Huawei FusionServer 2288H V5
V100R005

Technical White Paper

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About This Document

Purpose

This document describes the 2288H V5 in terms of its appearance, performance parameters, and component compatibility to help users have a profound understanding of the server.

Intended Audience

This document is intended for:

- Huawei presales engineers
- Channel partner presales engineers
- Enterprise presales engineers

Symbol Conventions

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

Symbol	Description
⚠ **DANGER**	Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.
⚠ **WARNING**	Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.
⚠ **CAUTION**	Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.
NOTICE	Indicates a potentially hazardous situation which, if not avoided, could result in equipment damage, data loss, performance deterioration, or unanticipated results. NOTICE is used to address practices not related to personal injury.

Symbol	Description
☐ NOTE	Calls attention to important information, best practices and tips. NOTE is used to address information not related to personal injury, equipment damage, and environment deterioration.

Change History

Changes between document issues are cumulative. The latest document issue contains all the changes made in earlier issues.

Issue 09 (2019-04-05)

This issue is the ninth official release.

Mode	Description
New	Added Cascade Lake CPU.

Issue 08 (2018-10-30)

This issue is the eighth official release.

Mode	Description
Modified	Optimized description.

Issue 07 (2018-09-06)

This issue is the seventh official release.

Mode	Change Description
New	Added NVMe configurations. For details, see **Storage**.

Issue 06 (2018-05-14)

This issue is the sixth official release.

Mode	Change Description
Modified	Modified video card description. For details, see **Table 5-1**.

Issue 05 (2018-04-18)

This issue is the fifth official release.

Mode	Change Description
New	● Added TPM specifications. For details, see **Technical Specifications**. ● Added internal drive specifications. For details, see **Storage**.
Modified	Modified operating temperature specifications.

Issue 04 (2018-02-07)

This issue is the fourth official release.

Mode	Change Description
New	Added NVMe configurations.

Issue 03 (2017-11-30)

This issue is the third official release.

Mode	Change Description
New	Added the GPU card and Broadcom SAS3508 RAID controller card specifications.

Issue 02 (2017-08-18)

This issue is the second official release.

Mode	Change Description
New	Added the support for DIMMs with a maximum speed of 2666 MT/s.

Issue 01 (2017-08-07)

This issue is the first official release.

Contents

1 Overview

Huawei FusionServer 2288H V5 is a 2U 2-socket rack server for Internet, Internet data center (IDC), cloud computing, enterprise, and telecom service applications.

□NOTE

For details about the nameplate models, see **Nameplate Models**.

The 2288H V5 is ideal for IT core services, cloud computing virtualization, high-performance computing, distributed storage, big data processing, enterprise or telecom service applications, and other complex workloads. It combines low power consumption with high scalability and reliability, and ease of deployment and management.

Figure 1-1 shows the appearance of the 2288H V5 server with 12 drives.

Figure 1-1 Appearance

2 Features

Performance and Scalability

The 2288H V5 provides the following performance and scalability features:

- Intel® Xeon® Scalable processors (Skylake, Cascade Lake) ensure high processing performance. Each processor provides up to 28 cores, 3.8 GHz frequency, 38.5 MB L3 cache, and two 10.4 GT/s Ultra Path Interconnect (UPI) links.
  - Each 2288H V5 supports two processors with 56 cores and 112 threads, maximizing concurrent execution of multithreaded applications.
  - Intel® Xeon® Scalable processors support L2 cache. Each core exclusively uses 1 MB L2 cache and at least 1.375 MB L3 cache.
  - Intel® Turbo Boost Technology 2.0 enables processor cores to further increase speed during peak hours by temporarily exceeding the processor thermal design power (TDP).
  - Intel® Hyper-Threading Technology enables each processor core to run up to two threads, improving parallel computing.
  - Intel® Virtualization Technology integrates hardware-level virtualization functions, allowing OS vendors to better use hardware to address virtualization workload.
- Up to 24 DDR4 error checking and correcting (ECC) RDIMMs or load-reduced DIMMs (LRDIMMs) provide memory transfers of 2933 MT/s and memory capacity of 3,072 GB, ensuring high speed and availability. The maximum memory bandwidth is 249.9375 GB/s in theory (for Cascade Lake CPU only).
- The 2288H V5 supports flexible drive configurations and provides elastic and scalable memory capacities to satisfy storage capacity and upgrade requirements.
- Intel® Advanced Vector Extensions 2.0 (AVX-512) improves floating-point computing performance for computing-intensive applications.
- Intel DL Boost (VNNI) is supported to improve the performance of deep learning applications (for Cascade Lake CPU only).
- The I/O performance of pure SSDs is higher than that of mixed configuration of SSDs and HDDs and 100 times that of pure HDDs.
- The 2288H V5 supports various LANs on motherboard (LOMs) and FlexIOs to provide rich network ports.
- The 2288H V5 supports up to eight Peripheral Component Interconnect Express (PCIe) 3.0 slots.

