



# ThinkSystem DW612S Neptune DWC Enclosure System Configuration Guide



**Machine Types:** 7D1L

## 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/](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 server, which can be found at:

<http://datacentersupport.lenovo.com/warrantylookup>

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## Safety

Before installing this product, read the Safety Information.

قبل تركيب هذا المنتج، يجب قراءة الملاحظات الأمنية

Antes de instalar este produto, leia as Informações de Segurança.

在安裝本产品之前，请仔细阅读 Safety Information（安全信息）。

安裝本產品之前，請先閱讀「安全資訊」。

Prije instalacije ovog produkta obavezno pročitajte Sigurnosne Upute.

Před instalací tohoto produktu si přečtěte příručku bezpečnostních instrukcí.

Læs sikkerhedsforskrifterne, før du installerer dette produkt.

Lees voordat u dit product installeert eerst de veiligheidsvoorschriften.

Ennen kuin asennat tämän tuotteen, lue turvaohjeet kohdasta Safety Information.

Avant d'installer ce produit, lisez les consignes de sécurité.

Vor der Installation dieses Produkts die Sicherheitshinweise lesen.

Πριν εγκαταστήσετε το προϊόν αυτό, διαβάστε τις πληροφορίες ασφάλειας (safety information).

לפני שתתקינו מוצר זה, קראו את הוראות הבטיחות.

A termék telepítése előtt olvassa el a Biztonsági előírásokat!

Prima di installare questo prodotto, leggere le Informazioni sulla Sicurezza.

製品の設置の前に、安全情報をお読みください。

본 제품을 설치하기 전에 안전 정보를 읽으십시오.

Пред да се инсталира овој продукт, прочитајте информацијата за безбедност.



Les sikkerhetsinformasjonen (Safety Information) før du installerer dette produktet.

Przed zainstalowaniem tego produktu, należy zapoznać się z książką "Informacje dotyczące bezpieczeństwa" (Safety Information).

Antes de instalar este produto, leia as Informações sobre Segurança.

Перед установкой продукта прочтите инструкции по технике безопасности.

Pred inštaláciou tohto zariadenia si pečítajte Bezpečnostné predpisy.

Pred namestitvijo tega proizvoda preberite Varnostne informacije.

Antes de instalar este producto, lea la información de seguridad.

Läs säkerhetsinformationen innan du installerar den här produkten.

ཐོན་ཁུངས་འདི་བདེ་སྤྱད་མ་བྱས་གོང་། སྐྱོར་གྱི་ཡིད་གཟབ་  
བྱ་འདྲ་མིན་ཡིད་པའི་འོད་མེར་བལྟ་དགོས།

Bu ürünü kurmadan önce güvenlik bilgilerini okuyun.

مەزكۇر مەھسۇلاتنى ئورنىتىشتىن بۇرۇن بىخەتەرلىك ئۇچۇرلىرىنى ئوقۇپ چىقىڭ.

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canjbinj soengq cungj vahgangj ancien siusik.

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## Safety inspection checklist

Use the information in this section to identify potentially unsafe conditions with your server. As each machine was designed and built, required safety items were installed to protect users and service technicians from injury.

**Note:** The product is not suitable for use at visual display workplaces according to §2 of the Workplace Regulations.

**Note:** The set-up of the server is made in the server room only.

### CAUTION:

**This equipment must be installed or serviced by trained personnel, as defined by the NEC, IEC 62368-1 & IEC 60950-1, the standard for Safety of Electronic Equipment within the Field of Audio/Video, Information Technology and Communication Technology. Lenovo assumes you are qualified in the servicing of equipment and trained in recognizing hazards energy levels in products. Access to the equipment is by the use of a tool, lock and key, or other means of security, and is controlled by the authority responsible for the location.**

**Important:** Electrical grounding of the server is required for operator safety and correct system function. Proper grounding of the electrical outlet can be verified by a certified electrician.

Use the following checklist to verify that there are no potentially unsafe conditions:

1. Make sure that the power is off and the power cord is disconnected.
2. Check the power cord.
  - Make sure that the third-wire ground connector is in good condition. Use a meter to measure third-wire ground continuity for 0.1 ohm or less between the external ground pin and the frame ground.
  - Make sure that the power cord is the correct type.

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

- a. Go to:

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

- b. Click **Preconfigured Model** or **Configure to order**.
- c. Enter the machine type and model for your server to display the configurator page.
- d. Click **Power → Power Cables** to see all line cords.
  - Make sure that the insulation is not frayed or worn.
3. Check for any obvious non-Lenovo alterations. Use good judgment as to the safety of any non-Lenovo alterations.
4. Check inside the server for any obvious unsafe conditions, such as metal filings, contamination, water or other liquid, or signs of fire or smoke damage.
5. Check for worn, frayed, or pinched cables.
6. Make sure that the power-supply cover fasteners (screws or rivets) have not been removed or tampered with.



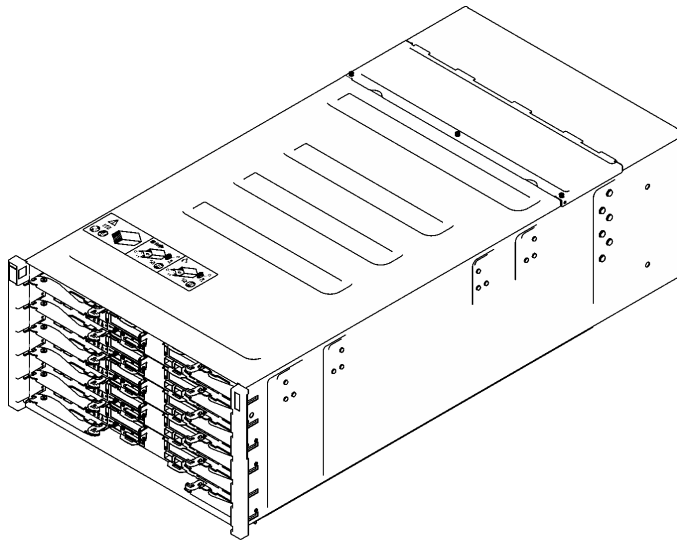


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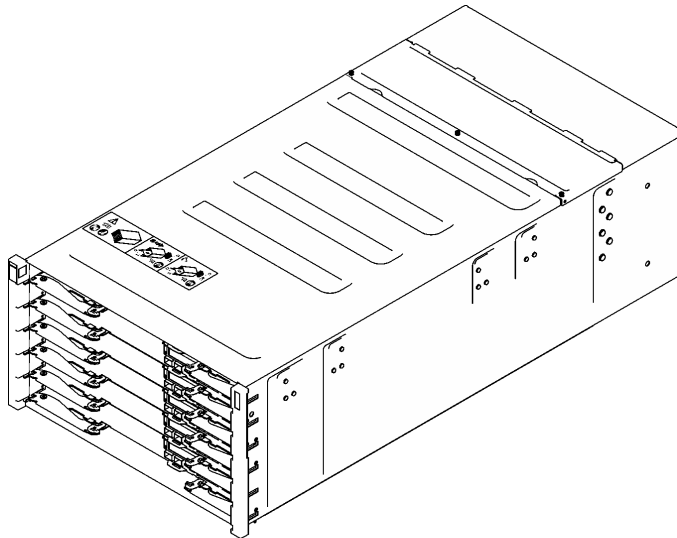
## Chapter 1. Introduction

The ThinkSystem DW612S Neptune DWC Solution 6U enclosure is designed for high performance computing. This solution includes a single enclosure that can contain up to six ThinkSystem high-density servers, which are designed to deliver a dense, scalable platform for distributed enterprise and hyperconverged.

*Figure 1. ThinkSystem DW612S Neptune DWC Solution installed with SD650 V3*

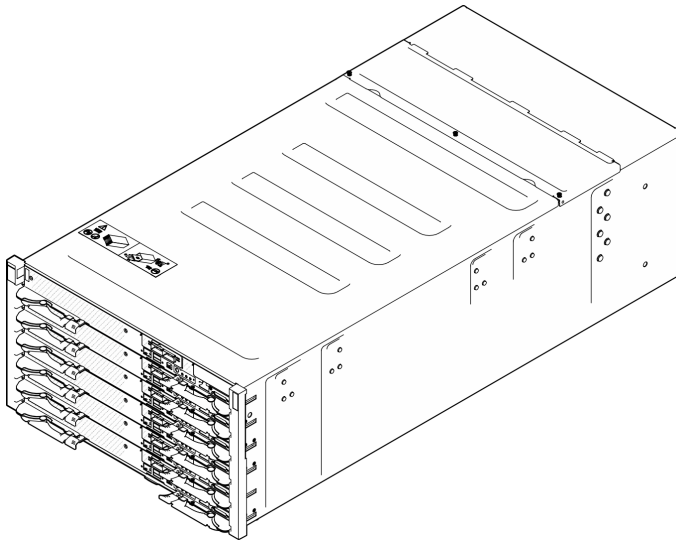


**SD650 V3**

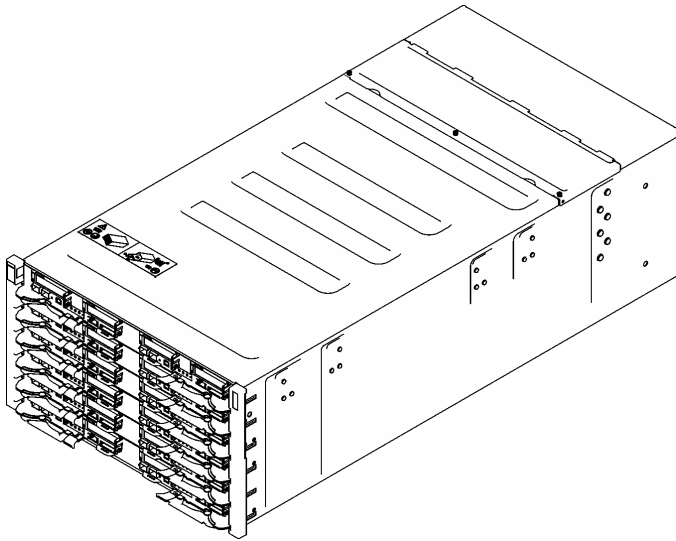


**SD650-I V3**

*Figure 2. ThinkSystem DW612S Neptune DWC Solution installed with SD650-I V3*



*Figure 3. ThinkSystem DW612S Neptune DWC Solution installed with SD650-N V3*



*Figure 4. ThinkSystem DW612S Neptune DWC Solution installed with SD665 V3*

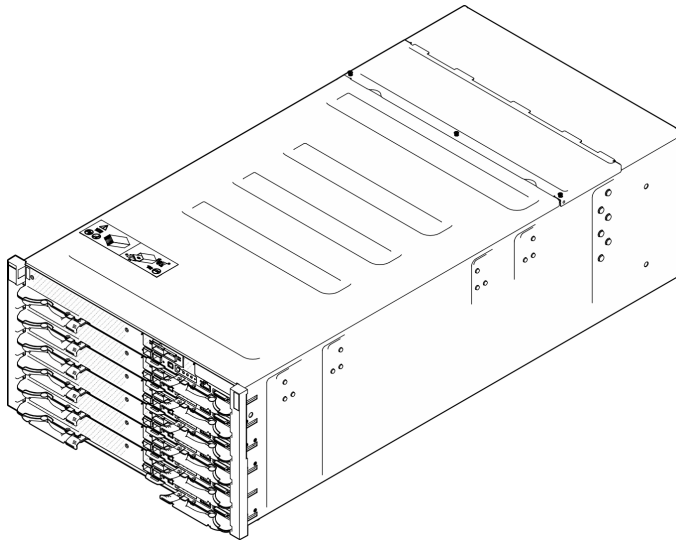


Figure 5. ThinkSystem DW612S Neptune DWC Solution installed with SD665-N V3

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## 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.

Your solution implements the following features and technologies:

- **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>

- **Lenovo XClarity Controller (XCC)**

The Lenovo XClarity Controller is the common management controller for Lenovo ThinkSystem server hardware. The Lenovo XClarity Controller consolidates multiple management functions in a single chip on the server system board (system board assembly). Some of the features that are unique to the Lenovo XClarity Controller are enhanced performance, higher-resolution remote video, and expanded security options.

The server supports Lenovo XClarity Controller 2 (XCC2). For additional information about Lenovo XClarity Controller 2 (XCC2), refer 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 solutions 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).

- **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**

The solution supports synchronous dynamic random-access memory (SDRAM) registered dual inline memory modules (DIMMs) with error correcting code (ECC). For more information about the specific types and maximum amount of memory, see “Technical Specifications” in the *User Guide* of each high-density server..

- **Integrated network support**

The tray comes with an integrated 1-port Gigabit Ethernet controller with RJ-45 connector and 2-port 25Gb Ethernet controller with SFP28 connector, which support connection to a 1000 Mbps network.

- **Large data-storage capacity**

See the “Specifications” section in the *User Guide* of the high-density server.

- **Lightpath Diagnostics**

Lightpath Diagnostics provides LEDs to help you diagnose problems. For more information about the Lightpath Diagnostics, see “[Troubleshooting by system LEDs and diagnostics display](#)” on page 21.

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

The solution provides a QR code on the system service label, which is on the cover of the DWC tray cover, 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.

- **Active Energy Manager**

Lenovo XClarity Energy Manager is a power and temperature management solution for data centers. You can monitor and manage the power consumption and temperature of Converged, NeXtScale, System x, and ThinkServer solutions, and improve energy efficiency using Lenovo XClarity Energy Manager.

