuration has changed. You can use the Setup utility to view the node configuration information, see Chapter 4 "System configuration" on page 141 for more information.
- Install higher capacity (ranked) DIMMs first, following the population sequence for the Memory Mode being used.
- The node supports only industry-standard double-data-rate 4 (DDR4), 2666 MT/s, PC4-21300 (single-rank or dual-rank), unbuffered or synchronous dynamic random-access memory (SDRAM) dual inline memory modules (DIMMs) with error correcting code (ECC).
- Do not mix RDIMMs, LRDIMMs and 3DS DIMMs in the same node.
- The maximum operating speed of the node is determined by the slowest DIMM in the node.
- If you install a pair of DIMMs in DIMM connectors 1 and 3, the size and speed of the DIMMs that you install in DIMM connectors 1 and 3 must match each other. However, they do not have to be the same size and speed as the DIMMs that are installed in DIMM connectors 2 and 4.
- You can use compatible DIMMs from various manufacturers in the same pair.
- The specifications of a DDR4 DIMM are on a label on the DIMM, in the following format.
- *gggGBpheRxff* PC4-*wwwwaa-mccd-bb*

  where:

  - *gggGB* is the total capacity, in gigabytes, for primary bus (ECC not counted) 4GB, 8GB, 16GB, etc. (no space between digits and units)
  - *pheR* is the number of package ranks of memory installed and number of logical ranks per package rank
    - p =
      - 1 = 1 package rank of SDRAMs installed
      - 2 = 2 package ranks of SDRAMs installed
      - 3 = 3 package ranks of SDRAMs installed
      - 4 = 4 package ranks of SDRAMs installed
    - he = blank for monolithic DRAMs, else for modules using stacked DRAM:
      - h = DRAM package type
        - D = multi-load DRAM stacking (DDP)
        - Q = multi-load DRAM stacking (QDP)
        - S = single load DRAM stacking (3DS)
      - e = blank for SDP, DDP and QDP, else modules using 3DS stacks, logical ranks per package rank
        - 2 = 2 logical ranks in each package rank
        - 4 = 4 logical ranks in each package rank
        - 8 = 8 logical ranks in each package rank

  - R = rank(s)
  - xff = Device organization (data bit width) of SDRAMs used on this assembly
    - x4 = x4 organization (4 DQ lines per SDRAM)
    - x8 = x8 organization
    - x16 = x16 organization
- *wwwww* is the DIMM bandwidth, in MBps: 2133, 2400, 2666, 2933, 3200
- *aa* is the SDRAM speed grade
- *m* is the DIMM type
  - E = Unbuffered DIMM (UDIMM), x64 primary + 8 bit ECC module data bus
  - L = Load Reduced DIMM (LRDIMM), x64 primary + 8 bit ECC module data bus
  - R = Registered DIMM (RDIMM), x64 primary + 8 bit ECC module data bus
  - U = Unbuffered DIMM (UDIMM) with no ECC (x64-bit primary data bus)
- *cc* is the reference design file used for this design
- *d* is the revision number of the reference design used
- *bb* is the JEDEC SPD Revision Encoding and Additions level used on this DIMM

The following illustration shows the location of the DIMM connectors on the system board.

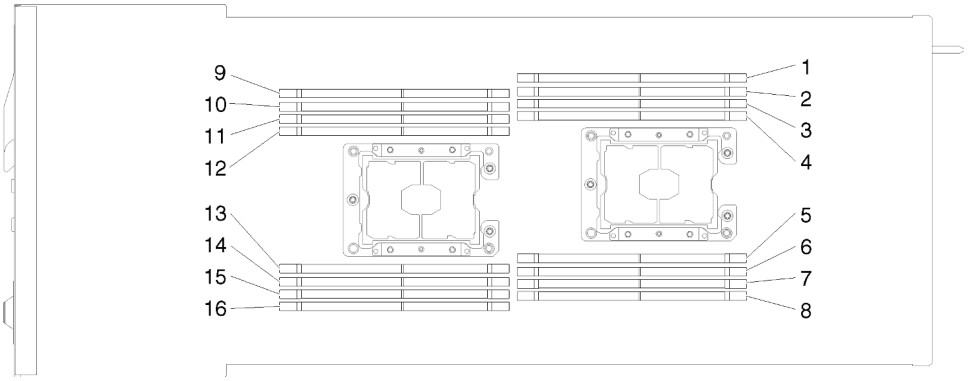


Figure 98. The location of the DIMM connectors on the system board

DC Persistent Memory Module (DCPMM) setup

Follow the instructions in this section to complete required setup before installing DCPMMs for the first time, determine the most suitable configuration, and install memory modules accordingly.

Complete the following steps to finish system setup to support DCPMMs, and install the memory modules according to the designated combination.

1. Update the system firmware to the latest version that supports DCPMMs (see “Update the firmware” on page 142).
2. Make sure to meet all the following requirements before installing DCPMMs.
   - All the DCPMMs that are installed must be of the same part number.
   - All the DRAM DIMMs that are installed must be of the same type, rank, and capacity with minimum capacity of 16 GB. It is recommended to use Lenovo DRAM DIMMs of the same part number.
   - DCPMMs are not supported in the compute node that is installed to a PCIe expansion node.

3. Refer to “PMEM and DRAM DIMM installation order” on page 68 to determine the most suitable combination and the following:
   - Number and capacity of the DCPMMs and DRAM DIMMs to install.
   - Check if the presently installed processors support the combination. If not, replace the processors with ones that support the combination.
4. Based on the determined DCPMM combination, acquire the DCPMMs, DRAM DIMMs and processors if necessary.
5. Replace the processors if necessary (see “Processor and heat sink replacement” in *Maintenance Manual*).
6. Remove all the memory modules that are installed (see “Remove a memory module” in *Maintenance Manual*).
7. Follow the slot combination in “PMEM and DRAM DIMM installation order” on page 68 to install all the DCPMMs and DRAM DIMMs (see “Install a memory module” on page 106).
8. Disable security on all the installed DCPMMs (see “Configure DC Persistent Memory Module (DCPMM)” on page 147).
9. Make sure the DCPMM firmware is the latest version. If not, update it to the latest version (see https://sysmgt.lenovofiles.com/help/topic/com.lenovo.lxca.doc/update_fw.html).
10. Configure DCPMMs so that the capacity is available for use (see “Configure DC Persistent Memory Module (DCPMM)” on page 147).

Adding memory modules with DCPMMs

Follow the instructions in this section to add memory modules to the existing configuration with DCPMMs.

If DCPMMs are already installed and configured in the system, complete the following steps to add new memory modules.

1. Update the system firmware to the latest version (see “Update the firmware” on page 142).
2. Consider the following DCPMM requirements before acquiring new DCPMM units.
   - All the DCPMMs that are installed must be of the same part number.
   - All the DRAM DIMMs that are installed must be of the same type, rank, and capacity with minimum capacity of 16 GB. It is recommended to use Lenovo DRAM DIMMs of the same part number.
3. See “PMEM and DRAM DIMM installation order” on page 68 to determine the new configuration, and acquire memory modules accordingly.
4. If the DCPMMs are in Memory Mode and will stay in Memory Mode after new units are installed, follow the combination in “DCPMM installation: Memory Mode” on page 73 to install the new modules in the correct slots. Otherwise, go to the next step.
5. Make sure to back up the stored data.
6. If the App Direct capacity is interleaved:
   a. Delete all the created namspaces and filesystems in the operating system.
   b. Perform secure erase on all the DCPMMs that are installed. Go to **Intel Optane DCPMMs → Security → Press to Secure Erase** to perform secure erase.

   Note: If one or more DCPMMs are secured with passphrase, make sure security of every unit is disabled before performing secure erase. In case the passphrase is lost or forgotten, contact Lenovo service.
7. Follow the slot combination in “PMEM and DRAM DIMM installation order” on page 68 to install all the DCPMMs and DRAM DIMMs (see “Install a memory module” on page 106).

8. Disable security on all the installed DCPMMs (see “Configure DC Persistent Memory Module (DCPMM)” on page 147).
9. Make sure the DCPMM firmware is the latest version. If not, update it to the latest version (see https://sysmgt.lenovofiles.com/help/topic/com.lenovo.lxca.doc/update_fw.html).
10. Configure DCPMMs so that the capacity is available for use (see “Configure DC Persistent Memory Module (DCPMM)” on page 147).
11. Restore the data that have been backed up.

Install a memory module

Use this information to install a memory module. This section applies to both DRAM DIMMs and DCPMMs.

See “Memory module installation order” on page 66 for detailed information about memory configuration and setup.

Before you install a memory module:

1. If you are installing DCPMMs for the first time, follow the instructions in “DC Persistent Memory Module (DCPMM) setup” on page 104 so that the system supports DCPMMs.
2. Read the following section(s) to ensure that you work safely.
   - “Installation Guidelines” on page 64
3. Turn off the corresponding compute node that you are going to perform the task on.
4. Remove the compute node (see “Remove a compute node from the enclosure” on page 91).
5. Remove the compute node cover (see “Remove the compute node cover” on page 92).
6. Remove the air baffle (see “Remove the air baffle” on page 93).

Attention: Memory modules are sensitive to static discharge and require special handling. In addition to the standard guidelines for “Handling static-sensitive devices” on page 66:

- Always wear an electrostatic-discharge strap when removing or installing memory modules. Electrostatic-discharge gloves can also be used.
- Never hold two or more memory modules together so that they touch. Do not stack memory modules directly on top of each other during storage.
- Never touch the gold memory module connector contacts or allow these contacts to touch the outside of the memory-module connector housing.
- Handle memory modules with care: never bend, twist, or drop a memory module.

The following illustration shows the location of the memory module connectors on the system board. The following illustration shows the location of the memory module connectors on the system board.

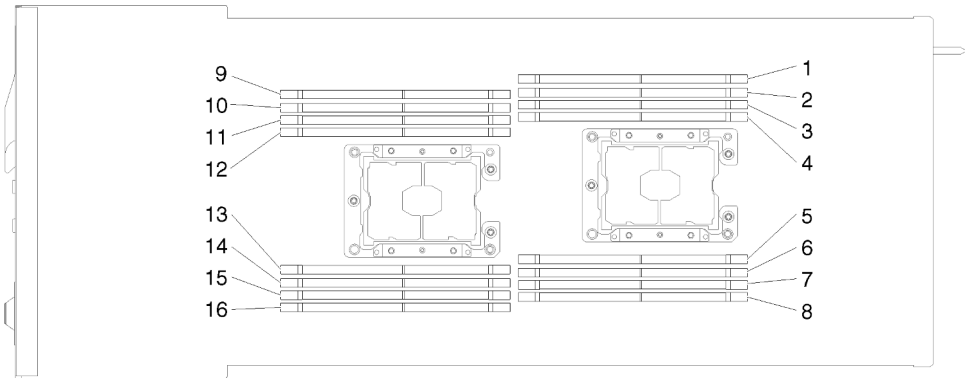


Figure 99. The location of the memory module connectors on the system board

Complete the following steps to install a memory module.

Important: Before installing a memory module, make sure that you understand the required installation order, depending on whether you are implementing memory mirroring, memory rank sparing, or independent Memory Mode. See "Memory module installation order" on page 66 for the required installation order.

Step 1. Open the retaining clip on each end of the memory module connector.

Attention:

- Memory modules are static-sensitive devices. The package must be grounded before it is opened.
- To avoid breaking the retaining clips or damaging the memory module connectors, open and close the clips gently.

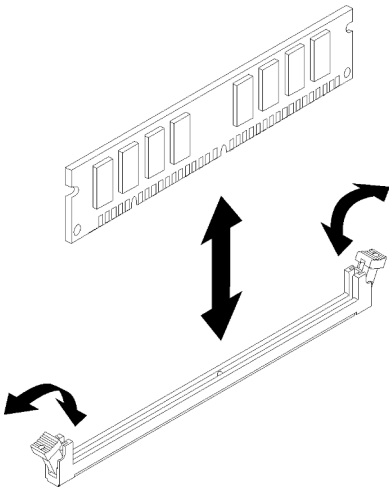


Figure 100. Memory module installation

Step 2. Touch the static-protective package that contains the memory module to any unpainted metal surface on the outside of the node. Then, remove the memory module from the package.

Step 3. Turn the memory module so that the alignment slot align correctly with the alignment tab.

Step 4. Insert the memory module into the connector by aligning the edges of the memory module with the slots at the ends of the memory module connector.

Step 5. Firmly press the memory module straight down into the connector by applying pressure on both ends of the memory module simultaneously. The retaining clips snap into the locked position when the memory module is firmly seated in the connector.

Note: If there is a gap between the memory module and the retaining clips, the memory module has not been correctly inserted; open the retaining clips, remove the memory module, and then reinsert it.

Step 6. Reconnect any cable that you removed.

After you install a memory module, complete the following steps:

1. Reinstall the air baffle (see "Install the air baffle" on page 115).
2. Reinstall the compute node cover (see "Install the compute node cover" on page 116).
3. Reinstall the compute node (see "Install a compute node in the enclosure" on page 117).
4. Check the power LED to make sure it transitions between fast blink and slow blink to indicate the node is ready to be powered on.
5. If you have installed a DCPMM:
   a. Update the system firmware to the latest version (see "Update the firmware" on page 142).
   b. Make sure the firmware of all the DCPMM units is the latest version. If not, update it to the latest version (see https://sysmgt.lenovofiles.com/help/topic/com.lenovo.lxca.doc/update_fw.html).
   c. Configure DCPMMs and DRAM DIMMs (see "Configure DC Persistent Memory Module (DCPMM)" on page 147).
   d. Restore the data that have been backed up if necessary.

Demo video

Watch the procedure on YouTube

Install a RAID adapter into the compute node

Use this information to install a RAID adapter into the compute node.

Before you install a RAID adapter into the compute node.:

1. Read the following section(s) to ensure that you work safely.
   - "Installation Guidelines" on page 64
2. Turn off the corresponding compute node that you are going to perform the task on.
3. Remove the compute node (see "Remove a compute node from the enclosure" on page 91).
4. Remove the compute node cover (see "Remove the compute node cover" on page 92).
5. Make sure the RAID adapter support bracket is installed. If not, install it into the node and secure it with three screws.

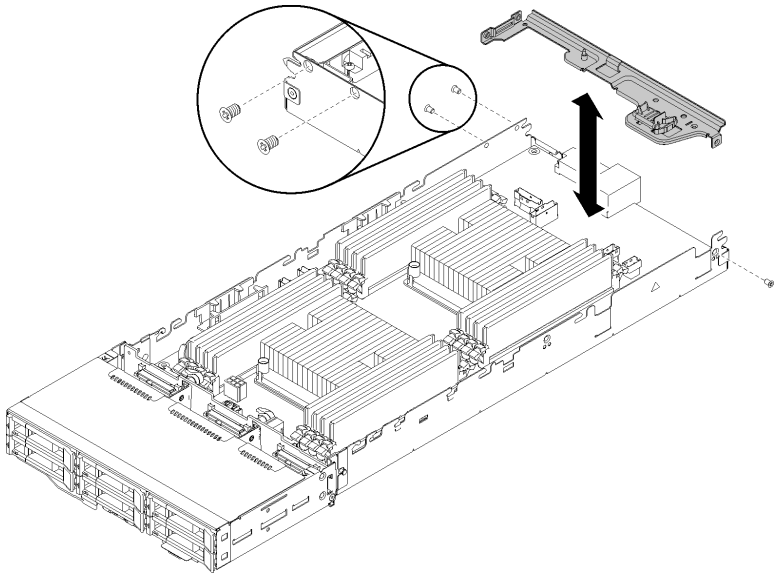


Figure 101. Installing the RAID adapter support bracket

6. Touch the static-protective package that contains the RAID adapter to any unpainted metal surface on the node; then, remove the adapter from the package.
7. Place the RAID adapter, component side up, on a flat, static-protective surface and set any jumpers or switches as described by the adapter manufacturer.

Complete the following steps to install a RAID adapter.

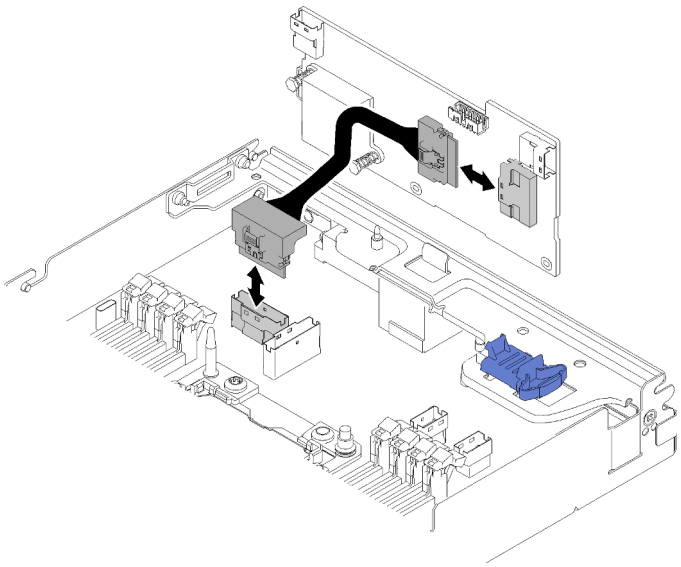


Figure 102. Connecting the PCIe cable

Step 1. Connect the PCIe cable from the PCIe slot 1 connector to the RAID adapter. See "System-board internal connectors" on page 33 to locate the PCIe slot 1 connector.

Step 2. Connect SAS/SATA cables (up to two) to the RAID adapter.