- Intel® Xeon® Scalable processors incorporate the PCIe 3.0 controller using Intel® Integrated I/O. This significantly reduces I/O latency and enhances overall system performance.

Availability and Serviceability

The 2288H V5 provides the following availability and serviceability features:

- The 2288H V5 uses carrier-class components and follows the engineering process, significantly improving system reliability.

- The 2288H V5 uses hot-swappable SAS/SATA drives or NVMe SSDs. It supports redundant array of independent disks (RAID) 0, 1, 1E, 10, 5, 50, 6, and 60 and offers RAID cache. A supercapacitor is used to protect RAID cache data from power failure.

- SSDs offer better reliability than HDDs, prolonging system uptime.

- By looking at the panel, technical support personnel can quickly locate faulty components or identify fault risks by checking the UID and health indicators, and fault diagnostic LEDs. Furthermore, they can check the key component status displayed on the iBMC WebUI help page. These features simplify maintenance, shorten troubleshooting time, and improve system availability.

- The iBMC monitors system parameters in real time, triggers alarms, and performs recovery actions in case of failures, minimizing system downtime.

- Huawei provides a three-year warranty for parts replacement and limited onsite repair for the servers used in China. Huawei provides support 10 hours a day, 7 days a week. Service requests are handled the subsequent business day. Optional service upgrades are available.

- Huawei provides a three-year warranty for parts replacement and repair for the servers used outside China. Huawei provides support 9 hours a day, 5 days a week. Service requests are handled the subsequent business day. Huawei delivers the repaired or new parts within 45 calendar days of receiving the defective parts.

Manageability and Security

The 2288H V5 provides the following manageability and security features:

- The built-in iBMC module monitors server operating status and provides remote management.

- The Network Controller Sideband Interface (NC-SI) enables a network port to function as a management network port and a service port, which maximizes the return on investment (ROI) for customers. NC-SI is disabled by default. You can enable it on the iBMC WebUI or in the BIOS.

- The integrated industry-standard Unified Extensible Firmware Interface (UEFI) makes setup, configuration, update, and fault handling more efficient.

- The front bezel in the server chassis is locked to ensure local data security and reliability.

- Intel® Advanced Encryption Standard–New Instructions (AES NI) support faster and stronger encryption.

- Intel® Execute Disable Bit (EDB) prevents certain types of malicious buffer overflow attacks when working with a supported OS.

- Intel® Trusted Execution technology uses hardware to defend against malicious software attacks, allowing an application to run in isolation from all other applications running on the OS.

● TPM and TCM cards are supported.

📖**NOTE**

Service network ports supporting NC-SI have the following features:

- The service network port can be bound to a network port (host network port 1 by default) on a flexible or standard NIC.
- The service network port allows you to enable, disable, and configure a VLAN ID. A VLAN ID is disabled by default, and the default VLAN ID is 0.
- The service network port supports IPv4 and IPv6 addresses. You can set an IP address, subnet mask, default gateway, and IPv6 address prefix length for the service network port.

Energy Efficiency

The 2288H V5 offers the following energy-saving features:

- The 2288H V5 supports 80 Plus Platinum power supply units (PSUs). At 50% load, the PSUs provide 94% power efficiency.

- The 2288H V5 supports active-standby power supplies and high-voltage DC (HVDC), improving power supply efficiency.

- Efficient VRD PSUs reduce energy loss in DC/DC power conversion.

- The 2288H V5 supports area-based and intelligent fan speed adjustment, Proportional-Integral-Derivative (PID) speed adjustment, and intelligent processor frequency adjustment, reducing power consumption.

- The improved thermal design with energy-efficient fans ensures optimal heat dissipation and reduces system power consumption.