- **Optional power capabilities**

The solution supports a maximum of nine 2400W or 2600W hot-swap power supplies, or three 7200W DWC PSUs.

**Note:** Do not mix power supplies in the same unit of solution.

- **ThinkSystem RAID support**

See the “Specifications” section in the *User Guide* of the high-density server.

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## Tech Tips

Lenovo continually updates the support website with the latest tips and techniques that you can use to solve issues that your server might encounter. These Tech Tips (also called retain tips or service bulletins) provide procedures to work around issues or solve problems related to the operation of your server.

To find the Tech Tips available for your server:

1. Go to <http://datacentersupport.lenovo.com> and navigate to the support page for your server.
2. Click on the documentation icon **How To's** from the navigation pane.
3. Click **Article Type → Solution** from the drop-down menu.

Follow the on-screen instructions to choose the category for the problem that you are having.

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## Security advisories

Lenovo is committed to developing products and services that adhere to the highest security standards in order to protect our customers and their data. When potential vulnerabilities are reported, it is the responsibility of the Lenovo Product Security Incident Response Team (PSIRT) to investigate and provide information to our customers so they may put mitigation plans in place as we work toward providing solutions.

The list of current advisories is available at the following site:

[https://datacentersupport.lenovo.com/product\\_security/home](https://datacentersupport.lenovo.com/product_security/home)

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## Specifications

Summary of the specifications of enclosure. Depending on the model, some features might not be available, or some specifications might not apply.

### Technical specifications

Integrated functions and I/O connectors
<ul style="list-style-type: none"><li>Hot-swappable System Management Module 2 (SMM2)</li></ul> <p><b>Note:</b> See <a href="https://pubs.lenovo.com/mgt_tools_smm2/">https://pubs.lenovo.com/mgt_tools_smm2/</a> for more details about System Management Module.</p>
Network
10/100/1000 Mb Ethernet port dedicated for System Management Module (SMM2).

### Mechanical specifications

Dimension
<ul style="list-style-type: none"><li>Height: 263.3 mm (10.40 inches)</li><li>Depth: 914.5 mm (36.00 inches)</li><li>Width: 447.0 mm (17.60 inches)</li></ul>
Weight
<ul style="list-style-type: none"><li>Weight:<ul style="list-style-type: none"><li>Empty enclosure (with midplane, SMM2, and cables): approximately 25 kg (55 lbs)</li><li>Fully configured (stand-alone):<ul style="list-style-type: none"><li>Enclosure with six SD650 V3 trays and three DWC PSU: approximately 168.34 kg (371.19 lbs)</li><li>Enclosure with six SD650-I V3 trays: approximately 176.62 kg (389.45 lbs)</li><li>Enclosure with six SD650-N V3 trays and three DWC PSU: approximately 183.3 kg (404.11 lbs)</li><li>Enclosure with six SD665 V3 trays and three DWC PSU: approximately 173.7 kg (382.9 lbs)</li><li>Enclosure with six SD665-N V3 trays and three DWC PSU: approximately 188.7 kg (416 lbs)</li></ul></li></ul></li></ul>

## 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 1. Limits for particulates and gases

Contaminant	Limits
Reactive gases	<p>Severity level G1 as per ANSI/ISA 71.04-1985<sup>1</sup>:</p> <ul style="list-style-type: none"> <li>The copper reactivity level shall be less than 300 Angstroms per month (<math>\text{\AA}/\text{month} \approx 0.0039 \mu\text{g}/\text{cm}^2\text{-hour}</math> weight gain).<sup>2</sup></li> <li>The silver reactivity level shall be less than 200 <math>\text{\AA}/\text{month}</math> (<math>\text{\AA}/\text{month} \approx 0.0035 \mu\text{g}/\text{cm}^2\text{-hour}</math> weight gain).<sup>3</sup></li> <li>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.</li> </ul>
Airborne particulates	<p>Data centers must meet the cleanliness level of ISO 14644-1 class 8.</p> <p>For data centers without airside economizer, the ISO 14644-1 class 8 cleanliness might be met by choosing one of the following filtration methods:</p> <ul style="list-style-type: none"> <li>The room air might be continuously filtered with MERV 8 filters.</li> <li>Air entering a data center might be filtered with MERV 11 or preferably MERV 13 filters.</li> </ul> <p>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.</p> <ul style="list-style-type: none"> <li>The deliquescent relative humidity of the particulate contamination should be more than 60% RH.<sup>4</sup></li> <li>Data centers must be free of zinc whiskers.<sup>5</sup></li> </ul>
<p><sup>1</sup> ANSI/ISA-71.04-1985. <i>Environmental conditions for process measurement and control systems: Airborne contaminants</i>. Instrument Society of America, Research Triangle Park, North Carolina, U.S.A.</p> <p><sup>2</sup> The derivation of the equivalence between the rate of copper corrosion growth in the thickness of the corrosion product in <math>\text{\AA}/\text{month}</math> and the rate of weight gain assumes that <math>\text{Cu}_2\text{S}</math> and <math>\text{Cu}_2\text{O}</math> grow in equal proportions.</p> <p><sup>3</sup> The derivation of the equivalence between the rate of silver corrosion growth in the thickness of the corrosion product in <math>\text{\AA}/\text{month}</math> and the rate of weight gain assumes that <math>\text{Ag}_2\text{S}</math> is the only corrosion product.</p> <p><sup>4</sup> 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.</p> <p><sup>5</sup> 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.</p>	

## 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	<p>Baseboard management controller (BMC)</p> <p>Consolidates the service processor functionality, Super I/O, video controller, and remote presence capabilities into a single chip on the server system board (system board assembly).</p> <p><b>Interface</b></p> <ul style="list-style-type: none"><li>• CLI application</li><li>• Web GUI interface</li><li>• Mobile application</li><li>• Redfish API</li></ul> <p><b>Usage and downloads</b></p> <p><a href="https://pubs.lenovo.com/lxcc-overview/">https://pubs.lenovo.com/lxcc-overview/</a></p>
Lenovo XCC Logger Utility	<p>Application that reports the XCC events to local OS system log.</p> <p><b>Interface</b></p> <ul style="list-style-type: none"><li>• CLI application</li></ul> <p><b>Usage and downloads</b></p> <ul style="list-style-type: none"><li>• <a href="https://pubs.lenovo.com/lxcc-logger-linux/">https://pubs.lenovo.com/lxcc-logger-linux/</a></li><li>• <a href="https://pubs.lenovo.com/lxcc-logger-windows/">https://pubs.lenovo.com/lxcc-logger-windows/</a></li></ul>
Lenovo XClarity Administrator	<p>Centralized interface for multi-server management.</p> <p><b>Interface</b></p> <ul style="list-style-type: none"><li>• Web GUI interface</li><li>• Mobile application</li><li>• REST API</li></ul> <p><b>Usage and downloads</b></p> <p><a href="http://sysmgt.lenovofiles.com/help/topic/com.lenovo.lxca.doc/ug_product_page.html">http://sysmgt.lenovofiles.com/help/topic/com.lenovo.lxca.doc/ug_product_page.html</a></p>
Lenovo XClarity Essentials toolset	<p>Portable and light toolset for server configuration, data collection, and firmware updates. Suitable both for single-server or multi-server management contexts.</p> <p><b>Interface</b></p> <ul style="list-style-type: none"><li>• <b>OneCLI:</b> CLI application</li><li>• <b>Bootable Media Creator:</b> CLI application, GUI application</li><li>• <b>UpdateXpress:</b> GUI application</li></ul> <p><b>Usage and downloads</b></p> <p><a href="https://pubs.lenovo.com/lxce-overview/">https://pubs.lenovo.com/lxce-overview/</a></p>

Options	Description
Lenovo XClarity Provisioning Manager	<p>UEFI-based embedded GUI tool on a single server that can simplify management tasks.</p> <p><b>Interface</b></p> <ul style="list-style-type: none"> <li>• Web interface (BMC remote access)</li> <li>• GUI application</li> </ul> <p><b>Usage and downloads</b></p> <p><a href="https://pubs.lenovo.com/lxpm-overview/">https://pubs.lenovo.com/lxpm-overview/</a></p> <p><b>Important:</b> 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 <a href="https://pubs.lenovo.com/lxpm-overview/">https://pubs.lenovo.com/lxpm-overview/</a>.</p>
Lenovo XClarity Integrator	<p>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.</p> <p><b>Interface</b></p> <ul style="list-style-type: none"> <li>• GUI application</li> </ul> <p><b>Usage and downloads</b></p> <p><a href="https://pubs.lenovo.com/lxci-overview/">https://pubs.lenovo.com/lxci-overview/</a></p>
Lenovo XClarity Energy Manager	<p>Application that can manage and monitor server power and temperature.</p> <p><b>Interface</b></p> <ul style="list-style-type: none"> <li>• Web GUI Interface</li> </ul> <p><b>Usage and downloads</b></p> <p><a href="https://datacentersupport.lenovo.com/solutions/lnvo-lxem">https://datacentersupport.lenovo.com/solutions/lnvo-lxem</a></p>
Lenovo Capacity Planner	<p>Application that supports power consumption planning for a server or rack.</p> <p><b>Interface</b></p> <ul style="list-style-type: none"> <li>• Web GUI Interface</li> </ul> <p><b>Usage and downloads</b></p> <p><a href="https://datacentersupport.lenovo.com/solutions/lnvo-lcp">https://datacentersupport.lenovo.com/solutions/lnvo-lcp</a></p>
System Management Module 2 (ThinkSystem high-density servers only)	<p>A hot-swap enclosure management module that helps you easily manage the system power supplies and fan speeds. It monitors the fan, power and enclosure status with event logs.</p> <p><b>Interface</b></p> <ul style="list-style-type: none"> <li>• Web GUI Interface</li> </ul> <p><b>Usage and downloads</b></p> <p><a href="https://pubs.lenovo.com/mgt_tools_smm2/">https://pubs.lenovo.com/mgt_tools_smm2/</a></p>



## Functions

Options		Functions							
		Multi-system mgmt	OS deployment	System configuration	Firmware updates <sup>1</sup>	Event-s/alert monitoring	Inven-tory/ logs	Pow-er mgmt	Power planning
Lenovo XClarity Controller				√	√ <sup>2</sup>	√	√ <sup>4</sup>		
Lenovo XCC Logger Utility						√			
Lenovo XClarity Administrator		√	√	√	√ <sup>2</sup>	√	√ <sup>4</sup>		
Lenovo XClarity Essentials toolset	OneCLI	√		√	√ <sup>2</sup>	√	√		
	Bootable Media Creator			√	√ <sup>2</sup>		√ <sup>4</sup>		
	UpdateXpress			√	√ <sup>2</sup>				
Lenovo XClarity Provisioning Manager			√	√	√ <sup>3</sup>		√ <sup>5</sup>		
Lenovo XClarity Integrator		√	√ <sup>6</sup>	√	√	√	√	√ <sup>7</sup>	
Lenovo XClarity Energy Manager		√				√		√	
Lenovo Capacity Planner									√ <sup>8</sup>
System Management Module 2(ThinkSystem high-density servers only)					√	√	√	√	

### 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.

## DW612S enclosure and high-density server support matrix

Refer to this section for information on the supported high-density server configurations for your enclosure.

## Supported high-density server configurations for DW612S enclosure

The DW612S enclosure supports the following high-density server configurations:

- “SD650 V3 high-density server” on page 10
- “SD650-I V3 high-density server” on page 11
- “SD650-N V3 high-density server” on page 12
- “SD665 V3 high-density server” on page 13
- “SD665-N V3 high-density server” on page 14

When installing different high-density servers in the same DW612S enclosure, make sure to follow the rules in “Guidance on mixing trays configuration for the DW612S enclosure” on page 49.

## SD650 V3 high-density server

Refer to this section to for a brief introduction on the DW612S enclosure configuration with six SD650 V3 server.

For more information on SD650 V3 high-density server, see <https://pubs.lenovo.com/sd650-v3/>.

**Attention:** Start with slot 1 when installing trays into the DW612S enclosure.

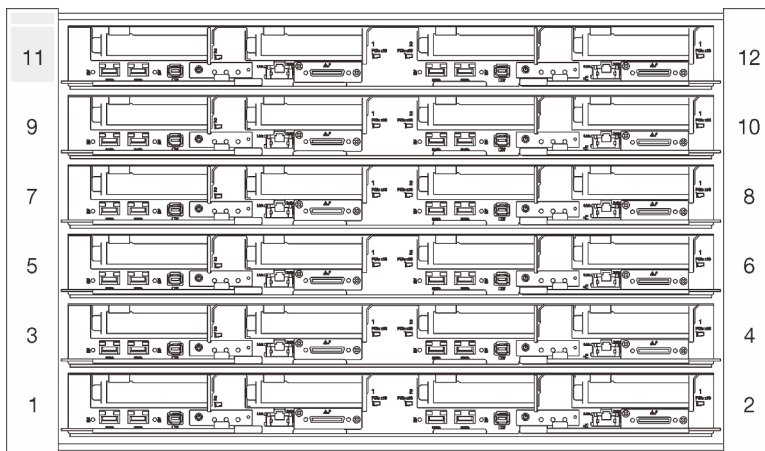


Figure 6. DW612S enclosure with six SD650 V3 server

### Notes:

- The illustration in this section is for reference only.
- The slot numbers are indicated on both sides of the enclosure.