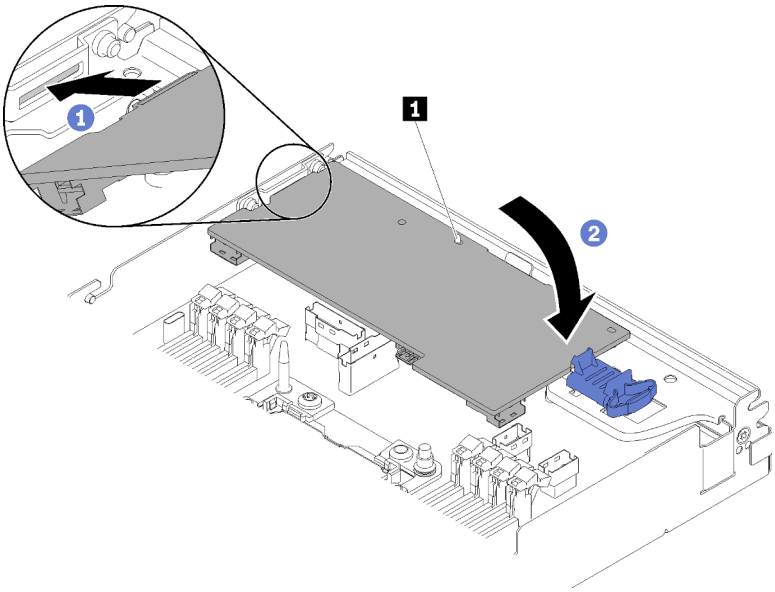


Figure 103. RAID adapter installation

Step 3. Insert the end of the adapter into the slot.

Step 4. Align the adapter with the guide pin 1; then, lower and rotate down the adapter to insert it.

After you install a RAID adapter into the compute node, complete the following steps.

1. If the air baffle is removed, reinstall it (see “Install the air baffle” on page 115).
2. Reinstall the compute node cover (see “Install the compute node cover” on page 116).
3. Reinstall the compute node (see “Install a compute node in the enclosure” on page 117).
4. Check the power LED to make sure it transitions between fast blink and slow blink to indicate the node is ready to be powered on.

Demo video

Watch the procedure on YouTube

Install the M.2 backplane

Use this information to install the M.2 backplane.

Before you install the M.2 backplane:

1. Read the following section(s) to ensure that you work safely.
   - “Installation Guidelines” on page 64
2. Turn off the corresponding compute node that you are going to perform the task on.
3. Remove the compute node (see “Remove a compute node from the enclosure” on page 91).
4. Remove the compute node cover (see “Remove the compute node cover” on page 92).

Complete the following steps to install the M.2 backplane.

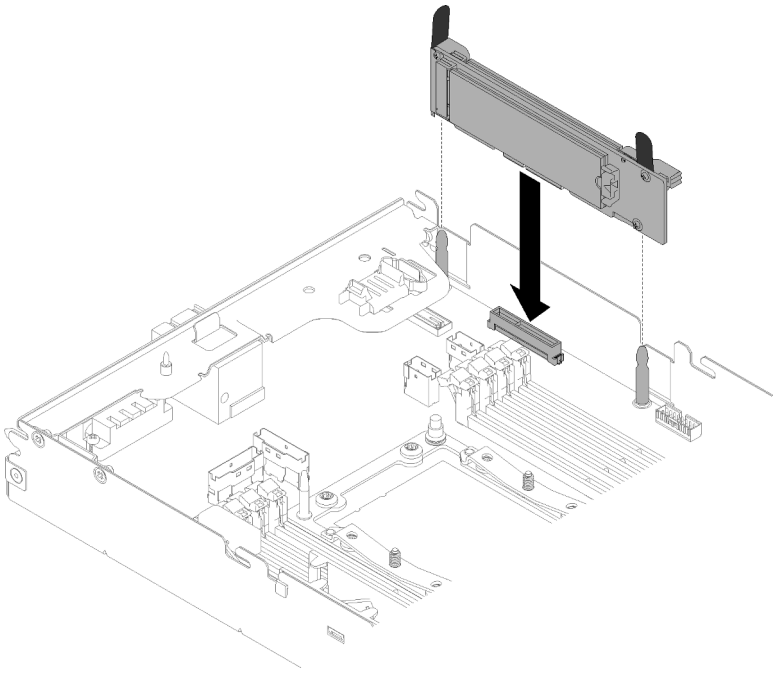


Figure 104. M.2 backplane installation

Step 1. Align the openings located at the bottom of the blue plastic supports at each end of the M.2 backplane with the guide pins on the system board; then, insert the backplane in the system board connector. Press down on the M.2 backplane to fully seat it.

After you install the M.2 backplane, complete the following steps:

1. If the air baffle is removed, reinstall it (see “Install the air baffle” on page 115).
2. Reinstall the compute node cover (see “Install the compute node cover” on page 116).
3. Reinstall the compute node (see “Install a compute node in the enclosure” on page 117).
4. Check the power LED to make sure it transitions between fast blink and slow blink to indicate the node is ready to be powered on.

Demo video

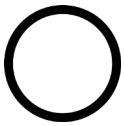
Watch the procedure on YouTube

Install a processor-heat-sink module

The processor and heat sink are removed together as part of a processor-heat-sink-module (PHM) assembly. PHM installation requires a Torx T30 driver.

Note: If you are installing multiple options relating to the system board, the PHM installation should be performed first.

"Read ” on page 64



"Power off ” on page 139

"ATTENTION: Static Sensitive Device ” on page 66

Attention:

- Each processor socket must always contain a cover or a PHM. When removing or installing a PHM, protect empty processor sockets with a cover.
- Do not touch the processor socket or processor contacts. Processor-socket contacts are very fragile and easily damaged. Contaminants on the processor contacts, such as oil from your skin, can cause connection failures.
- Remove and install only one PHM at a time. If the system board supports multiple processors, install the PHMs starting with the first processor socket.
- Do not allow the thermal grease on the processor or heat sink to come in contact with anything. Contact with any surface can compromise the thermal grease, rendering it ineffective. Thermal grease can damage components, such as electrical connectors in the processor socket. Do not remove the grease cover from a heat sink until you are instructed to do so.
- Thermal grease can stay functional on the heat sink for two years. When installing a new heat sink, make sure to check the manufacturing date to ensure the thermal grease is still functioning. If the date is over two years ago, replace the thermal grease to avoid seating issues.

Notes:

- PHMs are keyed for the socket where they can be installed and for their orientation in the socket.
- See https://serverproven.lenovo.com/ for a list of processors supported for your system. All processors on the system board must have the same speed, number of cores, and frequency.
- Before you install a new PHM or replacement processor, update your system firmware to the latest level. See “Update the firmware” on page 142.
- Installing an additional PHM can change the memory requirements for your system. See “Install a memory module” on page 103 for a list of processor-to-memory relationships.
- Optional devices available for your system might have specific processor requirements. See the documentation that comes with the optional device for information.

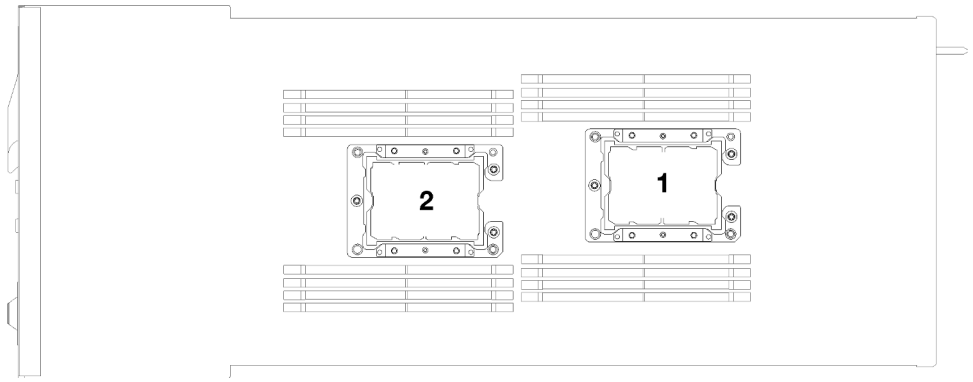


Figure 105. Processor locations

- The following types of heat sinks are applicable to SD530:
  - **108x108x24.5mm heat sink** is only applicable to processor socket 1.
  - **85x108x24.5mm heat sink** is only applicable to processor socket 2.
  - Low voltage configuration
    - **108x108x24.5mm heat sink** is only applicable to processor socket 1.
    - **85x108x24.5mm heat sink** is only applicable to processor socket 2.
  - High voltage configuration
    - **T-shaped heat sink** is only applicable to processor socket 1.
    - **105x108x24.5mm heat sink** is only applicable to processor socket 2.

Before installing a PHM:

Note: The PHM for your system might be different than the PHM shown in the illustrations.

1. Read the following section(s) to ensure that you work safely.
   - "Installation Guidelines" on page 64
2. Turn off the corresponding compute node that you are going to perform the task on.
3. Remove the compute node (see "Remove a compute node from the enclosure" on page 91).
4. Remove the compute node cover (see "Remove the compute node cover" on page 92).
5. Remove the air baffle (see "Remove the air baffle" on page 93).

Step 1. Remove the processor socket cover, if one is installed on the processor socket, by placing your fingers in the half-circles at each end of the cover and lifting it from the system board.

Step 2. If the processor comes with a T-shaped hear sink, secure the heat sink with two screws on the sides of the node.

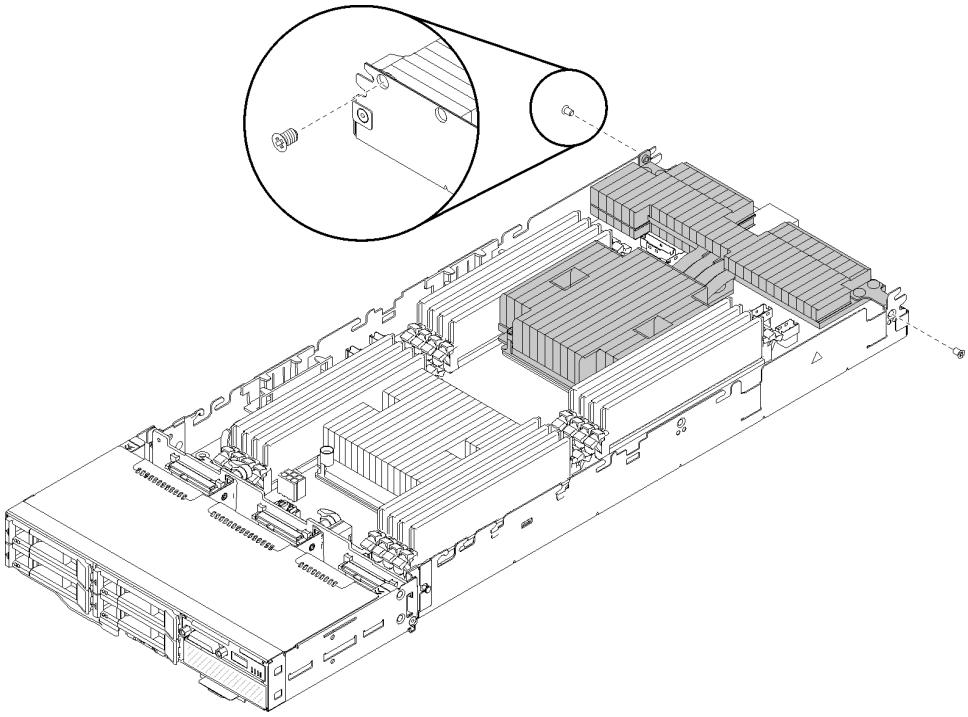


Figure 106. Securing the T-shaped heat sink with two screws

Note: Use Phillips #1 driver on these two screws.

Step 3. Install the processor-heat-sink module on the system board.

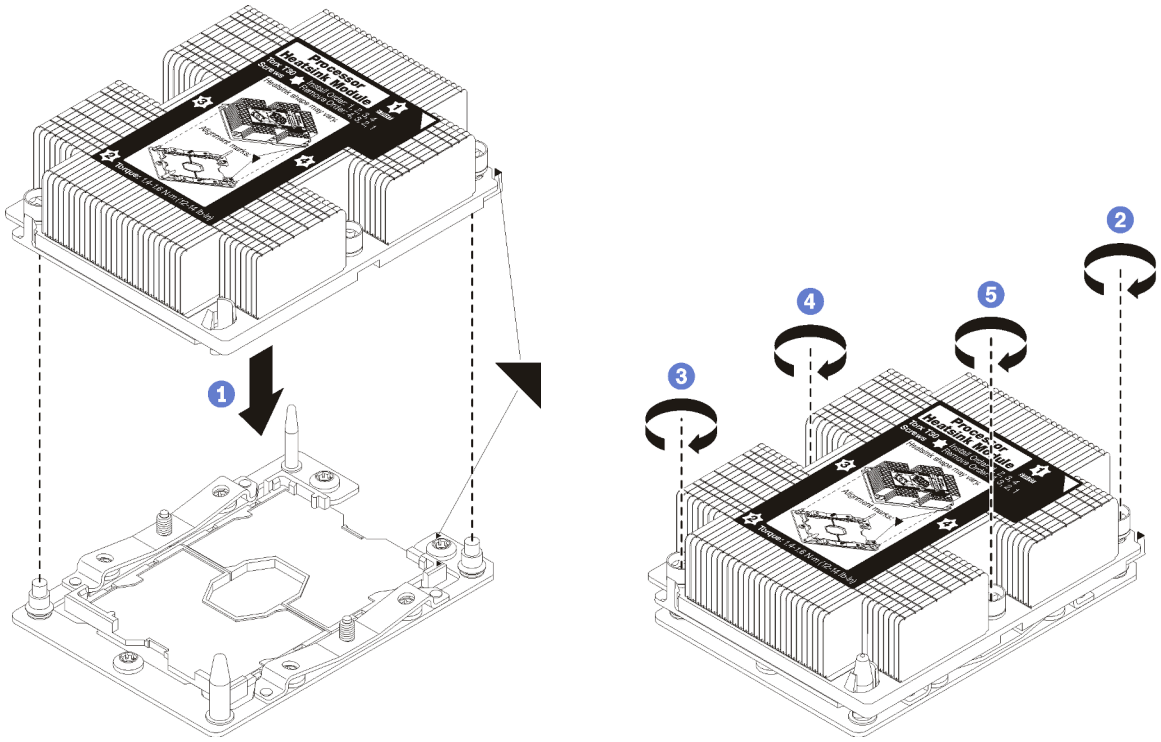


Figure 107. Installing a PHM

a. Align the triangular marks and guide pins on the processor socket with the PHM; then, insert the PHM into the processor socket.

   Attention: To prevent damage to components, make sure that you follow the indicated tightening sequence.

b. Fully tighten the Torx T30 captive fasteners *in the installation sequence shown* on the heat-sink label. Tighten the screws until they stop; then, visually inspect to make sure that there is no gap between the screw shoulder beneath the heat sink and the processor socket. (For reference, the torque required for the nuts to fully tighten is 1.4 - 1.6 newton-meters, 12 - 14 inch-pounds).

After installing the PHM option:

1. If there are memory modules to install, install them. See “Install a memory module” on page 106.
2. Reinstall the air baffle (see “Install the air baffle” on page 115).
3. Reinstall the compute node cover (see “Install the compute node cover” on page 116).
4. Reinstall the compute node (see “Install a compute node in the enclosure” on page 117).
5. Check the power LED to make sure it transitions between fast blink and slow blink to indicate the node is ready to be powered on.

Install the air baffle

Use this procedure to install the air baffle.

Before you install the air baffle:

1. Read the following section(s) to ensure that you work safely.
   - “Installation Guidelines” on page 64
2. Turn off the corresponding compute node that you are going to perform the task on.
3. Remove the compute node (see “Remove a compute node from the enclosure” on page 91).
4. Remove the compute node cover (see “Remove the compute node cover” on page 92).

Complete the following steps to install the air baffle.

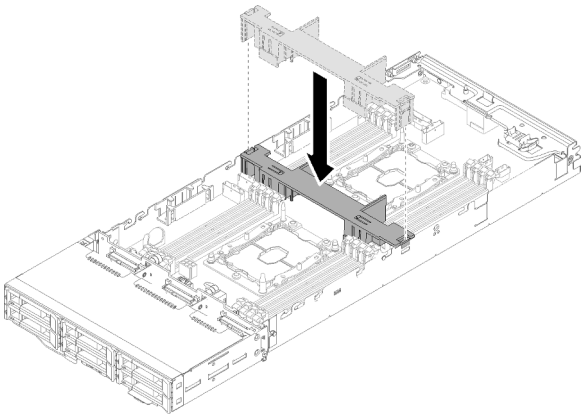


Figure 108. Air baffle installation

Step 1. Align the air baffle tabs with the baffle slots on both sides of the chassis; then, lower the air baffle into the node. Press the air baffle down until it is securely seated.

Attention:

- For proper cooling and airflow, reinstall the air baffle before you turn on the node. Operating the node with the air baffle removed might damage node components.
- Pay attention to the cables routed along the sidewalls of the node as they may catch under the air baffle.

After you install the air baffle, complete the following steps.

1. Reinstall the compute node cover (see “Install the compute node cover” on page 116).
2. Reinstall the compute node (see “Install a compute node in the enclosure” on page 117).
3. Check the power LED to make sure it transitions between fast blink and slow blink to indicate the node is ready to be powered on.

Demo video

Watch the procedure on YouTube

Install the compute node cover

Use this procedure to install the compute node cover.

S014

CAUTION:
Hazardous voltage, current, and energy levels might be present. Only a qualified service technician is authorized to remove the covers where the label is attached.

S033

CAUTION:
Hazardous energy present. Voltages with hazardous energy might cause heating when shorted with metal, which might result in spattered metal, burns, or both.

Before you install the compute node cover:

1. Read the following section(s) to ensure that you work safely.
   - “Installation Guidelines” on page 64
2. Turn off the corresponding compute node that you are going to perform the task on.
3. Make sure that all components are installed and seated correctly and that you have not left loose tools or parts inside the node.
4. Make sure that all internal cables are correctly routed. See “Internal cable routing” on page 45.
5. Remove the compute node (see “Remove a compute node from the enclosure” on page 91).

Complete the following steps to install the compute node cover.

