White Paper for KR4480V2 Series Servers

Powered by Intel Processors

For KR4480-X2-A0-R0-00

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Applicable Model

Model	Maintenance	Cooling
KR4480-X2-A0-R0-00	Rear access	Air cooling

Technical Support

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Preface

Abstract

This document describes the KR4480V2 Intel-based server's appearance, features, performance parameters, and software and hardware compatibility, providing in-depth information of the server.

Intended Audience

This document is intended for pre-sales engineers.

Symbol Conventions

The symbols that may be found in this document are defined as follows.

Symbol	Description
DANGER	A potential for serious injury, or even death if not properly handled
WARNING	A potential for minor or moderate injury if not properly handled
CAUTION	A potential loss of data or damage to equipment if not properly handled
IMPORTANT	Operations or information that requires special attention to ensure successful installation or configuration
NOTE	Supplementary description of document information

Revision History

Version	Date	Description of Changes
V1.0	2025/04/25	Initial release

Table of Contents

1 Product Overview

The KR4480V2 Intel-based system is a 4U 4-socket rack server powered by the 4th Gen Intel Xeon Scalable processors (code-named Sapphire Rapids), which is designed for the business applications of the finance, energy and other industries. The KR4480V2 provides excellent computing capacity, scalability, RAS (reliability, availability and serviceability), and energy efficiency ratio, making it ideal for in-memory databases, ERP, CRM, business intelligence (BI) system, large-scale virtualization applications, and data-intensive applications. It is especially suitable for critical business applications with high requirements for system performance, scalability, and stability.

Figure 1-1 24 × 2.5-Inch Drive Configuration

Figure 1-2 25 × 2.5-Inch Drive Configuration

Figure 1-3 50 × 2.5-Inch Drive Configuration

Figure 1-4 12 × 3.5-Inch + 8 × 2.5-Inch Drive Configuration

2 Features

2.1 Scalability and Performance

- Features the 4th Gen Intel Xeon Scalable processors (Sapphire Rapids), with up to 60 cores per processor, a maximum Turbo frequency of 4.1 GHz, an L3 cache of 112.5 MB, and 3 UPI links per CPU at up to 16 GT/s, delivering unrivaled processing performance.
  - Supports up to 4 processors with up to 60 cores and 120 threads per processor, maximizing the concurrent execution of multi-threaded applications.
  - With the processor cache hierarchy optimization, a larger L2 cache of private 2 MB per core is provided, so that memory data can be put and processed directly in L2 cache, improving the memory access performance and reducing the demand on L3 cache capacity. A single processor can share up to 112.5 MB of L3 cache.
  - Supports Intel Turbo Boost Technology 2.0 and automatically scales CPU speeds up to the max. Turbo frequency at peak workloads, allowing processor cores to exceed the thermal design power (TDP) for a limited time.
  - Supports Intel Hyper-Threading Technology, allowing up to 2 threads to run on each core to improve the performance of multi-threaded applications.
  - Supports Intel Virtualization Technology that provides hardware assist to the virtualization software, allowing the operating system to better use hardware to handle virtualized workloads.
  - Supports Intel Advanced Vector Extensions 512 (Intel AVX-512), significantly accelerating the workloads that are strongly floating point compute intensive.
  - Supports Intel Deep Learning Boost (Intel DL Boost) instructions, improving the performance for deep learning applications.
- Supports up to 64 DDR5 ECC DIMMs (4,800 MT/s, 16 TB max., RDIMMs), delivering high availability.
- Flexible drive configurations, providing elastic and scalable storage solutions to meet different capacity and upgrade requirements.

- Delivers all-SSD configuration, bringing higher I/O performance over all-HDD configuration or HDD-SSD mixing configuration.
- Offers 24 Gbps Serial Attached SCSI (SAS), quadrupling the data transfer rate of internal storage of 6 Gbps SAS solution and maximizing the performance of storage I/O-intensive applications.
- With Intel integrated I/O technology, the processors integrate the PCIe 5.0 controller to reduce I/O latency and enhance overall system performance.
- Up to 16 rear PCIe expansion slots and 1 OCP 3.0 slot.
- Two hot-swap OCP slots that can flexibly support 1/10/25/100/200 Gb OCP 3.0 cards.

2.2 Availability and Serviceability

- Supports hot-swap SAS/SATA/NVMe drives with RAID cache and data protection enabled by the super-capacitor in case of power failures. SAS/SATA drives can be configured to RAID 0/1/1E/10/5/50/6/60 depending on the RAID card in use.
- SSDs are much more reliable than traditional HDDs, increasing the system uptime.
- The UID and status LEDs for fault diagnosis on the front panel, the plug-in LCD module, and the BMC Web GUI indicate the status of key components and quickly lead technicians to failed (or failing) components, simplifying maintenance, speeding up troubleshooting, and enhancing system availability.
- The BMC management network port on the rear panel enables remote BMC O&M, improving O&M efficiency.
- Provides 4 hot-swap PSUs with 2+2 redundancy and 12 hot-swap fan modules with N+1 redundancy, improving overall system availability.
- The BMC monitors system parameters in real time and sends alerts in advance, enabling technicians to take appropriate measures to ensure stable system operation and minimize system downtime.
- Provides online memory diagnosis function, quickly marking the position of each faulty DIMM on the motherboard by the onboard LED, which helps service personnel quickly locate the DIMM to be serviced, and improves maintenance efficiency.

2.3 Manageability and Security

- The BMC monitors system operating status and enables remote management.

- The Network Controller Sideband Interface (NC-SI) feature allows a network port to serve as a management port and a service port. The NC-SI feature is disabled by default and can be enabled/disabled through the BIOS or BMC.
- The industry-standard UEFI improves the efficiency of setup, configuration and update, and simplifies the error handling process.
- Firmware update mechanism based on digital signatures prevents unauthorized firmware updates.
- Chassis intrusion detection enhances physical security.
- Flexible BMC access control policies and double factor authentication improve BMC management security.
- Dual-image mechanism for BMC recovers firmware upon detection of corrupted firmware.
- BMC Secure Boot based on hardware root of trust protects BMC from malicious tampering.
- Intel Platform Firmware Resilience (PFR) protects firmware from malicious tampering and restores detected corrupt firmware automatically.
- Intel Trusted Execution Technology provides enhanced security through hardware-based resistance to malicious software attacks.
- Intel Software Guard Extensions (SGX) technology allows applications to run in their own isolated space, helping prevent malicious theft and modification of critical codes and data.
- BIOS Secure Boot based on Trusted Platform Module (TPM) protects BIOS from malicious tampering.
- BIOS Secure Flash and BIOS Lock Enable (BLE) reduce attacks from malicious software on the BIOS flash region.
- UEFI Secure Boot protects the system from malicious boot loaders.
- Hierarchical password protection in BIOS ensures system boot and management security.
- Optional system secure erase function can wipe data on the storage devices with one click.
- Optional Trusted Platform Module (TPM) and Trusted Cryptography Module (TCM) provide advanced encryption.
- The optional front bezel with a lock prevents unauthorized users from removing or installing drives, thus ensuring the security of local data.

NOTE

The service port with NC-SI enabled supports:

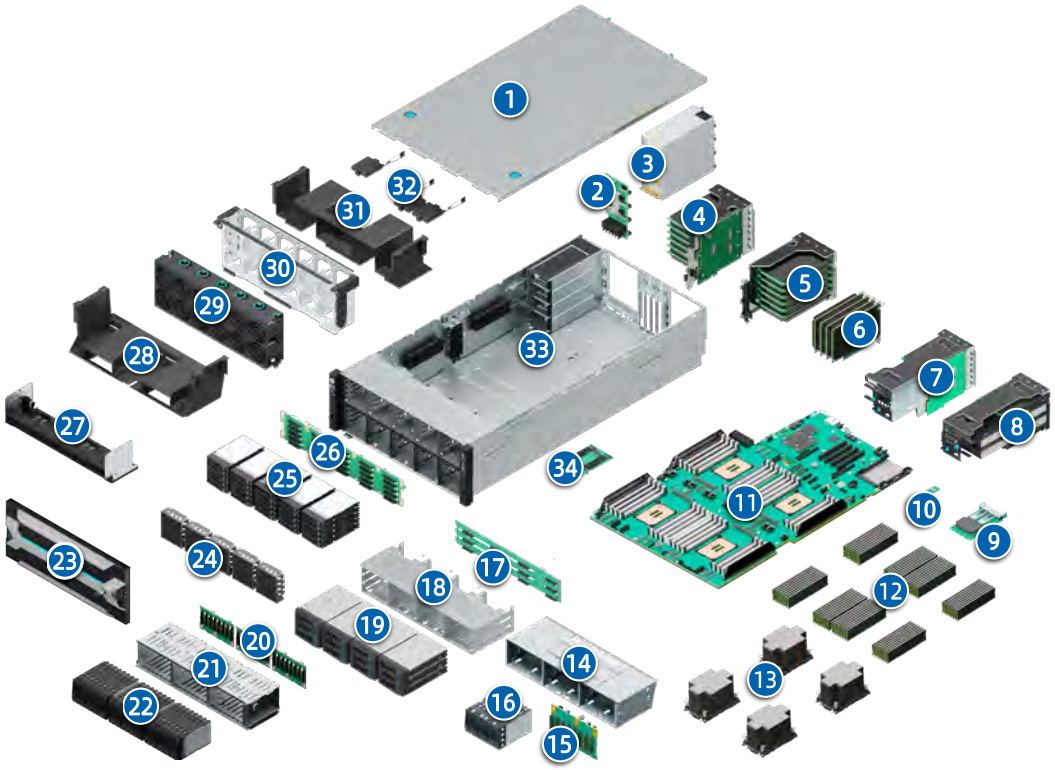
- Being bonded to any network port of the OCP 3.0 card 0.
- Enablement/Disablement and configuration of the VLAN, which is disabled by default.
- Both IPv4 and IPv6 addresses, of which the IP address, subnet mask, and default gateway can be configured, as well as the prefix length of IPv6 address.

2.4 Energy Efficiency

- Equipped with 80 Plus Platinum/Titanium PSUs of different power efficiency levels, with a power efficiency of up to 96% at a load of 50%.
- Offers 2+2 redundant PSUs for improved system reliability.
- Features the high-efficiency single-board voltage regulator-down (VRD) solution, reducing DC-DC conversion loss.
- Supports Proportional-Integral-Derivative (PID) intelligent fan speed control and intelligent CPU frequency scaling, conserving energy.
- Offers a fully-optimized system cooling design with energy-efficient cooling fans, lowering energy consumption from system cooling.
- Provides power capping and power control measures.
- Supports low-voltage 4th Gen Intel Xeon Scalable processors (Sapphire Rapids), consuming less energy and meeting the demands of data centers and telecommunications environments constrained by power and thermal limits.

3 System Parts Breakdown

Figure 3-1 Exploded View

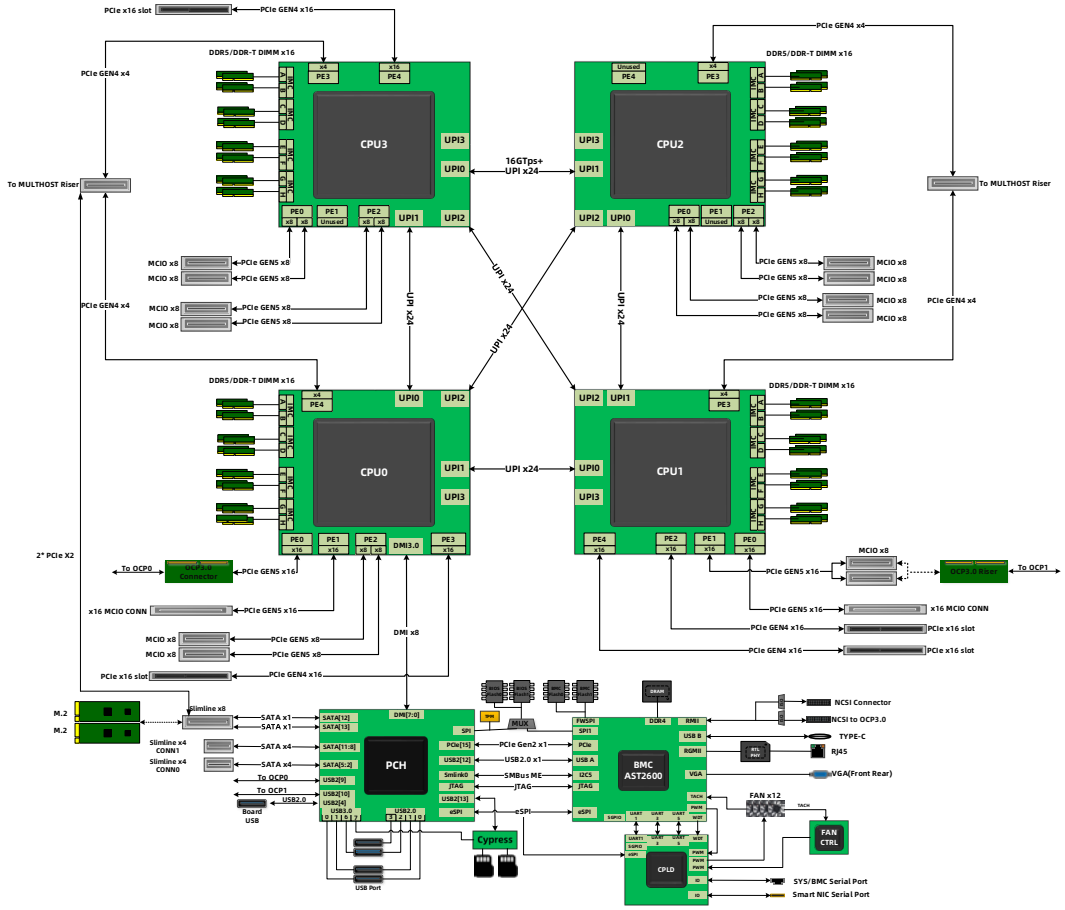


Item	Feature	Item	Feature
1	Top Cover	2	Power Backplane
3	PSU × 4	4	PCIe Riser Module 1
5	PCIe Riser Module 0	6	PCIe Expansion Card × 4
7	PCIe Riser Module 3 (GPU configuration)	8	PCIe Riser Module 2 (GPU configuration)
9	OCP 3.0 Card	10	TF Card
11	Motherboard	12	DIMM × 64
13	Heatsink × 4	14	Drive Cage
15	8 × 2.5-Inch Drive Backplane	16	2.5-Inch Drive × 8
17	12 × 3.5-Inch Drive Backplane	18	Drive Cage
19	3.5-Inch Drive × 12	20	8 × 2.5-Inch Drive Backplane × 3
21	Drive Cage	22	2.5-Inch Drive × 24
23	Front Bezel	24	Blank × 5

Item	Feature	Item	Feature
25	2.5-Inch Drive × 25	26	25 × 2.5-Inch Drive Backplane
27	Rear System Air Duct (GPU configuration)	28	Front System Air Duct
29	Fan Module × 6	30	Fan Cage
31	Rear System Air Duct	32	Super-Capacitor × 3
33	Chassis	34	M.2 SSD Module

4 System Logical Diagram

Figure 4-1 System Logical Diagram



- Two or four 4th Gen Intel Xeon Scalable processors (Sapphire Rapids).
- Up to 64 DDR5 RDIMMs.
- 3 UPI links per CPU at up to 16 GT/s.
- The motherboard provides 2 MCIO x16 connectors (for riser cards), 4 PCIe x16 slots, and 12 MCIO x8 connectors, and supports one Single-Host OCP 3.0 card directly connected to the motherboard and one Socket-Direct OCP 3.0 card (connector width 4 x4) expanded through another 2 MCIO connectors.
- The RAID card is connected to CPUs via the PCIe bus, and is connected to the drive backplane via the SAS signal cable. Multiple local storage configurations are supported through different drive backplanes.
- The motherboard integrates the Emmitsburg Platform Controller Hub (PCH) to support 3 USB 3.0 ports (compatible with USB 2.0), 2 USB 2.0 ports, 8 SATA

drives, and up to 2 TF cards. The motherboard supports 2 PCIe 3.0 x2/SATA 3.0 M.2 SSDs.

- The motherboard integrates an AST2600 management chip and supports 2 VGA ports, a management network port, a serial port, and other connectors.

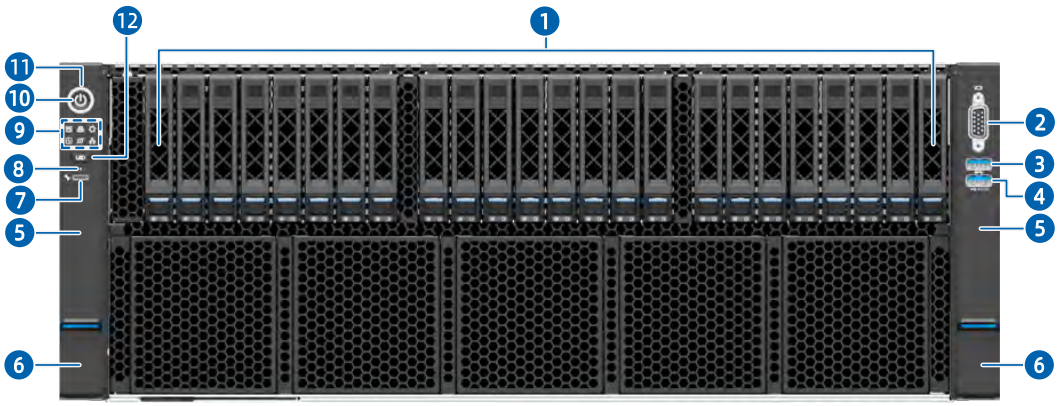
5 Hardware Description

5.1 Front Panel

5.1.1 Front View

1. 24 × 2.5-Inch Drive Configuration

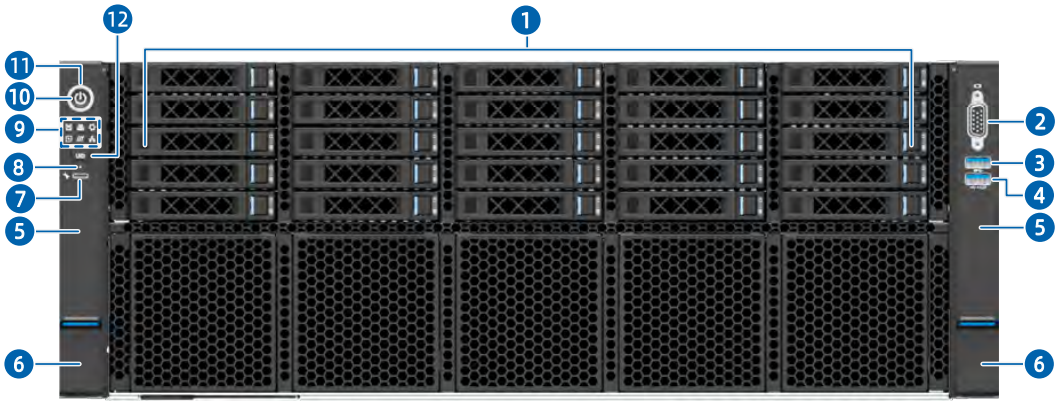
Figure 5-1 Front View



Item	Feature	Item	Feature
1	2.5-Inch Drive Bay × 24	2	VGA Port
3	USB 3.0 Port	4	USB 2.0/LCD Port
5	Screw Cover × 2	6	Ear Latch × 2
7	USB Type-C Port	8	USB Type-C Status LED
9	LEDs	10	Power Button and LED
11	CPU Load Status LED	12	UID/BMC RST Button and LED

2. 25 × 2.5-Inch Drive Configuration

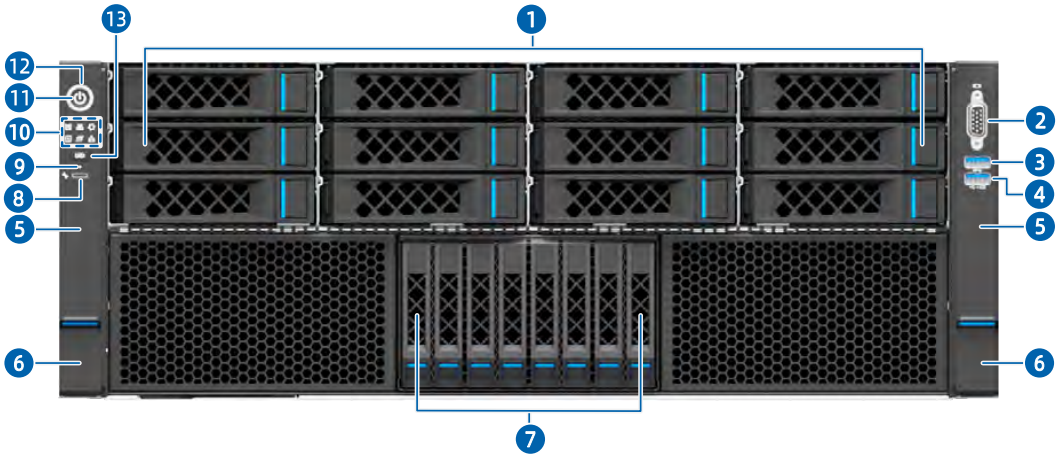
Figure 5-2 Front View



Item	Feature	Item	Feature
1	2.5-Inch Drive Bay × 25	2	VGA Port
3	USB 3.0 Port	4	USB 2.0/LCD Port
5	Screw Cover × 2	6	Ear Latch × 2
7	USB Type-C Port	8	USB Type-C Status LED
9	LEDs	10	Power Button and LED
11	CPU Load Status LED	12	UID/BMC RST Button and LED

3. 12 × 3.5-Inch + 8 × 2.5-Inch Drive Configuration

Figure 5-3 Front View



Item	Feature	Item	Feature
1	3.5-Inch Drive Bay × 12	2	VGA Port
3	USB 3.0 Port	4	USB 2.0/LCD Port

Item	Feature	Item	Feature
5	Screw Cover × 2	6	Ear Latch × 2
7	2.5-Inch Drive Bay × 8	8	USB Type-C Port
9	USB Type-C Status LED	10	LEDs
11	Power Button and LED	12	CPU Load Status LED
13	UID/BMC RST Button and LED	-	-

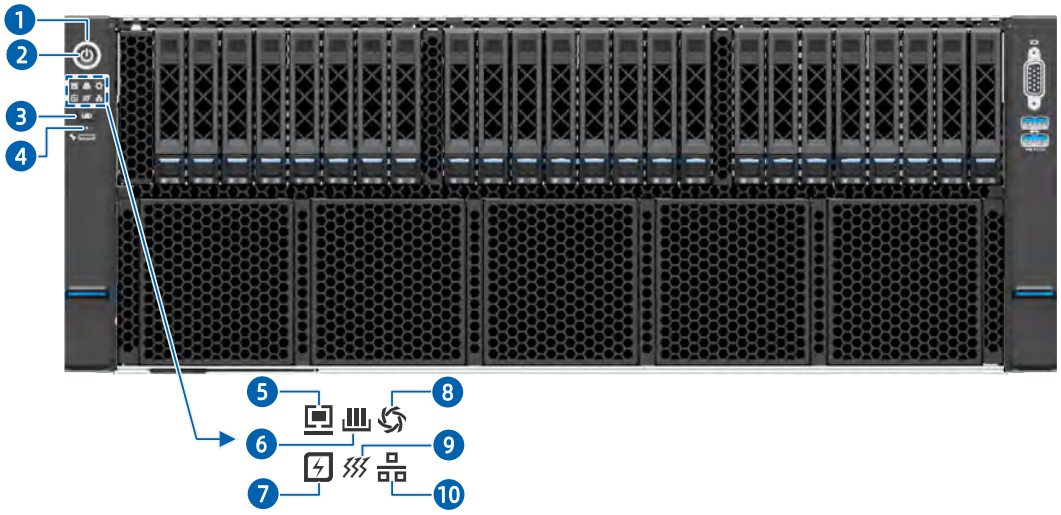
NOTE

A 3.5-inch drive tray can accommodate a 3.5-inch or 2.5-inch drive.