- The 2288H V5 supports power capping and power control.

- Drives are not powered on simultaneously, which reduces the server startup power consumption.

- The Intel® Intelligent Power Capability allows each processor to be powered on or off based on site requirements.

- Low-voltage Intel® Xeon® Scalable processors consume less energy, making them ideal for data centers and telecommunication environments with power and thermal limitations.
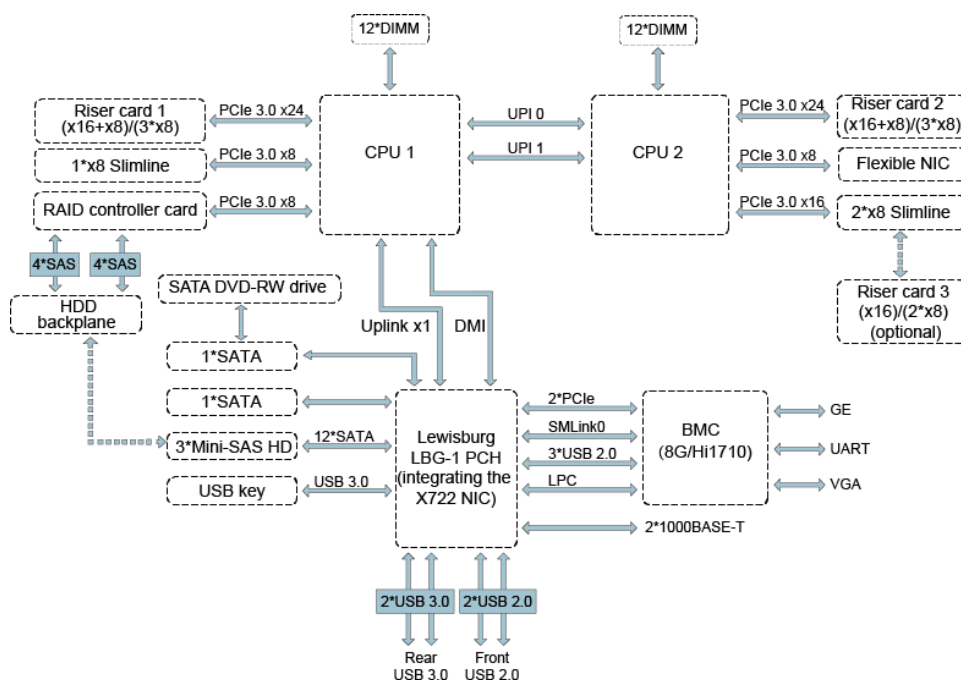
- SSDs consume 80% less power than HDDs.

Support for Customization

The 2288H V5 is a Huawei proprietary server. Huawei also provides customized development in a timely manner.