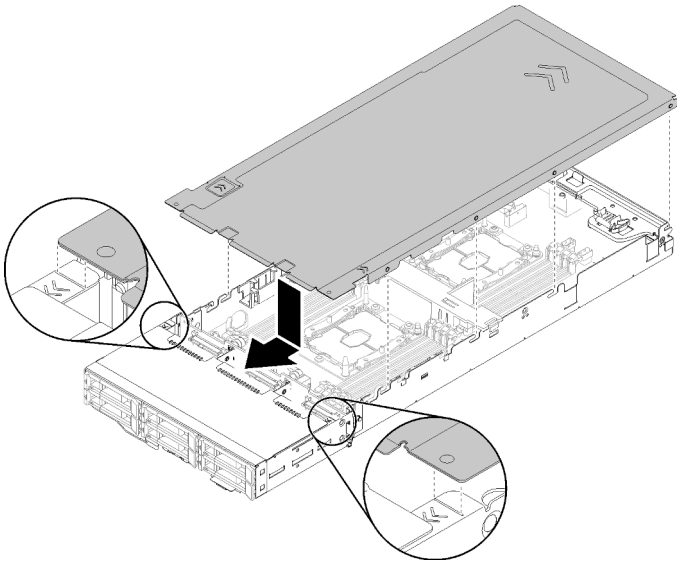


Figure 109. Compute node cover installation

Note: Before sliding the cover forward, make sure that all the tabs on the front, rear, and side of the cover engage the side walls correctly. If the pins do not engage the enclosure correctly, it will be very difficult to remove the cover next time.

Step 1. Align the cover pins with the notches in the side walls of the node, then, position the cover on top of the node.

Note: Align the front of the cover with lines in the node as shown in the illustration would help you to install the cover correctly.

Step 2. Slide the cover forward until the cover latches in place.

After you install the node cover, complete the following steps.

1. Reinstall the compute node (see “Install a compute node in the enclosure” on page 117).
2. Check the power LED to make sure it transitions between fast blink and slow blink to indicate the node is ready to be powered on.

Demo video

Watch the procedure on YouTube

Install a compute node in the enclosure

Use this procedure to install a compute node in the D2 Enclosure.

Note: If one or more sets of shared PCIe dual adapters are installed in the enclosure, it requires the completion of initialization of the nodes with the primary adapter to power on the nodes with the corresponding auxiliary adapter.

Before you install the compute node in a enclosure:

1. Read the following section(s) to ensure that you work safely.
   - “Installation Guidelines” on page 64

Attention: Be careful when you are removing or installing the node to avoid damaging the node connectors.

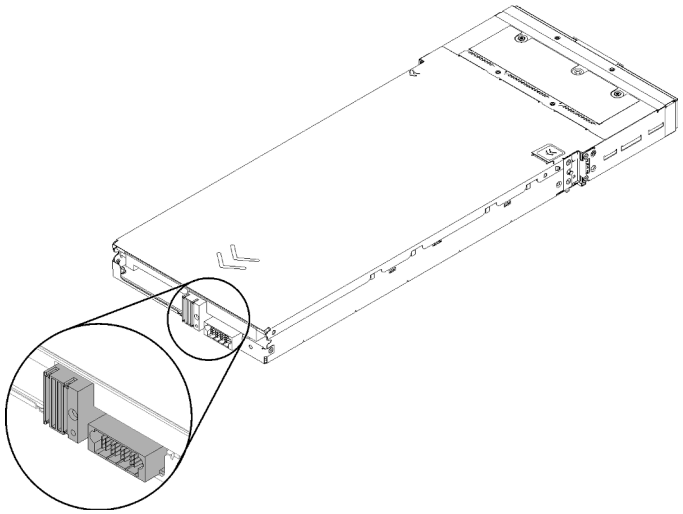


Figure 110. Node connectors

Complete the following steps to install the compute node in a enclosure.

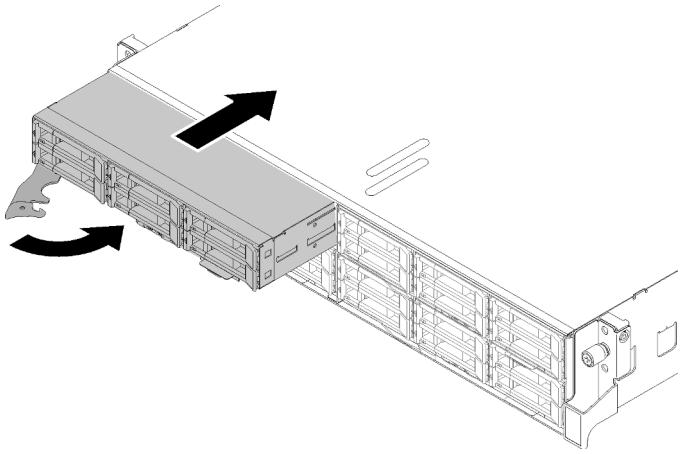


Figure 111. Node installation

Step 1. Select the node bay.

Note: If you are reinstalling a compute node that you removed, you must install it in the same node bay from which you removed it. Some compute node configuration information and update options are established according to node bay number. Reinstalling a compute node into a different node bay can have unintended consequences. If you reinstall the compute node into a different node bay, you might have to reconfigure the compute node.

Step 2. Make sure that the front handle on the compute node is in the fully open position.

Step 3. Slide the compute node into the node bay until it stops.

Step 4. Rotate the compute node handle to the fully closed position until the handle latch clicks.

Note: The time required for a compute node to initialize varies by system configuration. The power LED flashes rapidly; the power button on the compute node will not respond until the power LED flashes slowly, indicating that the initialization process is complete.

After you install a compute node, complete the following steps:

1. Check the power LED to make sure it transitions between fast blink and slow blink to indicate the node is ready to be powered on; then, power on the node.
2. Make sure that the power LED on the compute node control panel is lit continuously, indicating that the compute node is receiving power and is turned on.
3. If you have other compute nodes to install, do so now.
4. If this is the initial installation of the node in the enclosure, you must configure the node through the Lenovo XClarity Provisioning Manager and install the node operating system. See https://sysmgt.lenovofiles.com/help/topic/LXPM/os_installation.html for more details.
5. If compute node access over local console is not available:
   a. Access Lenovo XClarity Controller web interface (see https://sysmgt.lenovofiles.com/help/topic/com.lenovo.systems.management.xcc.doc/dw1lm_c_accessingtheimmwebinterface.html).
   b. Set up Lenovo XClarity Controller network connection through Lenovo XClarity Provisioning Manager (see https://sysmgt.lenovofiles.com/help/topic/com.lenovo.systems.management.xcc.doc/dw1lm_t_settinguptheimmnetworkconnection.html).
   c. Log in to Lenovo XClarity Controller (see https://sysmgt.lenovofiles.com/help/topic/com.lenovo.systems.management.xcc.doc/dw1lm_t_loggingintotheimm.html).
6. If you have changed the configuration of the compute node or if you are installing a different compute node from the one that you removed, you must configure the compute node through the Setup utility, and you might have to install the compute node operating system, see Chapter 4 “System configuration” on page 141 for more details.
7. If you are installing a different compute node from the one that you removed, update the machine type and serial number with new vital product data (VPD). Use the Lenovo XClarity Provisioning Manager to update the machine type and serial number. See “Update the machine type and serial number” in *ThinkSystem D2 Enclosure, Modular Enclosure, Modular Enclosure for 6U Configuration and ThinkSystem SD530 Compute Node Maintenance Manual*.
8. You can place identifying information on the pull out label tab that are accessible from the front of the node.

Demo video

Watch the procedure on YouTube

Install hardware options in the PCIe expansion node

Use the following information to remove and install the PCIe expansion node options.

Remove the compute-expansion node assembly from the enclosure

Use this procedure to remove the compute-expansion node assembly from the enclosure.

Attention: Unauthorized personnel should not remove or install the nodes. Only trained or service-related personnel are admitted to perform such actions.

Before you remove the PCIe expansion node assembly from the enclosure:

1. Read the following section(s) to ensure that you work safely.
   - “Installation Guidelines” on page 64
2. When you remove the compute-expansion node assembly, note the node bay numbers and make sure to reinstall it back to the original bays. Installing it into different node bays from the original can lead to unexpected consequences, as some configuration information and update options are established according to node bay number. If you reinstall the compute-expansion node assembly into different

node bays, you might have to reconfigure the reinstalled compute node. One way to track the node assembly is via the serial number of the compute node.

Note: The serial number is located on the pull-out tab of each compute node.

Complete the following steps to remove the PCIe expansion node assembly from the enclosure.

Step 1. Release and rotate the two front handles as shown in the illustration.

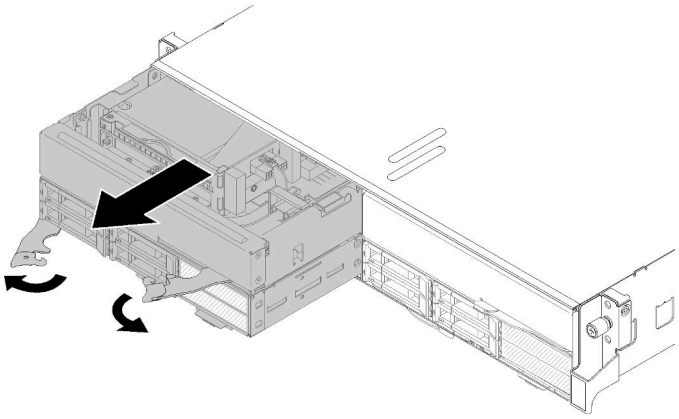


Figure 112. Compute-expansion node assembly removal

Attention: To maintain proper system cooling, do not operate the enclosure without a compute node or node bay filler installed in each node bay.

Step 2. Slide the node assembly out about 12 inches (300 mm); then, grip the node assembly with both hands and remove it from the enclosure.

Step 3. If the enclosure is powered on with nodes in the other two bays, it is critical for proper cooling that you install two nodes or node fillers in the empty bays within 1 minute.

If you are instructed to return the component or optional device, follow all packaging instructions, and use any packaging materials for shipping that are supplied to you.

Remove the rear cable cover

Use this information to remove the rear cable cover.

Before you remove the rear cable cover:

1. Read the following section(s) to ensure that you work safely.
   - “Installation Guidelines” on page 64
2. If the compute-expansion node assembly is installed in the enclosure, remove it (see “Remove the compute-expansion node assembly from the enclosure” on page 119).

Complete the following steps to remove the rear cable cover.

Step 1. Lift on the blue touch point of the rear cable cover.

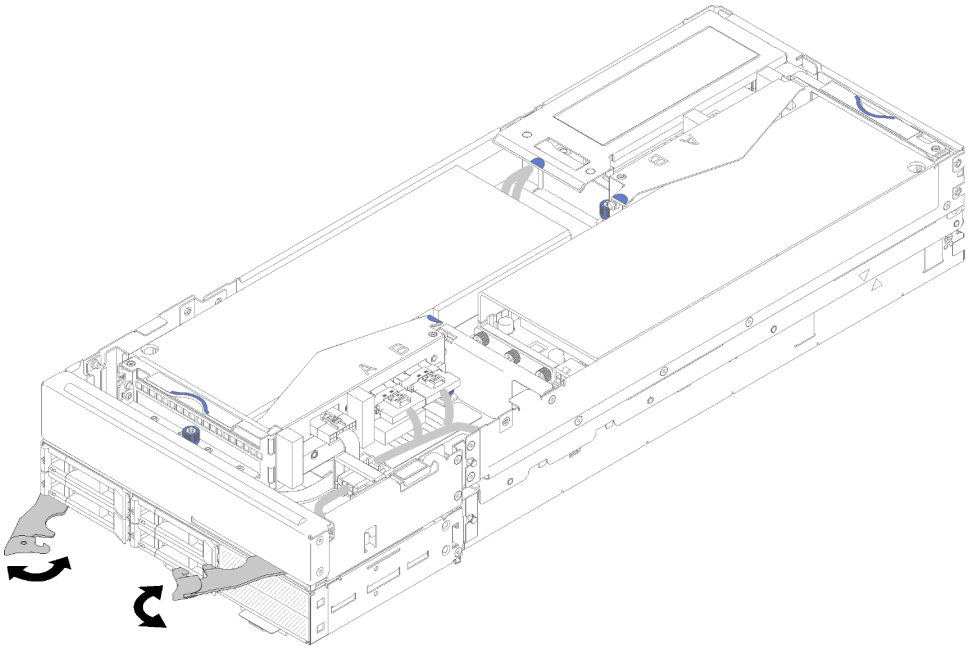


Figure 113. Rear cable cover removal

Step 2. Remove the rear cable cover.

If you are instructed to return the component or optional device, follow all packaging instructions, and use any packaging materials for shipping that are supplied to you.

Install a PCIe adapter into the riser cage

Use this information to install a PCIe adapter into the riser cage.

Before you install a PCIe adapter into the riser cage:

1. Read the following section(s) to ensure that you work safely.
   - "Installation Guidelines" on page 64
2. If the compute-expansion node assembly is installed in the enclosure, remove it (see "Remove the compute-expansion node assembly from the enclosure" on page 119).
3. Remove the rear cable cover (see "Remove the rear cable cover" on page 120).
4. Remove the riser miscellaneous cable from the front riser cage, and loosen the two captive screws to remove the riser cage from the node.

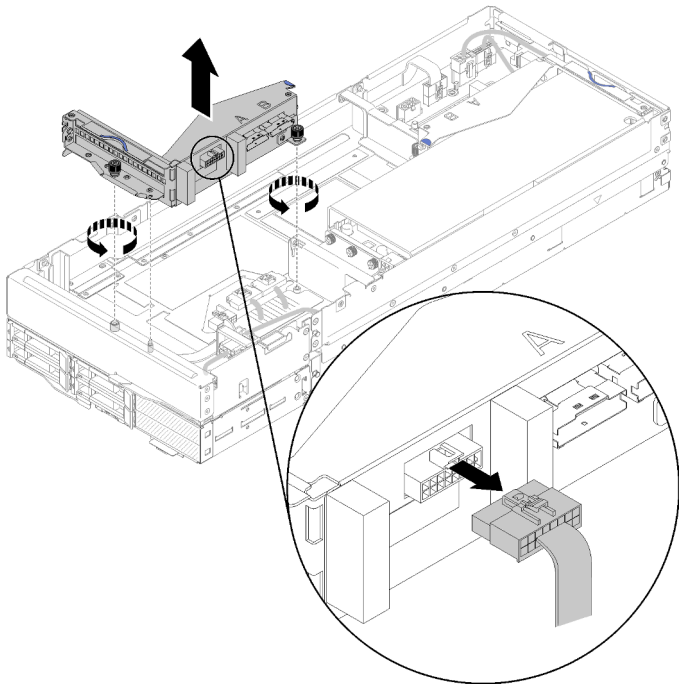


Figure 114. Disconnecting the riser miscellaneous cable from the riser cage and removing the riser cage from the expansion node

Complete the following steps to install a PCIe adapter into the riser cage.

Step 1. If no adapter has been installed in the riser cage, remove the screw from the riser cage.

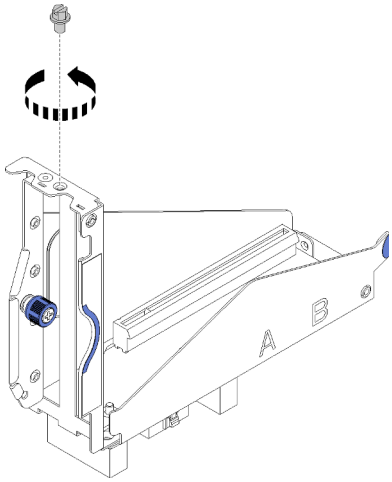


Figure 115. Removing the screw from the riser cage

Step 2. Slide the adapter into the slot on the riser cage; then, fasten the screw to secure the adapter.

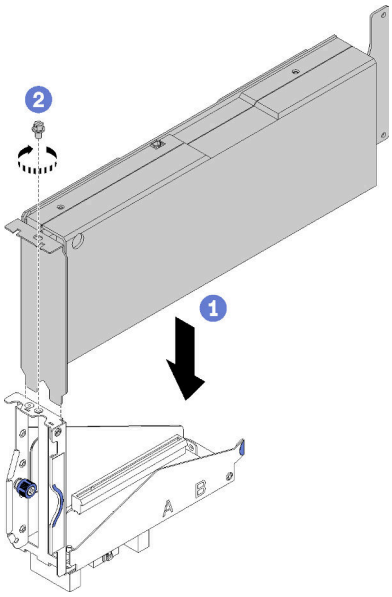


Figure 116. Installing an adapter into the riser cage

Step 3. Connect the auxiliary power cable that comes with the adapter as illustrated.

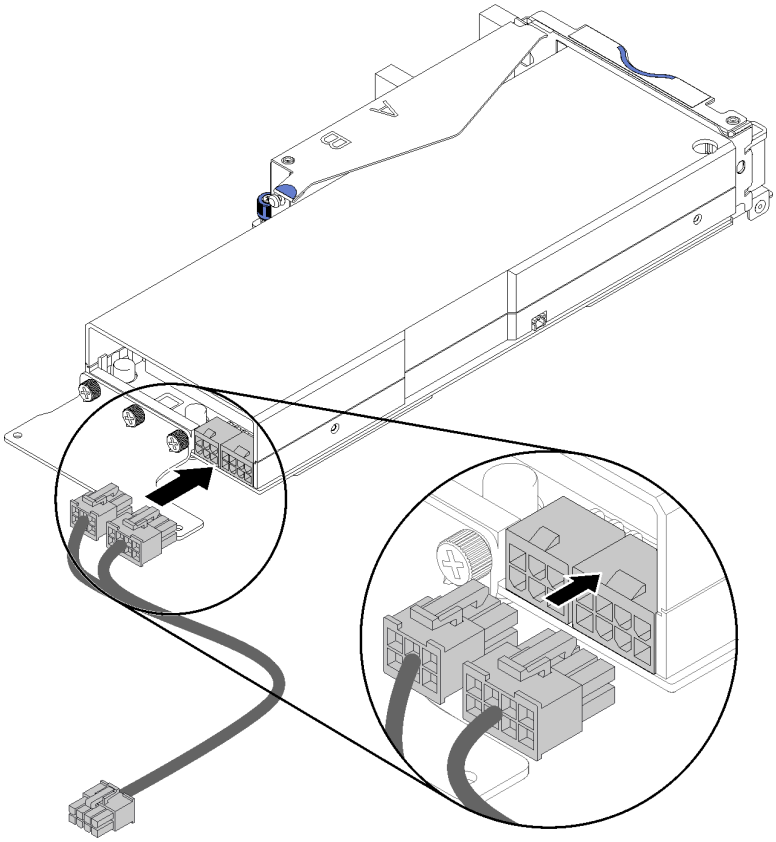


Figure 117. Connecting the auxiliary power cable to the adapter connectors

Attention: The PCIe adapter may come with more than one auxiliary power cable, and it is of crucial importance to adopt the cable specifically meant for SD530. Carefully examine the end of cable for PCIe expansion node, and make sure it is exactly the same as illustrated.