5.1.2 LEDs and Buttons

1. LED and Button Locations

Figure 5-4 Front Panel LED and Button Locations



Item	Feature	Item	Feature
1	CPU Load Status LED	2	Power Button and LED
3	UID/BMC RST Button and LED	4	USB Type-C Status LED
5	System Status LED	6	Memory Status LED
7	Power Status LED	8	Fan Status LED
9	System Overheat LED	10	Network Status LED

2. LED and Button Description

Table 5-1 Front Panel LED and Button Description

Icon	Feature	Description
	CPU Load Status LED	• Off = Standby state • Green = CPU load 0 - 30% • Blue = CPU load 31% - 80% • Yellow = CPU load 81% - 100%
	Power Button and LED	Power LED: • Off = No power • Solid green = Power-on state • Solid orange = Standby state Power button: • Press and release the button to power on the system from the standby state. • Press and hold the button for 4 seconds to force a shutdown from the power-on state.
	UID/BMC RST Button and LED	UID/BMC RST LED: • Gradually turning blue within 2 seconds and then gradually turning off within 2 seconds = PFR authentication in progress (Note: The server can be powered on only after this LED turns off.) • Blinking blue (4 Hz) = PFR authentication fails and the firmware images cannot be recovered • Solid blue = The UID LED is activated by the UID button or via the BMC UID/BMC RST Button: • Press and release the button to activate the UID LED.

Icon	Feature	Description
		• Press and hold the button for 6 seconds to force a BMC reset.
	USB Type-C Status LED	Connected to a terminal: • Off = Not connected to a terminal • Blinking green for 3 seconds and then off = Port function is disabled • Solid green = Connected to a terminal Connected to a USB storage device: • Off = Not connected to a USB storage device • Slow blinking red = Job fails or is completed with an error reported • Fast blinking green = Job in progress • Fast blinking green 5 times and then off = Port function is disabled • Solid green = Job is completed successfully
	System Status LED	• Off = Normal • Blinking red (1 Hz) = A warning error is detected on CPU, memory, power supply, drive, fan, etc. • Solid red = A critical error is detected on CPU, memory, power supply, drive, fan, etc.
	Memory Status LED	• Off = Normal • Blinking red (1 Hz) = A warning error occurs • Solid red = A critical error occurs
	Power Status LED	• Off = Normal • Blinking red (1 Hz) = A warning error occurs

Icon	Feature	Description
		• Solid red = A critical error occurs
	Fan Status LED	• Off = Normal • Blinking red (1 Hz) = A warning error occurs • Solid red = A critical error occurs, including fan failure and fan absence
	System Overheat LED	• Off = Normal • Blinking red (1 Hz) = A warning error occurs, including Proc Hot, resulting in CPU throttling • Solid red = A critical error occurs, including CPU Thermal Trip/PCH Hot/MEM Hot, etc.
	Network Status LED	• Off = No network connection • Blinking green = Network connected with data being transmitted • Solid green = Network connected without data being transmitted Note: It only indicates the status of our self-developed OCP cards.

5.1.3 Ports

1. Port Locations

Figure 5-5 Front Panel Port Locations

Item	Feature	Item	Feature
1	USB Type-C Port	2	VGA Port
3	USB 3.0 Port	4	USB 2.0/LCD Port

2. Port Description

Table 5-2 Front Panel Port Description

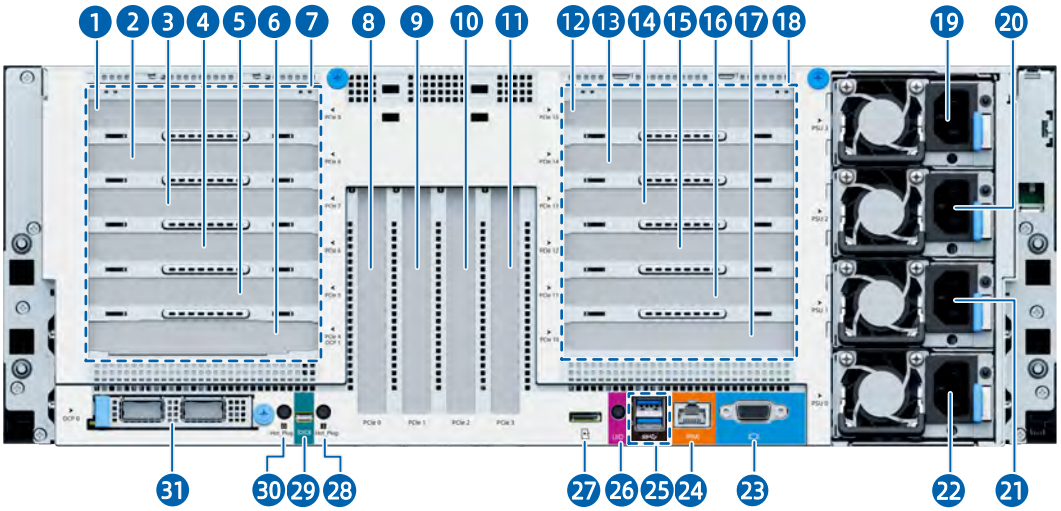
Feature	Type	Quantity	Description
USB Type-C Port	USB Type-C	1	Enables you to connect a USB flash drive, a mobile phone or a laptop to the system.
VGA Port	DB15	1	Enables you to connect a display terminal, for example, a monitor or KVM, to the system.
USB 3.0 Port	USB 3.0	1	Enables you to connect a USB 3.0 device to the system. Note: Make sure that the USB device is in good condition or it may cause the server to work abnormally.
USB 2.0/LCD Port	USB 2.0	1	• Enables you to connect a USB 2.0 device to the system. Note: Make sure that the USB device is in good condition or it may cause the server to work abnormally. • Enables you to connect an LCD module to the system.

5.2 Rear Panel

5.2.1 Rear View

1. Rear View 1

Figure 5-6 Rear View

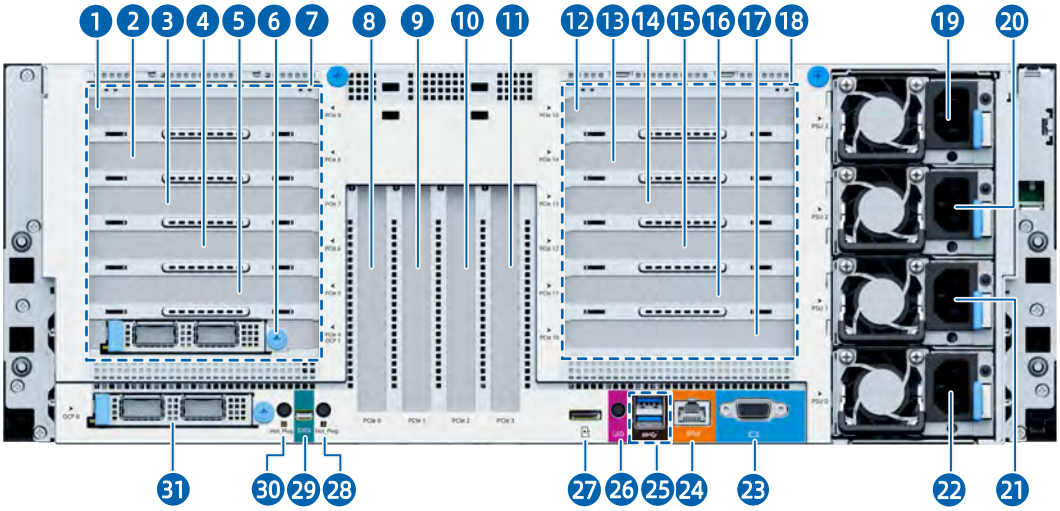


Item	Feature	Item	Feature
1	PCIe Slot 9	2	PCIe Slot 8
3	PCIe Slot 7	4	PCIe Slot 6
5	PCIe Slot 5	6	PCIe Slot 4
7	PCIe Riser Module 0	8	PCIe Slot 0
9	PCIe Slot 1	10	PCIe Slot 2
11	PCIe Slot 3	12	PCIe Slot 15
13	PCIe Slot 14	14	PCIe Slot 13
15	PCIe Slot 12	16	PCIe Slot 11
17	PCIe Slot 10	18	PCIe Riser Module 1
19	PSU3	20	PSU2
21	PSU1	22	PSU0
23	VGA Port	24	BMC Management Network Port
25	USB 3.0 Port × 2	26	UID/BMC RST Button and LED
27	BMC TF Card Slot	28	OCP 3.0 Card 1 Hot-Plug Button and LED
29	System/BMC Serial Port	30	OCP 3.0 Card 0 Hot-Plug Button and LED

Item	Feature	Item	Feature
31	OCP 3.0 Card 0	-	-

2. Rear View 2

Figure 5-7 Rear View

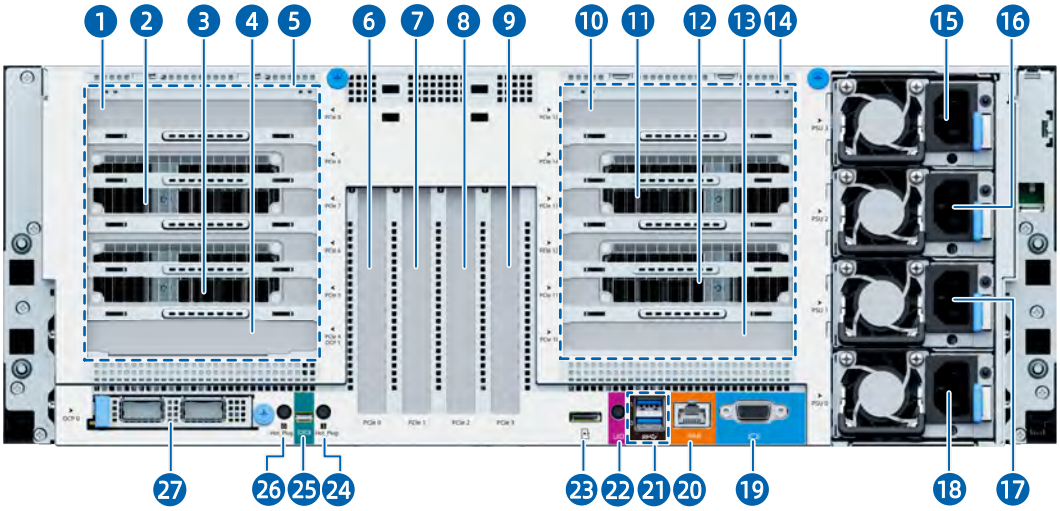


Item	Feature	Item	Feature
1	PCIe Slot 9	2	PCIe Slot 8
3	PCIe Slot 7	4	PCIe Slot 6
5	PCIe Slot 5	6	OCP 3.0 Card 1
7	PCIe Riser Module 0	8	PCIe Slot 0
9	PCIe Slot 1	10	PCIe Slot 2
11	PCIe Slot 3	12	PCIe Slot 15
13	PCIe Slot 14	14	PCIe Slot 13
15	PCIe Slot 12	16	PCIe Slot 11
17	PCIe Slot 10	18	PCIe Riser Module 1
19	PSU3	20	PSU2
21	PSU1	22	PSU0
23	VGA Port	24	BMC Management Network Port
25	USB 3.0 Port × 2	26	UID/BMC RST Button and LED
27	BMC TF Card Slot	28	OCP 3.0 Card 1 Hot-Plug Button and LED
29	System/BMC Serial Port	30	OCP 3.0 Card 0 Hot-Plug Button and LED

Item	Feature	Item	Feature
31	OCP 3.0 Card 0	-	-

3. Rear View 3

Figure 5-8 Rear View

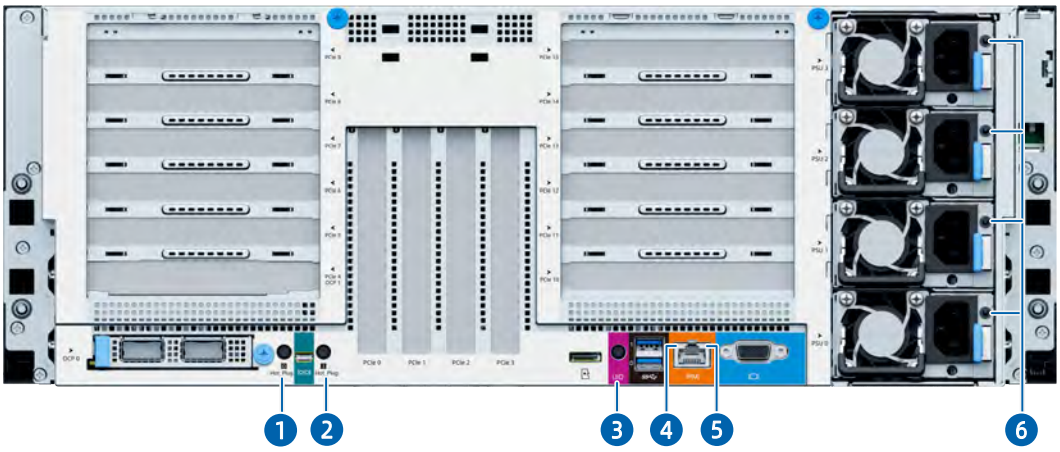


Item	Feature	Item	Feature
1	PCIe Slot 9	2	GPU
3	GPU	4	PCIe Slot 4
5	PCIe Riser Module 2	6	PCIe Slot 0
7	PCIe Slot 1	8	PCIe Slot 2
9	PCIe Slot 3	10	PCIe Slot 15
11	GPU	12	GPU
13	PCIe Slot 10	14	PCIe Riser Module 3
15	PSU3	16	PSU2
17	PSU1	18	PSU0
19	VGA Port	20	BMC Management Network Port
21	USB 3.0 Port × 2	22	UID/BMC RST Button and LED
23	BMC TF Card Slot	24	OCP 3.0 Card 1 Hot-Plug Button and LED
25	System/BMC Serial Port	26	OCP 3.0 Card 0 Hot-Plug Button and LED
27	OCP 3.0 Card 0	-	-

5.2.2 LEDs and Buttons

1. LED and Button Locations

Figure 5-9 Rear Panel LED and Button Locations



Item	Feature	Item	Feature
1	OCP 3.0 Card 0 Hot-Plug Button and LED	2	OCP 3.0 Card 1 Hot-Plug Button and LED
3	UID/BMC RST Button and LED	4	Management Network Port Link Speed LED
5	Management Network Port Link Activity LED	6	PSU LED × 4

2. LED and Button Description

Table 5-3 Rear Panel LED and Button Description

Icon	Feature	Description
	OCP 3.0 Card 0 Hot-Plug Button and LED	This button is used for hot-plugging the OCP 3.0 card 0. • Solid green = OCP card is powered on • Blinking green = OCP card is being powered on or powered off • Off = OCP card is powered off
	OCP 3.0 Card 1 Hot-Plug Button and LED	This button is used for hot-plugging the OCP 3.0 card 1. • Solid green = OCP card is powered on

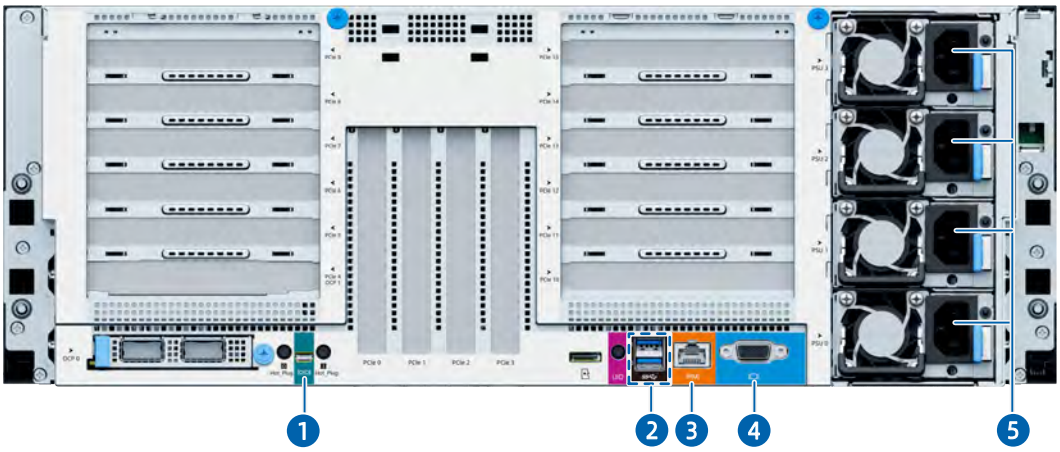
Icon	Feature	Description
		• Blinking green = OCP card is being powered on or powered off • Off = OCP card is powered off
	UID/BMC RST Button and LED	UID/BMC RST LED: • Gradually turning blue within 2 seconds and then gradually turning off within 2 seconds = PFR authentication in progress (Note: The server can be powered on only after this LED turns off.) • Blinking blue (4 Hz) = PFR authentication fails and the firmware images cannot be recovered • Solid blue = The UID LED is activated by the UID button or via the BMC UID/BMC RST Button: • Press and release the button to activate the UID LED. • Press and hold the button for 6 seconds to force a BMC reset.
-	Management Network Port Link Speed LED	• Off = No network connection • Solid green = Network connected with link speed at 1,000 Mbps • Solid orange = Network connected with link speed at 10/100 Mbps
-	Management Network Port Link Activity LED	• Off = No network connection • Solid green = Network connected without data being transmitted • Blinking green = Network connected with data being transmitted
	PSU LED	• Off = No AC/DC input to the PSU • Blinking green (1 Hz) = PSU operating in standby state with normal input

Icon	Feature	Description
		• Blinking green (2 Hz) = PSU firmware updating • Blinking green (off for 1 second and on for 2 seconds) = PSU in cold redundant state • Solid green = Normal input and output • Blinking amber (1 Hz) = PSU warning event where the PSU continues to operate (possible causes: PSU overtemperature warning, PSU overcurrent warning, excessively low fan speed warning) • Solid amber = Normal input, but no output (possible causes: PSU overtemperature protection, PSU overcurrent protection, PSU overvoltage protection, short circuit protection)

5.2.3 Ports

1. Port Locations

Figure 5-10 Rear Panel Port Locations



Item	Feature	Item	Feature
1	System/BMC Serial Port	2	USB 3.0 Port × 2
3	BMC Management Network Port	4	VGA Port
5	PSU Socket × 4	-	-

2. Port Description

Table 5-4 Rear Panel Port Description

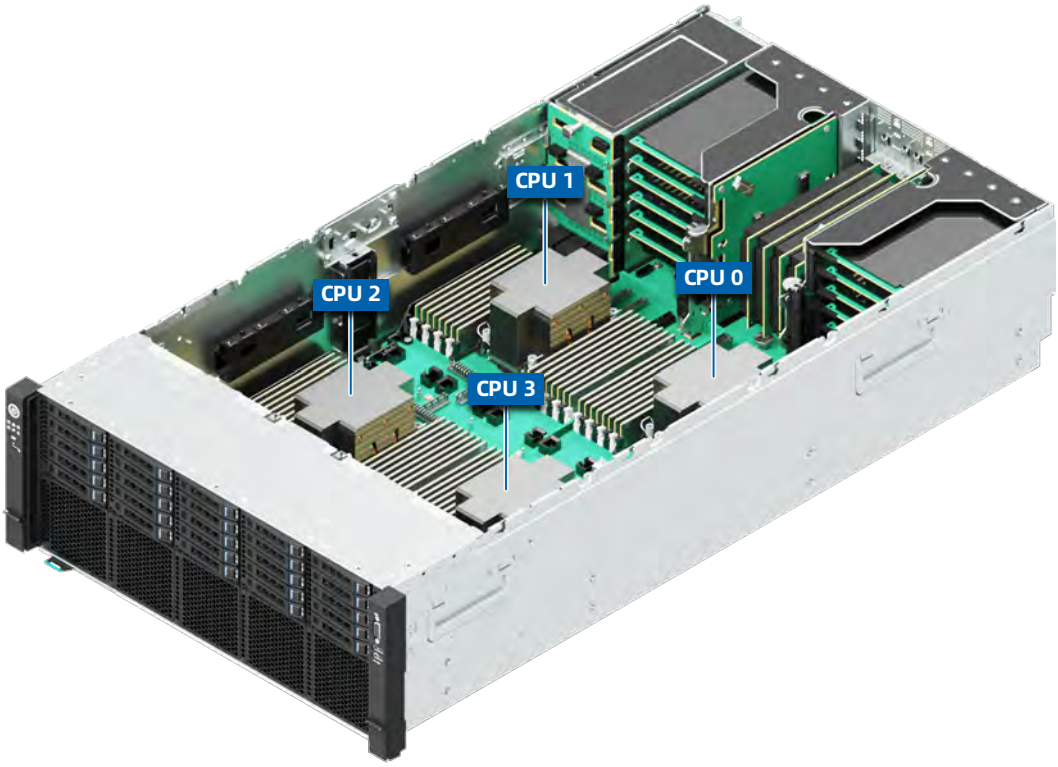
Feature	Type	Quantity	Description
System/BMC Serial Port	Micro USB	1	Enables you to debug and monitor the system/BMC.
USB 3.0 Port	USB 3.0	2	Enables you to connect a USB 3.0 device to the system. Notes: • The maximum current supported by the USB port is 0.9 A. • Make sure that the USB device is in good condition or it may cause the server to work abnormally.
BMC Management Network Port	RJ45	1	BMC management network port, used to manage the server. Note: It is a Gigabit Ethernet port that supports 100 Mbps and 1,000 Mbps auto-negotiation.
VGA Port	DB15	1	Enables you to connect a display terminal, for example, a monitor or KVM, to the system.
PSU Socket	-	4	Connected through a power cord. Users can select the PSUs as needed. Note: Make sure that the rated power of the PSUs is greater than that of the server.