3 Logical Structure
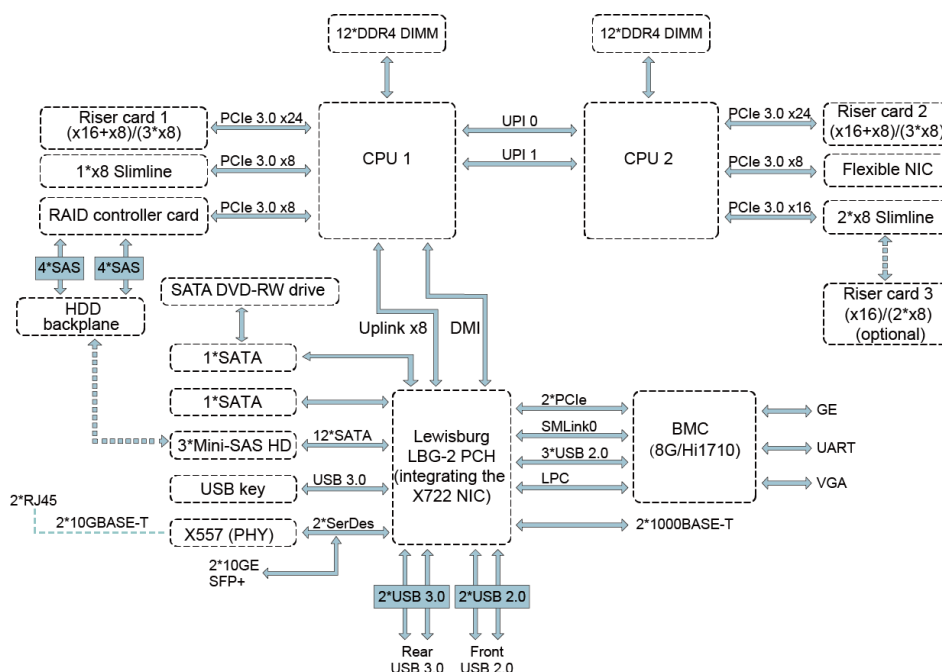
- Logical structure 1 (LBG-1)

Figure 3-1 2288H V5 logical structure

- The 2288H V5 supports two Intel® Xeon® CPUs and 24 DIMMs. The CPUs interconnect with each other through two UPI buses at a speed of up to 10.4 GT/s.

- The CPUs connect to three PCIe riser cards through PCIe buses and the riser cards provide various PCIe slots.

- The RAID controller card on the mainboard connects to CPU 1 through PCIe buses, and to the drive backplanes through SAS signal cables. The drive backplanes support various local storage configurations.

- The LBG-1 bridge chip supports two GE electrical LOM ports.

- The Huawei Hi1710 management chip provides a VGA port, management network port, and debugging serial port.

● Logical structure 2 (LBG-2)

Figure 3-2 2288H V5 logical structure

● The 2288H V5 supports two Intel® Xeon® CPUs and 24 DIMMs. The CPUs interconnect with each other through two UPI buses at a speed of up to 10.4 GT/s.

● The CPUs connect to three PCIe riser cards through PCIe buses and the riser cards provide various PCIe slots.

● The RAID controller card on the mainboard connects to CPU 1 through PCIe buses, and to the drive backplanes through SAS signal cables. The drive backplanes support various local storage configurations.

● The LBG-2 bridge chip provides two GE electrical LOM ports, and two 10GE optical LOM ports or two 10GE electrical LOM ports (through the X557 PHY).

● The Huawei Hi1710 management chip provides a VGA port, management network port, and debugging serial port.

4 Hardware Description

4.1 Appearance

Front Panel

- **Figure 4-1** shows the front panel of a server with eight 2.5-inch drives.

  Figure 4-1 Front panel of a server with eight 2.5-inch drives

1	Drive	2	Built-in DVD drive (optional)
3	Label plate with an SN label	-	-

- **Figure 4-2** shows the front panel of a server with twelve 3.5-inch drives.

Figure 4-2 Front panel of a server with twelve 3.5-inch drives
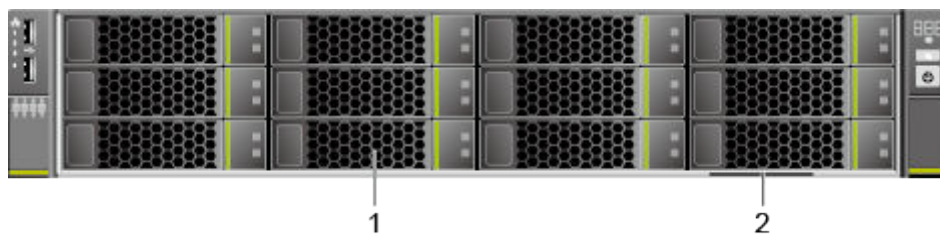
| 1 | Drive | 2 | Label plate with an SN label |

− **Figure 4-3** shows the front panel of a server with 8 x 2.5-inch SAS/SATA + 12 x 2.5-inch NVMe drives.

Figure 4-3 Front panel of a server with 8 x 2.5-inch SAS/SATA + 12 x 2.5-inch NVMe drives