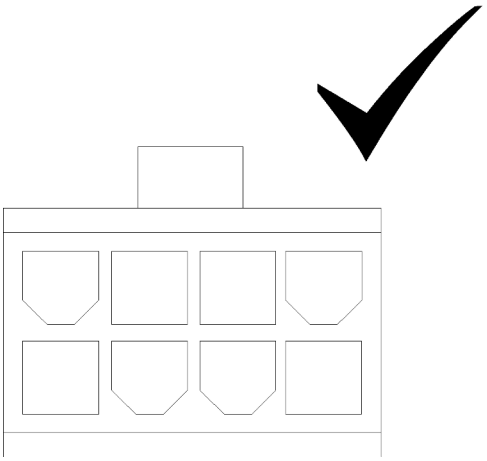


Figure 118. The connector of the auxiliary cable for SD530

Notes:

1. The auxiliary power cable that comes with your adapter might look different from that in the illustration.
2. The location of connectors might be different from that in the illustration.

After you install the PCIe adapter into the riser cage, complete the following steps:

1. Install the PCIe riser assembly into the PCIe expansion node (see “Install a PCIe riser assembly into the PCIe expansion node assembly ” on page 124).
2. Install the rear cable cover (see “Install the rear cable cover” on page 127).
3. Install the PCIe expansion node assembly into the enclosure (see “Install the compute-expansion node assembly into the enclosure” on page 129).
4. Power on the compute node.

Demo video

Watch the procedure on YouTube

Install a PCIe riser assembly into the PCIe expansion node assembly

Use this information to install a PCIe riser assembly into the compute-expansion node assembly.

Before you install a PCIe riser assembly into the compute-expansion node assembly:

1. Read the following section(s) to ensure that you work safely.
   - “Installation Guidelines” on page 64
2. If no adapter is installed in the riser cage, disconnect the front riser miscellaneous cable first if you are removing the front riser cage, and loosen the two captive screws to remove the riser cage from the expansion node; then, install an adapter into the riser cage (see “Install a PCIe adapter into the riser cage” on page 121) .

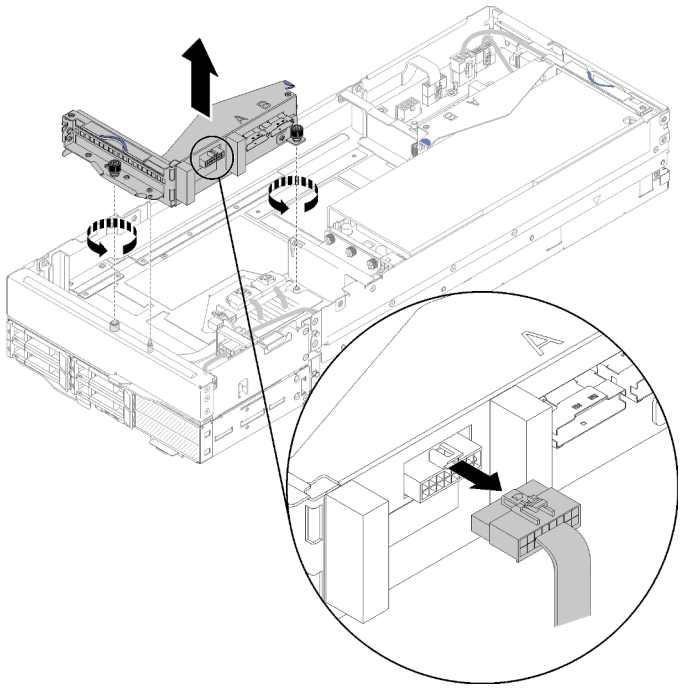


Figure 119. Riser cage removal

3. If you are installing a new adapter in addition to an existing one, remove the airflow filler from the gap by the front riser slot, and place it into the gap on the side of the expansion node as illustrated.

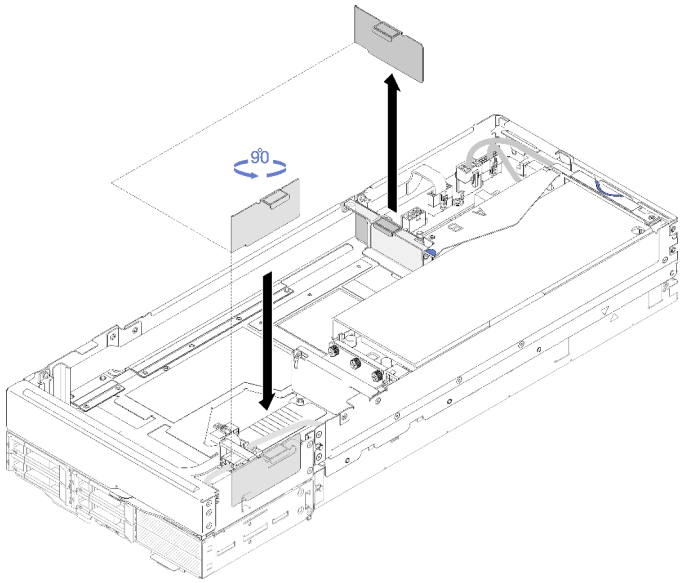


Figure 120. Airflow filler removal

Complete the following steps to install a PCIe riser assembly into the PCIe expansion node assembly.

Notes: For proper system cooling:

- When only one adapter is to be installed, make sure the adapter is install in the rear riser slot, and place the airflow filler into the gap by the front riser slot.

Install the front PCIe riser assembly

Step 1. Pass the auxiliary power cable through the narrow window as illustrated; then, align the riser assembly to the guide pins on the expansion node, and lower it until it stops.

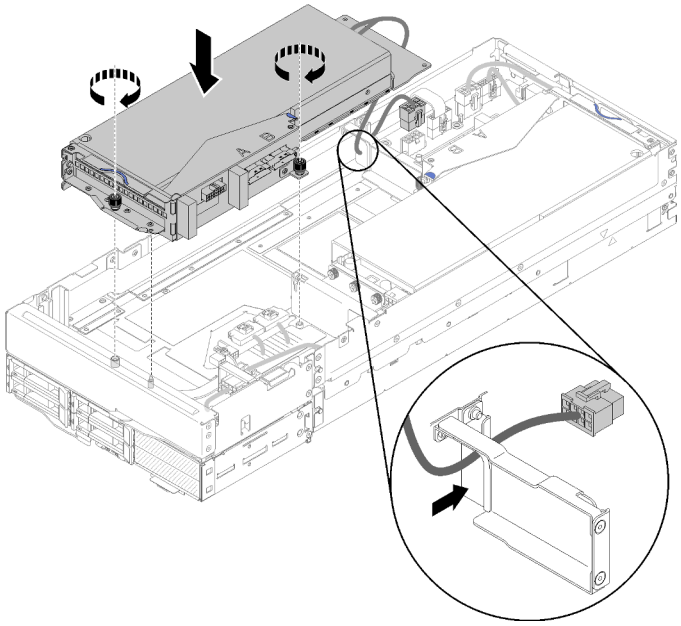


Figure 121. Installing the front riser assembly into the expansion node

Step 2. Tighten the two captive screws to secure the riser assembly to the expansion node.

Step 3. Connect PCIe#3-A cable to the riser connector labeled “A.”

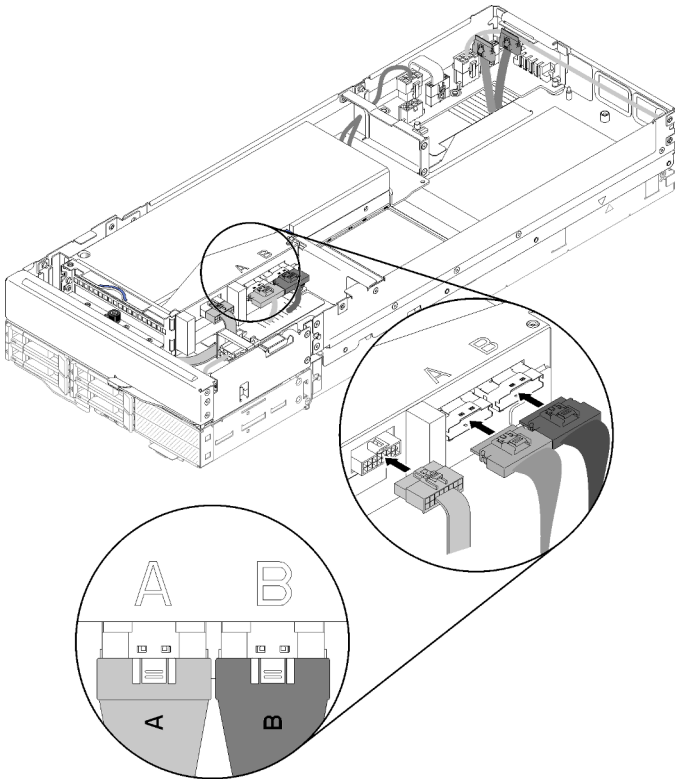


Figure 122. Connecting PCIe#3-A, PCIe#4-B and the riser miscellaneous cable to the front riser assembly

Step 4. Connect PCIe#4-B cable to the riser connector labeled “B.”

Step 5. Connect the riser miscellaneous cable to the riser assembly.

Step 6. Connect the auxiliary power cable to the expansion node.

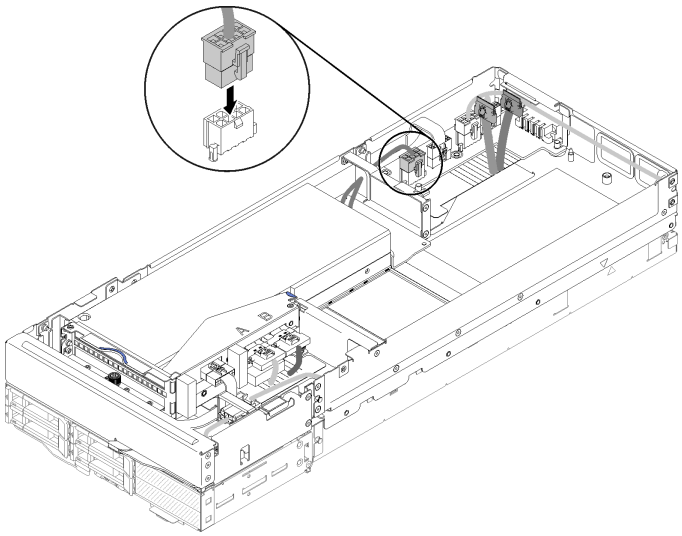


Figure 123. Connecting the auxiliary power cable to the expansion node

Install the rear cable cover

Use this information to install the rear cable cover.

Before you install the rear cable cover:

1. Read the following section(s) to ensure that you work safely.
   - “Installation Guidelines” on page 64
2. If the PCIe#2-B cable is connected to the rear riser assembly, make sure it is routed under the PCIe#1-A cable through the gap between the two front riser power connectors.
3. If the PCIe#1-A cable is connected to the rear riser assembly, make sure it is routed above the PCIe#2-B cable through the gap between the two front riser power connectors.
4. When both riser assemblies are installed, make sure the front riser auxiliary power cable is looped back into the gap between the two front riser power connectors, and routed above the PCIe#2-B cable.

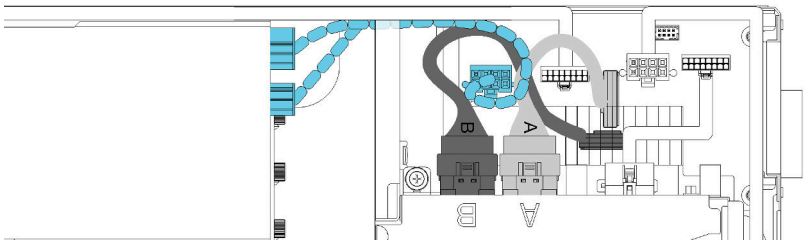


Figure 124. Routing PCIe#1-A, PCIe#2-B and the front riser auxiliary power cable

Complete the following steps to install the rear cable cover.

Step 1. Align the side of the rear cable cover to the slot on the end of the expansion node.

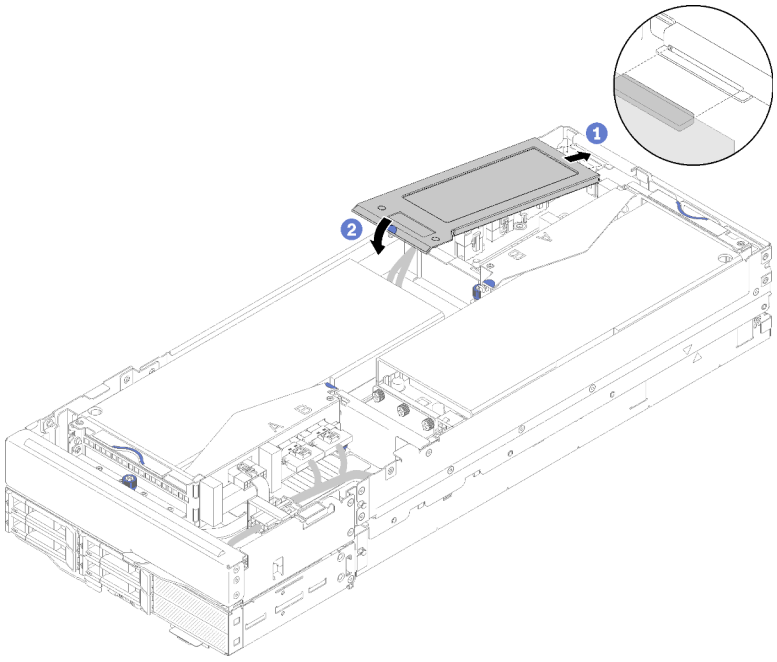


Figure 125. Rear cable cover installation

Step 2. Press down at the touch point until the rear cable cover snaps into place.

After you install the rear cable cover, complete the following steps:

1. Install the PCIe expansion node assembly into the enclosure (see “Install the compute-expansion node assembly into the enclosure” on page 129).

2. Power on the compute node.

Install the compute-expansion node assembly into the enclosure

Use this procedure to install a compute-expansion node assembly into the enclosure.

Before you install the compute-expansion node assembly into the enclosure:

1. Read the following section(s) to ensure that you work safely.
   - "Installation Guidelines" on page 64

Attention: When removing or installing the node assembly, be careful not to damage the node connectors.

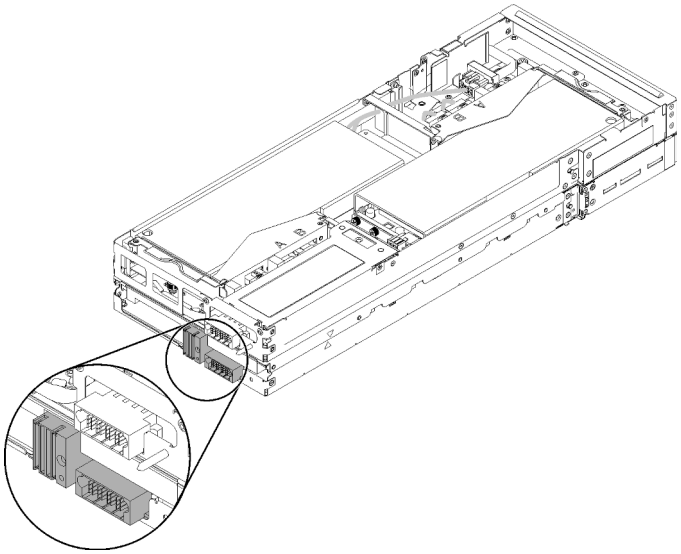


Figure 126. Connectors on the compute-expansion node assembly

Complete the following steps to install the PCIe expansion node assembly into the enclosure.

Step 1. Select two empty bays vertically adjacent to each other for installation.

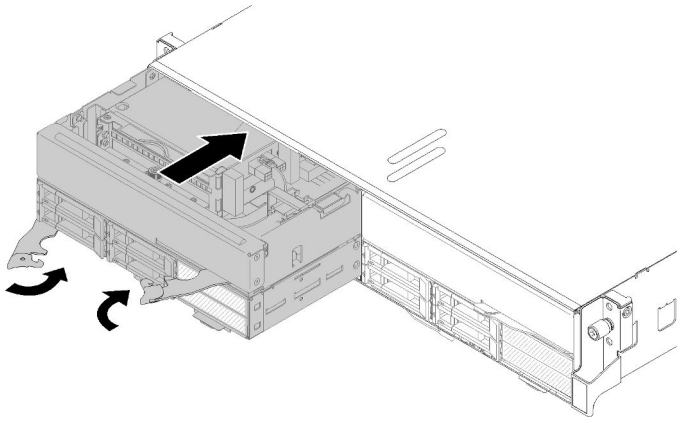


Figure 127. PCIe expansion node installation into the enclosure

Notes:

1. When reinstalling a compute-expansion node assembly removed previously, be sure to install it into the exact same node bays. Some compute node configuration information and update

options are established according to node bay number, and reinstalling a compute node into a different node bay can lead to unexpected consequences. If you reinstall the compute-expansion node assembly into different node bays, you might have to reconfigure the installed compute node.

2. When a compute-expansion node assembly is installed in an enclosure, the other two node bays in the same enclosure must be installed with either one compute-expansion node assembly or two node fillers.

Step 2. Make sure that the front handles of the compute node are in the fully open position.

Step 3. Slide the compute-expansion node assembly into the node bays until it stops.

Step 4. Rotate the compute node handles to the fully closed position with two hands until both the handle latches click into place.

Note: The time required for a node to initialize varies by system configuration. The power LED flashes rapidly; the power button on the compute node will not respond until the power LED flashes slowly, indicating that the initialization process is complete.