Table 2. DW612S enclosure with six SD650 V3 server

Number of SD650 V3 server	Power supply configurations
Six	<ul style="list-style-type: none"> <li>Supports six or nine hot-swap 2400W or 2600W AC power supplies. <ul style="list-style-type: none"> <li>Sine-wave input (50-60 Hz) required</li> <li>Input voltage for 2400W power supplies: <ul style="list-style-type: none"> <li>200-240 Vac, 240 Vdc</li> </ul> </li> <li>Input voltage for 2600W power supplies: <ul style="list-style-type: none"> <li>200-208 Vac, 240 Vdc (output up to 2400W only)</li> <li>208-240 Vac, 240 Vdc</li> </ul> </li> <li>Six power supplies: 5+1 with oversubscription, or Non-redundancy</li> <li>Nine power supplies: 8+1 without oversubscription</li> </ul> </li> <li>Supports two or three hot-swap DWC 7200W power supplies. <ul style="list-style-type: none"> <li>Input voltage: <ul style="list-style-type: none"> <li>200-208 Vac (work as 6900W)</li> <li>220-240 Vac, 240 Vdc (work as 7200W)</li> </ul> </li> <li>Two DWC PSUs: work as 5+1 with oversubscription, or Non-redundancy</li> <li>Three DWC PSUs: work as 8+1 without oversubscription</li> </ul> </li> </ul> <p><b>CAUTION:</b> Power supplies and redundant power supplies in the enclosure must be with the same brand, power rating, wattage or efficiency level.</p>

## SD650-I V3 high-density server

Refer to this section to for a brief introduction on the DW612S enclosure configuration with six SD650-I V3 server.

For more information on SD650-I V3 high-density server, see <https://pubs.lenovo.com/sd650-i-v3/>.

**Attention:** Start with slot 1 when installing trays into the DW612S enclosure.



Figure 7. DW612S enclosure with six SD650-I V3 server

### Notes:

- The illustration in this section is for reference only.
- The slot numbers are indicated on both sides of the enclosure.

Table 3. DW612S enclosure with six SD650-I V3 server

Number of SD650-I V3 server	Power supply configurations
Six	<ul style="list-style-type: none"> <li>• Supports nine hot-swap 2400W or 2600W AC power supplies. <ul style="list-style-type: none"> <li>– Sine-wave input (50-60 Hz) required</li> <li>– Input voltage for 2400W power supplies: <ul style="list-style-type: none"> <li>– 200-240 Vac, 240 Vdc</li> </ul> </li> <li>– Input voltage for 2600W power supplies: <ul style="list-style-type: none"> <li>– 200-208 Vac, 240 Vdc (output up to 2400W only)</li> <li>– 208-240 Vac, 240 Vdc</li> </ul> </li> <li>– Nine power supplies: 8+1 without oversubscription</li> <li>– 2400W AC power supplies is Delta only.</li> </ul> <p><b>Note:</b> Mixing PSUs manufactured by different vendors is not supported.</p> <li>• Supports three hot-swap DWC 7200W power supplies. <ul style="list-style-type: none"> <li>– Input voltage: <ul style="list-style-type: none"> <li>– 200-208 Vac (work as 6900W)</li> <li>– 220-240 Vac, 240 Vdc (work as 7200W)</li> </ul> </li> <li>– Three DWC PSUs: work as 8+1 without oversubscription.</li> </ul> <p><b>CAUTION:</b> Power supplies and redundant power supplies in the enclosure must be with the same brand, power rating, wattage or efficiency level.</p> </li> </li></ul>

## SD650-N V3 high-density server

Refer to this section to for a brief introduction on the DW612S enclosure configuration with six SD650-N V3 server.

For more information on SD650-N V3 high-density server, see <https://pubs.lenovo.com/sd650-n-v3/>.

**Attention:** Start with slot 1 when installing trays into the DW612S enclosure.

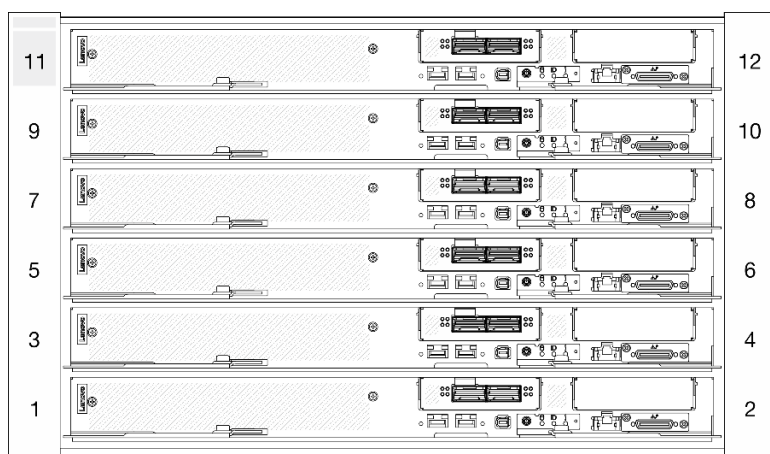


Figure 8. DW612S enclosure with six SD650-N V3 server

#### Notes:

- The illustration in this section is for reference only.
- The slot numbers are indicated on both sides of the enclosure.

Table 4. DW612S enclosure with six SD665-N V3 server

Number of SD665-N V3 server	Power supply configurations
Six	<ul style="list-style-type: none"> <li>• Supports nine hot-swap 2600W AC power supplies. <ul style="list-style-type: none"> <li>– Sine-wave input (50-60 Hz) required</li> <li>– Input voltage for 2600W power supplies: <ul style="list-style-type: none"> <li>– 200-208 Vac, 240 Vdc (output up to 2400W only)</li> <li>– 208-240 Vac, 240 Vdc</li> </ul> </li> <li>– Nine power supplies: 8+1 without oversubscription</li> </ul> </li> <li>• Supports three hot-swap DWC 7200W power supplies. <ul style="list-style-type: none"> <li>– Input voltage: <ul style="list-style-type: none"> <li>– 200-208 Vac (work as 6900W)</li> <li>– 220-240 Vac, 240 Vdc (work as 7200W)</li> </ul> </li> <li>– Three DWC PSUs: work as 8+1 without oversubscription</li> </ul> </li> </ul> <p><b>CAUTION:</b> Power supplies and redundant power supplies in the enclosure must be with the same brand, power rating, wattage or efficiency level.</p> <p><b>Mixing PSUs manufactured by different vendors is not supported.</b></p> <p><b>Note:</b> Refer to <a href="https://thinksystem.lenovofiles.com/help/topic/mgt_tools_smm2/c_overview.html">https://thinksystem.lenovofiles.com/help/topic/mgt_tools_smm2/c_overview.html</a> for more details of solution power status.</p>

## SD665 V3 high-density server

Refer to this section to for a brief introduction on the DW612S enclosure configuration with six SD665 V3 server.

For more information on SD665 V3 high-density server, see <https://pubs.lenovo.com/sd665-v3/>.

**Attention:** Start with slot 1 when installing trays into the DW612S enclosure.

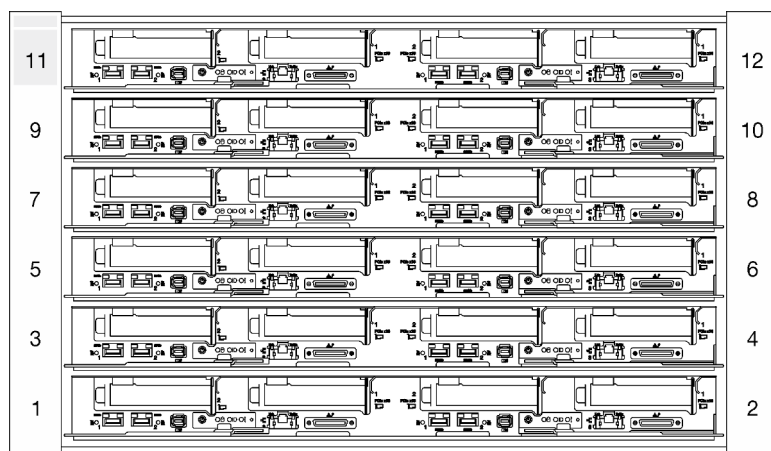


Figure 9. DW612S enclosure with six SD665 V3 server

**Notes:**

- The illustration in this section is for reference only.
- The slot numbers are indicated on both sides of the enclosure.

Table 5. DW612S enclosure with six SD665 V3 server

Number of SD665 V3 server	Power supply configurations
Six	<ul style="list-style-type: none"> <li>• Supports six or nine hot-swap 2400W or 2600W power supplies. <ul style="list-style-type: none"> <li>– Sine-wave input (50-60 Hz) required</li> <li>– Input voltage for 2400W power supplies: <ul style="list-style-type: none"> <li>– 200-240 Vac, 240 Vdc</li> </ul> </li> <li>– Input voltage for 2600W power supplies: <ul style="list-style-type: none"> <li>– 200-208 Vac, 240 Vdc (output up to 2400W only)</li> <li>– 208-240 Vac, 240 Vdc</li> </ul> </li> <li>– Six power supplies: 5+1 with oversubscription, or Non-redundancy</li> <li>– Nine power supplies: 8+1 without oversubscription</li> </ul> </li> <li>• Supports two or three hot-swap DWC 7200W power supplies. <ul style="list-style-type: none"> <li>– Input voltage: <ul style="list-style-type: none"> <li>– 200-208 Vac (work as 6900W)</li> <li>– 220-240 Vac, 240 Vdc (work as 7200W)</li> </ul> </li> <li>– Two DWC PSUs: work as 5+1 with oversubscription, or Non-redundancy</li> <li>– Three DWC PSUs: work as 8+1 without oversubscription</li> </ul> </li> </ul> <p><b>CAUTION:</b> Power supplies and redundant power supplies in the enclosure must be with the same brand, power rating, wattage or efficiency level.</p>

## SD665-N V3 high-density server

Refer to this section to for a brief introduction on the DW612S enclosure configuration with six SD665-N V3 server.

For more information on SD665-N V3 high-density server, see <https://pubs.lenovo.com/sd665-n-v3/>.

**Attention:** Start with slot 1 when installing trays into the DW612S enclosure.

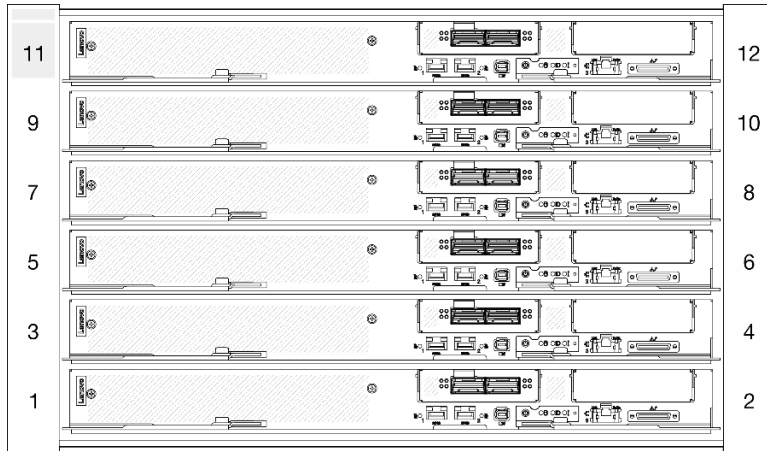


Figure 10. DW612S enclosure with six SD665-N V3 server

**Notes:**

- The illustration in this section is for reference only.
- The slot numbers are indicated on both sides of the enclosure.

Table 6. DW612S enclosure with six SD665-N V3 server

Number of SD665-N V3 server	Power supply configurations
Six	<ul style="list-style-type: none"> <li>• Supports nine hot-swap 2600W power supplies. <ul style="list-style-type: none"> <li>– Sine-wave input (50-60 Hz) required</li> <li>– Input voltage for 2600W power supplies: <ul style="list-style-type: none"> <li>– 200-208 Vac, 240 Vdc (output up to 2400W only)</li> <li>– 208-240 Vac, 240 Vdc</li> </ul> </li> <li>– Nine power supplies: 8+1 without oversubscription</li> </ul> </li> <li>• Supports three hot-swap DWC 7200W power supplies. <ul style="list-style-type: none"> <li>– Input voltage: <ul style="list-style-type: none"> <li>– 200-208 Vac (work as 6900W)</li> <li>– 220-240 Vac, 240 Vdc (work as 7200W)</li> </ul> </li> <li>– Three DWC PSUs: work as 8+1 without oversubscription</li> </ul> </li> </ul> <p><b>CAUTION:</b> Power supplies and redundant power supplies in the enclosure must be with the same brand, power rating, wattage or efficiency level.</p> <p><b>Notes:</b></p> <ul style="list-style-type: none"> <li>• Refer to <a href="https://pubs.lenovo.com/mgt_tools_smm2/c_overview">https://pubs.lenovo.com/mgt_tools_smm2/c_overview</a> for more details of solution power status.</li> <li>• Mixing PSUs manufactured by different vendors is not supported.</li> </ul>





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## Chapter 2. Enclosure components

This section contains information about each of the components associated with the enclosure.

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### Enclosure front view

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

#### Notes:

- The 6U enclosure supports up to six trays.
- Each tray contains two nodes; one left node and one right node (when viewed from front of enclosure).

#### Enclosure

##### Notes:

- The illustrations in this document might differ slightly from your hardware.
- The following illustration shows six trays installed in the enclosure.
- The slot numbers are indicated on both sides of the enclosure.