5.3 Processors

- Supports two or four 4th Gen Intel Xeon Scalable processors.
- If only 2 processors are configured, install them in CPU0 and CPU1 sockets.
- The processors used in a server must be the same model.

For specific processor options, consult your local sales representative or refer to 7.2 Hardware Compatibility.

Figure 5-11 Processor Locations

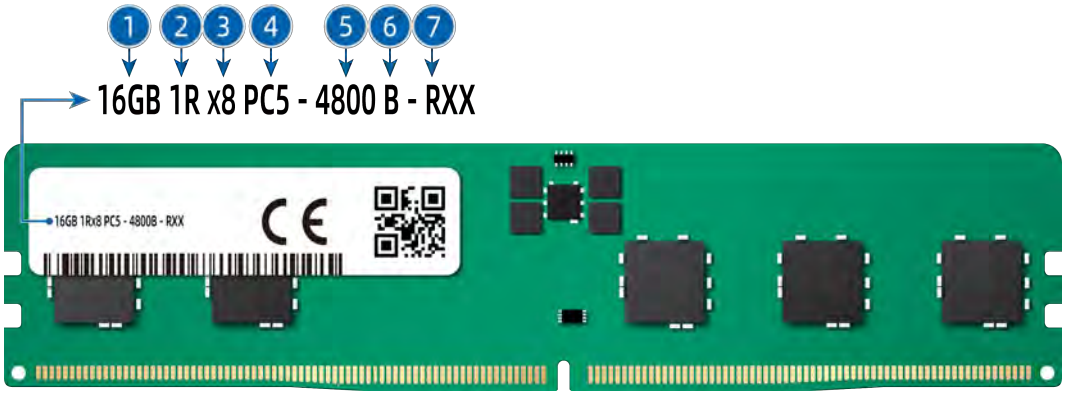


5.4 DDR5 DIMMs

5.4.1 Identification

To determine DIMM characteristics, refer to the label attached to the DIMM and the following figure and table.

Figure 5-12 DIMM Identification



Item	Description	Example
1	Capacity	• 16 GB • 32 GB • 64 GB • 128 GB • 256 GB
2	Rank(s)	• 1R = Single rank • 2R = Dual rank • 2S2R = Two ranks of two high stacked 3DS DRAM • 2S4R = Four ranks of two high stacked 3DS DRAM • 4R = Quad rank
3	Data width of DRAM	• x4 = 4 bits • x8 = 8 bits
4	DIMM slot type	• PC5 = DDR5
5	Maximum memory speed	• 4,800 MT/s • 5,600 MT/s
6	CAS latency	• SDP 4800B = 40-39-39 • 3DS 4800B = 46-39-39 • SDP 5600B = 46-45-45 • 3DS 5600B = 52-45-45
7	DIMM type	• R = RDIMM • L = LRDIMM

5.4.2 Memory Subsystem Architecture

The server supports 64 DIMM slots and 8 memory channels per CPU.

Table 5-5 DIMM Slot List

CPU	Channel ID	Silk Screen
CPU0	Channel 0	CPU0_C0D0
		CPU0_C0D1
	Channel 1	CPU0_C1D0
		CPU0_C1D1
	Channel 2	CPU0_C2D0
		CPU0_C2D1
	Channel 3	CPU0_C3D0
		CPU0_C3D1
	Channel 4	CPU0_C4D0
		CPU0_C4D1
	Channel 5	CPU0_C5D0
		CPU0_C5D1
	Channel 6	CPU0_C6D0
		CPU0_C6D1
	Channel 7	CPU0_C7D0
		CPU0_C7D1
CPU1	Channel 0	CPU1_C0D0
		CPU1_C0D1
	Channel 1	CPU1_C1D0
		CPU1_C1D1
	Channel 2	CPU1_C2D0
		CPU1_C2D1
	Channel 3	CPU1_C3D0
		CPU1_C3D1
	Channel 4	CPU1_C4D0
		CPU1_C4D1
	Channel 5	CPU1_C5D0
		CPU1_C5D1
	Channel 6	CPU1_C6D0
		CPU1_C6D1
	Channel 7	CPU1_C7D0
		CPU1_C7D1

CPU	Channel ID	Silk Screen
CPU2	Channel 0	CPU2_C0D0
		CPU2_C0D1
	Channel 1	CPU2_C1D0
		CPU2_C1D1
	Channel 2	CPU2_C2D0
		CPU2_C2D1
	Channel 3	CPU2_C3D0
		CPU2_C3D1
	Channel 4	CPU2_C4D0
		CPU2_C4D1
	Channel 5	CPU2_C5D0
		CPU2_C5D1
	Channel 6	CPU2_C6D0
		CPU2_C6D1
	Channel 7	CPU2_C7D0
		CPU2_C7D1
CPU3	Channel 0	CPU3_C0D0
		CPU3_C0D1
	Channel 1	CPU3_C1D0
		CPU3_C1D1
	Channel 2	CPU3_C2D0
		CPU3_C2D1
	Channel 3	CPU3_C3D0
		CPU3_C3D1
	Channel 4	CPU3_C4D0
		CPU3_C4D1
	Channel 5	CPU3_C5D0
		CPU3_C5D1
	Channel 6	CPU3_C6D0
		CPU3_C6D1
	Channel 7	CPU3_C7D0
		CPU3_C7D1

5.4.3 Compatibility

Refer to the following rules to configure the DDR5 DIMMs.

IMPORTANT

- A server must use DDR5 DIMMs with the same part number (P/N code). All DDR5 DIMMs operate at the same speed, which is the lowest of:
  - Memory speed supported by a specific CPU.
  - Maximum operating speed of a specific memory configuration.
- DIMMs of different capacities with the same DRAM data width only support the following combinations. Other DIMMs of different specifications (capacity, DRAM data width, rank, DRAM chip, etc.) do not support mixing. For more information, consult your local sales representative.
  - 8 × 16 GB + 8 × 32 GB
  - 8 × 32 GB + 8 × 64 GB
  - 8 × 64 GB + 8 × 128 GB
  - 8 × 128 GB + 8 × 256 GB
- Mixing non-3DS RDIMMs and 3DS RDIMMs is not allowed.
- For specific memory options, consult your local sales representative or refer to 7.2 Hardware Compatibility.

- DDR5 DIMMs can be used with the 4th Gen Intel Xeon Scalable processors (Sapphire Rapids). The maximum memory capacity supported varies with the CPU model.
- The total memory capacity is the sum of the capacities of all DDR5 DIMMs.
- The total memory capacity cannot exceed the maximum memory capacity supported by all CPUs.
- The maximum number of DIMMs supported varies with the CPU type, DIMM type and rank quantity.

NOTE

Maximum number of DIMMs supported per channel ≤ Maximum number of ranks supported per channel/Number of ranks per DIMM.

Table 5-6 DDR5 DIMM (4,800 MT/s) Specifications

Item		Value			
Capacity per DDR5 DIMM (GB)		32	64	96	128
Type		RDIMM	RDIMM	RDIMM	RDIMM
Rated speed (MT/s)		4,800	4,800	4,800	4,800
Operating voltage (V)		1.1	1.1	1.1	1.1
Maximum number of DDR5 DIMMs supported in a server[a]		64	64	64	64
Maximum capacity of DDR5 DIMMs supported in a server (TB)[b]		2	4	6	8
Actual speed (MT/s)	1 DPC[c]	4,800	4,800	4,800	4,800
	2 DPC	4,400	4,400	4,400	4,400
Notes: a: The maximum number of DDR5 DIMMs supported is based on the quad-CPU configuration. The number is halved for the dual-CPU configuration. b: It indicates the maximum memory capacity supported when all the DIMM slots are populated with DDR5 DIMMs. The maximum DDR5 capacity varies with the CPU type. c: DIMM Per Channel (DPC) is the number of DIMMs per memory channel. The information above is for reference only. Consult your local sales representative for details.					

Table 5-7 DDR5 DIMM (5,600 MT/s) Specifications

Item		Value			
Capacity per DDR5 DIMM (GB)		32	64	96	128
Type		RDIMM	RDIMM	RDIMM	RDIMM
Rated speed (MT/s)		5,600	5,600	5,600	5,600
Operating voltage (V)		1.1	1.1	1.1	1.1
Maximum number of DDR5 DIMMs supported in a server[a]		64	64	64	64
Maximum capacity of DDR5 DIMMs supported in a server (TB)[b]		2	4	6	8
Actual speed (MT/s)	1 DPC[c]	4,800	4,800	4,800	4,800
	2 DPC	4,400	4,400	4,400	4,400
Notes: a: The maximum number of DDR5 DIMMs supported is based on the quad-CPU configuration. The number is halved for the dual-CPU configuration.					

Item	Value
b: It indicates the maximum memory capacity supported when all the DIMM slots are populated with DDR5 DIMMs. The maximum DDR5 capacity varies with the CPU type. c: DIMM Per Channel (DPC) is the number of DIMMs per memory channel. The information above is for reference only. Consult your local sales representative for details.	

5.4.4 Population Rules

General population rules for DDR5 DIMMs:

- Install DIMMs only when the corresponding processor is installed.
- Install RDIMMs only.
- Install dummies in the empty DIMM slots.
- Install one DIMM at least for each CPU.

Population rules for DDR5 DIMMs in specific modes:

- Memory sparing
  - Follow the general population rules.
  - Each channel must have a valid online spare configuration.
  - Each channel can have a different online spare configuration.
  - Each channel with a DIMM installed must have a spare rank.
- Memory mirroring
  - Follow the general population rules.
  - Each processor supports 4 integrated memory controllers (iMCs). Each iMC has 2 channels to be populated with DIMMs. Installed DIMMs must be of the same capacity and organization.
  - In a multi-processor configuration, each processor must have a valid memory mirroring configuration.

5.4.5 DIMM Slot Layout

Up to 64 DDR5 DIMMs can be installed in a server, and a balanced DIMM configuration is recommended for optimal memory performance. DIMM configuration must be compliant with the DIMM population rules.

Figure 5-13 DIMM Slot Layout

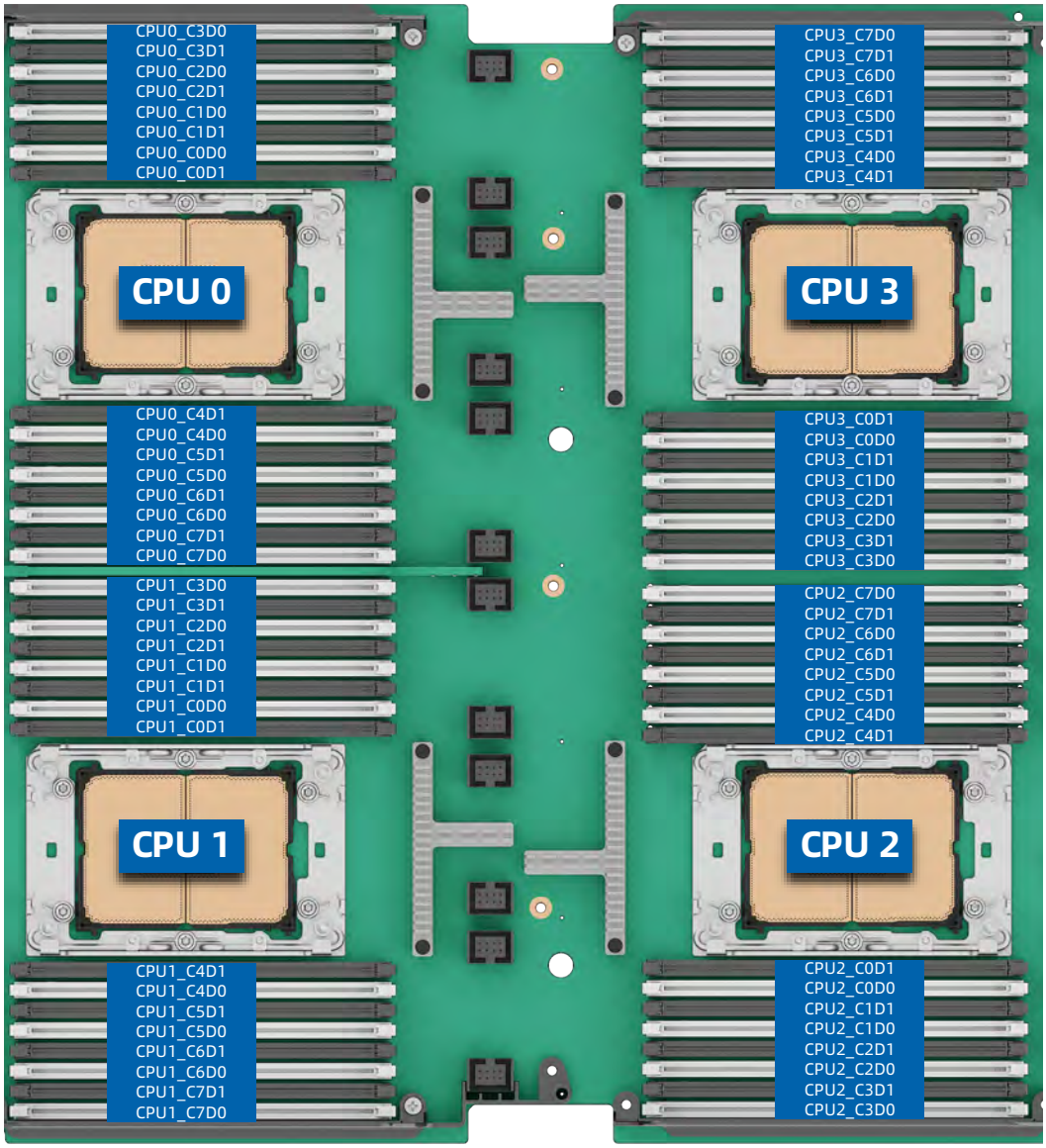


Table 5-8 DDR5 DIMM Population Rules (Dual-CPU Configuration)

DDR QTY		2	4	8	12	16	24	32
CPU0	C0D0	●	●	●	●	●	●	●
	C0D1						●	●
	C1D0					●	●	●
	C1D1							●
	C2D0			●	●	●	●	●
	C2D1						●	●
	C3D0				●	●	●	●
	C3D1							●
	C4D0			●	●	●	●	●
	C4D1						●	●
	C5D0				●	●	●	●
	C5D1							●
	C6D0		●	●	●	●	●	●
	C6D1						●	●
	C7D0					●	●	●
	C7D1							●
CPU1	C0D0	●	●	●	●	●	●	●
	C0D1						●	●
	C1D0					●	●	●
	C1D1							●
	C2D0			●	●	●	●	●
	C2D1						●	●
	C3D0				●	●	●	●
	C3D1							●
	C4D0			●	●	●	●	●
	C4D1						●	●
	C5D0				●	●	●	●
	C5D1							●
	C6D0		●	●	●	●	●	●
	C6D1						●	●
	C7D0					●	●	●
	C7D1							●

Table 5-9 DDR5 DIMM Population Rules (Quad-CPU Configuration)

DDR QTY		4	8	16	24	32	48	64
CPU0	C0D0	●	●	●	●	●	●	●
	C0D1						●	●
	C1D0					●	●	●
	C1D1							●
	C2D0			●	●	●	●	●
	C2D1						●	●
	C3D0				●	●	●	●
	C3D1							●
	C4D0			●	●	●	●	●
	C4D1						●	●
	C5D0				●	●	●	●
	C5D1							●
	C6D0		●	●	●	●	●	●
	C6D1						●	●
	C7D0					●	●	●
	C7D1							●
CPU1	C0D0	●	●	●	●	●	●	●
	C0D1						●	●
	C1D0					●	●	●
	C1D1							●
	C2D0			●	●	●	●	●
	C2D1						●	●
	C3D0				●	●	●	●
	C3D1							●
	C4D0			●	●	●	●	●
	C4D1						●	●
	C5D0				●	●	●	●
	C5D1							●
	C6D0		●	●	●	●	●	●
	C6D1						●	●
	C7D0					●	●	●
	C7D1							●
CPU2	C0D0	●	●	●	●	●	●	●
	C0D1						●	●
	C1D0					●	●	●
	C1D1							●
	C2D0			●	●	●	●	●
	C2D1						●	●
	C3D0				●	●	●	●
	C3D1							●
	C4D0			●	●	●	●	●
	C4D1						●	●
	C5D0				●	●	●	●
	C5D1							●
	C6D0		●	●	●	●	●	●
	C6D1						●	●
	C7D0					●	●	●
	C7D1							●
CPU3	C0D0	●	●	●	●	●	●	●
	C0D1						●	●
	C1D0					●	●	●
	C1D1							●
	C2D0			●	●	●	●	●
	C2D1						●	●
	C3D0				●	●	●	●
	C3D1							●
	C4D0			●	●	●	●	●
	C4D1						●	●
	C5D0				●	●	●	●
	C5D1							●
	C6D0		●	●	●	●	●	●
	C6D1						●	●
	C7D0					●	●	●
	C7D1							●

NOTE

For the dual-CPU configuration, the quantity of 96 GB DIMMs can only be 16 or 32. For the quad-CPU configuration, the quantity of 96 GB DIMMs can only be 32, 48 or 64. The DIMMs should be installed according to the population rules in above tables.

5.5 Storage

5.5.1 Drive Configurations

Table 5-10 Drive Configurations

Configuration	Front Drives	Internal Drives	Drive Management Mode
8 × 2.5-Inch Drive Configuration (8 × SAS/SATA)	Drive bays 0 to 7: SAS/SATA drives only	M.2 SSD: supported by the M.2 adapter	SAS/SATA drive: PCIe RAID card
8 × 2.5-Inch Drive Configuration (8 × NVMe)	Drive bays 0 to 7: NVMe drives only	M.2 SSD: supported by the M.2 adapter	NVMe drive: CPU
16 × 2.5-Inch Drive Configuration (16 × SAS/SATA)	Drive bays 0 to 15: SAS/SATA drives only	M.2 SSD: supported by the M.2 adapter	SAS/SATA drive: PCIe RAID card
16 × 2.5-Inch Drive Configuration (16 × NVMe)	Drive bays 0 to 15: NVMe drives only	M.2 SSD: supported by the M.2 adapter	NVMe drive: CPU
24 × 2.5-Inch Drive Configuration (24 × SAS/SATA)	Drive bays 0 to 23: SAS/SATA drives only	M.2 SSD: supported by the M.2 adapter	SAS/SATA drive: PCIe RAID card
24 × 2.5-Inch Drive Configuration (24 × NVMe)	Drive bays 0 to 23: NVMe drives only	M.2 SSD: supported by the M.2 adapter	NVMe drive: CPU
24 × 2.5-Inch Drive Configuration (8 × SAS/SATA + 16 × NVMe)	• Drive bays 0 to 7: SAS/SATA drives only • Drive bays 8 to 23: NVMe drives only	M.2 SSD: supported by the M.2 adapter	• SAS/SATA drive: PCIe RAID card • NVMe drive: CPU
24 × 2.5-Inch Drive Configuration (16 × SAS/SATA + 8 × NVMe)	• Drive bays 0 to 15: SAS/SATA drives only	M.2 SSD: supported by the M.2 adapter	• SAS/SATA drive: PCIe RAID card

Configuration	Front Drives	Internal Drives	Drive Management Mode
	• Drive bays 16 to 23: NVMe drives only		• NVMe drive: CPU
25 × 2.5-Inch Drive Configuration (25 × SAS/SATA)	Drive bays 0 to 24: SAS/SATA drives only	M.2 SSD: supported by the M.2 adapter	SAS/SATA drive: PCIe RAID card
25 × 2.5-Inch Drive Configuration (21 × SAS/SATA + 4 × NVMe)	• Drive bays 0 to 20: SAS/SATA drives only • Drive bays 21 to 24: NVMe drives only	M.2 SSD: supported by the M.2 adapter	• SAS/SATA drive: PCIe RAID card • NVMe drive: CPU
12 × 3.5-Inch Drive Configuration (12 × SAS/SATA)	Drive bays 0 to 11: SAS/SATA drives only	M.2 SSD: supported by the M.2 adapter	• SAS/SATA drive: PCIe RAID card
12 × 3.5-Inch + 8 × 2.5-Inch Drive Configuration (12 × SAS/SATA + 8 × SAS/SATA)	Drive bays 0 to 19: SAS/SATA drives only	M.2 SSD: supported by the M.2 adapter	SAS/SATA drive: PCIe RAID card
12 × 3.5-Inch + 8 × 2.5-Inch Drive Configuration (12 × SAS/SATA + 8 × NVMe)	• Drive bays 0 to 11: SAS/SATA drives only • Drive bays 12 to 19: NVMe drives only	M.2 SSD: supported by the M.2 adapter	• SAS/SATA drive: PCIe RAID card • NVMe drive: CPU

5.5.2 Drive Numbering

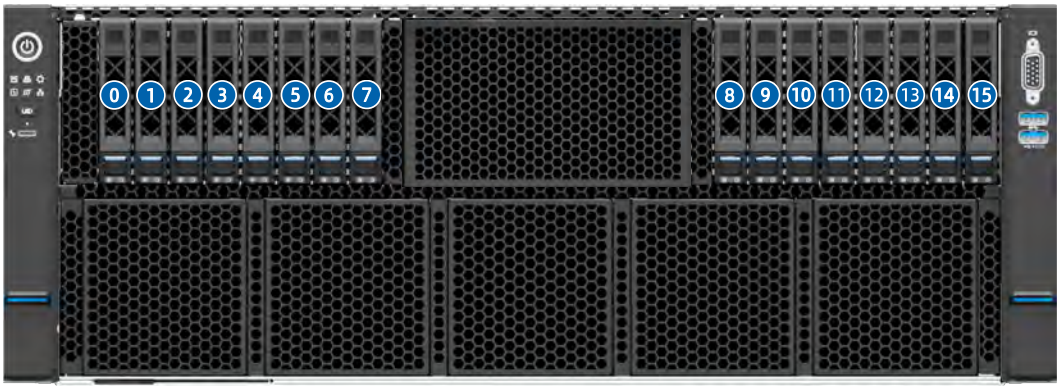
1. 8 × 2.5-Inch Drive Configuration

Figure 5-14 Drive Numbering

Configuration	Physical Drive No.	Drive No. Identified by the BMC	Drive No. Identified by the RAID Card
8 × SAS/SATA	0 to 7	0 to 7	0 to 7
8 × NVMe	0 to 7	12 to 19	-

2. 16 × 2.5-Inch Drive Configuration (IO Balance)