After you install the compute-expansion node assembly to the enclosure, complete the following steps:

1. Check the power LED to make sure it transitions between fast blink and slow blink to indicate the node is ready to be powered on; then, power on the node.
2. Make sure that the power LED on the compute node control panel is lit continuously, indicating that the compute node is receiving power and is turned on.
3. If you have other compute nodes to install, do so now.
4. If this is the initial installation of the node in the enclosure, you must configure the node through the Lenovo XClarity Provisioning Manager and install the node operating system. See https://sysmgt.lenovofiles.com/help/topic/LXPM/os_installation.html for more details.
5. If compute node access over local console is not available:
   a. Access Lenovo XClarity Controller web interface (see https://sysmgt.lenovofiles.com/help/topic/com.lenovo.systems.management.xcc.doc/dw1lm_c_accessingtheimmwebinterface.html).
   b. Set up Lenovo XClarity Controller network connection through Lenovo XClarity Provisioning Manager (see https://sysmgt.lenovofiles.com/help/topic/com.lenovo.systems.management.xcc.doc/dw1lm_t_settinguptheimmnetworkconnection.html).
   c. Log in to Lenovo XClarity Controller (see https://sysmgt.lenovofiles.com/help/topic/com.lenovo.systems.management.xcc.doc/dw1lm_t_loggingintotheimm.html).
6. If you have changed the configuration of the compute node or if you are installing a different compute node from the one that you removed, you must configure the compute node through the Setup utility, and you might have to install the compute node operating system, see Chapter 4 “System configuration” on page 141 for more details.
7. If you are installing a different compute node from the one that you removed, update the machine type and serial number with new vital product data (VPD). Use the Lenovo XClarity Provisioning Manager to update the machine type and serial number. See “Update the machine type and serial number” in *ThinkSystem D2 Enclosure, Modular Enclosure, Modular Enclosure for 6U Configuration and ThinkSystem SD530 Compute Node Maintenance Manual*.
8. You can place identifying information on the pull out label tab that are accessible from the front of the node.

Install the enclosure in a rack

To install the enclosure in a rack, follow the following instructions.

To install the enclosure in a rack, follow the instructions that are provided in the Rail Installation Kit for the rails on which the enclosure will be installed.

Install slide rails into the rack

Use this information to install slide rails into the rack.

Note: The slide rails are extensible as shown in the following illustration.

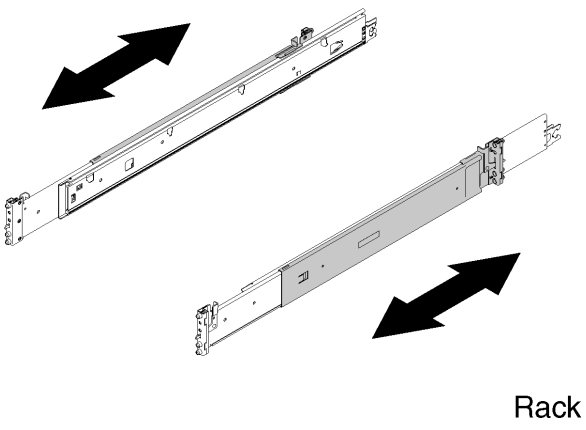


Figure 128. Slides

To install slide rails into the rack, complete the following steps.

1 Select the first slide rail you want to install.
2 Make sure the slide rail is shortened to the shortest position.

3 From the front of the rack cabinet, line up the pins on the rear of the slide rail with the flange holes at the rear of the rack.
4 Push the slide rail so that the pins and the latch go into the place.
Note: The holes on the rack will either be square-shaped or round-shaped.

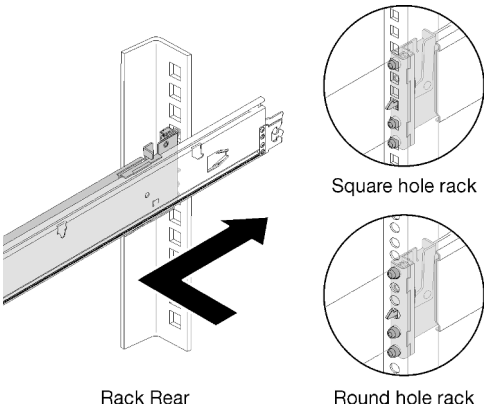


Figure 129. Left slide rear installation

5 Pull the slide forward and insert the pins and the latch into the EIA flange holes at the front of the rack.
Note: The holes on the rack will either be square-shaped or round-shaped.

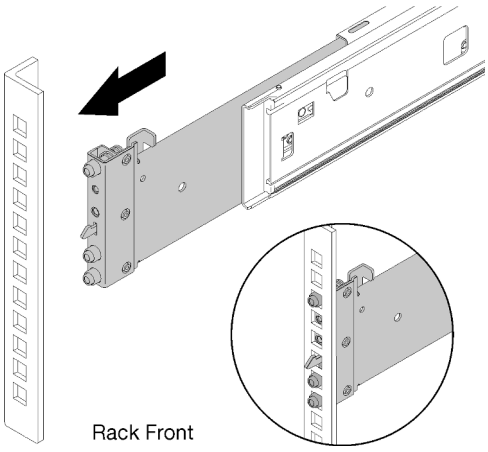


Figure 130. Left slide front installation

6 Repeat steps **2** to **5** to install the other slide rail. Make sure that each slide rail is securely engaged in the flange by inspecting that the hook has caught and by sliding back and forward to ensure the slide does not pop out.

Install the enclosure on the slide rails

Use this information to install the enclosure on the slide rails.

Attention: Before you install the enclosure, make sure that all compute nodes and the shuttle are removed out of the enclosure.

To install the enclosure on the rails, complete the following steps.

1 Pull the slide rails forward until the rails click into place.
2 Push up the front latches.
3 Pull the slides all the way out.

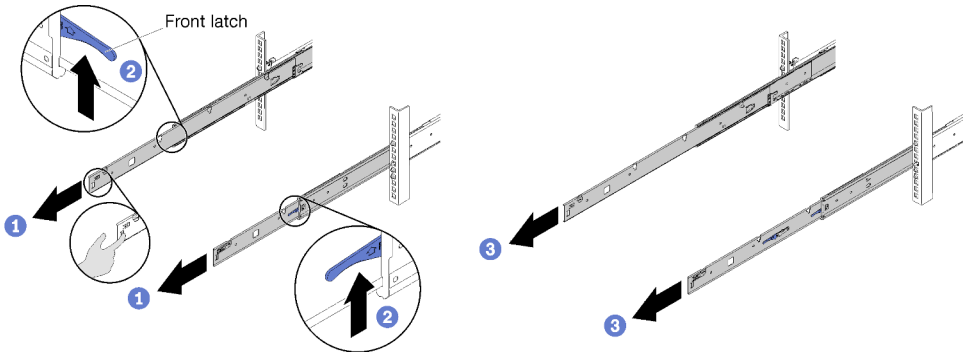


Figure 131. Slides

4 Carefully lift the enclosure.
Note: Make sure all compute nodes and the shuttle are removed out of the enclosure.

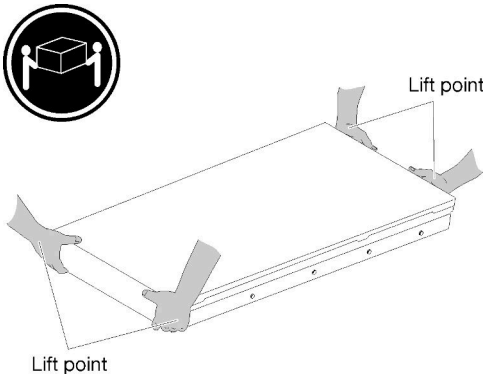


Figure 132. Enclosure

5 Tilt and lower the enclosure; then, push the slides toward the enclosure and make sure the farthest nailheads go into the slots on the slides.
6 Slowly lower the enclosure down and make sure the other 3 nailheads slip into the slots.
Attention: You can only install the enclosure successfully when the slides are fully extended.

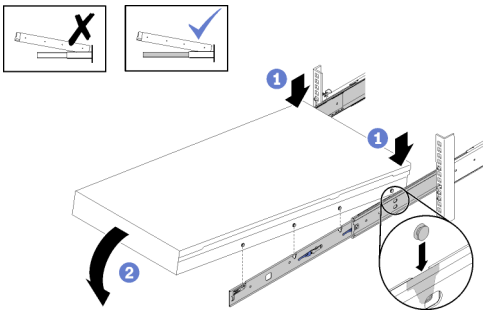


Figure 133. Enclosure installation

Slide the enclosure into the rack

Use this information to slide the enclosure into the rack.

To slide the enclosure into the rack, complete the following steps.

1 Push up the rear latches on the slide rails.
2 Push the enclosure until the slide rails click into place
3 Push up the front latches on the slide rails.
4 Push the enclosure all the way into the rack.

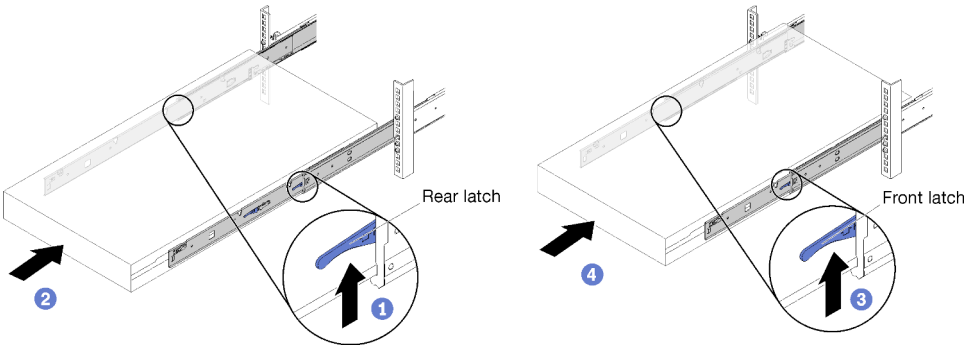


Figure 134. Enclosure installation

Secure the enclosure in the rack for shipping

Use this information to secure the enclosure in the rack for shipping.

To secure the enclosure in the rack for shipping, complete the following steps.

1 Insert the two M5 screws and washers; then, fasten the two M5 screws to secure the slides to the rack flanges.

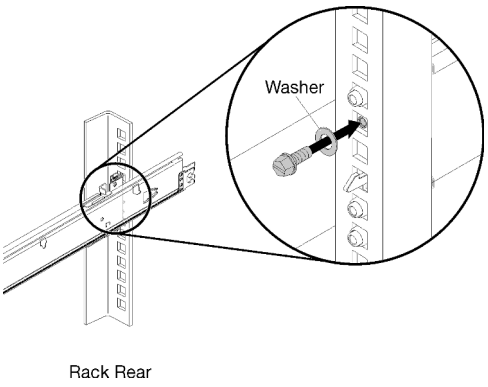


Figure 135. Screws installation

2 Fasten the two thumbscrews located on the front of the enclosure.

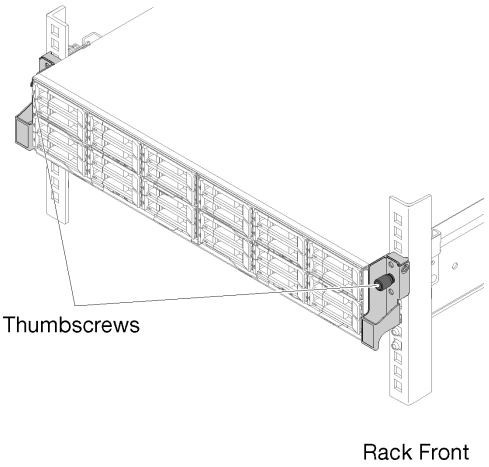


Figure 136. Thumbscrews

3 Install the compute nodes and the shuttle back to the enclosure. For more details, see *Setup Guide* or *Maintenance Manual*.

Install the cable management arm

Use this information to install the cable management arm.

ThinkSystem D2 Cable Management Arm contains the following items.

Note: The illustration in this document might differ slightly from your hardware.

Cable Management Arm box contents

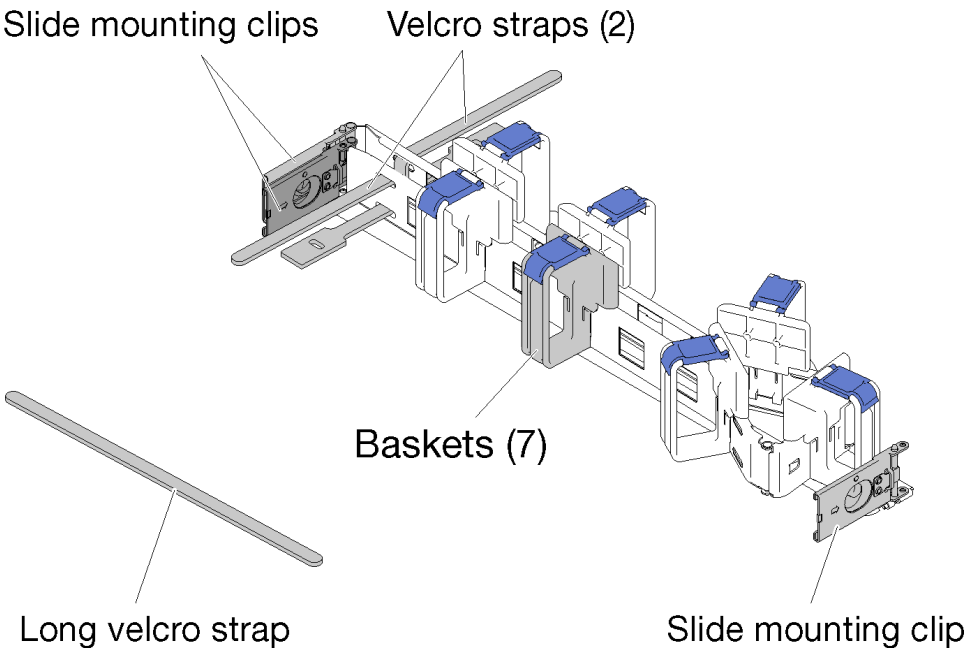


Figure 137. Cable management arm box contents

- One cable management arm
  - Two velcro straps (pre-attached)
  - One long velcro strap (used for shipping with a rack only)
  - Seven cable baskets (pre-attached)
  - Three slide mounting clips
- Installation guide

To install the cable management arm, complete the following steps.

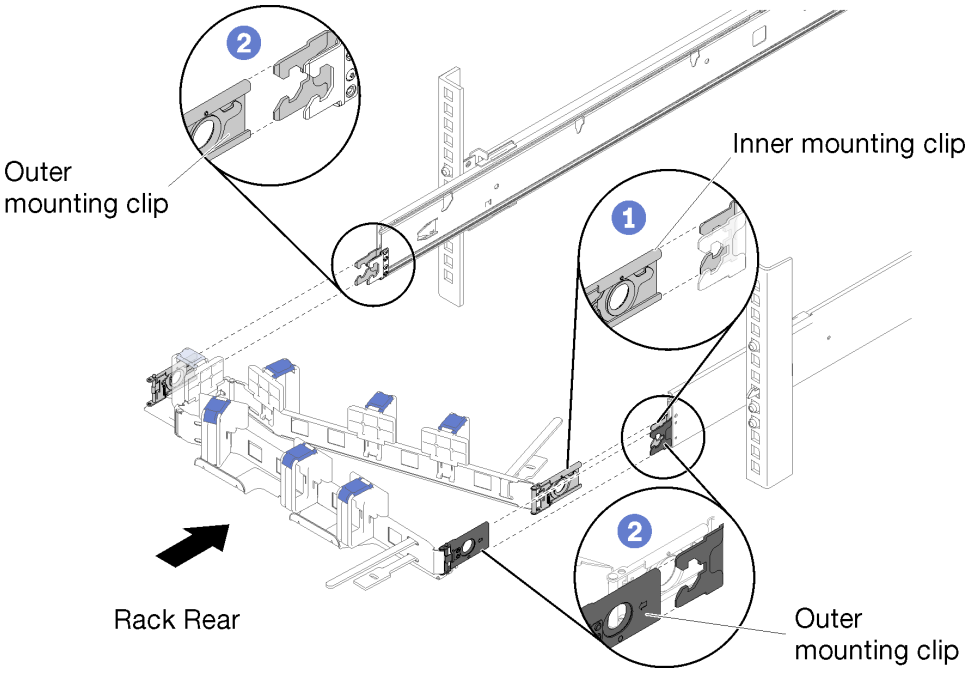


Figure 138. Cable management arm installation

Step 1. Make sure the enclosure is pushed fully into the rack and the thumbscrews are tightened.

Step 2. Align the inner mounting clip with the inner tab on the slide, then, push it until it snaps into place.

Step 3. Align two outer mounting clips with the outer tabs on the slides; then, push them until they snap into place.

Connect and route cables

Use this information to connect and route cables.

Note: Use the cable straps provided on the cable management arm to retain the cables and prevent them from sagging.

To connect and route cables, complete the following steps.

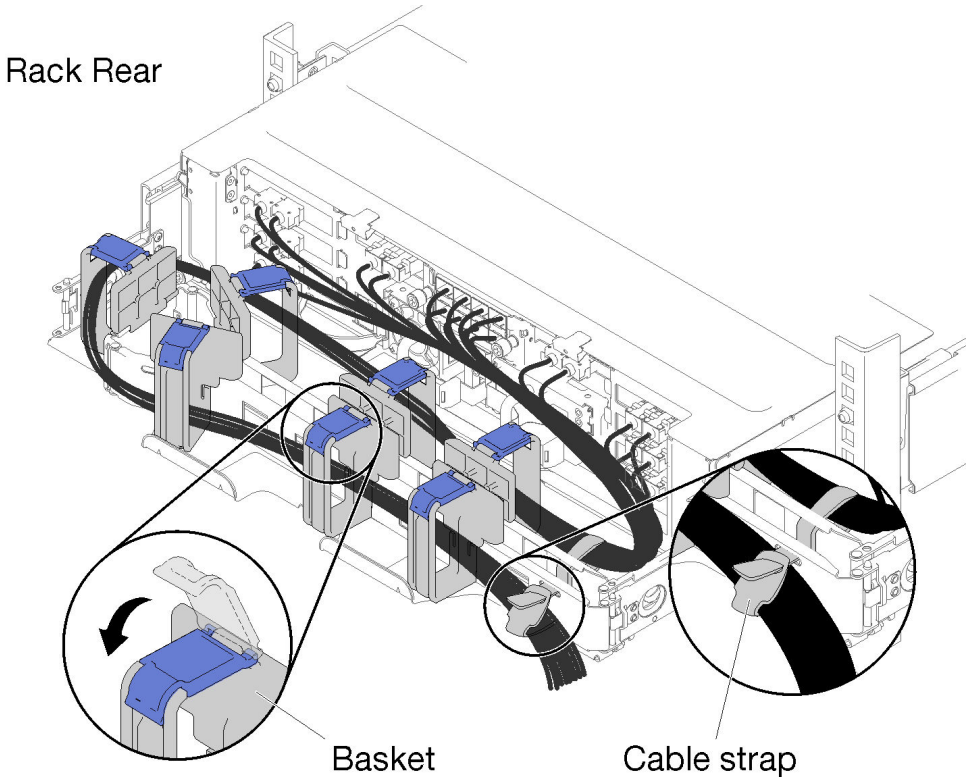


Figure 139. Cable routing

Step 1. Open the blue retaining clips on the seven cable baskets.