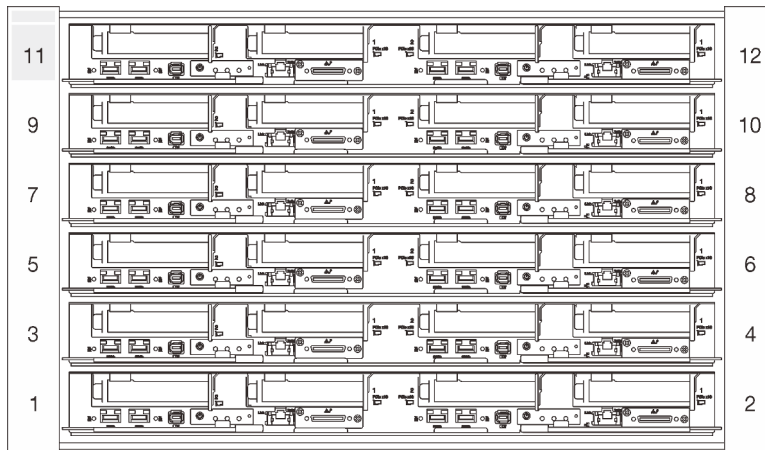


Figure 11. Enclosure with six SD650 V3 trays



Figure 12. Enclosure with six SD650-I V3 trays

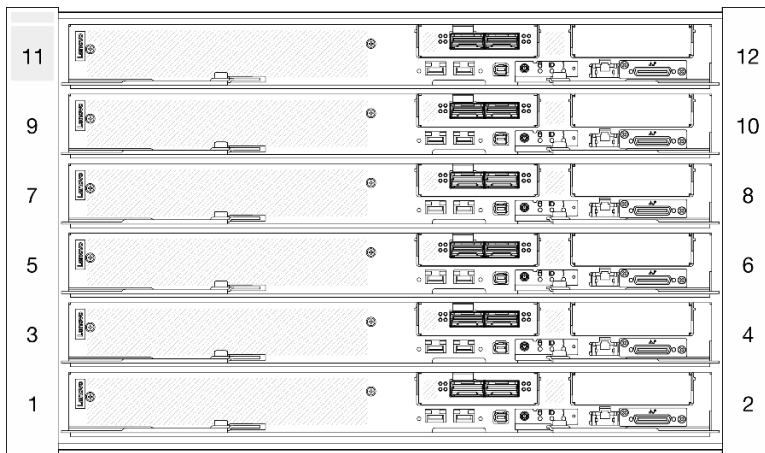


Figure 13. Enclosure with six SD650-N V3 trays

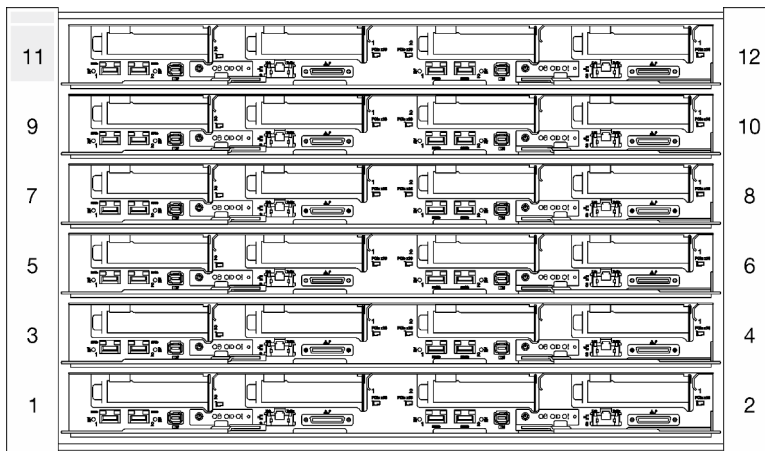


Figure 14. Enclosure with six SD665 V3 trays

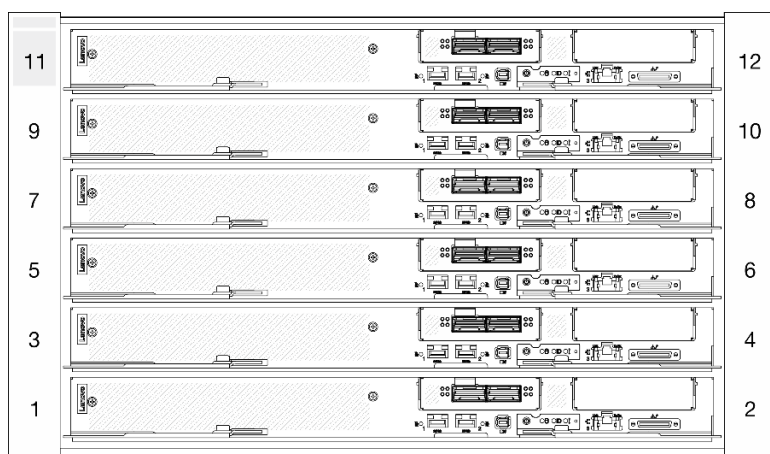


Figure 15. Enclosure with six SD665-N V3 trays

## System Management Module 2 (SMM 2)

The following illustration shows the connectors and buttons on the SMM2 module.

For SMM2 LEDs, see [“System Management Module 2 \(SMM 2\) LEDs” on page 21](#).

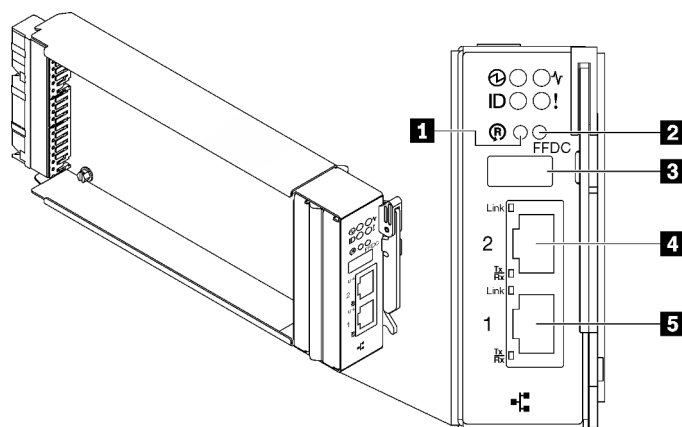


Figure 16. SMM2 connectors

Table 7. SMM2 connectors and LEDs

<b>1</b> Reset button hole	<b>4</b> Ethernet port 2
<b>2</b> USB port service mode button (FFDC dump)	<b>5</b> Ethernet port 1
<b>3</b> USB 2.0 connector	

**1 Reset button:** Press the button for 1 to 4 seconds, SMM2 reboots. Press over 4 seconds, SMM2 reboots and loads to the default settings.

**2 USB port service mode button (FFDC dump):** Press this button to collect FFDC logs after inserting the USB storage device to the USB 2.0 connector.

**3 USB 2.0 connector:** Insert the USB storage device to this connector and then press the **USB port service mode button** to collect FFDC logs.

- 4 Ethernet port 2:** Use this connector to access SMM2 management.
- 5 Ethernet port 1:** Use this connector to access SMM2 management.

## PSU slot numbering

Use this information to identify the PSU slot numbering.

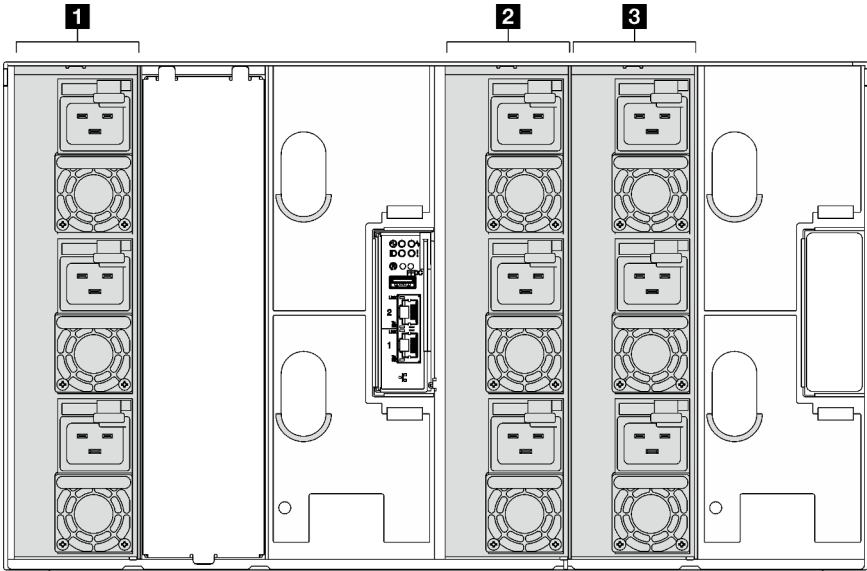


Figure 17. PSU slot numbering with hot-swap PSU

<b>1</b> Hot-swap power supply 1-3 (from bottom to top)	<b>3</b> Hot-swap power supply 7-9 (from bottom to top)
<b>2</b> Hot-swap power supply 4-6 (from bottom to top)	

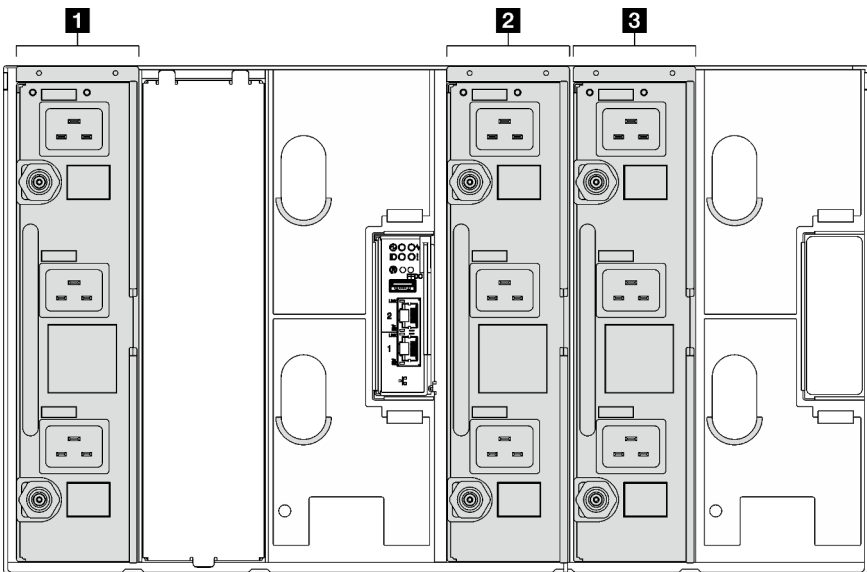


Figure 18. PSU slot numbering with DWC PSU

<b>1</b> DWC PSU 1	<b>3</b> DWC PSU 3
<b>2</b> DWC PSU 2	

## System LEDs and diagnostics display

See the following section for information on available enclosure LEDs and diagnostics display.

For more information, refer to [“Troubleshooting by system LEDs and diagnostics display” on page 21](#).

## Troubleshooting by system LEDs and diagnostics display

See the following section for information on available system LEDs and diagnostics display.

### System Management Module 2 (SMM 2) LEDs

The following illustration shows the LEDs on the SMM2 module.

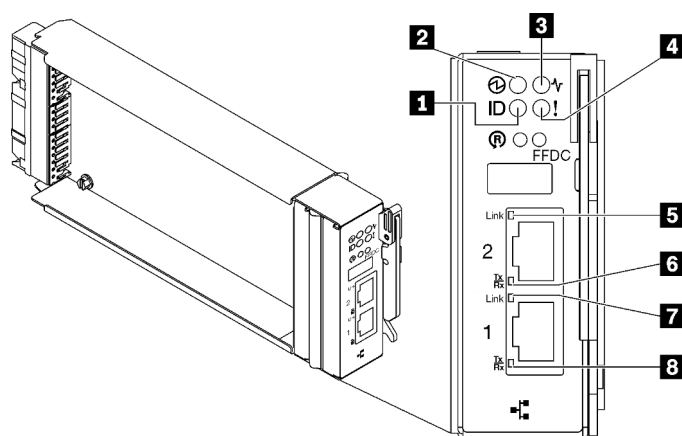


Figure 19. SMM2 LEDs

Table 8. SMM2 connectors and LEDs

<b>1</b> Identification LED (blue)	<b>5</b> Ethernet port 2 link (RJ-45) LED (green)
<b>2</b> Power LED (green)	<b>6</b> Ethernet port 2 activity (RJ-45) LED (green)
<b>3</b> Status LED (green)	<b>7</b> Ethernet port 1 link (RJ-45) LED (green)
<b>4</b> Check log LED (yellow)	<b>8</b> Ethernet port 1 activity (RJ-45) LED (green)

**1 Identification LED:** When this LED is lit (blue), it indicates the enclosure location in a rack.

**2 Power-on LED:** When this LED is lit (green), it indicates that the SMM2 has power.

**3 Status LED:** This LED (green) indicates the operating status of the SMM2.

- **Continuously on:** The SMM2 has encountered one or more problems.
- **Off:** When the enclosure power is on, it indicates the SMM2 has encountered one or more problems.
- **Flashing:** The SMM2 is working.
  - During the pre-boot process, the LED flashes rapidly.
  - Ten times per second: The SMM2 hardware is working and the firmware is ready to initialize.

- Two times per second: The firmware is initializing.
- When the pre-boot process is completed and the SMM2 is working correctly, the LED flashes at a slower speed (about once every two seconds).