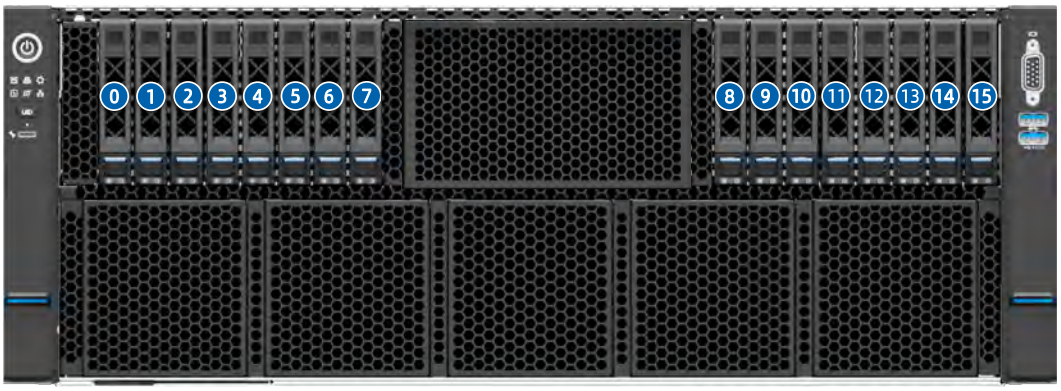
Figure 5-15 Drive Numbering



Configuration	Physical Drive No.	Drive No. Identified by the BMC	Drive No. Identified by the RAID Card
16 × SAS/SATA	0 to 15	0 to 15	0 to 15
16 × NVMe	0 to 7	0 to 7	-
	8 to 15	12 to 19	-

3. 16 × 2.5-Inch Drive Configuration (Non-IO Balance)

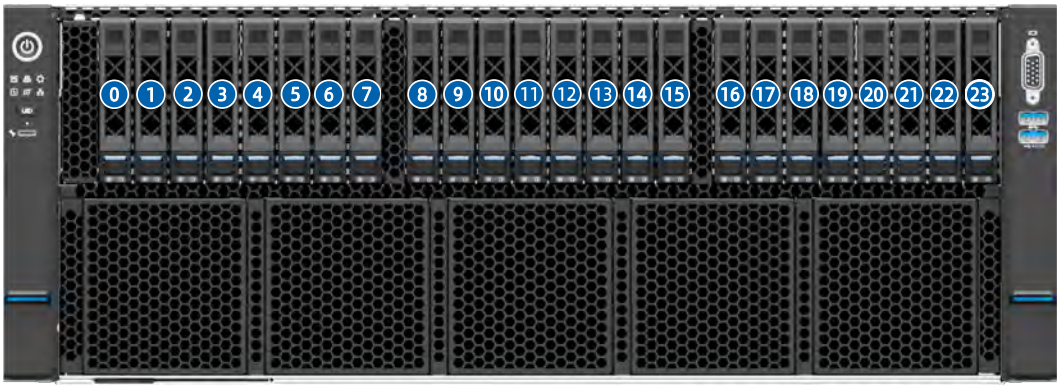
Figure 5-16 Drive Numbering



Configuration	Physical Drive No.	Drive No. Identified by the BMC	Drive No. Identified by the RAID Card
16 × SAS/SATA	0 to 15	0 to 15	0 to 15
16 × NVMe	0 to 7	8 to 15	-
	8 to 15	16 to 23	-

4. 24 × 2.5-Inch Drive Configuration

Figure 5-17 Drive Numbering

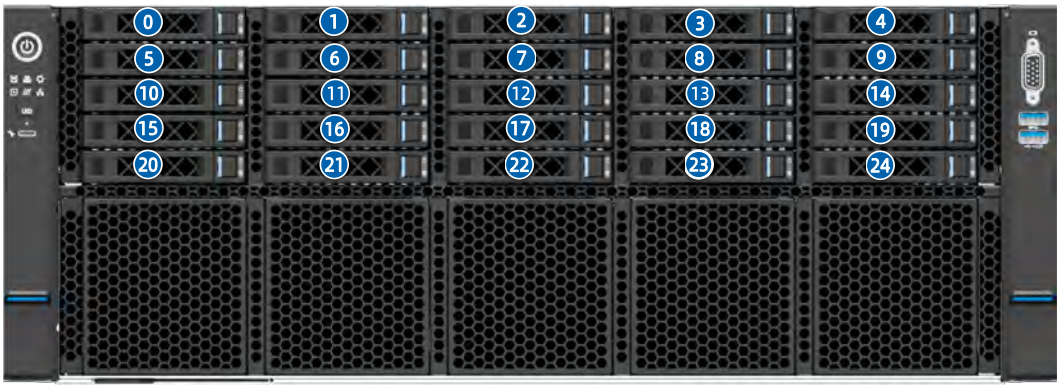


Configuration	Physical Drive No.	Drive No. Identified by the BMC	Drive No. Identified by the RAID Card
24 × SAS/SATA	0 to 23	0 to 23	0 to 23
24 × NVMe	0 to 23	0 to 23	-
8 × SAS/SATA + 16 × NVMe	0 to 7	0 to 7	0 to 7
	8 to 23	8 to 23	-

Configuration	Physical Drive No.	Drive No. Identified by the BMC	Drive No. Identified by the RAID Card
16 × SAS/SATA + 8 × NVMe	0 to 15	0 to 15	0 to 15
	16 to 23	16 to 23	-

5. 25 × 2.5-Inch Drive Configuration

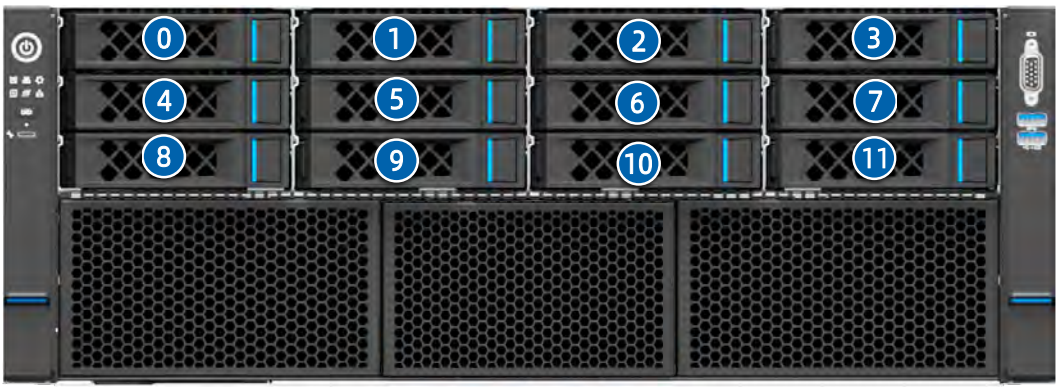
Figure 5-18 Drive Numbering



Configuration	Physical Drive No.	Drive No. Identified by the BMC	Drive No. Identified by the RAID Card
25 × SAS/SATA	0 to 24	0 to 24	0 to 24
21 × SAS/SATA + 4 × NVMe	0 to 20	0 to 20	0 to 20
	21 to 24	21 to 24	-

6. 12 × 3.5-Inch Drive Configuration

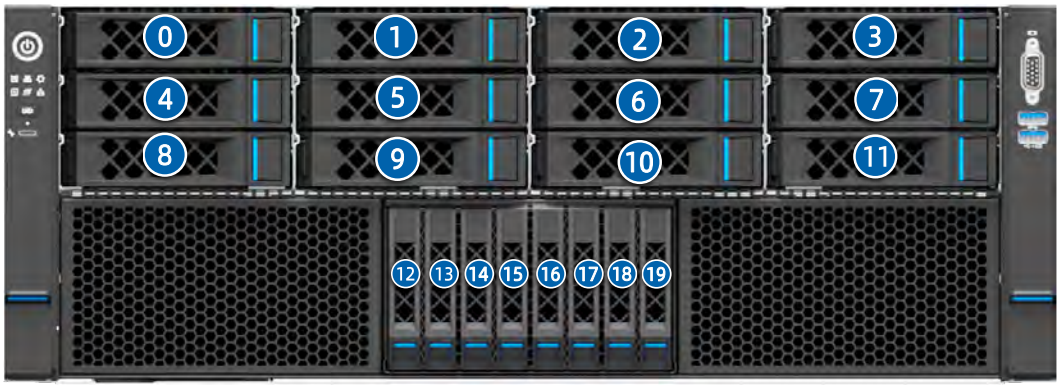
Figure 5-19 Drive Numbering



Configuration	Physical Drive No.	Drive No. Identified by the BMC	Drive No. Identified by the RAID Card
12 × SAS/SATA	0 to 11	0 to 11	0 to 11

7. 12 × 3.5-Inch + 8 × 2.5-Inch Drive Configuration

Figure 5-20 Drive Numbering



Configuration	Physical Drive No.	Drive No. Identified by the BMC	Drive No. Identified by the RAID Card
12 × SAS/SATA + 8 × SAS/SATA	0 to 11	0 to 11	0 to 11
	12 to 19	12 to 19	12 to 19
12 × SAS/SATA + 8 × NVMe	0 to 11	0 to 11	0 to 11
	12 to 19	12 to 19	-

5.5.3 Drive LEDs

1. SAS/SATA Drive LEDs

Figure 5-21 SAS/SATA Drive LEDs

Table 5-11 SAS/SATA Drive LED Description

Activity LED (①)	Locator/Error LED (②)			Description
Green	Blue	Red		
Off	Off	RAID created	RAID not created	Drive absent
		Solid on	Off	
Solid on	Off	Off		Drive present but not in use
Blinking	Off	Off		Drive present and in use
Blinking	Solid pink			Copyback/Rebuild in progress
Solid on	Solid on	Off		Drive selected but not in use
Blinking	Solid on	Off		Drive selected and in use
Off	Solid on	Off		Drive is selected but fails
Any status	Off	Solid on		Drive fails

2. NVMe Drive LEDs

Figure 5-22 NVMe Drive LEDs

When the VMD function is enabled and the latest VMD driver is installed, the NVMe drives support RAID.

Table 5-12 NVMe Drive LED Description

Activity LED (①)	Locator/Error LED (②)		Description
Green	Blue	Red	
Off	Off	Off	Drive absent
Solid on	Off	Off	Drive present but not in use
Blinking	Off	Off	Drive present and in use
Blinking	Solid pink		Copyback/Rebuild/Initializing/ Verifying in progress
Solid on	Solid on	Off	Drive selected but not in use
Blinking	Solid on	Off	Drive selected and in use

Activity LED (①)	Locator/Error LED (②)		Description
Green	Blue	Red	
Off	Solid on	Off	Drive is selected but fails
Any status	Off	Solid on	Drive fails

5.5.4 RAID Cards

The RAID card provides functions such as RAID configuration, RAID level migration, and drive roaming. For specific RAID card options, consult your local sales representative or refer to 7.2 Hardware Compatibility.

5.6 Network

NICs provide network expansion capabilities.

- The server supports one Single-Host OCP 3.0 card directly connected to the motherboard and one Socket-Direct OCP 3.0 card (connector width 4 x4) or Single-Host OCP 3.0 card expanded through an OCP adapter. Users can select the OCP 3.0 cards as needed.
- The PCIe expansion slots support PCIe NICs. Users can select the PCIe cards as needed.
- For specific NIC options, consult your local sales representative or refer to 7.2 Hardware Compatibility.

NOTE

There is a limit on the Smart NICs for the quad-CPU configuration. The bus quantity of the Mellanox BlueField-2 cannot be greater than 16, otherwise, it will cause system downtime.

5.7 I/O Expansion

5.7.1 PCIe Cards

PCIe cards provide system expansion capabilities.

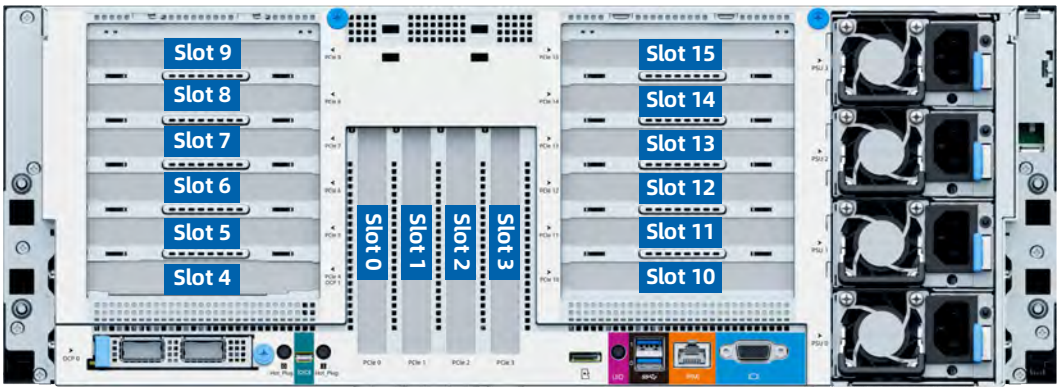
- The server supports up to 16 PCIe expansion slots and 1 OCP 3.0 slot.
- For specific PCIe card options, consult your local sales representative or refer to 7.2 Hardware Compatibility.

- The OpROM resources in Legacy mode is limited. Consult your local sales representative for details.

5.7.2 PCIe Slots

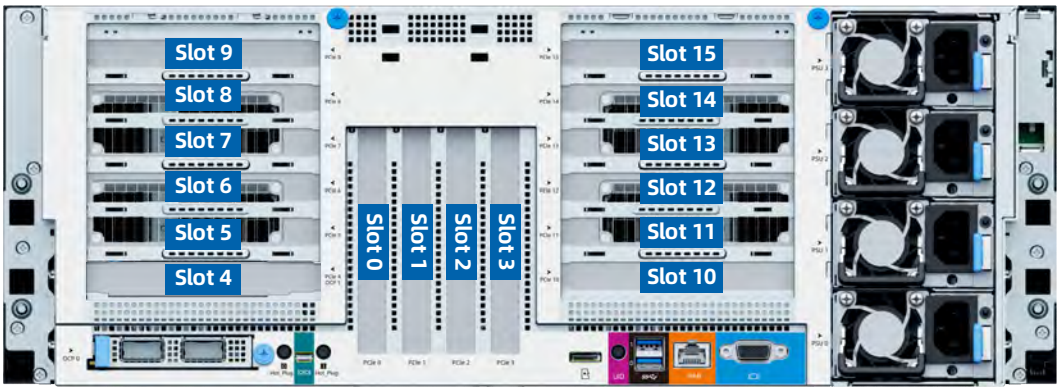
1. PCIe Slot Locations

Figure 5-23 PCIe Slots - General Configuration



- Slot 4, slot 5, slot 6, slot 7, slot 8 and slot 9 reside in PCIe riser module 0.
- Slot 10, slot 11, slot 12, slot 13 and slot 14 reside in PCIe riser module 1.
- Slot 0, slot 1, slot 2 and slot 3 reside on the motherboard.

Figure 5-24 PCIe Slots - GPU Configuration



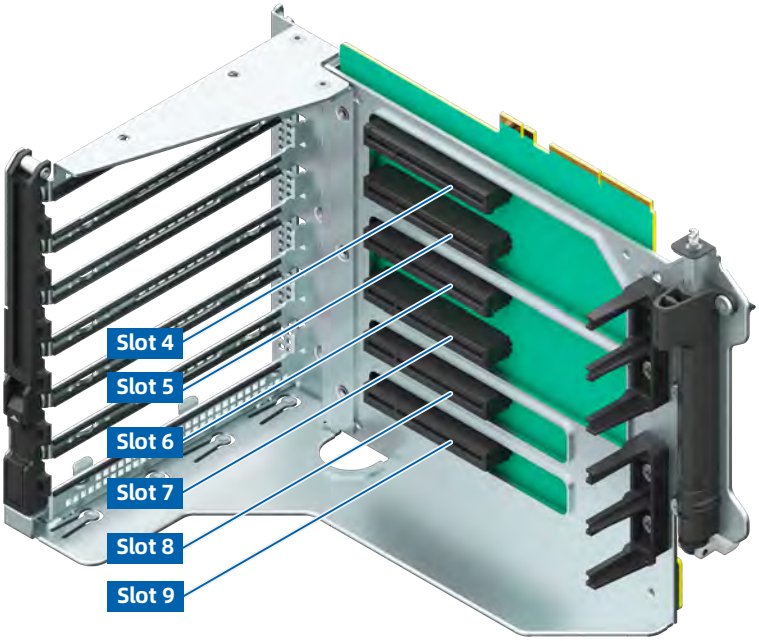
- Slot 4, slot 5, slot 6, slot 7, slot 8 and slot 9 reside in PCIe riser module 2. Dual-slot GPUs can be installed into slot 5 and slot 7 only, while single-slot GPUs can be installed into slot 4, slot 5, slot 7 and slot 9.
- Slot 10, slot 11, slot 12, slot 13, slot 14 and slot 15 reside in PCIe riser module 3. Dual-slot GPUs can be installed into slot 12 and slot 14 only, while single-slot GPUs can be installed into slot 10, slot 12, slot 14 and slot 15.

- Slot 0, slot 1, slot 2, and slot 3 reside on the motherboard, supporting FHHL single-slot GPUs.

2. PCIe Riser Modules

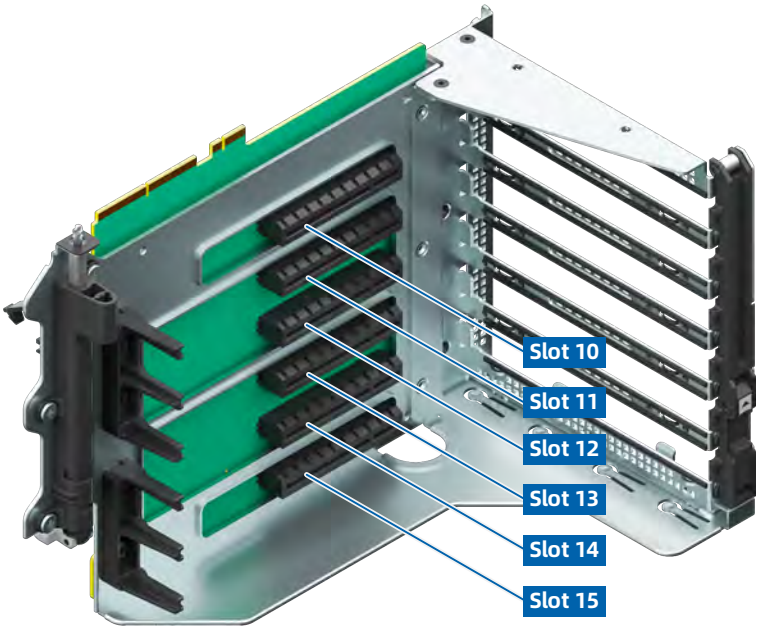
- PCIe Riser Module 0

Figure 5-25 PCIe Riser Module 0 (6 x8)



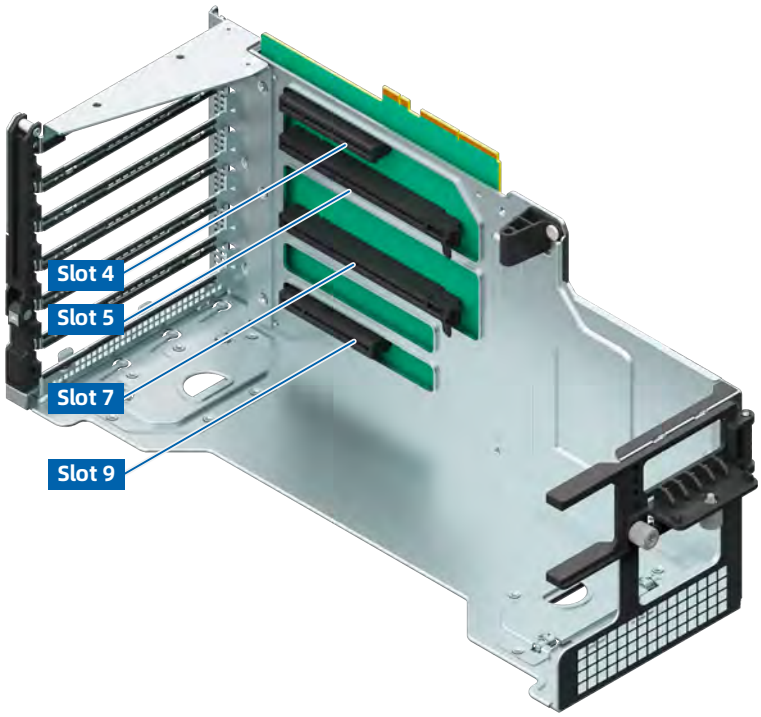
- PCIe Riser Module 1

Figure 5-26 PCIe Riser Module 1 (6 x8)



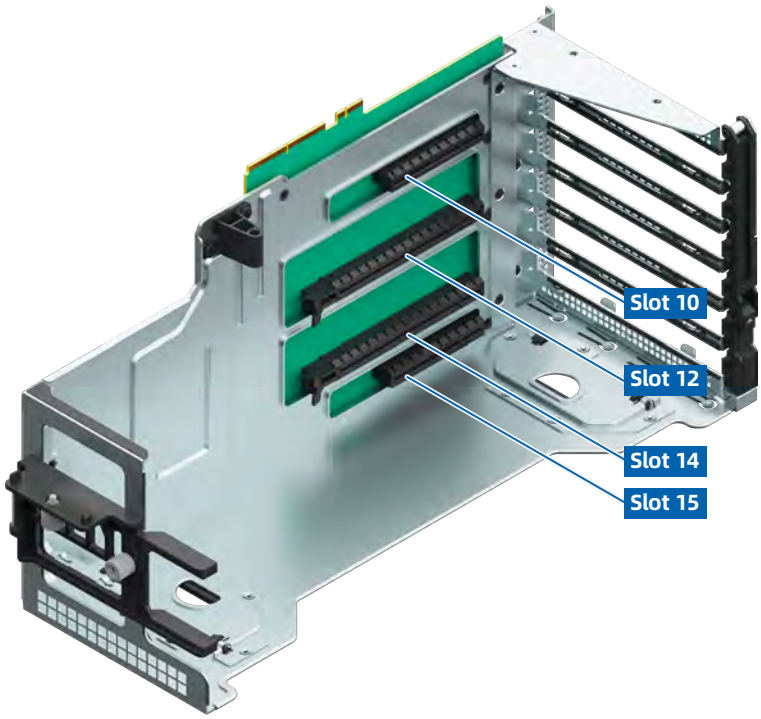
- PCIe Riser Module 2

Figure 5-27 PCIe Riser Module 2 - GPU (2 x16 + 2 x8)



- PCIe Riser Module 3

Figure 5-28 PCIe Riser Module 3 - GPU (2 x16 + 2 x8)



5.7.3 PCIe Slot Description

NOTE

When CPU2 and CPU3 are absent, their corresponding PCIe slots are not available.