Step 2. Attach the power cords and other cables to the rear of the enclosure.

Step 3. Route the cables and power cords in the cable management arm.

Step 4. Use the two cable straps to tightly secure the cables to the front and rear of the cable management arm.

Step 5. Close the blue retaining clips on the seven cable baskets.

Step 6. Carefully slide the enclosure back and forward to ensure the cables do not pinch, bind, or hang down into the U space directly below the enclosure.

Remove the cable management arm

Use this information to remove the cable management arm.

To remove the cable management arm, complete the following steps.

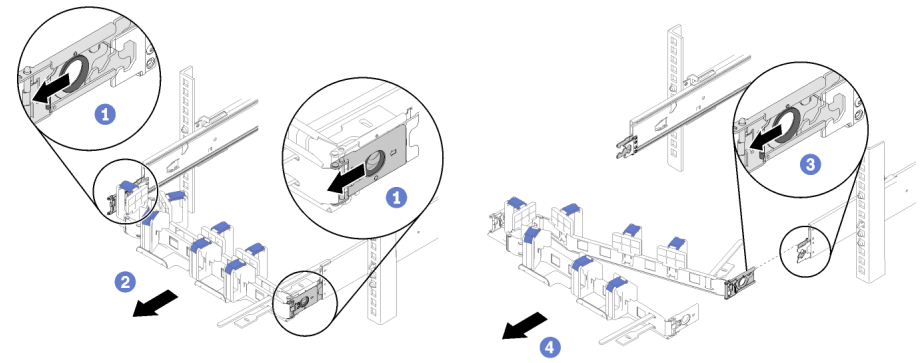


Figure 140. Cable management arm removal

Step 1. Disconnect all the cables from the cable management arm.

Step 2. Pull the two outer mounting clip release latches backward to disengage the cable management arm.

Step 3. Pull the inner mounting clip release latch backward to disengage the cable management arm.

Step 4. Remove the cable management arm out of the slide rails.

Change the cable management arm for installation tothe other side of the rack

See this section to learn how to change the CMA for installation to the other side of the rack.

To install the cable management arm on the opposite side, complete the following steps:

Step 1. Press the release latch.

Step 2. Pull the mounting clip up to remove the cable management arm out of the shelf.

Step 3. Press the release latch of the other mounting clip.

Step 4. Pull the mounting clip up to remove it.

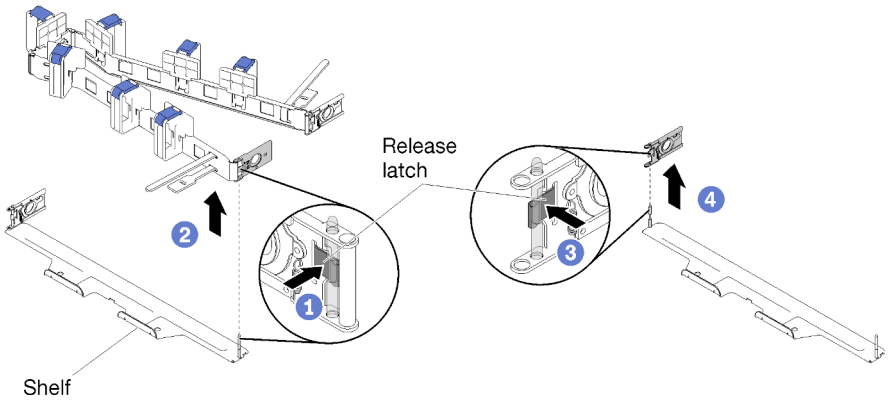


Figure 141. Mounting clip removal

Step 5. Align the mounting clip hole with the hinge pin; then, push the mounting clip to insert it.

Step 6. Turn and orient the cable management arm as illustrated.

Step 7. Align the other mounting clip hole with the hinge pin and push it to insert the cable management arm to the shelf.

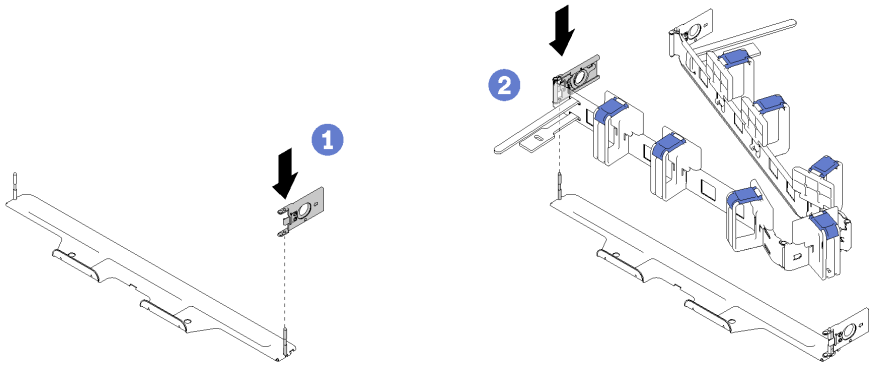


Figure 142. Mounting clip installation

Cable the solution

Attach all external cables to the solution. Typically, you will need to connect the solution to a power source, to the data network, and to storage. In addition, you will need to connect the solution to the management network.

Connect to power

Connect the solution to power.

Connect to the network

Connect the solution to the network.

Connect to storage

Connect the solution to any storage devices.

Power on the compute node

After the compute node performs a short self-test (power status LED flashes rapidly) when connected to input power, it enters the standby state (power status LED flashes once per second).

A compute node can be turned on (power LED on) in any of the following ways:

- You can press the power button.
- The compute node can restart automatically after a power interruption.
- The compute node can respond to remote power-on requests sent to the Lenovo XClarity Controller.

For information about powering off the compute node, see “Power off the compute node” on page 139.

Validate solution setup

After powering up the solution, make sure that the LEDs are lit and that they are green.

Power off the compute node

The compute node remains in the standby state when connected to a power source, while Lenovo XClarity Controller is allowed to respond to remote power-on requests. To completely power off the compute node (power status LED off), you must disconnect all power cables.

To power off the compute node that is in a standby state (power status LED flashes once per second):

Note: The Lenovo XClarity Controller can place the compute node in a standby state as an automatic response to a critical system failure.

- Start an orderly shutdown using the operating system (if supported by your operating system).
- Press the power button to start an orderly shutdown (if supported by your operating system).
- Press and hold the power button for more than 4 seconds to force a shutdown.

In the standby state, the compute node can respond to remote power-on requests sent to the Lenovo XClarity Controller. For information about powering on the compute node, see "Power on the compute node" on page 138.

Chapter 4. System configuration

Complete these procedures to configure your system.

Set the network connection for the Lenovo XClarity Controller

Before you can access the Lenovo XClarity Controller over your network, you need to specify how Lenovo XClarity Controller will connect to the network. Depending on how the network connection is implemented, you might need to specify a static IP address as well.

The following methods are available to set the network connection for the Lenovo XClarity Controller if you are not using DHCP:

- If a monitor is attached to the server, you can use Lenovo XClarity Provisioning Manager to set the network connection.

  Complete the following steps to connect the Lenovo XClarity Controller to the network using the Lenovo XClarity Provisioning Manager.

  1. Start the server.
  2. When you see <F1> Setup, press F1 to open up the Lenovo XClarity Provisioning Manager.
  3. Go to **LXPM → UEFI Setup → BMC Settings** to specify how the Lenovo XClarity Controller will connect to the network.
     - If you choose a static IP connection, make sure that you specify an IPv4 or IPv6 address that is available on the network.
     - If you choose a DHCP connection, make sure that the MAC address for the server has been configured in the DHCP server.
  4. Click **OK** to apply the setting and wait for two to three minutes.
  5. Use an IPv4 or IPv6 address to connect Lenovo XClarity Controller.

     Important: The Lenovo XClarity Controller is set initially with a user name of USERID and password of PASSW0RD (with a zero, not the letter O). This default user setting has Supervisor access. It is required to change this user name and password during your initial configuration for enhanced security.

- If no monitor attached to the server, you can set the network connection through the System Management Module interface. Connect an Ethernet cable from your laptop to the Ethernet port on the System Management Module, which is located at the rear of the server.

  Note: Make sure that you modify the IP settings on the laptop so that it is on the same network as the server default settings.

  To access the System Management Module interface, the System Management Module network must be enabled. For more information about accessing the System Management Module, see: the *System Management Module User's Guide*

  The default IPv4 address and the IPv6 Link Local Address (LLA) is provided on the Lenovo XClarity Controller Network Access label that is affixed to the Pull Out Information Tab.

- If you are using the Lenovo XClarity Administrator Mobile app from a mobile device, you can connect to the Lenovo XClarity Controller through the Lenovo XClarity Controller micro-USB connector on the front of the server. For the location of the Lenovo XClarity Controller USB connector, see "Compute node" on page 24.

  To connect using the Lenovo XClarity Administrator Mobile app:

1. Connect the USB cable of your mobile device to the Lenovo XClarity Administrator USB connector on the front panel.
2. On your mobile device, enable USB tethering.
3. On your mobile device, launch the Lenovo XClarity Administrator mobile app.
4. If automatic discovery is disabled, click **Discovery** on the USB Discovery page to connect to the Lenovo XClarity Controller.

For more information about using the Lenovo XClarity Administrator Mobile app, see:

http://sysmgt.lenovofiles.com/help/topic/com.lenovo.lxca.doc/lxca_usemobileapp.html

Set front USB port for Lenovo XClarity Controller connection

Before you can access the Lenovo XClarity Controller through the front USB port, you need to configure the USB port for Lenovo XClarity Controller connection.

Server support

To see if your server supports accessing Lenovo XClarity Controller through the front USB port, check one of the following:

- Refer to Chapter 2 “Solution components” on page 21.
-  If there is a wrench icon on the USB port of your server, you can set the USB port to connect to Lenovo XClarity Controller.

Setting the USB port for Lenovo XClarity Controller connection

You can switch the USB port between normal and Lenovo XClarity Controller management operation by performing one of the following steps.

- Hold the ID button for at least 3 second until its LED flashes slowly (once every couple of seconds). See Chapter 2 “Solution components” on page 21 for ID button location.
- From the Lenovo XClarity Controller management controller CLI, run the `usbfp` command. For information about using the Lenovo XClarity Controller CLI, see the “Command-line interface” section in the XCC documentation compatible with your server at https://pubs.lenovo.com/lxcc-overview/.
- From the Lenovo XClarity Controller management controller web interface, click **BMC Configuration → Network → Front Panel USB Port Manager**. For information about Lenovo XClarity Controller web interface functions, see the “Description of XClarity Controller functions on web interface” section in the XCC documentation compatible with your server at https://pubs.lenovo.com/lxcc-overview/.

Checking USB port current setting

You can also check the current setting of the USB port using the Lenovo XClarity Controller management controller CLI (`usbfp` command) or the Lenovo XClarity Controller management controller web interface (**BMC Configuration → Network → Front Panel USB Port Manager**). See the “Command-line interface” and “Description of XClarity Controller functions on web interface” sections in the XCC documentation compatible with your server at https://pubs.lenovo.com/lxcc-overview/.

Update the firmware

Several options are available to update the firmware for the server.

You can use the tools listed here to update the most current firmware for your server and the devices that are installed in the server.

- Best practices related to updating firmware is available at the following site:
  - http://lenovopress.com/LP0656
- The latest firmware can be found at the following site:
  - http://datacentersupport.lenovo.com/products/servers/thinksystem/sd530/7X21/downloads
- You can subscribe to product notification to stay up to date on firmware updates:
  - https://datacentersupport.lenovo.com/tw/en/solutions/ht509500

UpdateXpress System Packs (UXSPs)

Lenovo typically releases firmware in bundles called UpdateXpress System Packs (UXSPs). To ensure that all of the firmware updates are compatible, you should update all firmware at the same time. If you are updating firmware for both the Lenovo XClarity Controller and UEFI, update the firmware for Lenovo XClarity Controller first.

Update method terminology

- **In-band update**. The installation or update is performed using a tool or application within an operating system that is executing on the server's core CPU.
- **Out-of-band update**. The installation or update is performed by the Lenovo XClarity Controller collecting the update and then directing the update to the target subsystem or device. Out-of-band updates have no dependency on an operating system executing on the core CPU. However, most out-of-band operations do require the server to be in the S0 (Working) power state.
- **On-Target update.** The installation or update is initiated from an installed operating system executing on the target server itself.
- **Off-Target update.** The installation or update is initiated from a computing device interacting directly with the server's Lenovo XClarity Controller.
- **UpdateXpress System Packs (UXSPs)**. UXSPs are bundled updates designed and tested to provide the interdependent level of functionality, performance, and compatibility. UXSPs are server machine-type specific and are built (with firmware and device driver updates) to support specific Windows Server, Red Hat Enterprise Linux (RHEL) and SUSE Linux Enterprise Server (SLES) operating system distributions. Machine-type-specific firmware-only UXSPs are also available.

Firmware updating tools

See the following table to determine the best Lenovo tool to use for installing and setting up the firmware:

Tool	Update Methods Supported	Core System Firmware Updates	I/O Devices Firmware Updates	Graphical user interface	Command line interface	Supports UXSPs
Lenovo XClarity Provisioning Manager (LXPM)	In-band[2] On-Target	√		√		
Lenovo XClarity Controller (XCC)	Out-of-band Off-Target	√	Selected I/O devices	√		

Tool	Update Methods Supported	Core System Firmware Updates	I/O Devices Firmware Updates	Graphical user interface	Command line interface	Supports UXSPs
Lenovo XClarity Essentials OneCLI (OneCLI)	In-band Out-of-band On-Target Off-Target	√	All I/O devices		√	√
Lenovo XClarity Essentials UpdateXpress (LXCE)	In-band Out-of-band On-Target Off-Target	√	All I/O devices	√		√
Lenovo XClarity Essentials Bootable Media Creator (BoMC)	In-band Out-of-band Off-Target	√	All I/O devices	√ (BoMC application)	√ (BoMC application)	√
Lenovo XClarity Administrator (LXCA)	In-band[1] Out-of-band[2] Off-Target	√	All I/O devices	√		√
Lenovo XClarity Integrator (LXCI) for VMware vCenter	Out-of-band Off-Target	√	Selected I/O devices	√		
Lenovo XClarity Integrator (LXCI) for Microsoft Windows Admin Center	In-band Out-of-band On-Target Off-Target	√	All I/O devices	√		√
Lenovo XClarity Integrator (LXCI) for Microsoft System Center Configuration Manager	In-band On-Target	√	All I/O devices	√		√

Notes:

1. For I/O firmware updates.
2. For BMC and UEFI firmware updates.

- **Lenovo XClarity Provisioning Manager**

  From Lenovo XClarity Provisioning Manager, you can update the Lenovo XClarity Controller firmware, the UEFI firmware, and the Lenovo XClarity Provisioning Manager software.

Note: By default, the Lenovo XClarity Provisioning Manager Graphical User Interface is displayed when you press F1. If you have changed that default to be the text-based system setup, you can bring up the Graphical User Interface from the text-based system setup interface.

For additional information about using Lenovo XClarity Provisioning Manager to update firmware, see:

"Firmware Update" section in the LXPM documentation compatible with your server at https://pubs.lenovo.com/lxpm-overview/

- **Lenovo XClarity Controller**

  If you need to install a specific update, you can use the Lenovo XClarity Controller interface for a specific server.

  Notes:

  – To perform an in-band update through Windows or Linux, the operating system driver must be installed and the Ethernet-over-USB (sometimes called LAN over USB) interface must be enabled.

    For additional information about configuring Ethernet over USB, see:

    "Configuring Ethernet over USB" section in the XCC documentation compatible with your server at https://pubs.lenovo.com/lxcc-overview/

  – If you update firmware through the Lenovo XClarity Controller, make sure that you have downloaded and installed the latest device drivers for the operating system that is running on the server.

  For specific details about updating firmware using Lenovo XClarity Controller, see:

  "Updating Server Firmware" section in the XCC documentation compatible with your server at https://pubs.lenovo.com/lxcc-overview/

- **Lenovo XClarity Essentials OneCLI**

  Lenovo XClarity Essentials OneCLI is a collection of command line applications that can be used to manage Lenovo servers. Its update application can be used to update firmware and device drivers for your servers. The update can be performed within the host operating system of the server (in-band) or remotely through the BMC of the server (out-of-band).

  Specific details about updating firmware using Lenovo XClarity Essentials OneCLI, see:

  https://pubs.lenovo.com/lxce-onecli/onecli_c_update

- **Lenovo XClarity Essentials UpdateXpress**

  Lenovo XClarity Essentials UpdateXpress provides most of OneCLI update functions through a graphical user interface (GUI). It can be used to acquire and deploy UpdateXpress System Pack (UXSP) update packages and individual updates. UpdateXpress System Packs contain firmware and device driver updates for Microsoft Windows and for Linux.

  You can obtain Lenovo XClarity Essentials UpdateXpress from the following location:

  https://datacentersupport.lenovo.com/solutions/lnvo-xpress

- **Lenovo XClarity Essentials Bootable Media Creator**

  You can use Lenovo XClarity Essentials Bootable Media Creator to create bootable media that is suitable for firmware updates, VPD updates, inventory and FFDC collection, advanced system configuration, FoD Keys management, secure erase, RAID configuration, and diagnostics on supported servers.