**4 Check log LED:** When this LED is lit (yellow), it indicates that a system error has occurred. Check the SMM2 event log for additional information.

**5 Ethernet port 2 link (RJ-45) LED:** When this LED is lit (green), it indicates that there is an active connection through the remote management and console (Ethernet) port 2 to the management network.

**6 Ethernet port 2 activity (RJ-45) LED:** When this LED is flashing (green), it indicates that there is an activity through the remote management and console (Ethernet) port 2 over the management network.

**7 Ethernet port 1 link (RJ-45) LED:** When this LED is lit (green), it indicates that there is an active connection through the remote management and console (Ethernet) port 1 to the management network.

**8 Ethernet port 1 activity (RJ-45) LED:** When this LED is flashing (green), it indicates that there is an activity through the remote management and console (Ethernet) port 1 over the management network.

## Power supply LEDs

This topic provides information about various power supply LED status and corresponding action suggestions.

For SD650 V2/SD650-N V2, see the “Specifications” section in *Maintenance Manual* of the high-density server for information on minimal configuration required to start the solution.

The following minimal configuration is required for the solution to start:

- **SD650 V3**
  - One DW612S Enclosure
  - One SD650 V3 tray (with two compute nodes)
  - Two processors per node
  - 16 DIMMs per node
  - Two CFF v4 power supplies (2400W or above) or one DWC PSU
  - One drive (any type) (If OS is needed for debugging)
- **SD650-I V3**
  - One DW612S Enclosure
  - One SD650-I V3 tray (with one compute node and one GPU node)
  - Two processors on the compute node
  - Four Intel OAM GPU on the GPU node
  - 16 DIMMs on the compute node
  - Two CFF v4 power supplies (2400W or above) or one DWC PSU
  - One drive (any type) (If OS is needed for debugging)
- **SD650-N V3**
  - One DW612S Enclosure
  - One SD650-N V3 tray
  - Two processors on the compute node
  - One NVIDIA HGX H100 4-GPU board and network board (4 Connect-X 7)

- 2 DIMMs per node in slot 4 and slot 13. (one DIMM per processor)
- Two CFF v4 power supplies or one DWC PSU
- One drive (any type) (If OS is needed for debugging)
- **SD665 V3**
  - One DW612S Enclosure
  - One SD665 V3 tray (with two compute nodes)
  - Two processors per node
  - 2 DIMMs per node in slot 6 and slot 19. (one DIMM per processor)
  - Two CFF v4 power supplies (2400W or above) or one DWC PSU
  - One drive (any type) (If OS is needed for debugging)
- **SD665-N V3**
  - One DW612S Enclosure
  - One SD665-N V3 tray
  - Two processors on the compute node
  - One NVIDIA HGX H100 4-GPU board and network board (4 Connect-X 7)
  - 2 DIMMs per node in slot 6 and slot 19. (one DIMM per processor)
  - Two CFF v4 power supplies or one DWC PSU
  - One drive (any type) (If OS is needed for debugging)

The power supplies get electrical power from a 200 - 240 V ac power source and convert the ac input into 12 V outputs. The power supplies are capable of autoranging within the input voltage range. There is one common power domain for the enclosure that distributes power to each of the DWC tray and modules through the system midplane.

AC redundancy is achieved by distributing the ac power cord connections between independent ac circuits.

Each power supply has internal fans and a controller. The power supply controller can be powered by any installed power supply that is providing power through the midplane.

**Attention:** The power supplies contain internal cooling fans. Do not obstruct the fan exhaust vents.

You have to install all of nine power supplies regardless of the type of power supply, the enclosure power load, or selected enclosure power policy.

The enclosure does not support mixing of low input voltage power supplies with high input voltage power supplies. For example, if you install a power supply with an input voltage of 100 - 127 V ac in a enclosure that is powered by 200 - 240 V ac power supplies, the 100 - 127 V power supply will not power on. The same restriction applies to a enclosure that is powered by 100 - 127 V ac power supplies. If you install a 200 - 240 V ac power supply in a enclosure that is powered by 100 - 127 V ac power supplies, the 200 - 240 V ac power supply will not power on.

The following illustration shows the LEDs on the power supply:

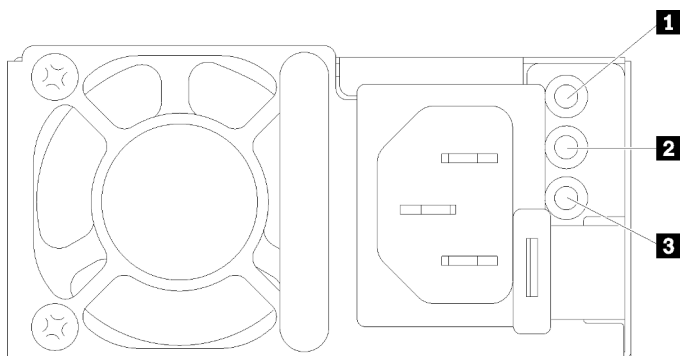


Figure 20. AC power supply LEDs

<b>1</b> Input (AC) power LED (green)	<b>3</b> Power supply error LED (yellow)
<b>2</b> Output (DC) power LED (green)	

There are three LEDs on each power supply:

**1 AC power LED (green):** When this LED is lit (green), it indicates that ac power is being supplied to the power supply.

**2 DC power LED (green):** When this LED is lit (green), it indicates that dc power is being supplied from the power supply to the enclosure midplane.

**3 Power supply error LED (yellow):** When this LED is lit (yellow), it indicates that there is a fault with the power supply. Dump the FFDC log from the system and contact Lenovo back end support team for PSU data log reviewing.

**Note:** Before unplugging the ac power cord from the power supply, or removing the power supply from the enclosure, verify that the capacity of the remaining power supplies are sufficient to meet the minimum power requirements for all components in the enclosure.

## DWC power supply LEDs

This topic provides information about various DWC power supply LED status and corresponding action suggestions.

For SD650 V2/SD650-N V2, see the “Specifications” section in *User Guide* of the high-density server for information on minimal configuration required to start the solution.

The following minimal configuration is required for the solution to start:

- **SD650 V3**
  - One DW612S Enclosure
  - One SD650 V3 tray (with two compute nodes)
  - Two processors per node
  - 16 DIMMs per node
  - Two CFF v4 power supplies (2400W or above) or one DWC PSU
  - One drive (any type) (If OS is needed for debugging)
- **SD650-I V3**
  - One DW612S Enclosure



- One SD650-I V3 tray (with one compute node and one GPU node)
- Two processors on the compute node
- Four Intel OAM GPU on the GPU node
- 16 DIMMs on the compute node
- Two CFF v4 power supplies (2400W or above) or one DWC PSU
- One drive (any type) (If OS is needed for debugging)
- **SD650-N V3**
  - One DW612S Enclosure
  - One SD650-N V3 tray
  - Two processors on the compute node
  - One NVIDIA HGX H100 4-GPU board and network board (4 Connect-X 7)
  - 2 DIMMs per node in slot 4 and slot 13. (one DIMM per processor)
  - Two CFF v4 power supplies or one DWC PSU
  - One drive (any type) (If OS is needed for debugging)
- **SD665 V3**
  - One DW612S Enclosure
  - One SD665 V3 tray (with two compute nodes)
  - Two processors per node
  - 2 DIMMs per node in slot 6 and slot 19. (one DIMM per processor)
  - Two CFF v4 power supplies (2400W or above) or one DWC PSU
  - One drive (any type) (If OS is needed for debugging)
- **SD665-N V3**
  - One DW612S Enclosure
  - One SD665-N V3 tray
  - Two processors on the compute node
  - One NVIDIA HGX H100 4-GPU board and network board (4 Connect-X 7)
  - 2 DIMMs per node in slot 6 and slot 19. (one DIMM per processor)
  - Two CFF v4 power supplies or one DWC PSU
  - One drive (any type) (If OS is needed for debugging)

The power supplies get electrical power from a 200 - 240 V ac power source and convert the ac input into 12 V outputs. The power supplies are capable of autoranging within the input voltage range. There is one common power domain for the enclosure that distributes power to each of the DWC tray and modules through the system midplane.

AC redundancy is achieved by distributing the ac power cord connections between independent ac circuits.

Each DWC power supply has internal water loops and a controller. The power supply controller can be powered by any installed power supply that is providing power through the midplane.

You have to install all three DWC power supplies regardless of the type of power supply, the enclosure power load, or selected enclosure power policy.

The enclosure does not support mixing of low input voltage power supplies with high input voltage power supplies. For example, if you install a power supply with an input voltage of 100 - 127 V ac in a enclosure that is powered by 200 - 240 V ac power supplies, the 100 - 127 V power supply will not power on. The same restriction applies to a enclosure that is powered by 100 - 127 V ac power supplies. If you install a 200 - 240 V ac power supply in a enclosure that is powered by 100 - 127 V ac power supplies, the 200 - 240 V ac power supply will not power on.

The following illustration shows the LEDs on the DWC power supply:

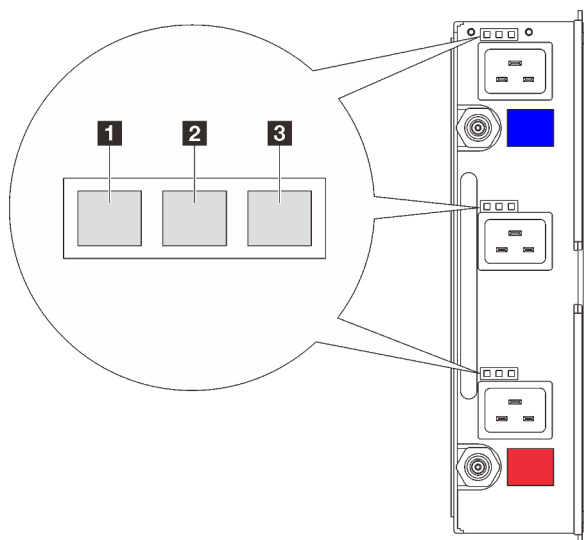


Figure 21. DWC power supply LEDs

<b>1</b> Input (AC) power LED (green)	<b>3</b> Power supply error LED (yellow)
<b>2</b> Output (DC) power LED (green)	

There are nine LEDs on each DWC power supply (three per power supply bay):

**1 AC power LED (green):** When this LED is lit (green), it indicates that ac power is being supplied to the DWC power supply in the corresponding power supply bay.

**2 DC power LED (green):** When this LED is lit (green), it indicates that dc power is being supplied from the corresponding power supply bay to the enclosure midplane.

**3 Power supply error LED (yellow):** When this LED is lit (yellow), it indicates that there is a fault with the corresponding power supply bay. Dump the FFDC log from the system and contact Lenovo back end support team for PSU data log reviewing.

**Note:** Before unplugging the ac power cord from the DWC power supply, or removing the DWC power supply from the enclosure, verify that the capacity of the remaining power supplies are sufficient to meet the minimum power requirements for all components in the enclosure.

## Drip sensor LED

The following illustration shows the light-emitting diodes (LEDs) on the drip sensor.

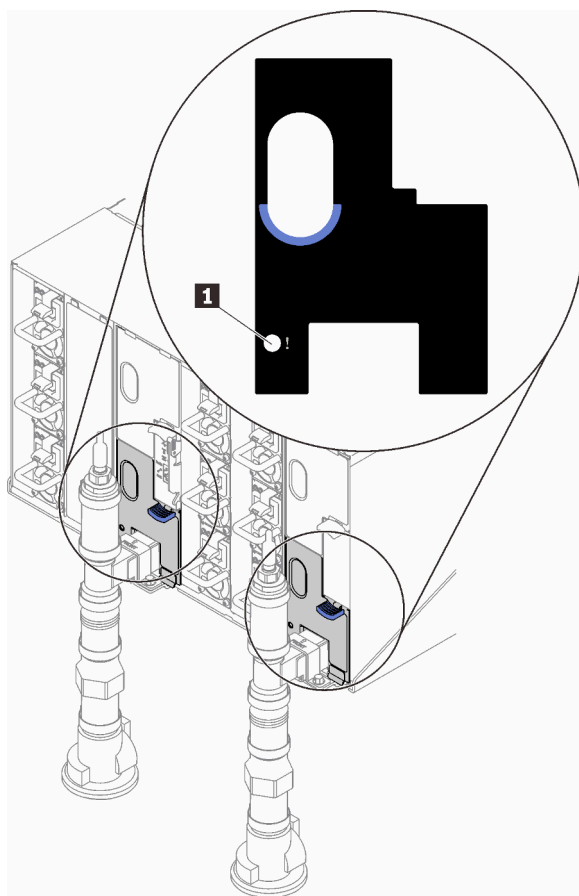


Figure 22. Drip sensor LED

Table 9. Drip sensor LED

<b>1</b> Drip sensor LED (yellow)
-----------------------------------

**1 Drip sensor LED:** When this LED is lit (yellow), it indicates that the drip sensor detects water in its respective catch basin.



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## Chapter 3. Parts list

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

For more information about ordering parts:

1. Go to <http://datacentersupport.lenovo.com> and navigate to the support page for your solution.
2. Click **Parts**.
3. Enter the serial number to view a listing of parts for your solution.

It is highly recommended that you check the power summary data for your solution using Lenovo Capacity Planner before purchasing any new parts.

**Note:** Depending on the model, your solution might look slightly different from the illustration.

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 solution.
- **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.