- Configurations with Rear PCIe Riser Modules

Table 5-13 PCIe Slot Description

PCIe Slot	Owner	PCIe Standard	Connector Width	Bus Width	Port No.	Riser/ Onboard	Form Factor
Slot 0	CPU0	PCIe 5.0	x16	x16	CPU0_PE3	Onboard	FHHL
Slot 1	CPU3	PCIe 4.0	x16	x16	CPU3_PE4	Onboard	FHHL
Slot 2	CPU1	PCIe 5.0	x16	x16	CPU1_PE4	Onboard	FHHL
Slot 3	CPU1	PCIe 5.0	x16	x16	CPU1_PE2	Onboard	FHHL
Slot 4	CPU0	PCIe 5.0	x8	x8	CPU0_PE1	L_6 x8	FHHL
	CPU0	PCIe 5.0	x8	x8	CPU0_PE2	L_2 x16 + 2 x8	FHHL
Slot 5	CPU0	PCIe 5.0	x8	x8	CPU0_PE1	L_6 x8	FHHL
	CPU0	PCIe 5.0	x16	x16	CPU1_PE0	L_2 x16 + 2 x8	FHHL
Slot 6	CPU0	PCIe 5.0	x8	x8	CPU0_PE2	L_6 x8	FHHL
	-	-	-	-	-	L_2 x16 + 2 x8	FHHL
Slot 7	CPU0	PCIe 5.0	x8	x8	CPU0_PE2	L_6 x8	FHHL
	CPU3	PCIe 5.0	x16	x16	CPU3_PE2	L_2 x16 + 2 x8	FHHL
Slot 8	CPU3	PCIe 4.0	x8	x8	CPU3_PE2	L_6 x8	FHHL
	-	-	-	-	-	L_2 x16 + 2 x8	FHHL
Slot 9	CPU3	PCIe 4.0	x8	x8	CPU3_PE2	L_6 x8	FHHL

PCIe Slot	Owner	PCIe Standard	Connector Width	Bus Width	Port No.	Riser/ Onboard	Form Factor
	CPU0	PCIe 5.0	x8	x8	CPU0_PE2	L_2 x16 + 2 x8	FHHL
Slot 10	CPU1	PCIe 5.0	x8	x8	CPU1_PE0	R_6 x8	FHHL
	CPU2	PCIe 4.0	x8	x8	CPU2_PE0	R_2 x16 + 2 x8	FHHL
Slot 11	CPU1	PCIe 5.0	x8	x8	CPU1_PE0	R_6 x8	FHHL
	-	-	-	-	-	R_2 x16 + 2 x8	FHHL
Slot 12	CPU1	PCIe 5.0	x8	x8	CPU1_PE1	R_6 x8	FHHL
	CPU1	PCIe 5.0	x16	x16	CPU1_PE0	R_2 x16 + 2 x8	FHHL
Slot 13	CPU1	PCIe 5.0	x8	x8	CPU1_PE1	R_6 x8	FHHL
	-	-	-	-	-	R_2 x16 + 2 x8	FHHL
Slot 14	CPU2	PCIe 4.0	x8	x8	CPU2_PE0	R_6 x8	FHHL
	CPU0	PCIe 5.0	x16	x16	CPU0_PE1	R_2 x16 + 2 x8	FHHL
Slot 15	CPU2	PCIe 4.0	x8	x8	CPU2_PE0	R_6 x8	FHHL
	CPU2	PCIe 4.0	x8	x8	CPU2_PE0	R_2 x16 + 2 x8	FHHL
OCP 3.0 Slot 1	CPU1	PCIe 5.0	x16	x16	CPU1_PE1	OCP adapter	SFF OCP 3.0
	CPU0 CPU1 CPU2 CPU3	PCIe 4.0	x4 x4 x4 x4	x16	CPU0_PE4 CPU1_PE3 CPU2_PE3 CPU3_PE3	OCP adapter	SFF OCP 3.0
OCP 3.0 Slot 0	CPU0	PCIe 5.0	x16	x16	CPU0_PE0	Onboard	SFF OCP 3.0

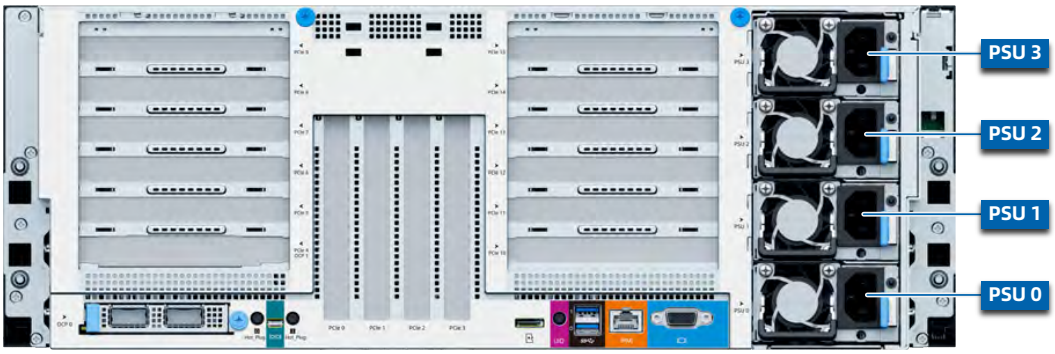
NOTE

There is a limit on the Smart NICs for the quad-CPU configuration. The bus quantity of the Mellanox BlueField-2 cannot be greater than 16, otherwise, it will cause system downtime.

5.8 PSUs

- The server supports 2 or 4 PSUs.
- The server supports AC or DC power input.
- The PSUs are hot-swappable.
- The server supports 4 PSUs in 2+2 redundancy.
- The server must use PSUs with the same part number (P/N code).

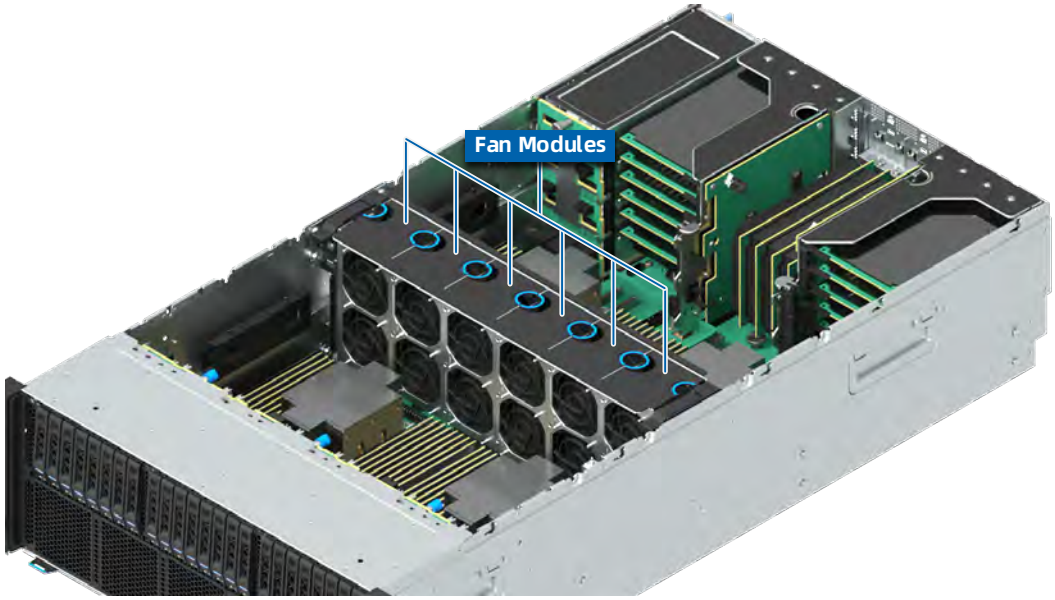
Figure 5-29 PSU Locations



5.9 Fans

- The server supports 12 fan modules. Users can select 6038 fans, and standard/high-performance 6056 fans based on the configuration.
- The fans are hot-swappable.
- The server supports fans in N+1 redundancy, which means that the server can continue working properly when a single fan fails.
- The server supports intelligent fan speed control.
- The server must use fans with the same part number (P/N code).

Figure 5-30 Fan Module Locations



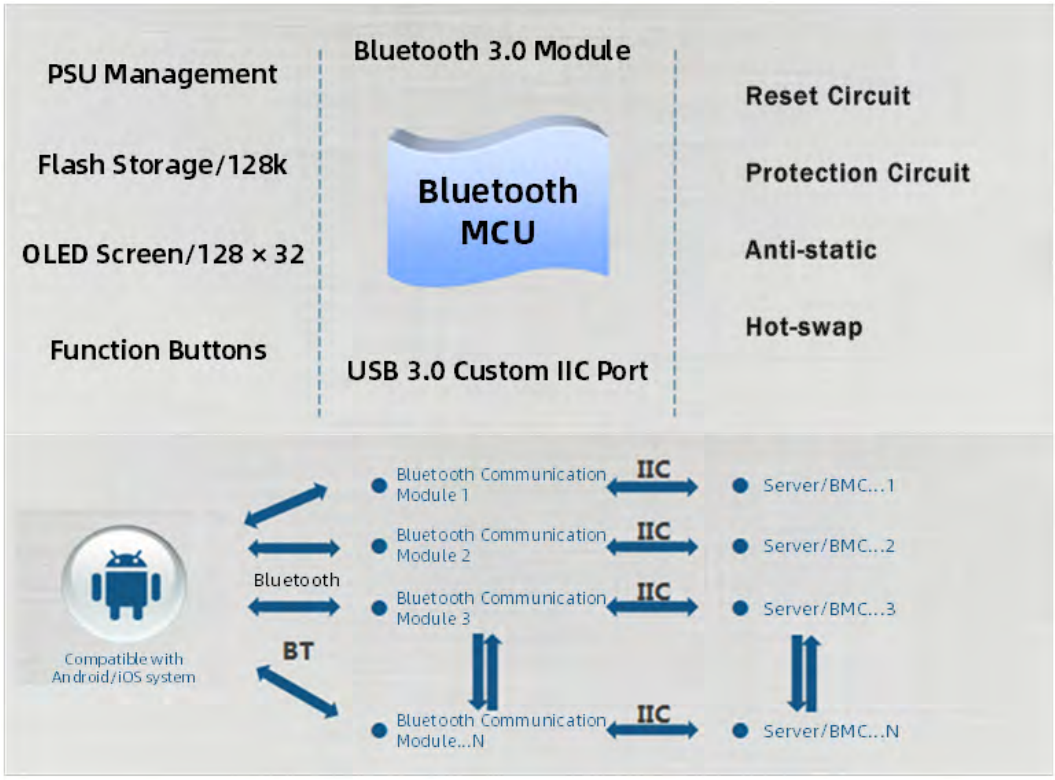
5.10 LCD Module

5.10.1 Function

The LCD module reads server-related information from the BMC, such as the operating status of processors and memories, network status, logs, and alerts, and transmits the information to client mobile terminals via Bluetooth.

The LCD module synchronizes information with the BMC through I^2C and can display information on an LCD screen or in the app. The server's basic information, system status and alert diagnosis can be displayed in the app via Bluetooth, facilitating the operation and maintenance.

Figure 5-31 How LCD Subsystem Works



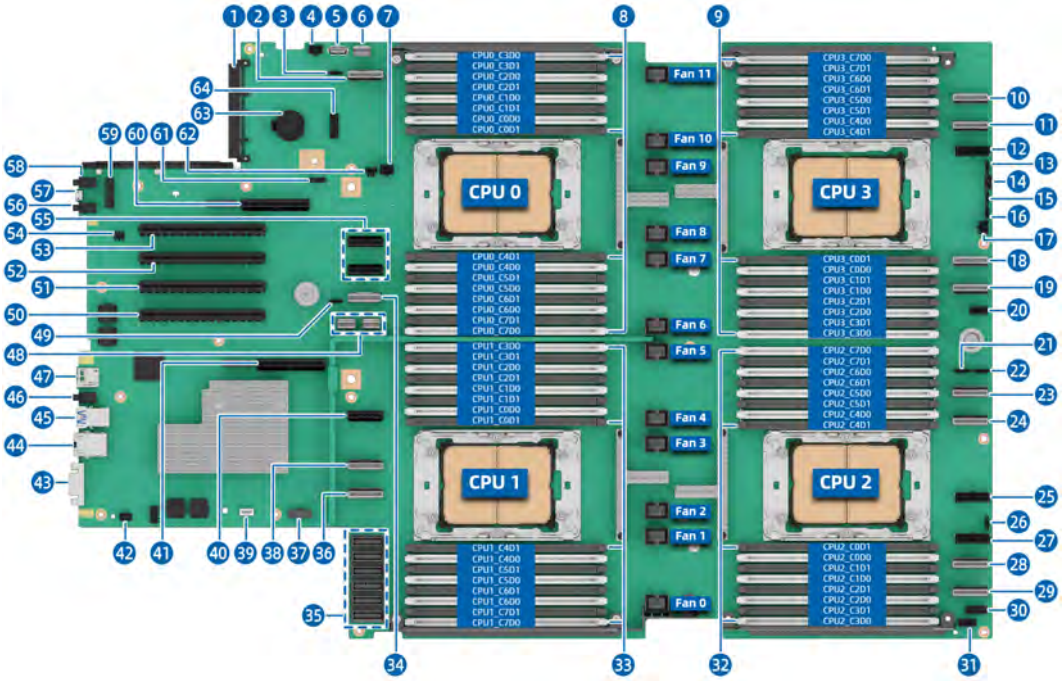
5.10.2 Interface

Figure 5-32 App Home Screen

5.11 Boards

5.11.1 Motherboard

Figure 5-33 Motherboard Layout



Item	Feature	Item	Feature
1	OCP 3.0 Connector	2	MCIO Connector (MCIO_CPU0_PE4_A_CPU3_PE3_A)
3	Drive Backplane I²C Connector 3	4	OCP 3.0 Adapter MISC Connector
5	USB 2.0 Port	6	Right Control Panel Signal Connector
7	OCP 3.0 Adapter Power Connector	8	DIMM Slots (CPU0)
9	DIMM Slots (CPU3)	10	MCIO Connector (MCIO_CPU3_PE2_EG)
11	MCIO Connector (MCIO_CPU3_PE2_AC)	12	Drive Backplane Power Connector
13	Front Panel Temperature Sensor Connector	14	Intrusion Switch Connector
15	Drive Backplane I²C Connector 2	16	Drive Backplane I²C Connector 1
17	Rear Drive Backplane Power Connector	18	MCIO Connector (MCIO_CPU3_PE0_EG)

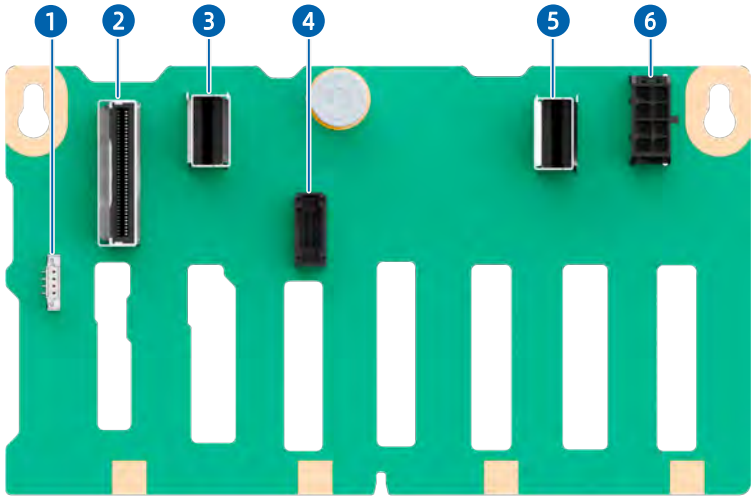
Item	Feature	Item	Feature
19	MCIO Connector (MCIO_CPU3_PE0_AC)	20	CPU2_CPU3_VPP Connector
21	Front Right Riser MISC Connector	22	Front Left Riser MISC Connector
23	MCIO Connector (MCIO_CPU2_PE2_EG)	24	MCIO Connector (MCIO_CPU2_PE2_AC)
25	Drive Backplane Power Connector	26	Drive Backplane I^2C Connector 0
27	Drive Backplane Power Connector	28	MCIO Connector (MCIO_CPU2_PE0_EG)
29	MCIO Connector (MCIO_CPU2_PE0_AC)	30	Left Control Panel Signal Connector
31	CPU0_CPU1_VPP Connector	32	DIMM Slots (CPU2)
33	DIMM Slots (CPU1)	34	M.2 Adapter Connector
35	Power Board Connector	36	MCIO Connector (MCIO_CPU1_PE1_EG)
37	Power Board MISC Connector	38	MCIO Connector (MCIO_CPU1_PE1_AC)
39	TPM/TCM Connector	40	MCIO Connector (MCIO_CPU1_PE3_G_CPU2_PE3_A)
41	PCIe_Riser1 Slot	42	Front Panel USB Type-C Port Connector
43	VGA Port	44	BMC Management Network Port
45	USB 3.0 Port × 2	46	UID/BMC RST Button and LED
47	BMC TF Card Slot	48	SLIM_SATA Connector × 2
49	Smart NIC UART Connector	50	PCIe3_CPU1 Slot
51	PCIe2_CPU1 Slot	52	PCIe1_CPU3 Slot
53	PCIe0_CPU0 Slot	54	CMOS Jumper
55	MCIO Connector × 2 (MCIO_CPU0_PE2)	56	OCP 3.0 Card 1 Hot-Plug Button and LED
57	System/BMC Serial Port	58	OCP 3.0 Card 0 Hot-Plug Button and LED
59	System TF Card Adapter Connector	60	PCIe_Riser0 Slot
61	RAID Key Connector	62	M.2 Adapter Power Connector
63	Button Cell Battery Socket	64	NC-SI Connector

5.11.2 Drive Backplanes

1. Front Drive Backplanes

- 8 × 2.5-Inch Drive Backplane (8 × SAS/SATA)

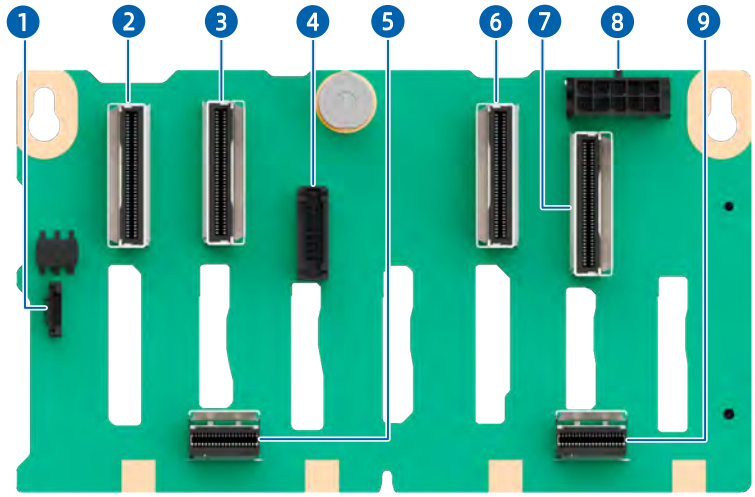
Figure 5-34 8 × 2.5-Inch Drive Backplane



Item	Feature	Item	Feature
1	BMC I²C Connector	2	MCIO x8 Connector
3	Slimline x4 Connector	4	VPP Connector
5	Slimline x4 Connector	6	Power Connector

- 8 × 2.5-Inch Gen5 Drive Backplane (8 × SAS/SATA/NVMe)

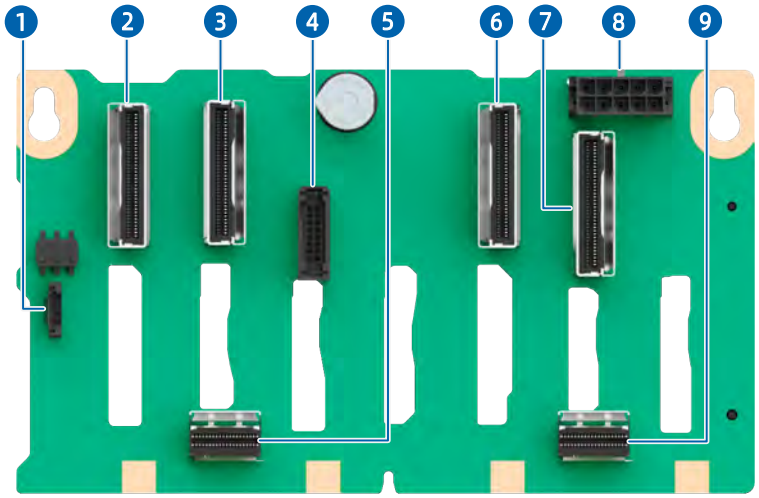
Figure 5-35 8 × 2.5-Inch Gen5 Drive Backplane



Item	Feature	Item	Feature
1	BMC I²C Connector	2	MCIO x8 Connector
3	MCIO x8 Connector	4	VPP Connector
5	Slimline x4 Connector	6	MCIO x8 Connector
7	MCIO x8 Connector	8	Power Connector
9	Slimline x4 Connector	-	-

- 8 × 2.5-Inch Gen4 Drive Backplane (8 × SAS/SATA/NVMe)

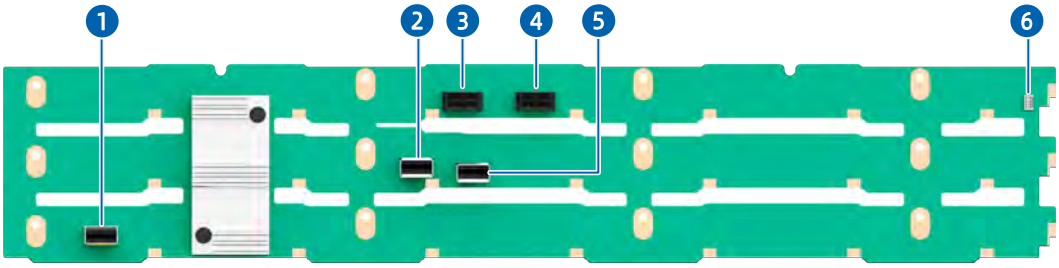
Figure 5-36 8 × 2.5-Inch Gen4 Drive Backplane



Item	Feature	Item	Feature
1	BMC I²C Connector	2	MCIO x8 Connector
3	MCIO x8 Connector	4	VPP Connector
5	Slimline x4 Connector	6	MCIO x8 Connector
7	MCIO x8 Connector	8	Power Connector
9	Slimline x4 Connector	-	-

- 12 × 3.5-Inch Drive Backplane (12 × SAS/SATA)

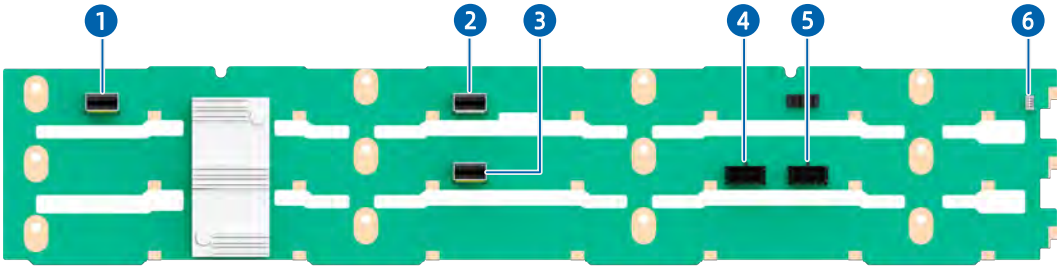
Figure 5-37 12 × 3.5-Inch Drive Backplane