  You can obtain Lenovo XClarity Essentials BoMC from the following location:

  https://datacentersupport.lenovo.com/solutions/lnvo-bomc

- **Lenovo XClarity Administrator**

If you are managing multiple servers using the Lenovo XClarity Administrator, you can update firmware for all managed servers through that interface. Firmware management is simplified by assigning firmware-compliance policies to managed endpoints. When you create and assign a compliance policy to managed endpoints, Lenovo XClarity Administrator monitors changes to the inventory for those endpoints and flags any endpoints that are out of compliance.

Specific details about updating firmware using Lenovo XClarity Administrator are available at:

http://sysmgt.lenovofiles.com/help/topic/com.lenovo.lxca.doc/update_fw.html

- **Lenovo XClarity Integrator offerings**

  Lenovo XClarity Integrator offerings can integrate management features of Lenovo XClarity Administrator and your server with software used in a certain deployment infrastructure, such as VMware vCenter, Microsoft Admin Center, or Microsoft System Center.

  Specific details about updating firmware using Lenovo XClarity Integrator offerings, see:

  https://pubs.lenovo.com/lxci-overview/

Configure the firmware

Several options are available to install and set up the firmware for the solution.

- **Lenovo XClarity Provisioning Manager**

  From Lenovo XClarity Provisioning Manager, you can configure the UEFI settings for your solution.

  Note: The Lenovo XClarity Provisioning Manager provides a Graphical User Interface to configure a solution. The text-based interface to system configuration (the Setup Utility) is also available. From Lenovo XClarity Provisioning Manager, you can choose to restart the solution and access the text-based interface. In addition, you can choose to make the text-based interface the default interface that is displayed when you press F1.

- **Lenovo XClarity Essentials OneCLI**

  You can use the config application and commands to view the current system configuration settings and make changes to Lenovo XClarity Controller and UEFI. The saved configuration information can be used to replicate or restore other systems.

  For information about configuring the solution using Lenovo XClarity Essentials OneCLI, see:

  https://pubs.lenovo.com/lxce-onecli/onecli_c_settings_info_commands

- **Lenovo XClarity Administrator**

  You can quickly provision and pre-provision all of your solutions using a consistent configuration. Configuration settings (such as local storage, I/O adapters, boot settings, firmware, ports, and Lenovo XClarity Controller and UEFI settings) are saved as a solution pattern that can be applied to one or more managed solutions. When the solution patterns are updated, the changes are automatically deployed to the applied solutions.

  Specific details about updating firmware using Lenovo XClarity Administrator are available at:

  http://sysmgt.lenovofiles.com/help/topic/com.lenovo.lxca.doc/server_configuring.html

- **Lenovo XClarity Controller**

  You can configure the management processor for the solution through the Lenovo XClarity Controller Web interface or through the command-line interface.

  For information about configuring the solution using Lenovo XClarity Controller, see:

"Configuring the Server" section in the XCC documentation compatible with your server at https://pubs.lenovo.com/lxcc-overview/

Memory configuration

Memory performance depends on several variables, such as Memory Mode, memory speed, memory ranks, memory population and processor.

More information about optimizing memory performance and configuring memory is available at the Lenovo Press website:

https://lenovopress.com/servers/options/memory

In addition, you can take advantage of a memory configurator, which is available at the following site:

http://1config.lenovo.com/#/memory_configuration

Configure DC Persistent Memory Module (DCPMM)

Follow the instructions in this section to configure DCPMMs and DRAM DIMMs.

DCPMM capacity could act as accessible persistent memory for applications or volatile system memory. Based on the approximate percentage of DCPMM capacity invested in volatile system memory, the following three operating modes are available for choice:

- **App Direct Mode** (0% of DCPMM capacity acts as system memory):

  In this mode, DCPMMs act as independent and persistent memory resources directly accessible by specific applications, and DRAM DIMMs act as system memory.

  The total displayed volatile system memory in this mode is the sum of DRAM DIMM capacity.

  Notes:

  - In App Direct Mode, the DRAM DIMMs that are installed can be configured to mirror mode.
  - When only one DCPMM is installed for each processor, only not-interleaved App Direct Mode is supported.
- **Mixed Memory Mode** (1-99% of DCPMM capacity acts as system memory):

  In this mode, some percentage of DCPMM capacity is directly accessible to specific applications (App Direct), while the rest serves as system memory. The App Direct part of DCPMM is displayed as persistent memory, while the rest of DCPMM capacity is displayed as system memory. DRAM DIMMs act as cache in this mode.

  The total displayed volatile system memory in this mode is the DCPMM capacity that is invested in volatile system memory.
- **Memory Mode** (100% of DCPMM capacity acts as system memory):

  In this mode, DCPMMs act as volatile system memory, while DRAM DIMMs act as cache.

  The total displayed volatile system memory in this mode is the sum of DCPMM capacity.

DCPMM Management options

DCPMMs can be managed with the following tools:

- **Lenovo XClarity Provisioning Manager (LXPM)**

To open LXPM, power on the system and press **F1** as soon as the logo screen appears. If a password has been set, enter the password to unlock LXPM.

Go to **UEFI Setup → System Settings → Intel Optane DCPMMs** to configure and manage DCPMMs.

For more details, see the "UEFI Setup" section in the Lenovo XClarity Provisioning Manager documentation version compatible with your server at https://pubs.lenovo.com/lxpm-overview/.

Note: If the text-based interface of Setup Utility opens instead of Lenovo XClarity Provisioning Manager, go to **System Settings → <F1> Start Control** and select **Tool Suite**. Then, reboot the system and press **F1** as soon as the logo screen appears to open Lenovo XClarity Provisioning Manager.

- **Setup Utility**

  To enter Setup Utility:

  1. Power on the system and press **F1** to open LXPM.
  2. Go to **UEFI Settings → System Settings**, click on the pull-down menu on the upper right corner of the screen, and select **Text Setup**.
  3. Reboot the system, and press **F1** as soon as the logo screen appears.

  Go to **System Configuration and Boot Management → System Settings → Intel Optane DCPMMs** to configure and manage DCPMMs.

- **Lenovo XClarity Essentials OneCLI**

  Some management options are available in commands that are executed in the path of Lenovo XClarity Essentials OneCLI in the operating system. See https://pubs.lenovo.com/lxce-onecli/download_use_onecli to learn how to download and use Lenovo XClarity Essentials OneCLI.

Following are the available management options:

- **Intel Optane DCPMM details**

  Select this option to view the following details concerning each of the the installed DCPMMs:

  - Firmware version
  - Configuration status
  - Raw capacity
  - Memory capacity
  - App Direct capacity
  - Unconfigured capacity
  - Inaccessible capacity
  - Reserved capacity
  - Percentage remaining
  - Security state

  Alternatively, view DCPMM details with the following command in OneCLI:

  ```
  onecli.exe config show IntelOptaneDCPMM --imm USERID:PASSWORD@10.104.195.86
  ```

  Notes:
  - *USERID* stands for XCC user ID.
  - *PASSW0RD* stands for XCC user password.
  - *10.104.195.86* stands for IP address.

- **Goals**

  - **Memory Mode [%]**

Select this option to define the percentage of DCPMM capacity that is invested in system memory, and hence decide the DCPMM mode:

- **0%:** App Direct Mode
- **1-99%:** Mixed Memory Mode
- **100%:** Memory Mode

Go to **Goals → Memory Mode [%]**, input the memory percentage, and reboot the system.

Notes:

- Before changing from one mode to another:
  1. Back up all the data and delete all the created namespaces. Go to **Namespaces → View/Modify/Delete Namespaces** to delete the created namespaces.
  2. Perform secure erase on all the installed DCPMMs. Go to **Security → Press to Secure Erase** to perform secure erase.
- Make sure the capacity of installed DCPMMs and DRAM DIMMs meets system requirements for the new mode (see "PMEM and DRAM DIMM installation order" on page 68).
- After the system is rebooted and the input goal value is applied, the displayed value in **System Configuration and Boot Management → Intel Optane DCPMMs → Goals** will go back to the following default selectable options:
  - **Scope:** [Platform]
  - **Memory Mode [%]:** 0
  - **Persistent Memory Type:** [App Direct]

  These values are selectable options for DCPMM settings, and do not represent the current DCPMM status.

In addition, you can take advantage of a memory configurator, which is available at the following site: http://1config.lenovo.com/#/memory_configuration

Alternatively, set DCPMM Goals with the following commands in OneCLI:

1. Set create goal status.
   ```
   onecli.exe config set IntelOptaneDCPMM.CreateGoal Yes --imm USERID:PASSWORD@10.104.195.86
   ```
2. Define the DCPMM capacity that is invested in system volatile memory.
   ```
   onecli.exe config set IntelOptaneDCPMM.MemoryModePercentage 20 --imm USERID:PASSWORD@10.104.195.86
   ```
   Where *20* stands for the percentage of capacity that is invested in system volatile memory.
3. Set the DCPMM mode.
   ```
   onecli.exe config set IntelOptaneDCPMM.PersistentMemoryType "App Direct" --imm
   USERID:PASSWORD@10.104.195.86
   ```
   Where *App Direct* stands for the DCPMM mode.

- **Persistent Memory Type**

  In App Direct Mode and Mixed Memory Mode, the DCPMMs that are connected to the same processor are by default interleaved (displayed as **App Direct**), while memory banks are used in turns. To set them as not interleaved in the Setup Utility, go to **Intel Optane DCPMMs → Goals → Persistent Memory Type [(DCPMM mode)]**, select **App Direct Not Interleaved** and reboot the system.

  Note: Setting DCPMM App Direct capacity to not interleaved will turn the displayed App Direct regions from one region per processor to one region per DCPMM.

- **Regions**

  After the memory percentage is set and the system is rebooted, regions for the App Direct capacity will be generated automatically. Select this option to view the App Direct regions.

- **Namespaces**

  App Direct capacity of DCPMMs requires the following steps before it is truly available for applications.

  1. Namespaces must be created for region capacity allocation.
  2. Filesystem must be created and formatted for the namespaces in the operating system.

  Each App Direct region can be allocated into one namespace. Create namespaces in the following operating systems:

  – Windows: Use *Pmem* command.
  – Linux: Use *ndctl* command.
  – VMware: Reboot the system, and VMware will create namespaces automatically.

  After creating namespaces for App Direct capacity allocation, make sure to create and format filesystem in the operating system so that the App Direct capacity is accessible for applications.

- **Security**

  – Enable Security

    Attention: By default, DCPMM security is disabled. Before enabling security, make sure all the country or local legal requirements regarding data encryption and trade compliance are met. Violation could cause legal issues.

    DCPMMs can be secured with passphrases. Two types of passphrase protection scope are available for DCPMM:

    – **Platform:** Choose this option to run security operation on all the installed DCPMM units at once. A platform passphrase is stored and automatically applied to unlock DCPMMs before operating system starts running, but the passphrase still has to be disabled manually for secure erase.

      Alternatively, enable/disable platform level security with the following commands in OneCLI:

      - Enable security:
        1. Enable security.
           ```
           onecli.exe config set IntelOptaneDCPMM.SecurityOperation "Enable Security" --imm
           USERID:PASSWORD@10.104.195.86
           ```
        2. Set the security passphrase.
           ```
           onecli.exe config set IntelOptaneDCPMM.SecurityPassphrase "123456" --imm
           USERID:PASSWORD@10.104.195.86
           ```

           Where *123456* stands for the passphrase.
        3. Reboot the system.
      - Disable security:
        1. Disable security.
           ```
           onecli.exe config set IntelOptaneDCPMM.SecurityOperation "Disable Security" --imm
           USERID:PASSWORD@10.104.195.86
           ```
        2. Enter passphrase.
           ```
           onecli.exe config set IntelOptaneDCPMM.SecurityPassphrase "123456" --imm
           USERID:PASSWORD@10.104.195.86
           ```
        3. Reboot the system.

    – **Single DCPMM:** Choose this option to run security operation on one or more selected DCPMM units.

      Notes:

- Single DCPMM passphrases are not stored in the system, and security of the locked units needs to be disabled before the units are available for access or secure erase.
- Always make sure to keep records of the slot number of locked DCPMMs and corresponding passphrases. In the case the passphrases are lost or forgotten, the stored data cannot be backed up or restored, but you can contact Lenovo service for administrative secure erase.
- After three failed unlocking attempts, the corresponding DCPMMs enter “exceeded” state with a system warning message, and the DCPMM unit can only be unlocked after the system is rebooted.

To enable passphrase, go to **Security → Press to Enable Security**.

– Secure Erase

Notes:

– Password is required to perform Secure Erase when security enabled.

– Before executing secure erase, make sure ARS (Address Range Scrub) is done on all PMEMs or on the specific PMEMs selected. Otherwise, secure erase cannot be started on all PMEMs or the specific PMEM selected, and the following text message will pop out:

```
The passphrase is incorrect for single or multiple or all Intel Optane PMEMs selected, or maybe there is
namespace on the selected PMEMs. Secure erase operation is not done on all Intel Optane PMEMs selected.
```

Secure erase cleanses all the data that is stored in the DCPMM unit, including encrypted data. This data deletion method is recommended before returning or disposing a malfunctioning unit, or changing DCPMM mode. To perform secure erase, go to **Security → Press to Secure Erase**.

Alternatively, perform platform level secure erase with the following command in OneCLI:

```
onecli.exe config set IntelOptaneDCPMM.SecurityOperation "Secure Erase Without Passphrase" --imm
USERID:PASSWORD@10.104.195.86
```

- **DCPMM Configuration**

DCPMM contains spared internal cells to stand in for the failed ones. When the spared cells are exhausted to 0%, there will be an error message, and it is advised to back up data, collect service log, and contact Lenovo support.

There will also be a warning message when the percentage reaches 1% and a selectable percentage (10% by default). When this message appears, it is advised to back up data and run DCPMM diagnostics (see the “Running diagnostics” section in the Lenovo XClarity Provisioning Manager documentation version compatible with your server at https://pubs.lenovo.com/lxpm-overview/). To adjust the selectable percentage that the warning message requires, go to **Intel Optane DCPMMs → DCPMM Configuration**, and input the percentage.

Alternatively, change the selectable percentage with the following command in OneCLI:

```
onecli.exe config set IntelOptaneDCPMM.PercentageRemainingThresholds 20 --imm USERID:PASSWORD@10.104.195.86
```

Where *20* is the selectable percentage.

RAID configuration

Using a Redundant Array of Independent Disks (RAID) to store data remains one of the most common and cost-efficient methods to increase node's storage performance, availability, and capacity.

RAID increases performance by allowing multiple drives to process I/O requests simultaneously. RAID can also prevent data loss in case of a drive failure by reconstructing (or rebuilding) the missing data from the failed drive using the data from the remaining drives.

RAID array (also known as RAID drive group) is a group of multiple physical drives that uses a certain common method to distribute data across the drives. A virtual drive (also known as virtual disk or logical drive) is a partition in the drive group that is made up of contiguous data segments on the drives. Virtual drive is presented up to the host operating system as a physical disk that can be partitioned to create OS logical drives or volumes.

An introduction to RAID is available at the following Lenovo Press website:

https://lenovopress.com/lp0578-lenovo-raid-introduction

Detailed information about RAID management tools and resources is available at the following Lenovo Press website:

https://lenovopress.com/lp0579-lenovo-raid-management-tools-and-resources

Deploy the operating system

Several options are available to deploy an operating system on the server.

Available operating systems

- Complete list of available operating systems: https://lenovopress.lenovo.com/osig.
- OS deployment instructions: “Deploy the operating system” on page 152.

Complete list of available operating systems: https://lenovopress.lenovo.com/osig.

Tool-based deployment

- **Multi-server**

  Available tools:

  – Lenovo XClarity Administrator

    http://sysmgt.lenovofiles.com/help/topic/com.lenovo.lxca.doc/compute_node_image_deployment.html

  – Lenovo XClarity Essentials OneCLI

    https://pubs.lenovo.com/lxce-onecli/onecli_r_uxspi_proxy_tool

  – Lenovo XClarity Integrator deployment pack for SCCM (for Windows operating system only)

    https://pubs.lenovo.com/lxci-deploypack-sccm/dpsccm_c_endtoend_deploy_scenario

- **Single-server**

  Available tools:

  – Lenovo XClarity Provisioning Manager

    “OS Installation” section in the LXPM documentation compatible with your server at https://pubs.lenovo.com/lxpm-overview/

  – Lenovo XClarity Essentials OneCLI

    https://pubs.lenovo.com/lxce-onecli/onecli_r_uxspi_proxy_tool

  – Lenovo XClarity Integrator deployment pack for SCCM (for Windows operating system only)

https://pubs.lenovo.com/lxci-deploypack-sccm/dpsccm_c_endtoend_deploy_scenario

Manual deployment

If you cannot access the above tools, follow the instructions below, download the corresponding *OS Installation Guide*, and deploy the operating system manually by referring to the guide.

1. Go to https://datacentersupport.lenovo.com/solutions/server-os.
2. Select an operating system from the navigation pane and click **Resources**.
3. Locate the "OS Install Guides" area and click the installation instructions. Then, follow the instructions to complete the operation system deployment task.

Back up the solution configuration

After setting up the solution or making changes to the configuration, it is a good practice to make a complete backup of the solution configuration.

Make sure that you create backups for the following solution components:

- **Management processor**

  You can back up the management processor configuration through the Lenovo XClarity Controller interface. For details about backing up the management processor configuration, see:

  "Backing up the BMC configuration" section in the XCC documentation compatible with your server at https://pubs.lenovo.com/lxcc-overview/.

  Alternatively, you can use the `save` command from Lenovo XClarity Essentials OneCLI to create a backup of all configuration settings. For more information about the `save` command, see:

  https://pubs.lenovo.com/lxce-onecli/onecli_r_save_command

- **Operating system**

  Use your own operating-system and user-data backup methods to back up the operating system and user data for the solution.

Update the Vital Product Data (VPD)

After initial setup of the system, you can update some Vital Product Data (VPD), such as asset tag and Universal Unique Identifier (UUID).