| 1 | Drive | 2 | Filler module |
| 3 | Label plate with an SN label | - | - |

● **Figure 4-4** shows the front panel of a server with twenty-four 2.5-inch drives.
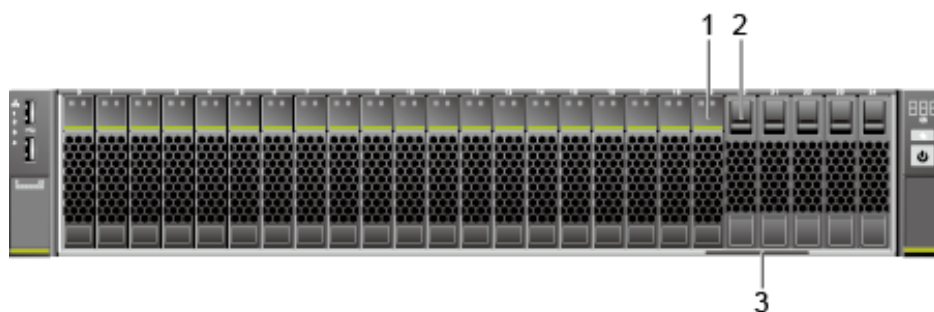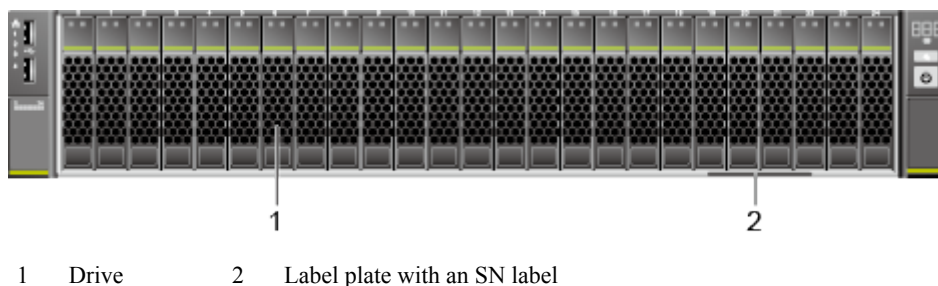
Figure 4-4 Front panel of a server with twenty-four 2.5-inch drives

| 1 | Drive | 2 | Label plate with an SN label |

● **Figure 4-5** shows the front panel of a server with twenty-five 2.5-inch drives.

Figure 4-5 Front panel of a server with twenty-five 2.5-inch drives

| 1 | Drive | 2 | Label plate with an SN label |

SN

The serial number (SN) on the label is a string that uniquely identifies a server. The SN is required when you contact Huawei technical support.

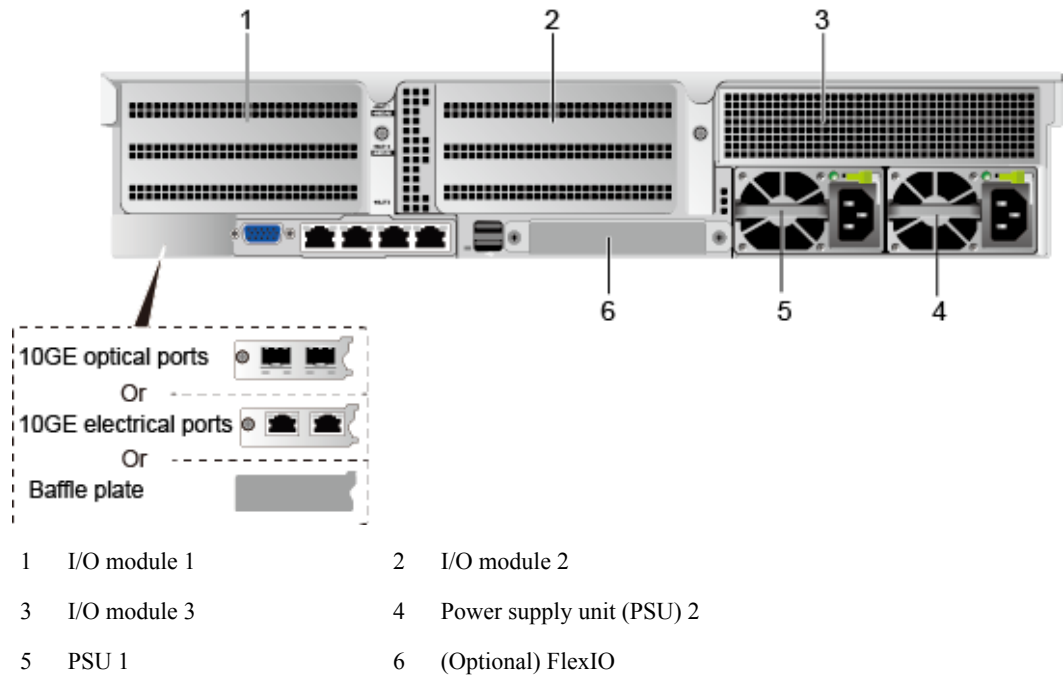**Figure 4-6** shows the SN format.