Item	Feature	Item	Feature
1	Slimline x4 Connector	2	Slimline x4 Connector
3	Power Connector	4	Power Connector
5	Slimline x4 Connector	6	BMC I^2C Connector

- 12 × 3.5-Inch Drive Backplane (12 × SAS/SATA)

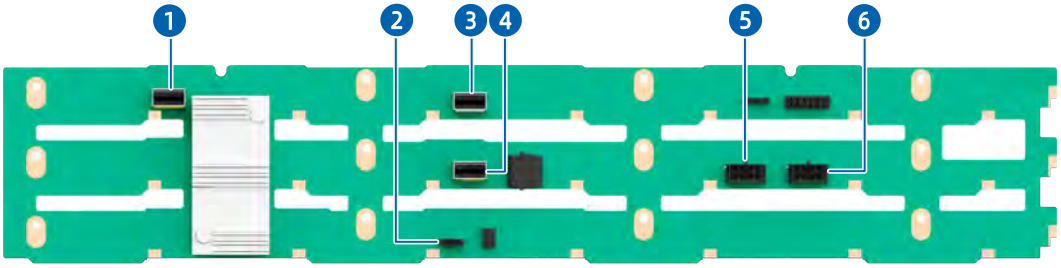
Figure 5-38 12 × 3.5-Inch Drive Backplane



Item	Feature	Item	Feature
1	Slimline x4 Connector	2	Slimline x4 Connector
3	Slimline x4 Connector	4	Power Connector
5	Power Connector	6	BMC I^2C Connector

- 12 × 3.5-Inch Drive Backplane (12 × SAS/SATA)

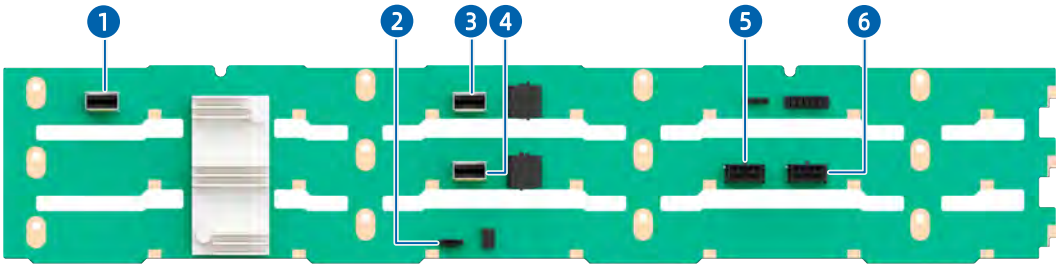
Figure 5-39 12 × 3.5-Inch Drive Backplane



Item	Feature	Item	Feature
1	Slimline x4 Connector	2	BMC I²C Connector
3	Slimline x4 Connector	4	Slimline x4 Connector
5	Power Connector	6	Power Connector

- 12 × 3.5-Inch Drive Backplane (12 × SAS/SATA)

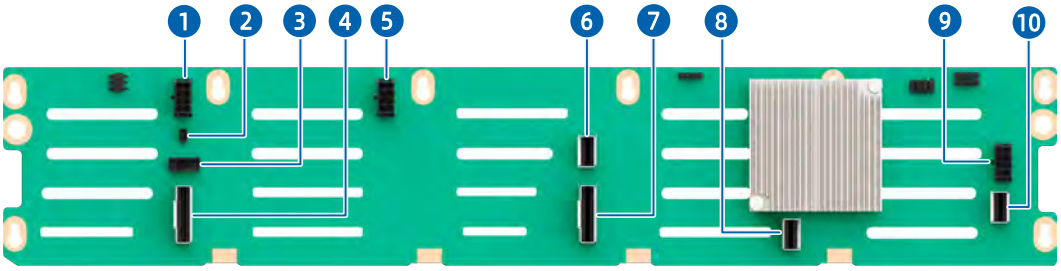
Figure 5-40 12 × 3.5-Inch Drive Backplane



Item	Feature	Item	Feature
1	Slimline x4 Connector	2	BMC I²C Connector
3	Slimline x4 Connector	4	Slimline x4 Connector
5	Power Connector	6	Power Connector

- 25 × 2.5-Inch Drive Backplane (21 × SAS/SATA + 4 × SAS/SATA/NVMe)

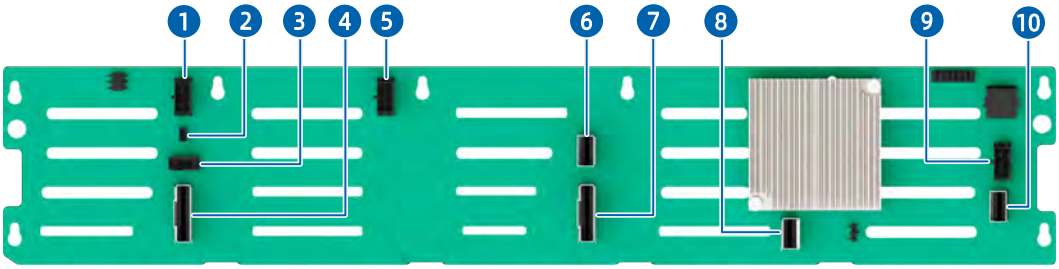
Figure 5-41 25 × 2.5-Inch Drive Backplane



Item	Feature	Item	Feature
1	Power Connector	2	BMC I²C Connector
3	VPP Connector	4	Slimline x8 Connector
5	Power Connector	6	Slimline x4 Connector
7	Slimline x8 Connector	8	Slimline x4 Connector
9	Power Connector	10	Slimline x4 Connector

- 25 × 2.5-Inch Drive Backplane (21 × SAS/SATA + 4 × SAS/SATA/NVMe)

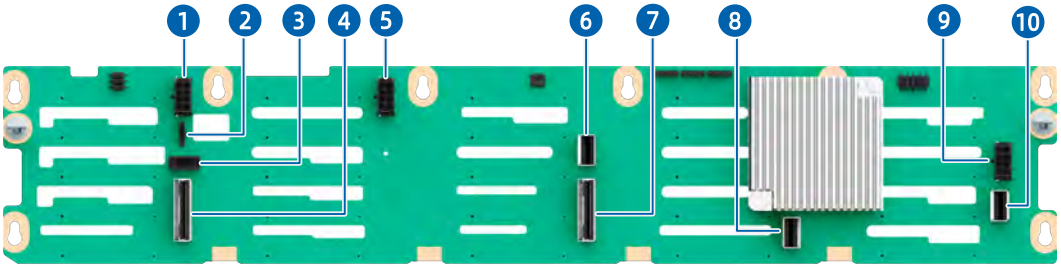
Figure 5-42 25 × 2.5-Inch Drive Backplane



Item	Feature	Item	Feature
1	Power Connector	2	BMC I²C Connector
3	VPP Connector	4	Slimline x8 Connector
5	Power Connector	6	Slimline x4 Connector
7	Slimline x8 Connector	8	Slimline x4 Connector
9	Power Connector	10	Slimline x4 Connector

- 25 × 2.5-Inch Drive Backplane (21 × SAS/SATA + 4 × SAS/SATA/NVMe)

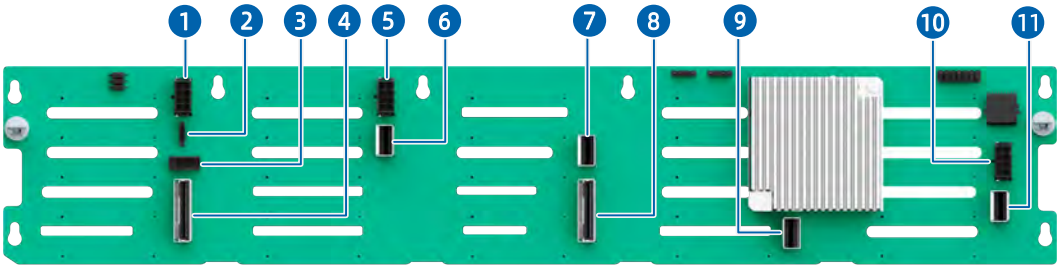
Figure 5-43 25 × 2.5-Inch Drive Backplane



Item	Feature	Item	Feature
1	Power Connector	2	BMC I²C Connector
3	VPP Connector	4	MCIO x8 Connector
5	Power Connector	6	Slimline x4 Connector
7	MCIO x8 Connector	8	Slimline x4 Connector
9	Power Connector	10	Slimline x4 Connector

- 25 × 2.5-Inch Drive Backplane (21 × SAS/SATA + 4 × SAS/SATA/NVMe)

Figure 5-44 25 × 2.5-Inch Drive Backplane

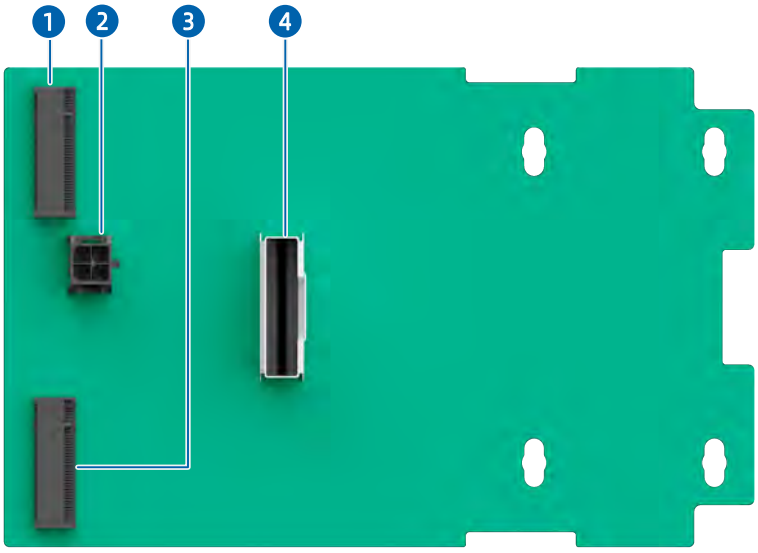


Item	Feature	Item	Feature
1	Power Connector	2	BMC I^2C Connector
3	VPP Connector	4	MCIO x8 Connector
5	Power Connector	6	Slimline x4 Connector
7	Slimline x4 Connector	8	MCIO x8 Connector
9	Slimline x4 Connector	10	Power Connector
11	Slimline x4 Connector	-	-

2. Internal Drive Backplane

- M.2 Adapter (2 × SATA/NVMe)

Figure 5-45 M.2 Adapter



Item	Feature	Item	Feature
1	M.2 SSD Connector 0	2	Power Connector
3	M.2 SSD Connector 1	4	Slimline x8 Connector

6 Product Specifications

6.1 Technical Specifications

Table 6-1 Technical Specifications

Item	Description
Form Factor	4U rack server
Chipset	Intel C741
Processor	• Supports two or four 4th Gen Intel Xeon Scalable processors (Sapphire Rapids). • Integrated memory controllers and 8 memory channels per processor • Integrated PCIe controllers and 80 PCIe 5.0 lanes per processor • 3 UPI links per CPU at up to 16 GT/s • Up to 60 cores with a base frequency of 1.9 GHz • Maximum Turbo frequency of 4.1 GHz (8 cores) • Minimum L3 cache per core of 1.875 MB • TDP up to 350 W Note: The information above is for reference only. See 7.2 Hardware Compatibility for details.
Memory	Provides 64 DIMM slots. • Up to 64 DDR5 DIMMs • RDIMMs supported • Up to 4,800 MT/s • A server must use DDR5 DIMMs with the same part number (P/N code). Notes: • Limited by the memory speed supported by SPR CPUs, the maximum memory speed of a DIMM rated at 5,600 MT/s is reduced to 4,800 MT/s when used with SPR CPUs. • The information above is for reference only. See 7.2 Hardware Compatibility for details.

Item	Description
Storage	Supports multiple drive configurations, see 5.5.1 Drive Configurations for details. • Supports 2 PCIe 3.0 x2/SATA 3.0 M.2 SSDs. - The M.2 SSDs support RAID configuration. - When the server is configured with an M.2 adapter, the M.2 SSDs support VROC (SATA/PCIe RAID) configuration. Notes: • It is recommended that the M.2 SSD be only used as a boot device for installing the OS. • The M.2 SSD has low endurance and cannot be used as a data storage device, especially in scenarios with frequent data erasing and re-writing. The reason is that write limits can be reached within a short period of time, which will result in damage and unavailability. • For data storage, use enterprise-class HDDs or SSDs with higher DWPD. • Write-intensive business software will cause the M.2 SSD to reach write endurance and wear out; therefore, the M.2 SSD is not recommended for such business scenarios. • Do not use the M.2 SSD as caching. • Supports hot-swap SAS/SATA/NVMe drives. - Up to 24 × 2.5-inch SAS/SATA/NVMe drive or - Up to 21 × 2.5-inch SAS/SATA drive + 4 × 2.5-inch SAS/SATA/NVMe drive or - Up to 12 × 3.5-inch SAS/SATA drive + 8 × 2.5-inch SAS/SATA/NVMe drive or - Up to 50 × 2.5-inch SAS/SATA drive Notes: When the server is configured with NVMe drives: • When the VMD function is enabled and the latest VMD driver is installed, the NVMe drive supports RAID. • Supports multiple models of RAID cards. See 7.2 Hardware Compatibility for details.
Network	Supports multiple network expansion configurations. • OCP 3.0 cards - One hot-plug Single-Host OCP 3.0 card supported by the motherboard.

Item	Description
	- One non-hot plug Socket-Direct OCP 3.0 card (connector width 4 x4) or one hot-plug Single-Host OCP 3.0 card expanded through an OCP adapter. • PCIe NICs
I/O Expansion	Supports PCIe expansion slots. • Supports up to 16 PCIe expansion slots and 1 OCP 3.0 slot. Note: Refer to 5.7.2 PCIe Slots and 5.7.3 PCIe Slot Description for details.
Port	Supports multiple ports. • Front: - 1 × USB 2.0/LCD port - 1 × USB 3.0 port - 1 × VGA port - 1 × USB Type-C port • Rear: - 2 × USB 3.0 port - 1 × VGA port - 1 × system/BMC serial port - 1 × RJ45 management network port • Motherboard: - 1 × USB 2.0 port - 1 × USB 3.0 port, supported by a USB module Note: OS installation on the USB storage media is not recommended.
Display	Integrated VGA with a video memory of 64 MB and a maximum 16M color resolution of 1,920 × 1,200 at 60 Hz. Notes: • The integrated VGA can support a maximum resolution of 1,920 × 1,200 only when the video driver matching the OS version is installed; otherwise, only the default resolution of the OS is supported. • When the front and rear VGA ports are both connected to monitors, only the monitor connected to the front VGA port works.

Item	Description
System Management	• UEFI • BMC • NC-SI • KSManage • KSManage Tools
Security	• Intel Platform Firmware Resilience (PFR) • Trusted Platform Module (TPM) and Trusted Cryptography Module (TCM) • Intel Trusted Execution Technology • Firmware update mechanism based on digital signatures • UEFI Secure Boot • Hierarchical BIOS password protection • BIOS Secure Flash and BIOS Lock Enable (BLE) • BMC and BIOS dual-image mechanism • Chassis intrusion detection

6.2 Environmental Specifications

Table 6-2 Environmental Specifications

Item	Description
Temperature[1,2,3]	• Operating: 5°C to 45°C (41°F to 113°F) (Compliant with ASHRAE Class A1/A2/A3/A4) • Storage (packed): -40°C to 70°C (-40°F to 158°F) • Storage (unpacked): -40°C to 70°C (-40°F to 158°F)
Relative Humidity (RH, non-condensing)	• Operating: 5% to 90% RH • Storage (packed): 5% to 95% RH • Storage (unpacked): 5% to 95% RH

Item	Description
Operating Altitude	≤3,050 m (10,007 ft)
Corrosive Gaseous Contaminants	Maximum growth rate of corrosion film thickness: • Copper coupon: 300 Å/month (compliant with the gaseous corrosivity level of G1 defined in ANSI/ISA-71.04-2013) • Silver coupon: 200 Å/month (compliant with the gaseous corrosivity level of G1 defined in ANSI/ISA-71.04-2013)
Acoustic Noise[4,5,6,7]	Noise emissions are measured in accordance with ISO 7779 (ECMA 74). Listed is the declared A-weighted sound power level (LWAd) at a server operating temperature of 25°C (77°F): • LWAd: 8.1 B

Notes:

1. Not all configurations support an operating temperature range of 5°C to 45°C (41°F to 113°F).
2. Standard operating temperature:
   - 10°C to 35°C (50°F to 95°F) is the standard operating temperature range at sea level. At the altitude of 0 to 3,050 m (0 to 10,007 ft), derate the maximum allowable temperature by 1°C per 305 m (1°F per 556 ft). The maximum temperature gradient is 20°C/h (36°F/h), varying with server configuration.
   - Any fan failure or operations above 30°C (86°F) may lead to system performance degradation.
3. Expanded operating temperature:
   - For some configurations, the supported system inlet ambient temperature can be expanded to 5°C to 10°C (41°F to 50°F) and 35°C to 40°C (95°F to 104°F) at sea level. At an altitude of 0 to 950 m (0 to 3,117 ft), derate the maximum allowable operating temperature by 1°C per 305 m (1°F per 556 ft). At an altitude of 950 to 3,050 m (3,117 to 10,007 ft), derate the maximum allowable operating temperature by 1°C per 175 m (1°F per 319 ft).
   - For some configurations, the supported system inlet ambient temperature can be expanded to 40°C to 45°C (104°F to 113°F) at sea level. At an altitude

of 0 to 950 m (0 to 3,117 ft), derate the maximum allowable operating temperature by 1°C per 305 m (1°F per 556 ft). At an altitude of 950 to 3,050 m (3,117 to 10,007 ft), derate the maximum allowable operating temperature by 1°C per 125 m (1°F per 228 ft).

- Any fan failure or operations under expanded operating temperature may lead to system performance degradation.

4. Servers are usually used in data centers, in which the sound power level is limited to 75 - 80 dBA for a rack-scale server and 8.4 B for a rack-mounted server. Based on this noise requirement, the noise perceived by the human ear of rack-mounted servers are divided into 4 levels, A, B, C, and F according to different server sizes (server heights in rack units). The specific sound power levels are shown in the following table.

Table 6-3 Rack-Mounted Server Sound Power Levels - LWAd (Unit: B)

U	Power-on & Start-up Phase	A		B		C		F
		Idle	Working	Idle	Working	Idle	Working	\
1	7.3	5.4	5.9	5.9	6.4	6.4	6.9	7.5
2	7.6	5.7	6.2	6.2	6.7	6.7	7.2	7.8
3	7.8	5.9	6.4	6.4	6.9	6.9	7.4	8.0
4	7.9	6.0	6.5	6.5	7.0	7.0	7.5	8.1

5. This document lists the LWAd of the product at a 25°C (77°F) ambient environment. All measurements are conducted in conformance with ISO 7779 (ECMA 74). The listed sound levels apply to the standard configuration. Additional options may result in increased sound levels. Contact your sales representative for more information.

6. The sound levels shown here were measured based on specific configurations of a server. Sound levels vary with server configuration. These values are for reference only and subject to change without further notice.

7. Product conformance to cited normative standards is based on sample testing, evaluation, or assessment. This product or family of products is eligible to bear the appropriate compliance logos and statements.

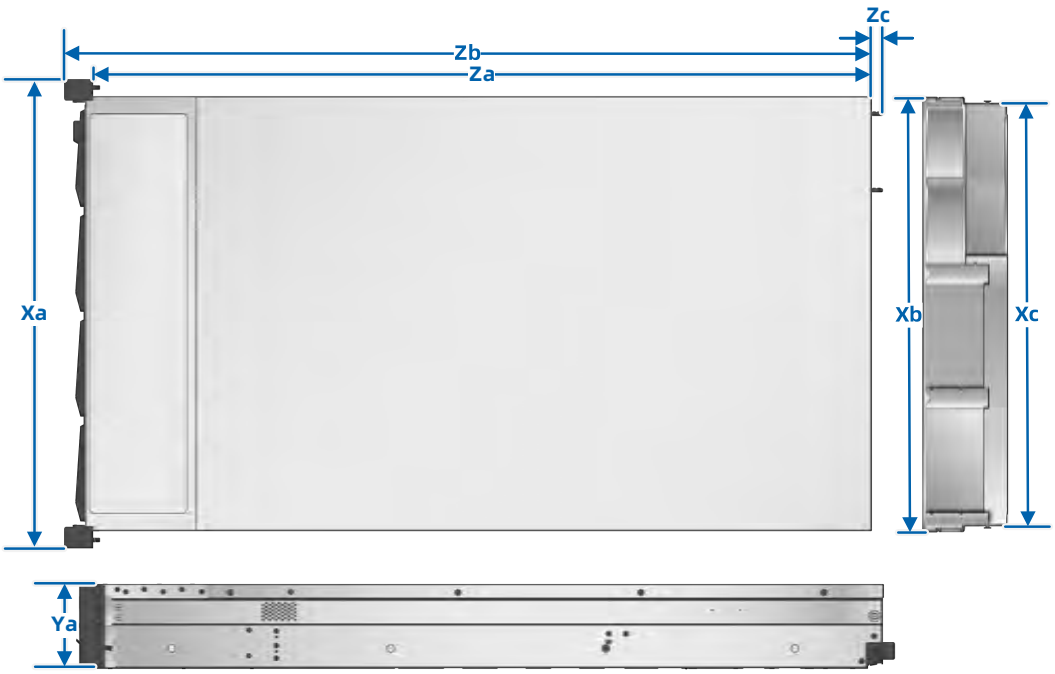
6.3 Physical Specifications

Table 6-4 Physical Specifications

Item	Description
Outer Packaging Dimensions (L × W × H)	1,100 × 625 × 475 mm (43.31 × 24.61 × 18.70 in.) (with the pallet)
Installation Dimension Requirements	• Installation requirements for the cabinet are as follows: - General cabinet compliant with the International Electrotechnical Commission 297 (IEC 297) standard - Width: 482.6 mm (19 in.) - Depth: Above 1,000 mm (39.37 in.) • Installation requirements for the server rails are as follows: - L-bracket rails: applicable to our cabinets only - Static rail kit: The distance between the mounting flanges at the front and rear of the cabinet ranges from 609 to 914 mm (23.98 to 35.98 in.) - Ball-bearing rail kit: The distance between the mounting flanges at the front and rear of the cabinet ranges from 609 to 914 mm (23.98 to 35.98 in.)
Weight	• 24 × 2.5-inch drive configuration: - Net weight: 47.7 kg (105.16 lbs) - Gross weight: 67.3 kg (148.37 lbs) (including server, packaging box, rails, accessory box and pallet) • 25 × 2.5-inch drive configuration: - Net weight: 50.4 kg (111.11 lbs) - Gross weight: 70.0 kg (154.32 lbs) (including server, packaging box, rails, accessory box and pallet) • 12 × 3.5-inch + 8 × 2.5-inch drive configuration: - Net weight: 52.4 kg (115.52 lbs)

Item	Description
	- Gross weight: 72.0 kg (158.73 lbs) (including server, packaging box, rails, accessory box and pallet) • 8 × 2.5-inch drive + 4 × dual-slot GPU configuration: - Net weight: 49.5 kg (109.13 lbs) - Gross weight: 69.1 kg (152.34 lbs) (including server, packaging box, rails, accessory box and pallet) Note: The server weight varies by configuration.