## Enclosure parts list

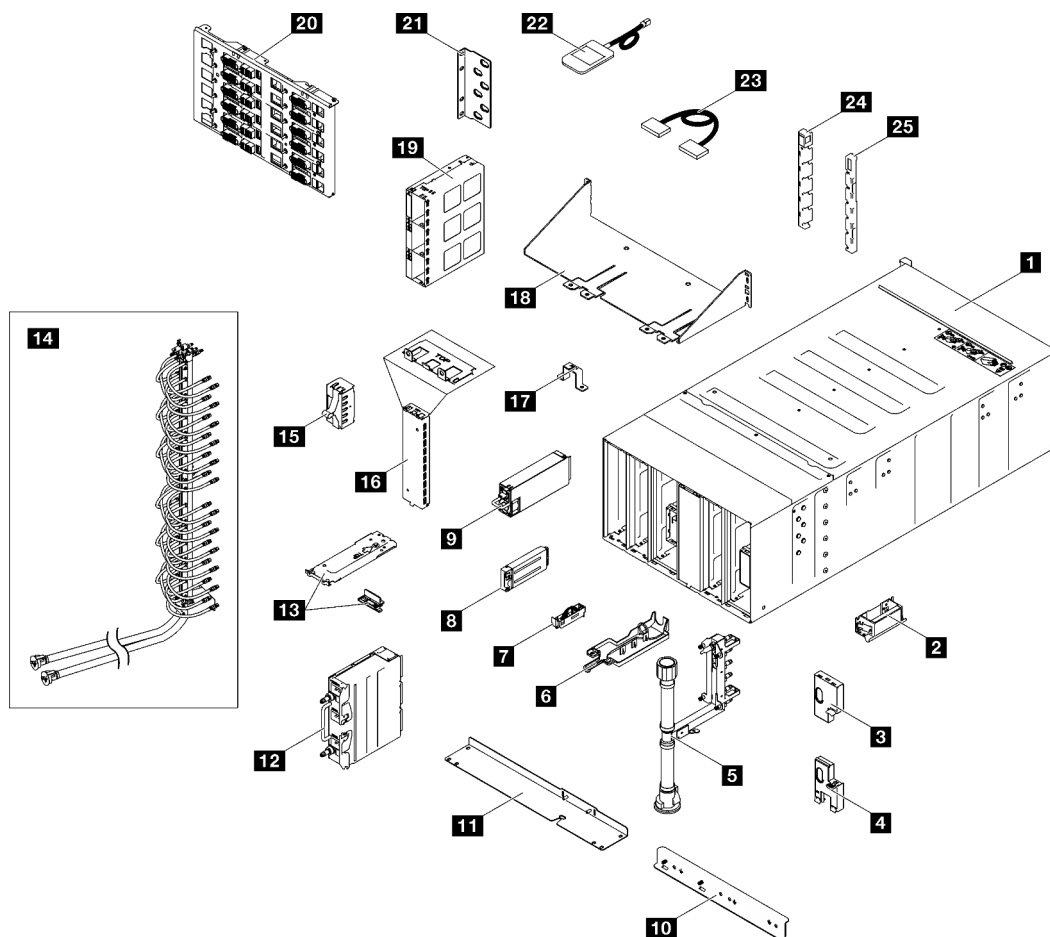


Figure 23. Enclosure parts list

Table 10. Enclosure parts list

Index	Description	Tier 1 CRU	Tier 2 CRU	FRU	Consumable and Structural part
<p>For more information about ordering parts:</p> <ol style="list-style-type: none"> <li>1. Go to <a href="http://datacentersupport.lenovo.com">http://datacentersupport.lenovo.com</a> and navigate to the support page for your solution.</li> <li>2. Click <b>Parts</b>.</li> <li>3. Enter the serial number to view a listing of parts for your solution.</li> </ol>					
<b>1</b>	6U enclosure assembly			✓	
<b>2</b>	Lift handle			✓	
<b>3</b>	Upper EMC shield			✓	
<b>4</b>	Lower EMC shield			✓	
<b>5</b>	Manifold assembly			✓	
<b>6</b>	Drip sensor tray			✓	

Table 10. Enclosure parts list (continued)

Index	Description	Tier 1 CRU	Tier 2 CRU	FRU	Consumable and Structural part
<b>7</b>	Drip sensor assembly			✓	
<b>8</b>	System Management Module 2			✓	
<b>9</b>	Power supply	✓			
<b>10</b>	DWC PSU manifold bottom bracket			✓	
<b>11</b>	DWC PSU manifold top bracket			✓	
<b>12</b>	DWC PSU			✓	
<b>13</b>	DWC PSU bracket and stopper			✓	
<b>14</b>	DWC PSU manifold			✓	
<b>15</b>	PSU cage filler			✓	
<b>16</b>	DWC PSU filler			✓	
<b>17</b>	Manifold retention bracket			✓	
<b>18</b>	Enclosure shipping bracket			✓	
<b>19</b>	PSU cage			✓	
<b>20</b>	High-power midplane			✓	
<b>21</b>	Support bracket			✓	
<b>22</b>	External LCD diagnostics handset	✓			
<b>23</b>	Cable			✓	
<b>24</b>	EIA cover left			✓	
<b>25</b>	EIA cover right			✓	

## 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.



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## Chapter 4. Unboxing and setup

Information in this section assists you on unboxing and setting up the server. When unboxing the server, check if the items in the package are correct, and learn where to find information of server serial number and Lenovo XClarity Controller access. Make sure to follow the instructions in [“Solution setup checklist” on page 34](#) when setting up the server.

---

### 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:

- DWC tray
- Enclosure
- Rail kit
- Four detachable chassis lift handles
- One console breakout cable (also known as a KVM Dongle)
- Material box, including items such as power cords\*, accessory kit, and printed documents.

#### Notes:

- Some of the items listed are available on select models only.
- Items marked with asterisk(\*) are optional.

If any item is missing or damaged, contact your place of purchase. Ensure that you retain your proof of purchase and packing material. They might be required to receive warranty service.

---

### Identify the solution and access the Lenovo XClarity Controller

This section contains instruction on how to identify your solution and where to find the Lenovo XClarity Controller access information.

#### Identifying 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.

The illustration below shows the location of the ID label which contains the enclosure model number, machine type, and serial number of the solution. You can also add other system information labels to the front of the enclosure in the customer label spaces.

**Note:** Depending on the model, your solution might look slightly different from the illustration.

*Table 11. Enclosure label on the front of the enclosure*

<b>1</b> Enclosure label
--------------------------

Enclosure label may be attached to the EIA bracket or to the enclosure. If the label is not on the EIA bracket, remove the EIA bracket to see the label.
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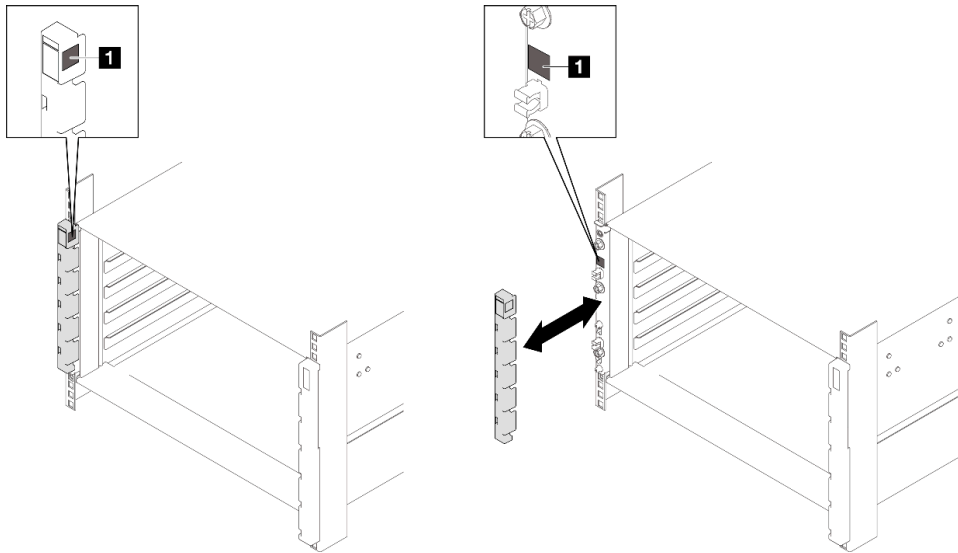


Figure 24. Enclosure label on the front of the enclosure

## 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.

### Setup the solution hardware

Complete the following procedures to setup the solution hardware.

1. Unpack the solution package. See [“Solution package contents” on page 33](#).
2. Install any required hardware or solution options. See the related topics in “Hardware replacement procedures” in *User Guide* or *Hardware Maintenance Guide*.
3. Connect all external cables to the solution. See [Chapter 2 “Enclosure components” on page 17](#) for connectors locations.

Typically, you will need to connect the following cables:

- Connect solution to the power source
  - Connect solution to the data network
  - Connect the solution to the storage device
  - Connect the solution to the management network
4. Power on the solution. For power button and power LED, see the [“Troubleshooting by system LEDs and diagnostics display” on page 21](#)

The node power button LED (Green) states are as followed:

**Off:** Power is not present or the power supply, or the LED itself has failed.

**Flashing rapidly (4 times per second):** The node is turned off and is not ready to be turned on. The power button is disabled. This will last approximately 5 to 10 seconds.

**Flashing slowly (once per second):** The node is turned off and is ready to be turned on. You can press the power button to turn on the node.

**On:** The node is turned on.

The solution can be turned on (power LED on) in any of the following ways:

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

**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 solution processor, see “Opening and Using the XClarity Controller Web Interface” section in the XCC documentation compatible with your solution at <https://pubs.lenovo.com/lxcc-overview/>.

5. Validate the solution. Make sure that the power LED, Ethernet connector LED, and network LED are lit with green light, which means the solution hardware was set up successfully.

See “Troubleshooting by system LEDs and diagnostics display” on page 21 for more information on the LED indications.

## Configure the system

Complete the following procedures to configure the system. For detailed instructions, refer to [Chapter 5 “System configuration” on page 37](#).

1. Set the network connection for the Lenovo XClarity Controller to the management network.
2. Update the firmware for the solution, if necessary.
3. Configure the firmware for the solution.

The following information is available for RAID configuration:

- <https://lenovopress.lenovo.com/lp0578-lenovo-raid-introduction>
- <https://lenovopress.lenovo.com/lp0579-lenovo-raid-management-tools-and-resources>

4. Install the operating system.
5. Back up the solution configuration.
6. Install the applications and programs for which the solution is intended to be used.



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## Chapter 5. System configuration

Complete these procedures to configure your system.

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### 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. Press the key specified in the on-screen instructions to display the Lenovo XClarity Provisioning Manager interface. (For more information, see the “Startup” section in the LXPM documentation compatible with your server at <https://pubs.lenovo.com/lxpm-overview/>.)
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 is 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: *System Management Module User's Guide* at [https://pubs.lenovo.com/mgt\\_tools\\_smm2/](https://pubs.lenovo.com/mgt_tools_smm2/).

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. See the “Identify the server and the access the Lenovo XClarity Controller” section in the *User Guide* of the high-density server.

- 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 USB connector or USB 3.0 Console

Breakout Cable. For location of Lenovo XClarity Controller USB connector and USB 3.0 Console Breakout Cable connector, see the “Front View” section in the *User Guide* of the high-density server.

To connect using the Lenovo XClarity Administrator Mobile app:

1. If applicable, connect the USB 3.0 Console Breakout Cable to the front panel.
2. Connect the USB cable of your mobile device to the Lenovo XClarity Controller USB connector or USB 3.0 Console Breakout Cable.
3. On your mobile device, enable USB tethering.
4. On your mobile device, launch the Lenovo XClarity Administrator mobile app.
5. 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](http://sysmgt.lenovofiles.com/help/topic/com.lenovo.lxca.doc/lxca_usemobileapp.html)

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## 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 “Enclosure components” on page 17](#).



- 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 “Enclosure components” on page 17](#) 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/>.

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## 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:
  - <https://lenovopress.lenovo.com/lp0656-lenovo-thinksystem-firmware-and-driver-update-best-practices>
- The latest firmware of the high-density server can be found at the following site:
  - <https://datacentersupport.lenovo.com/products/servers/thinksystem/sd650v3/7d7m/downloads/driver-list/>
  - <https://datacentersupport.lenovo.com/products/servers/thinksystem/sd650iv3/7d7l/downloads/driver-list/>
  - <https://datacentersupport.lenovo.com/products/servers/thinksystem/sd665v3/7d9p/downloads/driver-list/>
- You can subscribe to product notification to stay up to date on firmware updates:
  - <https://datacentersupport.lenovo.com/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
<b>Lenovo XClarity Provisioning Manager (LXPM)</b>	In-band <sup>2</sup> On-Target	✓		✓		
<b>Lenovo XClarity Controller (XCC)</b>	Out-of-band Off-Target	✓	Selected I/O devices	✓		
<b>Lenovo XClarity Essentials OneCLI (OneCLI)</b>	In-band Out-of-band On-Target Off-Target	✓	All I/O devices		✓	✓
<b>Lenovo XClarity Essentials UpdateXpress (LXCE)</b>	In-band Out-of-band On-Target Off-Target	✓	All I/O devices	✓		✓
<b>Lenovo XClarity Essentials Bootable Media Creator (BoMC)</b>	In-band Out-of-band Off-Target	✓	All I/O devices	✓ (BoMC application)	✓ (BoMC application)	✓
<b>Lenovo XClarity Administrator (LXCA)</b>	In-band <sup>1</sup> Out-of-band <sup>2</sup> Off-Target	✓	All I/O devices	✓		✓
<b>Lenovo XClarity Integrator (LXCI) for VMware vCenter</b>	Out-of-band Off-Target	✓	Selected I/O devices	✓		
<b>Lenovo XClarity Integrator (LXCI) for Microsoft Windows Admin Center</b>	In-band Out-of-band On-Target Off-Target	✓	All I/O devices	✓		✓
<b>Lenovo XClarity Integrator (LXCI) for Microsoft System Center Configuration Manager</b>	In-band On-Target	✓	All I/O devices	✓		✓
<b>Notes:</b> 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 start the server and press the key specified in the on-screen instructions. 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 version 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 additional information about using Lenovo XClarity Controller to update firmware, 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).