Figure 4-6 SN example

Table 4-1 SN description

No.	Description
1	SN ID (two characters), which is **21** by default.
2	Material identification code (eight characters), that is, processing code.
3	Vendor code (two characters). **10** indicates Huawei and other values indicate outsourcing vendors.
4	Year and month (two characters). ● The first character indicates the year. Digits 1 to 9 indicate 2001 to 2009, letters A to H indicate 2010 to 2017, letters J to N indicate 2018 to 2022, and letters P to Y indicate 2023 to 2032. **NOTE** The years from 2010 are represented by upper-case letters excluding I, O, and Z because the three letters are similar to digits 1, 0, and 2. ● The second character indicates the month. Digits 1 to 9 indicate January to September, and letters A to C indicate October to December.
5	Serial number (six characters).
6	RoHS compliance (one character). Y indicates environmental protection processing.
7	Internal model, that is, product name.

Rear Panel

Figure 4-7 shows the rear panel of a server.

Figure 4-7 Rear panel

1	I/O module 1	2	I/O module 2
3	I/O module 3	4	Power supply unit (PSU) 2
5	PSU 1	6	(Optional) FlexIO

📖**NOTE**
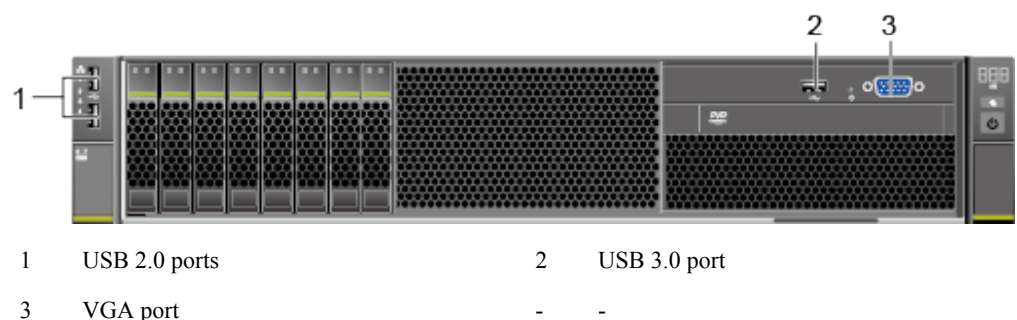
I/O modules 1, 2, and 3 can be drive modules or riser card modules. The preceding figure is for reference only.

4.2 Ports

Front Panel

● Figure 4-8 shows the ports on the front panel of a server with eight 2.5-inch drives.

Figure 4-8 Front panel of a server with eight 2.5-inch drives

1	USB 2.0 ports	2	USB 3.0 port
3	VGA port	-	-

- **Figure 4-9** shows the ports on the front panel of a server with twelve 3.5-inch drives.

Figure 4-9 Front panel of a server with twelve 3.5-inch drives

1	USB 2.0 ports	-	-

- **Figure 4-10** shows the ports on the front panel of a server with 8 x 2.5-inch SAS/SATA + 12 x 2.5-inch NVMe drives.

Figure 4-10 Front panel of a server with 8 x 2.5-inch SAS/SATA + 12 x 2.5-inch NVMe drives

1	USB 2.0 ports	-	-

- **Figure 4-11** shows the ports on the front panel of a server with twenty-four 2.5-inch drives.

Figure 4-11 Front panel of a server with twenty-four 2.5-inch drives

1	USB 3.0 port	2	VGA port
3	USB 2.0 ports	-	-

- **Figure 4-12** shows the ports on the front panel of a server with twenty-five 2.5-inch drives.

Figure 4-12 Front panel of a server with twenty-five 2.5-inch drives


1	USB 2.0 ports	-	-

Table 4-2 describes the ports on the front panel.

Table 4-2 Description of ports on the front panel

Port	Type	Description
VGA port	DB15	Used to connect a terminal, such as a monitor or KVM.
USB port	USB 2.0 and USB 3.0	Allow USB devices to be connected to the server. **NOTE** Before connecting an external USB device, check that the USB device functions properly; otherwise, it may adversely impact the server.