Figure 6-1 Chassis Dimensions



Model	Xa	Xb	Xc	Ya	Za	Zb	Zc
KR4480-X2-A0-R0-00	482 mm (18.98 in.)	447 mm (17.60 in.)	435 mm (17.13 in.)	174.5 mm (6.87 in.)	841.8 mm (33.14 in.)	870 mm (34.25 in.)	30 mm (1.18 in.)

7 Operating System and Hardware Compatibility

This section describes the OS and hardware compatibility of the server. For the latest compatibility configuration and the component models not listed in this document, contact your local sales representative.

IMPORTANT

- Using incompatible components may cause the server to work abnormally, and such failures are not covered by technical support or warranty.
- The server performance is strongly influenced by application software, middleware and hardware. The subtle differences in them may lead to performance variation in the application and test software.
  - For requirements on the performance of specific application software, contact your sales representatives to request for a proof of concept (POC) and confirm the detailed hardware and software configurations during the pre-sales phase.
  - For requirements on hardware performance consistency, define specific configuration requirements (for example, specific drive models, RAID cards, or firmware versions) during the pre-sales phase.

7.1 Supported Operating Systems

Table 7-1 Supported Operating Systems

OS Version
Red Hat Enterprise Linux 8.6
Red Hat Enterprise Linux 8.9
Red Hat Enterprise Linux 9.0
Red Hat Enterprise Linux 9.3
Windows Server 2019 Note
Windows Server 2022
SUSE Linux Enterprise Server 15.4
VMware ESXi 7.0 P04
VMware ESXi 8.0
KeyarchOS 5.8sp1
OpenEuler 22.03
Oracle Linux 8.9

Note: Before installing the OS, enter the BIOS to select **Socket Configuration** > **Uncore Configuration** > **Uncore General Configuration** and set **Limit CPU PA to 46 bits** to **Enabled**.

7.2 Hardware Compatibility

7.2.1 CPU Specifications

The server supports two or four 4th Gen Intel Xeon Scalable processors. The 84XXH and 64XXH series support up to 4,800 MHz.

Table 7-2 CPU Specifications

Model	Cores	Threads	Base Frequency (GHz)	Max. Turbo Frequency (GHz)	Cache (MB)	TDP (W)
8490H	60	120	1.9	2.9	112.5	350
8468H	48	96	2.1	3.0	105	330
8460H	40	80	2.2	3.1	105	330
8454H	32	64	2.1	2.7	82.5	270
8450H	28	56	2.0	2.6	75	250
8444H	16	32	2.9	3.2	45	270
6448H	32	64	2.4	3.2	60	250
6418H	24	48	2.1	2.9	60	185
6416H	18	36	2.2	2.9	45	165
6434H	8	16	3.7	4.1	22.5	195

7.2.2 DIMM Specifications

The server supports up to 64 DDR5 DIMMs. Each processor supports 8 memory channels with up to 2 DIMMs per channel. RDIMMs are supported.

Table 7-3 DIMM Specifications

Type	Capacity (GB)	Frequency (MHz)	Data Width	Organization
RDIMM	16	4,800	x64	1R x8
RDIMM	32	4,800	x64	1R x4/2R x8
RDIMM	64	4,800	x64	2R x4/2R x8
RDIMM	96	4800	x64	2R x4
RDIMM	128	4,800	x64	4R x4 (3DS 2H)

7.2.3 Drive Specifications

Table 7-4 SAS HDD Specifications

Type	Speed in rpm	Capacity	Max. Qty.
2.5-Inch SAS HDD	10k	600 GB/1.2 TB/1.8 TB/2.4 TB	33
2.5-Inch SAS HDD	15k	600 GB/900 GB	33

Table 7-5 SATA SSD Specifications

Type	Capacity	Max. Qty.
SATA SSD	240 GB/480 GB/960 GB/1.92 TB/3.84 TB/ 7.68 TB	33

Table 7-6 U.2 NVMe SSD Specifications

Type	Capacity	Max. Qty.
U.2 NVMe SSD	960 GB	24
U.2 NVMe SSD	1 TB	24
U.2 NVMe SSD	1.6 TB	24
U.2 NVMe SSD	2 TB	24
U.2 NVMe SSD	3.2 TB	24
U.2 NVMe SSD	4 TB	24
U.2 NVMe SSD	6.4 TB	24
U.2 NVMe SSD	7.68 TB	24
U.2 NVMe SSD	8 TB	24

Table 7-7 M.2 SSD Specifications

Type	Capacity	Max. Qty.
M.2 SATA SSD	240 GB	2
M.2 SATA SSD	480 GB	2
M.2 SATA SSD	960 GB	2
M.2 SATA SSD	1.92 TB	2

7.2.4 SAS/RAID Card Specifications

Table 7-8 SAS/RAID Card Specifications

Type	Description
SAS Card	SAS_PM8222_PM8222_8_SAS3_PCIe
	SAS_PM8222_SmartHBA_8_SAS3_PCIe3
	SAS_ZQ_8242_24R0_SAS3_PCIe3_MCTP
	SAS_BRCM_8R0_9500-8i_SMSAS3_PCIe4
	SAS_BRCM_16R0_9500-16i_SMSAS3_PCIe4
RAID Card	RAID_PM8204_RA_8_2GB_SAS3_PCIe3
	RAID_PM8204_RA_8_4GB_SAS3_PCIe3
	RAID_L_8R0_9560-8i_4G_HDM12G_PCIe4
	RAID_L_16R0_9560-16i_8GB_SMSAS3_PCIe4
	RAID_SND_2R0_9230_N_M.2_PCIe2

7.2.5 NIC Specifications

Table 7-9 OCP Card Specifications

Type	Description	Speed (Gbps)	Port Qty.
OCP 3.0 Card	NIC_I_10G_X710DA2_LC_O3x8-G3_2_XR	10	2
	NIC_M_25G_MCX631432AN_LC_O3x8-G4_2_XR	25	2
	NIC_M_100G_MCX623436AN_LC_O3x16-G4_2_XR	100	2
	NIC_BRCM_100G_57508M_LC_O3x16-G4_2_XR	100	2

Table 7-10 PCIe NIC Specifications

Type	Description	Speed (Gbps)	Port Qty.
PCIe NIC	NIC_I_10G_X710DA2_LC_P8-G3_2_XR	10	2
	NIC_I_10G_EX710DA2_LC_P8-G3_2_XR	10	2
	NIC_I_10G_X710T2L_RJ_P8-G3_2_XR_M7	10	2
	NIC_M_25G_MCX631102AN_LC_P8-G4_2_XR	25	2
	NIC_Andes-M6_E810_25G_LC_PCIEx8_2	25	2
	NIC_I_25G_E810XXVDA2_LC_P8-G4_2_XR_M7	25	2
	NIC_M_100G_MCX623106_LC_P16-G4_2_XR	100	2
	NIC_M_200G_MCX623105AN_LC_P16-G4_XR	200	1

7.2.6 HBA/HCA Card Specifications

Table 7-11 HBA Card Specifications

Type	Description
HBA Card	HBA_QL_4R1_QLE2690-ISR-BK_FC16G_PCIe
	HBA_QL_4R2_QLE2692-ISR-BK_FC16G_PCIe
	HBA_QL_8R1_QLE2740_FC32G_PCIe
	HBA_QL_8R2_QLE2742-ISR-BK_FC32G_PCIe
	HBA_E_8R0_LPE31000-M6_FC16G_PCIe
	HBA_E_8R2_LPE31002-M6_FC16G_PCIe
	HBA_E_8R2_LPE32002-AP_FC32G_PCIe
	HBA_E_0R1_LPE32000-AP_FC32G_PCIe

Table 7-12 HCA Card Specifications

Type	Description	Speed (Gbps)	Port Qty.
HCA Card	MCX653105A-ECAT PCIe 3.0/4.0 x16	100	1
	MCX653106A-ECAT PCIe 3.0/4.0 x16	100	2
	MCX653105A-HDAT PCIe 3.0/4.0 x16	200	1
	MCX653106A-HDAT PCIe 3.0/4.0 x16	200	2
	MCX75310AAS-HEAT PCIe 5.0 x16	200	1
	MCX755106AS-HEAT PCIe 5.0 x16	200	2

Type	Description	Speed (Gbps)	Port Qty.
	MCX75310AAS-NEAT PCIe 5.0 x16	400	1

7.2.7 GPU/Graphics Card Specifications

Table 7-13 GPU/Graphics Card Specifications

Type	Description	Max. Qty.
GPU	GPU_NV_48G_A40-PCIe_384b_MP	4
	GPU_NV_24G_NVIDIA-A30-PCIe4_3072b_MP	4
	GPU_NV_16G_A2-PCIe_384b_S	8
Graphics Card	Video_NV_4G_T400_64b_P	2

7.2.8 PSU Specifications

The server supports up to 4 PSUs in 2+2 redundancy that follow the Intel Common Redundant Power Supply (CRPS) specification. The PSUs share a common electrical and structural design that allows for hot-swap and tool-less installation into the server with the PSUs locking automatically after being inserted into the power bay. The CRPS PSUs are 80 Plus Platinum or Titanium rated with various output powers, allowing customers to choose as needed.

- The following rated 110 Vac and 230 Vac PSUs in 2+2 redundancy are supported:
  - 550 W Platinum PSU: 550 W (110 Vac), 550 W (230 Vac)
  - 800 W Platinum PSU: 800 W (110 Vac), 800 W (230 Vac)
  - 1,300 W Platinum PSU: 1,000 W (110 Vac), 1,300 W (230 Vac)
  - 1,600 W Platinum PSU: 1,000 W (110 Vac), 1,600 W (230 Vac)
  - 2,000 W Platinum PSU: 1,000 W (110 Vac), 2,000 W (230 Vac)
  - 2,700 W Platinum PSU: 1,200 W (110 Vac), 2,700 W (230 Vac)
  - 800 W Titanium PSU: 800 W (110 Vac), 800 W (230 Vac)
  - 1,300 W Titanium PSU: 1,000 W (110 Vac), 1,300 W (230 Vac)

NOTE

At a rated input voltage of 110 Vac, the output power of a 1,300/1,600/2,000 W

PSU will be derated to 1,000 W, and the output power of a 2,700 W PSU will be derated to 1,200 W.

Operating voltage range:

- 110 Vac: 90 Vac to 132 Vac
- 230 Vac: 180 Vac to 264 Vac

- The following rated -48 Vdc PSUs with 2+2 redundancy are supported:
  - 800 W PSU: 800 W (-48 Vdc)
  - 1,300 W PSU: 1,300 W (-48 Vdc)

  Operating voltage range:

  -48 Vdc: -40 Vdc to -72 Vdc

8 Regulatory Information

8.1 Safety

8.1.1 General

- Strictly comply with local laws and regulations while installing the equipment. The safety instructions in this section are only a supplement to local safety regulations.
- To ensure personal safety and to prevent damage to the equipment, all personnel must strictly observe the safety instructions in this section and on the device labels.
- People performing specialized activities, such as electricians and electric forklift operators, must possess qualifications recognized by the local government or authorities.

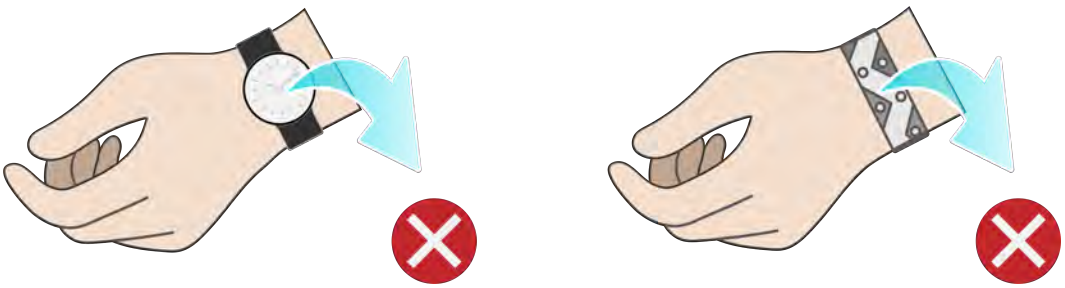
8.1.2 Personal Safety

- Only personnel certified or authorized by us are allowed to perform the installation procedures.
- Stop any operation that could cause personal injury or equipment damage. Report to the project manager and take effective protective measures.
- Working during thunderstorms, including but not limited to handling equipment, installing cabinets and installing power cords, is forbidden.
- Do not carry the weight over the maximum load per person allowed by local laws or regulations. Arrange appropriate installation personnel and do not overburden them.
- Installation personnel must wear clean work clothes, work gloves, safety helmets and safety shoes, as shown in Figure 8-1.

Figure 8-1 Protective Clothing

- Before touching the equipment, put on ESD clothes and ESD gloves or an ESD wrist strap, and remove any conductive objects such as wrist watches or metal jewelry, as shown in Figure 8-2, in order to avoid electric shock or burns.

Figure 8-2 Removing Conductive Objects



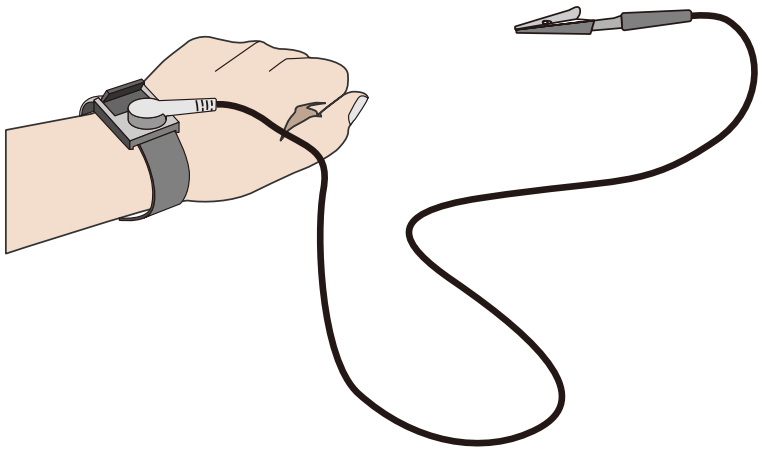
How to put on an ESD strap (Figure 8-3).

a. Put your hand through an ESD wrist strap.

b. Tighten the strap buckle to ensure a snug fit.

c. Plug the alligator clip of the ESD wrist strap into the corresponding jack on the grounded cabinet or grounded chassis.

Figure 8-3 Wearing an ESD Wrist Strap



- Use tools correctly to avoid personal injury.
- When moving or lifting equipment above shoulder height, use lifting devices and other tools as necessary to avoid personal injury or equipment damage due to equipment slippage.
- The power sources of the server carry a high voltage. Direct contact or indirect contact through damp objects with the high-voltage power source is fatal.
- To ensure personal safety, ground the server before connecting power.
- When using ladders, always have someone hold and guard the bottom of the ladders. In order to prevent injury, never use a ladder alone.
- When connecting, testing or replacing optical fiber cable, avoid looking into the optical port without eye protection in order to prevent eye damage from laser light.

8.1.3 Equipment Safety

- To ensure personal safety and prevent equipment damage, use only the power cords and cables that come with the server. Do not use them with any other equipment.
- Before touching the equipment, put on ESD clothing and ESD gloves to prevent static electricity from damaging the equipment.
- When moving the server, hold the bottom of the server. Do not hold the handles of any module installed in the server, such as PSUs, fan modules, drive modules, or motherboard. Handle the equipment with care at all times.
- Use tools correctly to avoid damage to the equipment.
- Connect the power cords of active and standby PSUs to different PDUs to ensure high system reliability.

- To ensure equipment safety, always ground the equipment before powering it on.

8.1.4 Transportation Precautions

Contact the manufacturer for precautions before transportation as improper transportation may damage the equipment. The precautions include but not limited to:

- Hire a trusted logistics company to move all equipment. The transportation process must comply with international transportation standards for electronic equipment. Always keep the equipment being transported right-side up. Avoid collision, moisture, corrosion, packaging damage or contamination.
- Transport the equipment in its original packaging.
- If the original packaging is unavailable, separately package heavy and bulky components (such as chassis, blade servers and blade switches), and fragile components (such as optical modules and PCIe expansion cards).
- Power off all equipment before shipping.

8.1.5 Manual Handling Weight Limits

CAUTION

Observe local laws or regulations regarding the manual handling weight limits per person. The limits shown on the equipment and in the document are recommendations only.

Table 8-1 lists the manual handling weight limits per person specified by some organizations.

Table 8-1 Manual Handling Weight Limits per Person

Organization	Weight Limit (kg/lbs)
European Committee for Standardization (CEN)	25/55.13
International Organization for Standardization (ISO)	25/55.13
National Institute for Occupational Safety and Health (NIOSH)	23/50.72
Health and Safety Executive (HSE)	25/55.13
General Administration of Quality Supervision, Inspection and Quarantine of the People's Republic of China (AQSIQ)	• Male: 15/33.08 • Female: 10/22.05

9 Limited Warranty

This limited warranty applies only to the original purchasers of our products who are direct customers or distributors of us (“Customer”).

We warrant all our hardware products, if properly used and installed, to be free from defects in material and workmanship within the warranty period. The term “Hardware Product” is limited to the hardware components and required firmware. The term “Hardware Product” DOES NOT include software applications or programs, and DOES NOT include products or peripherals that are not supplied by us. We may, at our discretion, repair or replace the defective parts. Repair or replacement parts may be new, used, or equivalent to new in performance and reliability. Repair or replacement parts are warranted to be free of defects in material or workmanship for ninety (90) calendar days or for the remainder of the warranty period of the product, whichever is longer.

Service offerings may vary by geographic region. Please contact your representative to identify service levels and needs for your region.

9.1 Warranty Service

Our warranty service includes 24 × 7 remote technical support, RMA (Return Material Authorization) Service, ARMA (Advanced Return Material Authorization) Service, 9 × 5 × NBD (Next Business Day) Onsite Service and 24 × 7 × 4 Onsite Service.

9.1.1 Remote Technical Support

The 24 × 7 remote technical support can be obtained through hotline, e-mail, and Service Portal*[1]. Through hotline and e-mail support, our engineers help customers diagnose the causes of malfunctions and provide solutions. Service Portal*[1] provides access to firmware, customized update files, and related manuals for Hardware Products. Customer may also access the Service Portal*[1] to submit an RMA request or an ARMA request for parts replacement or repair.

Information needed when requesting support:

- Contact name, phone number, e-mail address
- System serial number, part number, model and location (address) of the product needing service
- Detailed description of problem, logs (SELs and blackbox logs, and any other related logs from OS), screenshot of issue, pictures of damaged/faulty parts, etc.

9.1.2 RMA Service

Standard Replacement: When a hardware failure occurs, Customer may submit an RMA request to us via e-mail or Service Portal*[1]. We will review and approve the RMA submission at our own discretion, and provide an RMA number and return information that Customer may use to return the defective part(s) for the RMA service. We will ship out replacement part(s) within one (1) business day after receiving the defective part(s) and cover one-way shipment.

NOTE

- Customer should return the defective parts in original packaging to our designated service center at their own expense.
- After our further diagnosing and testing, if the defective parts conform to our repair policy, we will ship out the repair or replacement parts at our own expense; otherwise, we will return the defective parts at Customer's expense.
- If Customer needs to designate a logistics company, allocation of the shipping cost to us/Customer will be redefined.

9.1.3 ARMA Service

Advanced Replacement: If a problem with our hardware products cannot be resolved via hotline or e-mail support and replacement part(s) are required, we will ship out replacement part(s) in advance within one (1) business day. Customer should return defective part(s) within five (5) business days after receiving the replacement(s). The shipping cost coverage varies by region. Contact your sales representative for details.

NOTE

- Customer should return the defective parts in original packaging to our designated service center.
- We will ship out the replacement parts at our own expense after completing remote diagnosis.
- If Customer needs to designate a logistics company, allocation of the shipping cost to us/Customer will be redefined.

9.1.4 9 × 5 × NBD Onsite Service

When we ultimately determine that an onsite service call is required to repair or replace a defect, the call will be scheduled in accordance with the Response Time Commitment. The response time is measured from the time when the remote troubleshooting is completed and logged to the arrival of a service engineer and parts to Customer location for repair.

NOTE

9 × 5 × NBD: Our service engineer typically arrives at the customer's data center on the next business day. Service engineers are available on local business day from 9:00 am to 6:00 pm local time. Calls received/dispatches after 5:00 pm local time will require an additional day for the service engineer to arrive.

9.1.5 24 × 7 × 4 Onsite Service

When we ultimately determine that an onsite service call is required to repair or replace a defect, the call will be scheduled in accordance with the Response Time Commitment. The response time is measured from the time when the remote troubleshooting is completed and logged to the arrival of a service engineer and parts to Customer location for repair.

NOTE

24 × 7 × 4: Our service engineer typically arrives at the customer site within 4 hours. Service engineers are available at any time, including weekends and local national holidays.

9.2 Our Service SLA

We offer a variety of Service Level Agreements (SLA)*[2] to meet customer requirements.

- RMA Service
- ARMA Service
- 9 × 5 × NBD Onsite Service
- 24 × 7 × 4 Onsite Service

9.3 Warranty Exclusions

We do not guarantee that there will be no interruptions or mistakes during the use of the products. We will not undertake any responsibility for the losses arising from any operation not conducted according to instructions intended for Hardware Products.

The Limited Warranty does not apply to

- expendable or consumable parts, such as, but not limited to, batteries or protective coatings that are designed to diminish over time, unless failure has occurred during DOA period due to a defect in material or workmanship;
- any cosmetic damage, such as, but not limited to, scratches, dents, broken plastics, metal corrosion, or mechanical damage, unless failure has occurred during DOA period due to a defect in material or workmanship;
- damage or defects caused by accident, misuse, abuse, contamination, improper or inadequate maintenance or calibration or other external causes;
- damage or defects caused by operation beyond the parameters as stipulated in the user documentation;
- damage or defects by software, interfacing, parts or supplies not provided by us;
- damage or defects by improper storage, usage, or maintenance;
- damage or defects by virus infection;
- loss or damage in transit which is not arranged by us;
- Hardware Products that have been modified or serviced by non-authorized personnel;
- any damage to or loss of any personal data, programs, or removable storage media;
- the restoration or reinstallation of any data or programs except the software installed by us when the product is manufactured;
- any engineering sample, evaluation unit, or non-mass production product that is not covered under warranty service;
- any solid-state drive (SSD) which has reached its write endurance limit.