Update the Universal Unique Identifier (UUID)

Optionally, you can update the Universal Unique Identifier (UUID).

There are two methods available to update the UUID:

- From Lenovo XClarity Provisioning Manager

  To update the UUID from Lenovo XClarity Provisioning Manager:

  1. Start the server and press the key according to the on-screen instructions. (For more information, see the "Startup" section in the LXPM documentation compatible with your server at https://pubs.lenovo.com/lxpm-overview/.) The Lenovo XClarity Provisioning Manager interface is displayed by default.
  2. If the power-on Administrator password is required, enter the password.
  3. From the System Summary page, click **Update VPD**.
  4. Update the UUID.

- From Lenovo XClarity Essentials OneCLI

  Lenovo XClarity Essentials OneCLI sets the UUID in the Lenovo XClarity Controller. Select one of the following methods to access the Lenovo XClarity Controller and set the UUID:

  – Operate from the target system, such as LAN or keyboard console style (KCS) access
  – Remote access to the target system (TCP/IP based)

  To update the UUID from Lenovo XClarity Essentials OneCLI:

  1. Download and install Lenovo XClarity Essentials OneCLI.

     To download Lenovo XClarity Essentials OneCLI, go to the following site:

     https://datacentersupport.lenovo.com/solutions/HT116433

  2. Copy and unpack the OneCLI package, which also includes other required files, to the server. Make sure that you unpack the OneCLI and the required files to the same directory.
  3. After you have Lenovo XClarity Essentials OneCLI in place, type the following command to set the UUID:
     `onecli config createuuid SYSTEM_PROD_DATA.SysInfoUUID [access_method]`

     Where:

     [access_method]
     The access method that you select to use from the following methods:

     – Online authenticated LAN access, type the command:
       `[--bmc-username <xcc_user_id> --bmc-password <xcc_password>]`

       Where:

       xcc_user_id
       The BMC/IMM/XCC account name (1 of 12 accounts). The default value is USERID.

       xcc_password
       The BMC/IMM/XCC account password (1 of 12 accounts).

       Example command is as follows:
       `onecli config createuuid SYSTEM_PROD_DATA.SysInfoUUID --bmc-username <xcc_user_id> --bmc-password <xcc_password>`
     – Online KCS access (unauthenticated and user restricted):

       You do not need to specify a value for *access_method* when you use this access method.

       Example command is as follows:
       `onecli config createuuid SYSTEM_PROD_DATA.SysInfoUUID`

       Note: The KCS access method uses the IPMI/KCS interface, which requires that the IPMI driver be installed.
     – Remote LAN access, type the command:
       `[--bmc <xcc_user_id>:<xcc_password>@<xcc_external_ip>]`

       Where:

       xcc_external_ip
       The BMC/IMM/XCC external IP address. There is no default value. This parameter is required.

       xcc_user_id
       The BMC/IMM/XCC account name (1 of 12 accounts). The default value is USERID.

xcc_password
The BMC/IMM/XCC account password (1 of 12 accounts).

Note: BMC, IMM, or XCC external IP address, account name, and password are all valid for this command.

Example command is as follows:
```
onecli config createuuid SYSTEM_PROD_DATA.SysInfoUUID --bmc <xcc_user_id>:<xcc_password>@<xcc_external_ip>
```

4. Restart the Lenovo XClarity Controller.
5. Restart the server.

Update the asset tag

Optionally, you can update the asset tag.

There are two methods available to update the asset tag:

- From Lenovo XClarity Provisioning Manager

  To update the asset tag from Lenovo XClarity Provisioning Manager:

  1. Start the server and press the key specified in the on-screen instructions to display the Lenovo XClarity Provisioning Manager interface.
  2. If the power-on Administrator password is required, enter the password.
  3. From the System Summary page, click **Update VPD**.
  4. Update the asset tag information.

- From Lenovo XClarity Essentials OneCLI

  Lenovo XClarity Essentials OneCLI sets the asset tag in the Lenovo XClarity Controller. Select one of the following methods to access the Lenovo XClarity Controller and set the asset tag:

  – Operate from the target system, such as LAN or keyboard console style (KCS) access
  – Remote access to the target system (TCP/IP based)

  To update the asset tag from Lenovo XClarity Essentials OneCLI:

  1. Download and install Lenovo XClarity Essentials OneCLI.

     To download Lenovo XClarity Essentials OneCLI, go to the following site:

     https://datacentersupport.lenovo.com/solutions/HT116433
  2. Copy and unpack the OneCLI package, which also includes other required files, to the server. Make sure that you unpack the OneCLI and the required files to the same directory.
  3. After you have Lenovo XClarity Essentials OneCLI in place, type the following command to set the DMI:
     ```
     onecli config set SYSTEM_PROD_DATA.SysEncloseAssetTag <asset_tag> [access_method]
     ```

     Where:

     <asset_tag>
     The server asset tag number. Type `aaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaa`, where *aaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaa* is the asset tag number.

     [access_method]
     The access method that you select to use from the following methods:

     – Online authenticated LAN access, type the command:

```
[--bmc-username <xcc_user_id> --bmc-password <xcc_password>]
```

Where:

xcc_user_id
The BMC/IMM/XCC account name (1 of 12 accounts). The default value is USERID.

xcc_password
The BMC/IMM/XCC account password (1 of 12 accounts).

Example command is as follows:

```
onecli config set SYSTEM_PROD_DATA.SysEncloseAssetTag <asset_tag> --bmc-username <xcc_user_id>
--bmc-password <xcc_password>
```

– Online KCS access (unauthenticated and user restricted):

You do not need to specify a value for *access_method* when you use this access method.

Example command is as follows:

```
onecli config set SYSTEM_PROD_DATA.SysEncloseAssetTag <asset_tag>
```

Note: The KCS access method uses the IPMI/KCS interface, which requires that the IPMI driver be installed.

– Remote LAN access, type the command:
```
[--bmc <xcc_user_id>:<xcc_password>@<xcc_external_ip>]
```

Where:

xcc_external_ip
The BMC/IMM/XCC IP address. There is no default value. This parameter is required.

xcc_user_id
The BMC/IMM/XCC account (1 of 12 accounts). The default value is USERID.

xcc_password
The BMC/IMM/XCC account password (1 of 12 accounts).

Note: BMC, IMM, or XCC internal LAN/USB IP address, account name, and password are all valid for this command.

Example command is as follows:

```
onecli config set SYSTEM_PROD_DATA.SysEncloseAssetTag <asset_tag> --bmc <xcc_user_id>:<xcc_
password>@<xcc_external_ip>
```

4. Reset the Lenovo XClarity Controller to the factory defaults. See “Resetting the BMC to Factory Default” section in the XCC documentation compatible with your server at https://pubs.lenovo.com/lxcc-overview/.

Chapter 5. Resolving installation issues

Use this information to resolve issues that you might have when setting up your system.

Use the information in this section to diagnose and resolve problems that you might encounter during the initial installation and setup of your solution.

Solution does not power on

Complete the following steps until the problem is resolved:

1. Check XCC web page can be logged in via out-of-band network interface.
2. Check the power button LED. If the power button LED is flashing slowly, press the power button to turn on the solution.
3. Check power supplies are installed correctly and power supply LEDs are lit normally.
4. If one or more sets of shared PCIe dual adapters are installed in the enclosure, reseat the nodes and the shared PCIe adapters that are installed in the enclosure, and reboot the nodes.
5. If the error recurs, check FFDC logs for more details.

The solution immediately displays the POST Event Viewer when it is turned on

Complete the following steps until the problem is solved.

1. Correct any errors that are indicated by the light path diagnostics LEDs.
2. Make sure that the solution supports all the processors and that the processors match in speed and cache size.

   You can view processor details from system setup.

   To determine if the processor is supported for the solution, see https://serverproven.lenovo.com/.
3. (Trained technician only) Make sure that processor 1 is seated correctly
4. (Trained technician only) Remove processor 2 and restart the solution.
5. Replace the following components one at a time, in the order shown, restarting the solution each time:
   a. (Trained technician only) Processor
   b. (Trained technician only) System board

Solution cannot recognize a drive

Complete the following steps until the problem is solved.

1. Verify that the drive is supported for the solution. See https://serverproven.lenovo.com/ for a list of supported hard drives.
2. Make sure that the drive is seated in the drive bay properly and that there is no physical damage to the drive connectors.

3. Run the diagnostics tests for the SAS/SATA adapter and hard disk drives. When you start a server and press the key according to the on-screen instructions, the LXPM interface is displayed by default. (For more information, see the “Startup” section in the LXPM documentation compatible with your server at https://pubs.lenovo.com/lxpm-overview/.) You can perform hard drive diagnostics from this interface. From the Diagnostic page, click **Run Diagnostic → HDD test/Disk Drive Test**.

   Depending on the LXPM version, you may see **HDD test** or **Disk Drive Test**.

   Based on those tests:

   - If the adapter passes the test but the drives are not recognized, replace the backplane signal cable and run the tests again.
   - Replace the backplane.
   - If the adapter fails the test, disconnect the backplane signal cable from the adapter and run the tests again.
   - If the adapter fails the test, replace the adapter.

Displayed system memory less than installed physical memory

Complete the following steps until the problem is solved:

Note: Each time you install or remove a memory module, you must disconnect the solution from the power source; then, wait 10 seconds before restarting the solution.

1. Make sure that:
   - No error LEDs are lit on the operator information panel.
   - Memory mirrored channel does not account for the discrepancy.
   - The memory modules are seated correctly.
   - You have installed the correct type of memory module (see “Specifications” on page 7 for requirements).
   - If you changed the memory, you updated the memory configuration in the Setup utility.
   - All banks of memory are enabled. The solution might have automatically disabled a memory bank when it detected a problem, or a memory bank might have been manually disabled.
   - There is no memory mismatch when the solution is at the minimum memory configuration.
   - When DCPMMs are installed:
     a. If the memory is set in App Direct or Mixed Memory Mode, all the saved data have been backed up, and created namespaces are deleted before any DCPMM is replaced.
     b. Refer to “DC Persistent Memory Module (DCPMM) setup” on page 104 and see if the displayed memory fits the mode description.
     c. If DCPMMs are recently set in Memory Mode, turn it back to App Direct Mode and examine if there is namespace that has not been deleted (see “DC Persistent Memory Module (DCPMM) setup” on page 104).
     d. Go to the Setup Utility, select **System Configuration and Boot Management → Intel Optane DCPMMs → Security**, and make sure all the DCPMM units are unlocked.
2. Reseat the memory modules, and then restart the solution.
3. Check the POST error log:
   - If a memory module was disabled by a systems-management interrupt (SMI), replace the memory module.
   - If a memory module was disabled by the user or by POST, reseat the memory module; then, run the Setup utility and enable the memory module.

4. Run memory diagnostics. Power on the system and press **F1** when the logo screen appears, the Lenovo XClarity Provisioning Manager interface will start. Perform memory diagnostics with this interface. Go to **Diagnostics → Run Diagnostic → Memory test** or **DCPMM test**.

   When DCPMMs are installed, run diagnostics based on the current DCPMM mode:

   - App Direct Mode
     - Run **DCPMM Test** for DCPMMs.
     - Run **Memory Test** for DRAM DIMMs.
   - Memory Mode and Mixed Memory Mode
     - Run **DCPMM Test** for App Direct capacity of DCPMMs.
     - Run **Memory Test** for memory capacity of DCPMMs.

   Note: DRAM DIMMs in these two modes act as cache, and are not applicable to memory diagnostics.

5. Reverse the modules between the channels (of the same processor), and then restart the solution. If the problem is related to a memory module, replace the failing memory module.

   Note: When DCPMMs are installed, only adopt this method in Memory Mode.

6. Re-enable all memory modules using the Setup Utility, and restart the system.
7. (Trained technician only) Install the failing memory module into a memory module connector for processor 2 (if installed) to verify that the problem is not the processor or the memory module connector.
8. (Trained technician only) Replace the node.

A Lenovo optional device that was just installed does not work.

1. Make sure that:
   - The device is supported for the solution (see https://serverproven.lenovo.com/).
   - You followed the installation instructions that came with the device and the device is installed correctly.
   - You have not loosened any other installed devices or cables.
   - You updated the configuration information in the Setup utility. Whenever memory or any other device is changed, you must update the configuration.
2. Reseat the device that you just installed.
3. Check XCC event log for related errors. Refer to *ThinkSystem D2 Enclosure, Modular Enclosure, Modular Enclosure for 6U Configuration and ThinkSystem SD530 Compute Node Messages and Codes Reference* and follow the instructions to fix the errors.
4. Replace the device that you just installed.

Voltage planar fault is displayed in the event log

Complete the following steps until the problem is solved.

1. Revert the system to the minimum configuration. See “Specifications” on page 7 for the minimally required number of processors and DIMMs.
2. Restart the system.
   - If the system restarts, add each of the items that you removed one at a time, restarting the system each time, until the error occurs. Replace the item for which the error occurs.
   - If the system does not restart, suspect the system board.

Appendix A. Getting help and technical assistance

If you need help, service, or technical assistance or just want more information about Lenovo products, you will find a wide variety of sources available from Lenovo to assist you.

On the World Wide Web, up-to-date information about Lenovo systems, optional devices, services, and support are available at:

http://datacentersupport.lenovo.com

Note: This section includes references to IBM web sites and information about obtaining service. IBM is Lenovo's preferred service provider for ThinkSystem.

Before you call

Before you call, there are several steps that you can take to try and solve the problem yourself. If you decide that you do need to call for assistance, gather the information that will be needed by the service technician to more quickly resolve your problem.

Attempt to resolve the problem yourself

You can solve many problems without outside assistance by following the troubleshooting procedures that Lenovo provides in the online help or in the Lenovo product documentation. The Lenovo product documentation also describes the diagnostic tests that you can perform. The documentation for most systems, operating systems, and programs contains troubleshooting procedures and explanations of error messages and error codes. If you suspect a software problem, see the documentation for the operating system or program.

You can find the product documentation for your ThinkSystem products at https://pubs.lenovo.com/

You can take these steps to try to solve the problem yourself:

- Check all cables to make sure that they are connected.
- Check the power switches to make sure that the system and any optional devices are turned on.
- Check for updated software, firmware, and operating-system device drivers for your Lenovo product. The Lenovo Warranty terms and conditions state that you, the owner of the Lenovo product, are responsible for maintaining and updating all software and firmware for the product (unless it is covered by an additional maintenance contract). Your service technician will request that you upgrade your software and firmware if the problem has a documented solution within a software upgrade.
- If you have installed new hardware or software in your environment, check https://serverproven.lenovo.com/ to make sure that the hardware and software are supported by your product.
- Go to http://datacentersupport.lenovo.com and check for information to help you solve the problem.
  - Check the Lenovo forums at https://forums.lenovo.com/t5/Datacenter-Systems/ct-p/sv_eg to see if someone else has encountered a similar problem.

Gathering information needed to call Support

If you require warranty service for your Lenovo product, the service technicians will be able to assist you more efficiently if you prepare the appropriate information before you call. You can also go to http://datacentersupport.lenovo.com/warrantylookup for more information about your product warranty.

Gather the following information to provide to the service technician. This data will help the service technician quickly provide a solution to your problem and ensure that you receive the level of service for which you might have contracted.

- Hardware and Software Maintenance agreement contract numbers, if applicable
- Machine type number (Lenovo 4-digit machine identifier)
- Model number
- Serial number
- Current system UEFI and firmware levels
- Other pertinent information such as error messages and logs

As an alternative to calling Lenovo Support, you can go to https://support.lenovo.com/servicerequest to submit an Electronic Service Request. Submitting an Electronic Service Request will start the process of determining a solution to your problem by making the pertinent information available to the service technicians. The Lenovo service technicians can start working on your solution as soon as you have completed and submitted an Electronic Service Request.

Collecting service data

To clearly identify the root cause of a solution issue or at the request of Lenovo Support, you might need collect service data that can be used for further analysis. Service data includes information such as event logs and hardware inventory.

Service data can be collected through the following tools:

- **Lenovo XClarity Provisioning Manager**

  Use the Collect Service Data function of Lenovo XClarity Provisioning Manager to collect system service data. You can collect existing system log data or run a new diagnostic to collect new data.

- **Lenovo XClarity Controller**

  You can use the Lenovo XClarity Controller web interface or the CLI to collect service data for the solution. The file can be saved and sent to Lenovo Support.

  – For more information about using the web interface to collect service data, see the “Downloading service data” section in the XCC documentation version compatible with your server at https://pubs.lenovo.com/lxcc-overview/.

  – For more information about using the CLI to collect service data, see the “ffdc command” section in the XCC documentation version compatible with your server at https://pubs.lenovo.com/lxcc-overview/.

- **Lenovo XClarity Administrator**

  Lenovo XClarity Administrator can be set up to collect and send diagnostic files automatically to Lenovo Support when certain serviceable events occur in Lenovo XClarity Administrator and the managed endpoints. You can choose to send diagnostic files to Lenovo Support using Call Home or to another service provider using SFTP. You can also manually collect diagnostic files, open a problem record, and send diagnostic files to the Lenovo Support Center.

  You can find more information about setting up automatic problem notification within the Lenovo XClarity Administrator at http://sysmgt.lenovofiles.com/help/topic/com.lenovo.lxca.doc/admin_setupcallhome.html.

- **Lenovo XClarity Essentials OneCLI**

  Lenovo XClarity Essentials OneCLI has inventory application to collect service data. It can run both in-band and out-of-band. When running in-band within the host operating system on the solution, OneCLI can collect information about the operating system, such as the operating system event log, in addition to the hardware service data.

To obtain service data, you can run the `getinfor` command. For more information about running the `getinfor`, see https://pubs.lenovo.com/lxce-onecli/onecli_r_getinfor_command.

Contacting Support

You can contact Support to obtain help for your issue.

You can receive hardware service through a Lenovo Authorized Service Provider. To locate a service provider authorized by Lenovo to provide warranty service, go to https://datacentersupport.lenovo.com/serviceprovider and use filter searching for different countries. For Lenovo support telephone numbers, see https://datacentersupport.lenovo.com/supportphonelist for your region support details.

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