For additional information about using Lenovo XClarity Essentials OneCLI to update firmware, see:

[https://pubs.lenovo.com/lxce-onecli/onecli\\_c\\_update](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/Invo-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.

For additional information about using Lenovo XClarity Administrator to update firmware, see:

[http://sysmgt.lenovofiles.com/help/topic/com.lenovo.lxca.doc/update\\_fw.html](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.

For additional information about using Lenovo XClarity Integrator to update firmware, see:

<https://pubs.lenovo.com/lxci-overview/>

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## Configure the firmware

Several options are available to install and set up the firmware for the server.

**Important:** Lenovo does not recommend setting option ROMs to **Legacy**, but you can conduct this setting if necessary. Note that this setting prevents UEFI drivers for the slot devices from loading, which may cause negative side effects to Lenovo software, such as LXCA, OneCLI, and XCC. These side effects include but are not limited to the inability to determine adapter card details, such as model name and firmware levels. For example, "ThinkSystem RAID 930-16i 4GB Flash" may be displayed as "Adapter 06:00:00". In some cases, the functionality on a specific PCIe adapter may not be enabled properly.

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

From Lenovo XClarity Provisioning Manager, you can configure the UEFI settings for your server.

**Notes:** The Lenovo XClarity Provisioning Manager provides a Graphical User Interface to configure a server. The text-based interface to system configuration (the Setup Utility) is also available. From Lenovo XClarity Provisioning Manager, you can choose to restart the server 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 start LXPM. To do this, go to **Lenovo XClarity Provisioning Manager → UEFI Setup → System Settings → <F1>Start Control → Text Setup**. To start the server with Graphic User Interface, select **Auto** or **Tool Suite**.

See the following documentations for more information:

- Search for the LXPM documentation version compatible with your server at <https://pubs.lenovo.com/lxpm-overview/>
- *UEFI User Guide* at <https://pubs.lenovo.com/uefi-overview/>

- **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 server using Lenovo XClarity Essentials OneCLI, see:

[https://pubs.lenovo.com/lxce-onecli/onecli\\_c\\_settings\\_info\\_commands](https://pubs.lenovo.com/lxce-onecli/onecli_c_settings_info_commands)

- **Lenovo XClarity Administrator**

You can quickly provision and pre-provision all of your servers 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 server pattern that can be applied to one or more managed servers. When the server patterns are updated, the changes are automatically deployed to the applied servers.

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](http://sysmgt.lenovofiles.com/help/topic/com.lenovo.lxca.doc/server_configuring.html)

- **Lenovo XClarity Controller**

You can configure the management processor for the server through the Lenovo XClarity Controller Web interface, the command-line interface, or Redfish API.

For information about configuring the server using Lenovo XClarity Controller, see:

“Configuring the Server” section in the XCC documentation compatible with your server at <https://pubs.lenovo.com/lxcc-overview/>

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## Memory module configuration

Memory performance depends on several variables, such as memory mode, memory speed, memory ranks, memory population and processor.

Information about optimizing memory performance and configuring memory is available at the Lenovo Press website:

<https://lenovopress.lenovo.com/servers/options/memory>

In addition, you can take advantage of a memory configurator, which is available at the following site:

[https://dcsc.lenovo.com/#/memory\\_configuration](https://dcsc.lenovo.com/#/memory_configuration)

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## Enable Software Guard Extensions (SGX)

Intel® Software Guard Extensions (Intel® SGX) operates under the assumption that the security perimeter includes only the internals of the CPU package, and leaves the DRAM untrusted.

Make sure to refer to “Memory module installation rules and order” section in the *User Guide* of the high-density server, which specifies whether your server supports SGX and lists the memory module population sequence for SGX configuration.

Complete the following steps to enable SGX.

- Step 1. Restart the system. Before the operating system starts up, press the key specified in the on-screen instructions to enter the Setup Utility. (For more information, see the “Startup” section in the LXPM documentation compatible with your server at <https://pubs.lenovo.com/lxpm-overview/>.)
- Step 2. Go to **System settings → Processors → UMA-Based Clustering** and disable the option.
- Step 3. Go to **System settings → Processors → Total Memory Encryption (TME)** and enable the option.
- Step 4. Save the changes, then go to **System settings → Processors → SW Guard Extension (SGX)** and enable the option.

---

## 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 server'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.lenovo.com/lp0578-lenovo-raid-introduction>

Detailed information about RAID management tools and resources is available at the following Lenovo Press website:

<https://lenovopress.lenovo.com/lp0579-lenovo-raid-management-tools-and-resources>

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## PSU configuration

Refer to the following section for more information on the PSU configurations.

- “SD650 V3 PSU configuration” on page 44
- “SD650-I V3 PSU configuration” on page 45
- “SD650-N V3 PSU configuration” on page 46
- “SD665 V3 PSU configuration” on page 47
- “SD665-N V3 PSU configuration” on page 47

**Note:** Installing different DWC trays in the DW612S enclosure requires specific PSU configuration, see [Guidance on mixing trays configuration for the DW612S enclosure](#).

### SD650 V3 PSU configuration

#### PSU support matrix

Validate the power requirements for your configuration using the latest version of the Power Configurator to ensure that the number of power supplies selected are adequate for supporting your chassis configuration. The Power Configurator tool can be found at <https://datacentersupport.lenovo.com/solutions/Invo-lcp>.

#### CAUTION:

**Failure to validate the configuration with the Power Configurator tool could result in system errors, failure to power on, or microprocessor throttling, and limiting system's ability to leverage all the microprocessor performance.**

**Note:** The tables below are based on nodes with all DIMM slots, PCIe slots, and hard disk drives populated.

Component	SD650 V3 support configurations
ThinkSystem 2400W (230V) v2 Platinum PSU	6 or 9 PSUs
ThinkSystem 2600W (230V) v2 Titanium PSU	6 or 9 PSUs  Mixing PSUs manufactured by different vendors is not supported.
7200W Titanium DWC PSU	2 or 3 PSUs
High Power Midplane	Supported
Standard Midplane (Air PSU only)	Supported
SMM2	Supported

### Power policy

Component	SD650 V3 power policy
ThinkSystem 2400W (230V) v2 Platinum PSU	6 PSU: 5+1 with OVS, or Non-redundancy  9 PSU: 8+1 without OVS
ThinkSystem 2600W (230V) v2 Titanium PSU	6 PSU: 5+1 with OVS, or Non-redundancy  9 PSU: 8+1 without OVS
7200W Titanium DWC PSU	2 PSUs configured as 5+1 redundancy without OVS  3 PSUs configured as 8+1 redundancy without OVS

**Note:** OVS (Oversubscription) of the power system allows for more efficient use of the available system power.

### SD650-I V3 PSU configuration

#### PSU support matrix

Validate the power requirements for your configuration using the latest version of the Power Configurator to ensure that the number of power supplies selected are adequate for supporting your chassis configuration. The Power Configurator tool can be found at <https://datacentersupport.lenovo.com/solutions/Invo-lcp>.

#### CAUTION:

**Failure to validate the configuration with the Power Configurator tool could result in system errors, failure to power on, or microprocessor throttling, and limiting system's ability to leverage all the microprocessor performance.**

**Note:** The tables below are based on nodes with all DIMM slots, PCIe slots, and hard disk drives populated.

Component	SD650-I V3 support configurations
ThinkSystem 2400W (230V) v2 Platinum PSU	6 or 9 PSUs
ThinkSystem 2600W (230V) v2 Titanium PSU	6 or 9 PSUs  Mixing PSUs manufactured by different vendors is not supported.
7200W Titanium DWC PSU	3 PSUs

Component	SD650-I V3 support configurations
High Power Midplane	Supported
Standard Midplane (Air PSU only)	Supported
SMM2	Supported

### Power policy

Component	SD650-I V3 power policy
ThinkSystem 2400W (230V) v2 Platinum PSU	9 PSU: 8+1 without OVS
ThinkSystem 2600W (230V) v2 Titanium PSU	6 PSU: 5+1 with OVS, or Non-redundancy 9 PSU: 8+1 without OVS
7200W Titanium DWC PSU	3 PSUs configured as 8+1 redundancy without OVS

**Note:** OVS (Oversubscription) of the power system allows for more efficient use of the available system power.

### SD650-N V3 PSU configuration

#### PSU support matrix

Validate the power requirements for your configuration using the latest version of the Power Configurator to ensure that the number of power supplies selected are adequate for supporting your chassis configuration. The Power Configurator tool can be found at <https://datacentersupport.lenovo.com/solutions/Invo-lcp>.

#### CAUTION:

**Failure to validate the configuration with the Power Configurator tool could result in system errors, failure to power on, or microprocessor throttling, and limiting system's ability to leverage all the microprocessor performance.**

**Note:** The tables below are based on nodes with all DIMM slots, PCIe slots, and hard disk drives populated.

Component	SD650-N V3 support configurations
ThinkSystem 2600W (230V) v2 Titanium PSU	9 PSUs
7200W Titanium DWC PSU	3 PSUs
High Power Midplane	Supported
Standard Midplane (Air PSU only)	Supported
SMM2	Supported

### Power policy

Component	SD650-N V3 power policy
ThinkSystem 2600W (230V) v2 Titanium PSU	9 PSU: 8+1 without OVS
7200W Titanium DWC PSU	3 PSUs configured as 8+1 redundancy without OVS

**Note:** OVS (Oversubscription) of the power system allows for more efficient use of the available system power.

## SD665 V3 PSU configurations

### PSU support matrix

Validate the power requirements for your configuration using the latest version of the Power Configurator to ensure that the number of power supplies selected are adequate for supporting your chassis configuration. The Power Configurator tool can be found at <https://datacentersupport.lenovo.com/solutions/Invo-lcp>.

#### CAUTION:

**Failure to validate the configuration with the Power Configurator tool could result in system errors, failure to power on, or microprocessor throttling, and limiting system's ability to leverage all the microprocessor performance.**

**Note:** The tables below are based on nodes with all DIMM slots, PCIe slots, and hard disk drives populated.

Component	SD665 V3 support configurations
ThinkSystem 2400W (230V) v2 Platinum PSU	6 or 9 PSUs
ThinkSystem 2600W (230V) v2 Titanium PSU	6 or 9 PSUs  Mixing PSUs manufactured by different vendors is not supported.
7200W Titanium DWC PSU	2 or 3 PSUs
High Power Midplane	Supported
SMM2	Supported

### Power policy

Component	SD665 V3 power policy
ThinkSystem 2400W (230V) v2 Platinum PSU	6 PSU: 5+1 with OVS, or Non-redundancy 9 PSU: 8+1 without OVS
ThinkSystem 2600W (230V) v2 Titanium PSU	6 PSU: 5+1 with OVS, or Non-redundancy 9 PSU: 8+1 without OVS
7200W Titanium DWC PSU	2 PSUs configured as 5+1 redundancy with OVS 3 PSUs configured as 8+1 redundancy without OVS

**Note:** OVS (Oversubscription) of the power system allows for more efficient use of the available system power.

## SD665-N V3 PSU configurations

### PSU support matrix

Validate the power requirements for your configuration using the latest version of the Power Configurator to ensure that the number of power supplies selected are adequate for supporting your chassis configuration. The Power Configurator tool can be found at <https://datacentersupport.lenovo.com/solutions/Invo-lcp>.

#### CAUTION:

**Failure to validate the configuration with the Power Configurator tool could result in system errors, failure to power on, or microprocessor throttling, and limiting system's ability to leverage all the microprocessor performance.**

**Note:** The tables below are based on nodes with all DIMM slots, PCIe slots, and hard disk drives populated.

Component	SD665-N V3 support configurations
ThinkSystem 2600W (230V) v2 Titanium PSU	9 PSUs <b>Note:</b> Mixing PSUs manufactured by different vendors is not supported.
7200W Titanium DWC PSU	3 PSUs
High Power Midplane	Supported
SMM2	Supported

### Power policy

Component	SD665-N V3 power policy
ThinkSystem 2600W (230V) v2 Titanium PSU	9 PSU: 8+1 without OVS
7200W Titanium DWC PSU	3 PSUs configured as 8+1 redundancy without OVS

**Note:** OVS (Oversubscription) of the power system allows for more efficient use of the available system power.

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## Deploy the operating system

Several options are available to deploy an operating system on the server.

### Available operating systems

- Microsoft Windows Server
- VMware ESXi
- Red Hat Enterprise Linux
- SUSE Linux Enterprise Server

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](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](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](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](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](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 server configuration**

After setting up the server or making changes to the configuration, it is a good practice to make a complete backup of the server configuration.