In no event will we be liable for any direct loss of use, interruption of business, lost profits, lost data, or indirect, special, incidental or consequential damages of any kind regardless of the form of action, whether in contract, tort (including negligence), strict liability or otherwise, even if we have been advised of the possibility of such damage, and whether or not any remedy provided should fail of

its essential purpose.

*1 Service Portal availability is subject to customer type and customer location. Please contact your representative to learn more.

*2 Not all SLA offerings are available at all customer locations. Some SLA offerings may be limited to geolocation and/or customer type. Please contact your representative to learn more.

10 System Management

10.1 Intelligent Management System BMC

BMC, a remote server management system, supports mainstream management specifications in the industry such as IPMI 2.0 and Redfish 1.13. BMC features high operational reliability, easy serviceability for different business scenarios, accurate and comprehensive fault diagnosis capabilities, and industry-leading security reinforcement capabilities.

BMC supports:

- IPMI 2.0
- Redfish 1.13
- SNMP v1/v2c/v3
- HTML5/Java remote consoles (Keyboard, Video, Mouse)
- remote virtual media
- login via web browsers
- intelligent fault diagnosis

Table 10-1 BMC Features

Feature	Description
Management Interface	Supports extensive remote management interfaces for various server O&M scenarios. The supported interfaces include: • IPMI • SMASH CLP • SNMP • HTTPS • Web GUI • Redfish • RESTful • Syslog

Feature	Description
Accurate and Intelligent Fault Location	IDL, a fault diagnosis system, offers accurate and comprehensive hardware fault location capabilities, and outputs detailed fault causes and handling suggestions.
Alert Management	Supports rich automatic remote alert capabilities, including proactive alerting mechanisms such as SNMP Trap (v1/v2/v3), email alerts and syslog remote alerts to ensure 24 × 7 reliability.
Remote Console KVM	Supports HTML5- and Java-based remote console to remotely control and operate the monitor/mouse/keyboard of the server, providing highly available remote management capabilities without on-site operation.
Virtual Network Console (VNC)	Supports mainstream third-party VNC clients without relying on Java, improving management flexibility.
Remote Virtual Media	Supports virtualizing images, USB devices, folders and local media devices as media devices of remote servers, simplifying OS installation, file sharing, and other O&M tasks.
Web GUI	Supports the visual management interface developed by us, displaying abundant information of the server and components, and offers easy-to-use Web GUIs.
Crash Screenshot and Crash Video Recording	• Supports automatic crash screenshot and crash video recording (video needs to be enabled manually) to capture the last screen and video before crash. • Provides manual screenshot, which can quickly capture the screen for easy inspection at scheduled time.
Dual Flash and Dual Image	Supports dual flash and dual image, enabling automatic flash failover in case of software or flash corruption, improving operational reliability.
Power Capping	Supports power capping, increasing deployment density and reducing energy consumption.
IPv4/IPv6	Supports both IPv4 and IPv6, enhancing network deployment flexibility.
Auto-Switching of Management Network Port	Supports auto-switching between the dedicated management network port and shared management network port, providing customers with flexible network deployment solutions for different management network deployment scenarios.
BMC Self-Diagnosis and Self-Recovery System	• Supports the reliable dual watchdog mechanism for hardware and software, enabling automatic restoration of BMC in case of BMC abnormality.

Feature	Description
	• Provides a thermal protection mechanism, which is automatically triggered when the BMC is abnormal to ensure that the fan operates at safe speeds to avoid system overheating. • Supports self-diagnosis of processors, memory modules, and storage devices of BMC, and automatically cleans the workload to restore to normal when the device usage rate is too high.
Power Control	Supports virtual power buttons for power on/off, power cycle and reset.
UID LED	Supports remote lighting of the UID LED for locating the server in the server room.
Secure Firmware Update	• Supports firmware update based on secure digital signatures, and mismatch prevention mechanism for firmware from different manufacturers and firmware for different models. • Supports firmware update of BMC/BIOS/CPLD/PSU.
Serial Port Redirection	Supports remote redirection of the system serial port, BMC serial port and other serial ports, and directs the server-side serial port output to the local administrator via the network for server debugging.
Storage Information Display	Displays RAID logical array information and drive information, and supports remote RAID creation for improved deployment efficiency.
User Role Management	Supports user detail management based on user roles and flexible creation of user roles with different privileges, and provides more user roles to allow administrators to grant different privileges to O&M personnel.
Security Features	Adopts the industry-leading server security baseline standard V3.0. SSH, HTTPS, SNMP and IPMI use secure and reliable algorithms. BMC offers capabilities including secure update and boot and security reinforcement mechanisms such as anti-replay, anti-injection, and anti-brute force.
Double Factor Authentication	Supports double factor authentication for local BMC users. Users need to log in to the BMC with both password and certificate, thus to prevent attacks caused by password leakage.
Configuration Exporting and Importing	To import and export the existing system configurations.

Feature	Description
System Information Display	Displays the server basic information such as the information and health status of major server components, including CPU, memory, power supply, device inventory, hard drive, network adapter, and security chip.
Fan Management	Displays the status, current speed, duty ratio, and other information of a fan module. You can select the fan control mode and preset the speed for each fan module in the Manual Fan Control mode.
Power Policy	To set how the server operating system reacts under the BMC's control when AC power is reconnected to the server.
One-Key Erasing	To perform non-recoverable erasing on all storage devices of the server, preventing data leakage when the server is to be retired.
System Lockdown	After this feature is enabled, some parameters of the server cannot be set and some operations cannot be performed on the server.

10.2 KSManage

The server is compatible with the latest version of KSManage, a new-generation infrastructure O&M management platform for data centers.

Built on cutting-edge O&M concepts, KSManage provides users with leading and efficient overall management solutions for data centers to ensure advanced infrastructure management. This platform provides a rich set of functions such as centralized asset management, in-depth fault diagnosis, component fault early warning, intelligent energy consumption management, 3D automatic topologies, and stateless automatic deployment. With these functions, users can implement centralized O&M of servers, storage devices, network devices, security devices, and edge devices, effectively improving O&M efficiency, reducing O&M costs, and ensuring the secure, reliable, and stable operation of data centers. KSManage offers:

- lightweight deployment in multiple scenarios and full lifecycle management of devices
- high reliability and on-demand scalability enabled by 1 to N data collectors
- intelligent asset management and real-time tracking of asset changes
- comprehensive monitoring for overall business control
- intelligent fault diagnosis for reduced maintenance time
- second-level performance monitoring for real-time status of devices

- batch configuration, deployment and update, shortening the time needed to bring the production environment online
- improved firmware version management efficiency
- standardized northbound interfaces for easy integration and interfacing

Table 10-2 KSManage Features

Feature	Description
Home	Display of basic information (data centers, server rooms, cabinets, assets and alerts), quick addition of devices and custom home page
Assets	• Batch asset import, automatic asset discovery, and full lifecycle management of assets • Management of the full range of our server family, including general-purpose rack servers, AI servers, multi-node servers, edge servers and all-in-one servers • Management of our general-purpose disk arrays and distributed storage devices • Management of network devices (switches, routers, etc.), security devices (firewalls, load balancers, etc.), cabinets and clouds • Management of data centers • Asset warranty information management, asset inventory reports for server acceptance, asset attribute expansion, etc.
Monitor	• Display of real-time alerts, history alerts, blocked alerts and events • Fault prediction of drives and memories • Custom inspection plan and inspection result management • Notification record viewing • Intelligent fault diagnosis and analysis, automatic fault reporting and repair ticket viewing • Trap management and Redfish management • Management of monitoring rules, such as alert rules, notification rules, blocking rules, alert noise reduction

Feature	Description
	rules, compression rules and fault reporting rules, and redefinition of above rules
Control	• Quick start of firmware update, OS installation, power management, drive data erasing and stress test • Batch firmware update (BMC/BIOS/RAID Card/NIC/Drive/HBA Card/MB CPLD/BP CPLD/PSU) • Batch firmware configuration (BMC/BIOS) • Batch RAID configuration and OS deployment for servers • Secure and quick drive data erasing • CPU and memory stress test • Automatic firmware baseline management • BMC and BIOS snapshot management • Repositories for update files
Energy Efficiency	• Overview of data center power consumption trend chart and carbon emission trend chart • Setting of server dynamic power consumption policies and minimum power consumption policies • Server temperature optimization, utilization optimization, power consumption characteristics analysis, power consumption prediction, load distribution, etc. • Carbon asset and carbon emission management
Log	• Fault log record management • Diagnosis record and diagnosis rule management
Topologies	• Centralized management of multiple data centers and panoramic 3D views, including dynamic display of power consumption, temperature, alerts and cabinet capacity of the data center • Network topologies

Feature	Description
Reports	• Management of warranty information reports, alert reports, asset reports, hardware reports and performance reports • Export of reports in .xlsx format
System	• Password management, alert forwarding and data dump • Customized KSManage parameters
Security	Security control of KSManage via a set of security policies such as user management, role management, authentication management (local authentication and LDAP authentication) and certificate management

10.3 KSManage Tools

Table 10-3 Features of KSManage Tools

Feature	Description
KSManage Kits	A lightweight automatic batch O&M tool for servers, mainly used for server deployment, routine maintenance, firmware update, fault handling, etc.
KSManage Boot	A unified batch management platform for bare metals, with features including firmware management, hardware configuration, system deployment and migration, stress test and in-band management
KSManage Server CLI	Fast integration with third-party management platforms, delivering a new O&M mode of Infrastructure as Code (IaC)
KSManage Driver	Operates under the OS and gets system asset and performance information via the in-band mode, providing users with more comprehensive server management capabilities.
KSManage Server Provisioning	Offers users with RAID configuration, intelligent OS installation, firmware update, hardware diagnosis, secure erasing and software upgrade, using the TF card as the carrier.

11 Certifications

Table 11-1 Certifications

Country/Region	Certification	Mandatory/Voluntary
International	CB	Voluntary
EU	CE	Mandatory
US	FCC	Mandatory
	UL	Voluntary

12 Appendix A

12.1 Operating Temperature Specification Limits

Table 12-1 Operating Temperature Specification Limits

Configuration	Max. Operating Temp. 35°C (95°F)	Max. Operating Temp. 40°C (104°F)	Max. Operating Temp. 45°C (113°F)
Standard configurations: 8 × 2.5-inch drive; 16 × 2.5-inch drive; 24 × 2.5-inch drive; 25 × 2.5-inch drive; NVMe/SAS/ SATA drives supported	• 6038 fans • RDIMMs ≤64 pcs • CPU TDP ≤165 W • 4 PCIe cards supported • GPUs not supported	NS	NS
High-end CPU configurations: 24 × 2.5-inch drive; 25 × 2.5-inch drive; 12 × 3.5-inch + 8 × 2.5-inch drive; NVMe/SAS/ SATA drives supported	• Standard 6056 fans • RDIMMs ≤64 pcs • CPU TDP ≤350 W • 16 PCIe cards supported • GPUs not supported • 100 Gb OCP cards or dual OCP cards are supported with other options limited • 200 Gb PCIe NICs are	• High-performance 6056 fans • RDIMMs ≤64 pcs • CPU TDP ≤195 W • 15 PCIe cards supported • GPUs not supported • OCP cards >25 Gb not supported	• High-performance 6056 fans • RDIMMs ≤64 pcs • CPU TDP ≤165 W • 15 PCIe cards supported • GPUs not supported • OCP cards >25 Gb not supported • PSUs can only be installed into power bays 2 and 3

Configuration	Max. Operating Temp. 35°C (95°F)	Max. Operating Temp. 40°C (104°F)	Max. Operating Temp. 45°C (113°F)
	supported with other options limited or used with high-performance 6056 fans • DIMMs >64 Gb are supported with high-performance 6056 fans used		
GPU configuration: 8 × 2.5-inch drive; NVMe/SAS/ SATA drives supported	• High-performance 6056 fans • RDIMMs ≤64 pcs • CPU TDP ≤195 W • CPU TDP ≤250 W supported with other options at the rear panel limited • 4 PCIe cards supported • GPUs supported (dual-slot GPUs are supported with other options limited or in specific conditions) • 100 Gb OCP cards or 200 Gb PCIe NICs are supported with	NS	NS

Configuration	Max. Operating Temp. 35°C (95°F)	Max. Operating Temp. 40°C (104°F)	Max. Operating Temp. 45°C (113°F)
	other options limited • 2 or 4 CPUs supported		

NOTE

- The maximum operating temperature is 5°C (9°F) lower than the rated value if a single fan fails.
- Single fan failure may affect system performance.
- When using the front bezel with the OCP card (100 Gb or above)/350 W CPU/GPU or all front drives (in 24-drive/25-drive configuration) installed, the maximum operating temperature is 3°C (5.4°F) lower than the rated value.

12.2 Model

Certified Model	Description
KR4480-X2-A0-R0-00	Global

12.3 RAS Features

The server supports a variety of RAS (Reliability, Availability, and Serviceability) features. By configuring these features, the server can provide greater reliability, availability, and serviceability.

12.4 Sensor List

Sensor	Description	Sensor Location
Inlet_Temp	Air inlet temperature	-
Outlet_Temp	Air outlet temperature	-
CPUx_VR_Temp	CPUx VR temperature	CPUx

Sensor	Description	Sensor Location
		x indicates the CPU number with a value of 0 - 3
CPUx_Temp	CPUx core temperature	CPUx x indicates the CPU number with a value of 0 - 3
CPUx_DTS	CPUx DTS temperature, CPU margin temperature before it reaches the throttling frequency	CPUx x indicates the CPU number with a value of 0 - 3
CPUx_DIMM_T	The maximum temperature among DDR5 DIMMs of CPUx	CPUx x indicates the CPU number with a value of 0 - 3
PCH_Temp	PCH temperature	Motherboard
PSU_Inlet_Temp	PSU temperature	PSU
SYS_1V8	System 1.8 V voltage	Motherboard
SYS_1V	System 1 V voltage	Motherboard
BMC_STBY_2V5	BMC standby voltage	Motherboard
SYS_1V2	System 1.2 V voltage	Motherboard
PVNN_MAIN_CPUx	CPUx core voltage	Motherboard
PSUx_VIN	PSUx input voltage	PSUx x indicates the PSU number with a value of 0 - 3
PSUx_VOUT	PSUx output voltage	PSUx x indicates the PSU number with a value of 0 - 3
SYS_12V	System 12 V voltage	Motherboard
SYS_5V	System 5 V voltage	Motherboard
SYS_3V3	System 3.3 V voltage	Motherboard
BMC_RGM_STBY3V3	BMC RGMII standby 3.3 V voltage	Motherboard
PVNN_PCH_STBY	PCH core voltage	Motherboard
P1V05_PCH_STBY	PCH logic voltage	Motherboard
RTC_Battery	Motherboard RTC battery voltage	Motherboard
Total_Power	Total power	Motherboard
PSUx_PIN	PSUx input power	PSUx x indicates the PSU number with a value of 0 - 3
PSUx_POUT	PSUx output power	PSUx

Sensor	Description	Sensor Location
		x indicates the PSU number with a value of 0 - 3
CPU_Power	Total CPU power (obtained through ME)	Motherboard
Memory_Power	Total memory power (obtained through ME)	Motherboard
FANx_F_Speed, FANx_R_Speed	FANx speed	FANx x indicates the fan number with a value of 0 - 11
SYS_STBY_3V3	System standby 3.3 V voltage	Motherboard
RAID_Temp	The maximum temperature among all PCIe RAID cards	PCIe RAID cards
OCP_RAID_Temp	RAID mezz card temperature	RAID mezz card
HDD_MAX_Temp	The maximum temperature among all drives	-
OCP_NIC_SFP_Temp	OCP card SFP temperature	Optical module
PCIE_NIC_SFP_Temp	PCIe NIC SFP temperature	Optical module
OCP_NIC_Temp	OCP card temperature (The maximum temp. will be taken in case of multiple OCP cards)	OCP cards
MEM_ResourceRate	Memory utilization rate	-
CPU_ResourceRate	CPU utilization rate	-
PCIE_NIC_Temp	PCIe NIC temperature (The maximum temp. will be taken in case of multiple PCIe NICs)	-
FAN_Power	Total fan power	Fans
GPUx_Temp	GPUx core temperature	GPUx x indicates the GPU number with a value of 0 - 3
CPUx_Status	CPUx status	CPUx x indicates the CPU number with a value of 0 - 3
PSU_Redundant	PSU redundancy status	PSU
FANx_Status	FANx status	FANx

Sensor	Description	Sensor Location
		x indicates the fan number with a value of 0 - 11
CPUx1_Cx2Dx3	DIMM	Motherboard x1 indicates the CPU number with a value of 0 – 3; x2 indicates the channel number with a value of 0 – 7; x3 indicates the DIMM slot number with a value of 0 - 1
PSU_Mismatch	PSU models mismatch	PSU
POST_Status	System firmware and POST status	-
CPU_Config	CPU configuration status (mixing of CPUs, or primary CPU not installed)	-
SEL_Status	SEL status	-
PCIe_Status	The status of PCIe device (including PCIe bus, slots and cards)	-
PWR_CAP_Fail	Power capping failure	-
PSUx_Status	PSUx status	PSUx x indicates the PSU number with a value of 0 - 3
Watchdog2	Watchdog overflow and actions	-
K_HDDx	DriveX health status	DriveX K denotes front, internal and rear, with a value of F/I/R respectively; x indicates the drive number
Intrusion	Chassis-opening activity	Top cover
BMC_Boot_Up	BMC boot up complete	-
BIOS_Boot_Up	BIOS boot up complete	-
FAN_Redundant	Fan redundancy status	-
Sys_Health	System health status	-
ACPI_PWR	ACPI power status	-

Sensor	Description	Sensor Location
NVME_Temp	The maximum temperature among all NVMe drives	NVMe drives
ME_FW_Status	ME health status	-
TPM_Verify	TPM verification status	-
PWR_On_TMOUT	Power-on timeout	-
System_Error	System error	-
BMC_Status	BMC status	-
OCP_Riser_T	OCP adapter temperature	OCP adapter
PDB_BOARD_T	Power board temperature	Power board
HDD_Power	Total drive power	Motherboard

13 Appendix B Acronyms and Abbreviations

A

AC	Alternating Current
ACPI	Advanced Configuration and Power Interface
AI	Artificial Intelligence
ANSI	American National Standards Institute
APP	Application
AQSIQ	General Administration of Quality Supervision, Inspection and Quarantine of the People's Republic of China
ARMA	Advanced Return Material Authorization
AVX	Advanced Vector Extensions

B

BIOS	Basic Input Output System
BLE	BIOS Lock Enable
BMC	Baseboard Management Controller

C

CAS	Column Address Strobe
CB	Certification Body

CCC	China Compulsory Certificate
CE	Conformite Europeenne
CEN	European Committee for Standardization
CLI	Command-Line Interface
CMOS	Complementary Metal-Oxide-Semiconductor
CPLD	Complex Programmable Logic Device
CPU	Central Processing Unit
CRPS	Common Redundant Power Supply

D

DC	Direct Current
DCMI	Data Center Manageability Interface
DDR5	Double Data Rate 5
DIMM	Dual In-line Memory Module
DL	Deep Learning
DOA	Dead on Arrival
DPC	DIMM Per Channel
DRAM	Dynamic Random Access Memory
DTS	Digital Thermal Sensor
DWPD	Drive Writes Per Day

E

EAC	Eurasian Conformity
ECC	Error-Correcting Code
ECMA	European Computer Manufacturers Association
ESD	Electrostatic Discharge

F

FCC	Federal Communications Commission
FHHL	Full-Height Half-Length
FW	Firmware

G

GPU	Graphics Processing Unit
GUI	Graphical User Interface

H

HBA	Host Bus Adapter
HCA	Host Channel Adapter
HDD	Hard Disk Drive
HSE	Health and Safety Executive
HTML	HyperText Markup Language
HTTPS	HyperText Transfer Protocol Secure

I

I^2C	Inter-Integrated Circuit
IEC	International Electrotechnical Commission
iMC	Integrated Memory Controller
I/O	Input/Output
IP	Internet Protocol
IPMI	Intelligent Platform Management Interface
IPv4	Internet Protocol version 4
IPv6	Internet Protocol version 6
ISA	International Society of Automation
ISO	International Organization for Standardization

K

KVM	Keyboard, Video, Mouse

L

LAN	Local Area Network
LCD	Liquid Crystal Display
LDAP	Lightweight Directory Access Protocol
LED	Light Emitting Diode

M

MCIO	Mini Cool Edge Input/Output

ME	Management Engine

N

NBD	Next Business Day
NC-SI	Network Controller Sideband Interface
NIC	Network Interface Card
NIOSH	National Institute for Occupational Safety and Health
NVMe	Non-Volatile Memory Express

O

OCP	Open Compute Project
OpROM	Option ROM
OS	Operating System

P

PCH	Platform Controller Hub
PCIe	Peripheral Component Interconnect Express
PDB	Power Distribution Board
PDU	Power Distribution Unit
PFR	Platform Firmware Resilience
PID	Proportional-Integral-Derivative
POC	Proof of Concept

POST	Power-On Self-Test
PSU	Power Supply Unit
PXE	Preboot Execution Environment

R

RAID	Redundant Arrays of Independent Disks
RAS	Reliability, Availability, Serviceability
RDIMM	Registered Dual In-line Memory Module
RGMII	Reduced Gigabit Media Independent Interface
RH	Relative Humidity
RHEL	Red Hat Enterprise Linux
RJ45	Registered Jack 45
RMA	Return Material Authorization
ROM	Read-Only Memory
RST	Reset
RTC	Real Time Clock

S

SAS	Serial Attached SCSI
SATA	Serial Advanced Technology Attachment
SCSI	Small Computer System Interface
SEL	System Event Log

SFP	Small Form-factor Pluggable
SGX	Software Guard Extensions
SLA	Service Level Agreements
SNMP	Simple Network Management Protocol
SSD	Solid State Drive
SSH	Secure Shell

T

TCM	Trusted Cryptography Module
TDP	Thermal Design Power
TF	TransFlash
TPM	Trusted Platform Module

U

UEFI	Unified Extensible Firmware Interface
UID	Unit Identification
UL	Underwriters Laboratories
UPI	Ultra Path Interconnect
USB	Universal Serial Bus

V

VGA	Video Graphics Array

VLAN	Virtual Local Area Network
VMD	Volume Management Device
VNC	Virtual Network Console
VPP	Virtual Pin Port
VRD	Voltage Regulator-Down
VROC	Virtual RAID on CPU