Rear Panel

Figure 4-13 Rear panel
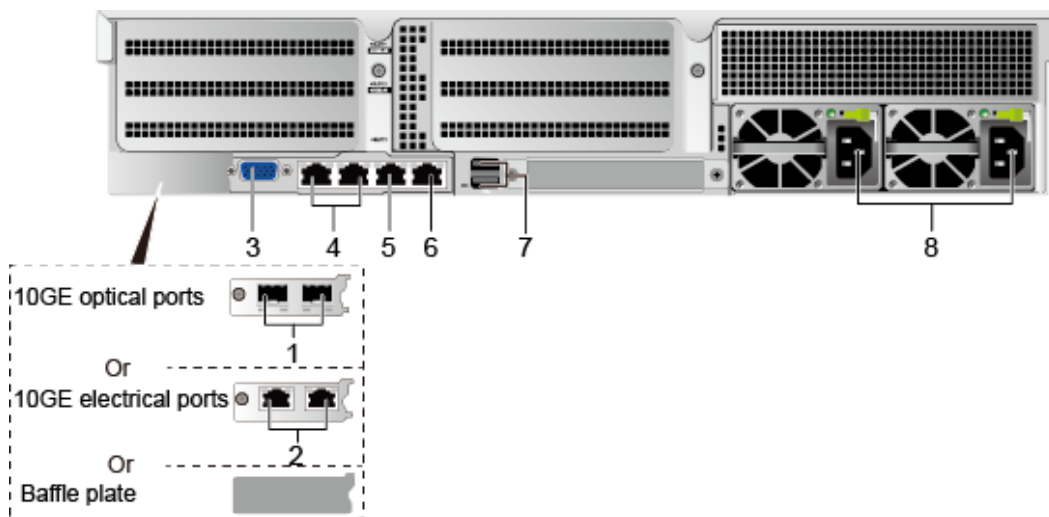
1 (Optional) 10GE optical ports (LOM port)   2 (Optional) 10GE electrical ports (LOM port)

3 VGA port   4 GE electrical ports (LOM port)

5 Management network port   6 Serial port

7 USB 3.0 ports   8 PSU sockets

NOTE

The LOM ports (10GE electrical ports) or LOM ports (10GE optical ports) are labeled 🔲1 and 🔲2 from left to right, and the LOM ports (GE electrical ports) are labeled 🔲1 and 🔲2 from left to right.

Table 4-3 describes the ports on the rear panel.

Table 4-3 Description of ports on the rear panel

Port	Type	Quantity	Description
10GE electrical port	10GBASE-T	2	10GE service network LOM port (electrical port), which can be selected as required.
10GE optical port	10GE SFP+	2	10GE service network LOM port (optical port), which can be selected as required.
VGA port	DB15	1	Used to connect a terminal, such as a monitor or KVM.
GE electrical port	1000BASE-T	2	Service network port integrated on the server mainboard.
Serial port	RJ45	1	The system serial port by default. You can set it as the iBMC serial port by using the iBMC command. This port is used for debugging.
Management network port	1000BASE-T	1	The 1000 Mbit/s Ethernet port is used for server management, and GE network ports are provided to support 100/1000 Mbit/s auto-negotiation.
USB port	USB 3.0	2	Allow USB devices to be connected to the server. **NOTICE** Before connecting an external USB device, check that the USB device functions properly; otherwise, it may adversely impact the server.
PSU socket	-	2	Determine the quantity of PSUs based on actual requirements, but ensure that the rated power of the PSUs is greater than that of the server. When one PSU is used, **Predicted PSU Status** cannot be set to **Active/Standby**.

Table 4-4 LOM port description

LOM Port	Chip Model	Rate Negotiation Mode	Supported Rate	Not Supported Rate
10GE optical port	X722	Auto-negotiation 10000 Mbit/s (full duplex)	10000 Mbit/s	10/100/1000 Mbit/s

LOM Port	Chip Model	Rate Negotiation Mode	Supported Rate	Not Supported Rate
10GE electrical port		Auto-negotiation 1000 Mbit/s (full duplex)	1000 Mbit/s	10/100 Mbit/s
		Auto-negotiation 10000 Mbit/s (full duplex)	10000 Mbit/s	10/100 Mbit/s
GE electrical port		Auto-negotiation 1000 Mbit/s (full duplex)	1000 Mbit/s	10/100 Mbit/s

NOTE

- The LOM ports do not support forcible rates.
- The GE LOM electrical port does not support SR-IOV.
- The 10GE electrical ports and GE electrical ports provided by the X722 NIC does not support interconnection with the PoE power supply device (for example, the PoE switch with the POE function enabled). If the X722 NIC is forcibly connected, the link communication may be abnormal or the NIC may be damaged.
- Table 4-5 lists the cables and optical modules supported by the LOM ports.