Make sure that you create backups for the following server 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](https://pubs.lenovo.com/lxce-onecli/onecli_r_save_command)

- **Operating system**

Use your backup methods to back up the operating system and user data for the server.

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## **Guidance on mixing trays configuration for the DW612S enclosure**

Refer to the following section for more information on installing various direct water cooling trays into the DW612S enclosure.

### **DWC trays supported by the DW612S enclosure**

1. SD650 V2
2. SD650-N V2
3. SD650 V3
4. SD650-I V3

5. SD650-N V3
6. SD665 V3
7. SD665-N V3

### Mixing tray guidance

DW612S enclosure allows mixing trays configuration, which is installing different supporting trays in the same DW612S enclosure. Mixing trays configuration must meet the following requirements.

### Mixing tray requirements

1. Enclosure total power consumption is reviewed and approved in Lenovo Capacity Planner (LCP): <https://datacentersupport.lenovo.com/solutions/Invo-lcp>.
2. SMM2 is updated to the latest firmware.
3. If SD665-N V3 or SD650-N V3 is installed in the enclosure, only 2600W or 7200W PSUs are supported.
4. If SD650 V2 or SD650 V3 is installed in the enclosure and shared I/O configuration is enabled, the shared I/O special node power on/off sequence must be followed. See [Shared I/O configuration specific power on and power off sequence](#).
5. Install the tray starting from enclosure bottom to top (node 1-2 to node 11-12). The tray placement order in the enclosure should be:

**SD665-N V3 → SD650-N V3 → SD650-I V3 → SD650-N V2 → SD665 V3 → SD650 V3 → SD650 V2**

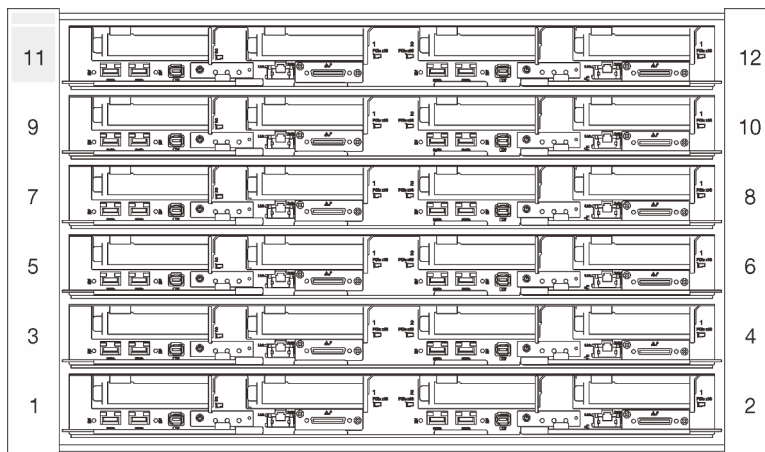
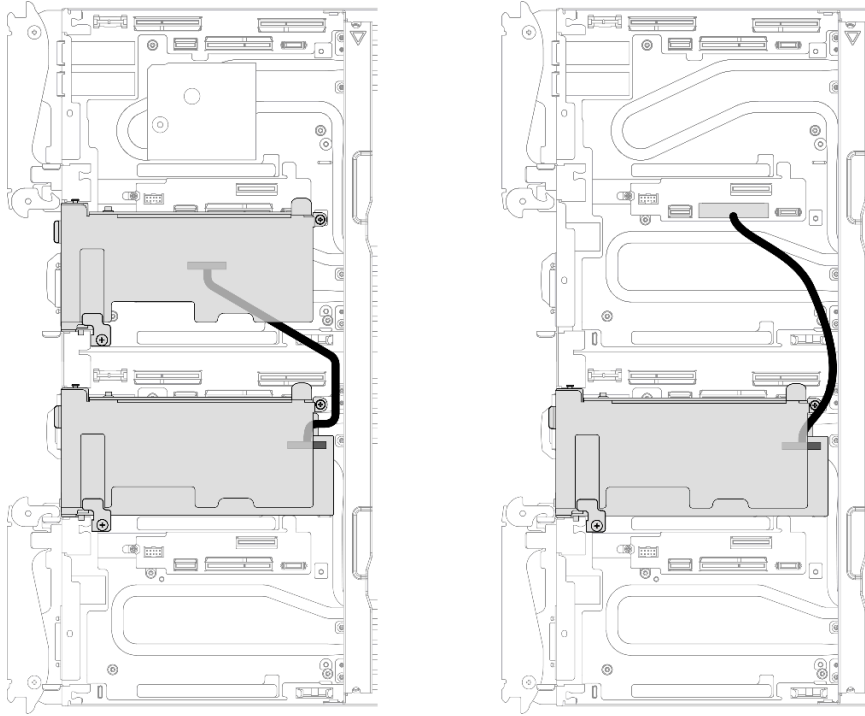


Figure 25. Front view of DW612S enclosure installed with six SD650 V3 tray

6. Refer to Lenovo Press <https://lenovopress.lenovo.com/> for individual tray's maximum inlet water temperature supported and minimum flow rate required. Set CDU temperature setpoint to ensure the lowest maximum supported inlet water is not exceeded. Set CDU flow setpoint to ensure the largest minimum flow rate is delivered to every tray.
7. If encounter system error in mixing trays configurations, check if the system meets the requirements above. If system error remains, contact Lenovo technician.

### Shared I/O configuration specific power on and power off sequence

- When viewed from the front of the tray, the right node is installed with main adapter, while the left node is either installed with the auxiliary adapter kit or connected to main adapter with the shared I/O cable.
- Power on sequence: first, power on the right node; then, power on the left node.
- Power off sequence: first, power off the left node; then, power off the right node.



*Figure 26. Left: shared I/O with auxiliary adapter kit, right: shared I/O with cable*



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## 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:** IBM is Lenovo's preferred service provider for ThinkSystem

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### 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 online help 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 the following location:

<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. (See the following links) 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.
  - Drivers and software downloads
    - <https://datacentersupport.lenovo.com/products/servers/thinksystem/sd650v3/7d7m/downloads/driver-list/>
    - <https://datacentersupport.lenovo.com/products/servers/thinksystem/sd650iv3/7d7l/downloads/driver-list/>
    - <https://datacentersupport.lenovo.com/products/servers/thinksystem/sd650iv3/7d7l/downloads/driver-list/>
  - Operating system support center
    - <https://datacentersupport.lenovo.com/solutions/server-os>
  - Operating system installing instructions
    - <https://pubs.lenovo.com/#os-installation>

- 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.
- Refer to “Problem Determination” in *User Guide* or *Hardware Maintenance Guide* for instructions on isolating and solving issues.
- Go to <http://datacentersupport.lenovo.com> and check for information to help you solve the problem.

To find the Tech Tips available for your server:

1. Go to <http://datacentersupport.lenovo.com> and navigate to the support page for your server.
2. Click on the documentation icon **How To's** from the navigation pane.
3. Click **Article Type** → **Solution** from the drop-down menu.

Follow the on-screen instructions to choose the category for the problem that you are having.

- Check Lenovo Data Center Forum at [https://forums.lenovo.com/t5/Datacenter-Systems/ct-p/sv\\_eg](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). Machine type number can be found on the ID label, see “Identifying the server and access the Lenovo XClarity Controller” in the *User Guide* of the high-density server.
- 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.

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## Collecting service data

To clearly identify the root cause of a server 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 server. The file can be saved and sent to Lenovo Support.

- For more information about using the web interface to collect service data, see the “Backing up the BMC configuration” section in the XCC documentation compatible with your server at <https://pubs.lenovo.com/lxcc-overview/>.
- For more information about using the CLI to collect service data, see the “XCC `ffdc` command” section in the XCC documentation 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.

You can find more information about setting up automatic problem notification within the Lenovo XClarity Administrator at [http://sysmgmt.lenovofiles.com/help/topic/com.lenovo.lxca.doc/admin\\_setupcallhome.html](http://sysmgmt.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 server, 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](https://pubs.lenovo.com/lxce-onecli/onecli_r_getinfor_command).

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## 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/supportphonenumber> for your region support details.





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## Appendix B. Documents and supports

This section provides handy documents, driver and firmware downloads, and support resources.

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### Documents download

This section provides introduction and download link for handy documents.

- Rail Installation Guide

- *Rail Installation Guide for DW612S Enclosure*

- *ThinkSystem DW612S Neptune DWC Enclosure User Guide*

Complete overview, system configuration, hardware components replacing, and troubleshooting.

Selected chapters from *User Guide*:

- *System Configuration Guide* : Server overview, components identification, system LEDs and diagnostics display, product unboxing, setting up and configuring the server.
- *Hardware Maintenance Guide* : Installing hardware components, cable routing, and troubleshooting.

For high-density servers supported by DW612S Neptune DWC Enclosure, see:

- <https://pubs.lenovo.com/sd650-v3/>
- <https://pubs.lenovo.com/sd650-i-v3/>
- <https://pubs.lenovo.com/sd650-n-v3/>
- <https://pubs.lenovo.com/sd665-v3/>
- <https://pubs.lenovo.com/sd665-n-v3/>

- *ThinkSystem DW612S Neptune DWC Enclosure SMM2 Messages and Codes Reference*

SMM2 events

For XClarity Controller, LXPM, and uEFI events for high density servers supported by DW612S Neptune DWC Enclosure, see:

- [https://pubs.lenovo.com/sd650-v3/sd650\\_v3\\_messages\\_reference.pdf](https://pubs.lenovo.com/sd650-v3/sd650_v3_messages_reference.pdf)
- [https://pubs.lenovo.com/sd650-i-v3/sd650\\_i\\_v3\\_messages\\_reference.pdf](https://pubs.lenovo.com/sd650-i-v3/sd650_i_v3_messages_reference.pdf)
- [https://pubs.lenovo.com/sd650-n-v3/sd650\\_n\\_v3\\_messages\\_reference.pdf](https://pubs.lenovo.com/sd650-n-v3/sd650_n_v3_messages_reference.pdf)
- [https://pubs.lenovo.com/sd665-v3/sd665\\_v3\\_messages\\_reference.pdf](https://pubs.lenovo.com/sd665-v3/sd665_v3_messages_reference.pdf)
- [https://pubs.lenovo.com/sd665-n-v3/sd665\\_n\\_v3\\_messages\\_reference.pdf](https://pubs.lenovo.com/sd665-n-v3/sd665_n_v3_messages_reference.pdf)

- *UEFI Manual*

- UEFI setting introduction

**Note:** DW612S enclosure can be installed in the ThinkSystem Heavy Duty Full Depth Rack Cabinets. For ThinkSystem Heavy Duty Full Depth Rack Cabinets User Guide, see [https://pubs.lenovo.com/hdc\\_rackcabinet/](https://pubs.lenovo.com/hdc_rackcabinet/).

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### Support websites

This section provides driver and firmware downloads and support resources.

## Support and downloads

- Lenovo Data Center Forum
  - [https://forums.lenovo.com/t5/Datacenter-Systems/ct-p/sv\\_eg](https://forums.lenovo.com/t5/Datacenter-Systems/ct-p/sv_eg)
- Lenovo License Information Documents
  - <https://datacentersupport.lenovo.com/documents/Invo-eula>
- Lenovo Press website (Product Guides/Datasheets/White papers)
  - <https://lenovopress.lenovo.com/>
- Lenovo Privacy Statement
  - <https://www.lenovo.com/privacy>
- Lenovo Product Security Advisories
  - [https://datacentersupport.lenovo.com/product\\_security/home](https://datacentersupport.lenovo.com/product_security/home)
- Lenovo Product Warranty Plans
  - <http://datacentersupport.lenovo.com/warrantylookup>
- Lenovo Server Operating Systems Support Center website
  - <https://datacentersupport.lenovo.com/solutions/server-os>
- Lenovo ServerProven website (Options compatibility lookup)
  - <https://serverproven.lenovo.com>
- Operating System Installation Instructions
  - <https://pubs.lenovo.com/#os-installation>
- Submit an eTicket (service request)
  - <https://support.lenovo.com/servicerequest>
- Subscribe to Lenovo Data Center Group product notifications (Stay up to date on firmware updates)
  - <https://datacentersupport.lenovo.com/solutions/ht509500>

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## Important notes

Processor speed indicates the internal clock speed of the processor; other factors also affect application performance.

CD or DVD drive speed is the variable read rate. Actual speeds vary and are often less than the possible maximum.

When referring to processor storage, real and virtual storage, or channel volume, KB stands for 1 024 bytes, MB stands for 1 048 576 bytes, and GB stands for 1 073 741 824 bytes.

When referring to hard disk drive capacity or communications volume, MB stands for 1 000 000 bytes, and GB stands for 1 000 000 000 bytes. Total user-accessible capacity can vary depending on operating environments.

Maximum internal hard disk drive capacities assume the replacement of any standard hard disk drives and population of all hard-disk-drive bays with the largest currently supported drives that are available from Lenovo.

Maximum memory might require replacement of the standard memory with an optional memory module.

Each solid-state memory cell has an intrinsic, finite number of write cycles that the cell can incur. Therefore, a solid-state device has a maximum number of write cycles that it can be subjected to, expressed as total bytes written (TBW). A device that has exceeded this limit might fail to respond to system-generated commands or might be incapable of being written to. Lenovo is not responsible for replacement of a device that has exceeded its maximum guaranteed number of program/erase cycles, as documented in the Official Published Specifications for the device.

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Contacts are available for Taiwan Region import and export information.

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