Table 4-5 Cables and optical modules

Huawei Part Number	Description
34060494	Switch Products,LE0M0XSM88,Optical Transceiver,SFP+,10G,Multi-mode Module(850nm,0.3km,LC)
34060495	Switch Products,LE0M0XS1DD,Optical Transceiver,SFP+,10G,Single-mode Module(1310nm,10km,LC)
04050233	High Speed Cable,10G Passive SFP+ Cable,1m,(SFP+20M),(CC2P0.254B),(SFP+20M),LSFRZH For Indoor,ETH 10GbE,Y
04050185	High Speed Cable,10G SFP+ High Speed Cable,3m,SFP+20M,CC2P0.254B(S),SFP+20M,LSFRZH For Indoor,ETH 10GbE,LSZH

4.3 Indicators and Buttons

Front Panel

- **Figure 4-14** shows the indicators and buttons on the front panel of a server with eight 2.5-inch drives.

  Figure 4-14 Front panel of a server with eight 2.5-inch drives

1 NMI button	2 Fault diagnostic LED
3 Health indicator	4 UID button/indicator
5 Power button/indicator	6 LOM port connection status indicators (1 to 4 from top to bottom)

- **Figure 4-15** shows the indicators and buttons on the front panel of a server with twelve 3.5-inch drives.

  Figure 4-15 Front panel of a server with twelve 3.5-inch drives

1 LOM port connection status indicators (1 to 4 from top to bottom)	2 Fault diagnostic LED
3 Health indicator	4 UID button/indicator
5 Power button/indicator	- -

- **Figure 4-16** shows the indicators and buttons on the front panel of a server with 8 x 2.5-inch SAS/SATA + 12 x 2.5-inch NVMe drives.

  Figure 4-16 Front panel of a server with 8 x 2.5-inch SAS/SATA + 12 x 2.5-inch NVMe drives

1 LOM port connection status indicators (1 to 4 from top to bottom)	2 Fault diagnostic LED

3 Health indicator		4 UID button/indicator
5 Power button/indicator		- -

- **Figure 4-17** shows the indicators and buttons on the front panel of a server with twenty-four 2.5-inch drives.

Figure 4-17 Front panel of a server with twenty-four 2.5-inch drives

1 LOM port connection status indicators (1 to 4 from top to bottom)		2 Fault diagnostic LED
3 Health indicator		4 UID button/indicator
5 Power button/indicator		6 NMI button

- **Figure 4-18** shows the indicators and buttons on the front panel of a server with twenty-five 2.5-inch drives.

Figure 4-18 Front panel of a server with twenty-five 2.5-inch drives

1 LOM port connection status indicators (1 to 4 from top to bottom)		2 Fault diagnostic LED
3 Health indicator		4 UID button/indicator
5 Power button/indicator		- -

Table 4-6 describes the indicators and buttons on the front panel of a server.

Table 4-6 Description of indicators and buttons on the front panel

Silk Screen	Indicator and Button	State Description
🔲🔲🔲	Fault diagnostic LED	● ---: The server is operating normally. ● Error code: A server component is faulty. For error code details, see the *Huawei Rack Server iBMC Alarm Handling*.

Silk Screen	Indicator and Button	State Description
⏻	Power button/ indicator	Power indicator: ● Steady yellow: The server is ready to power on. ● Steady green: The server is properly powered on. ● Blinking yellow: The iBMC is starting. ● Off: The server is not connected to a power source. Power button: ● When the server is powered on, you can press this button to shut down the OS. ● When the server is powered on, holding down this button for 6 seconds will power off the server. ● When the server is ready to be powered on, you can press this button to start the server.
⃝	UID button/ indicator	The UID button/indicator helps identify and locate a server. You can turn on or off the UID indicator by pressing the UID button or remotely running a command on the iBMC CLI. UID indicator: ● Steady blue/Blinking blue: The server is being located. ● Off: The server is not being located. UID button: ● You can press this button to turn on or off the UID indicator. ● You can press and hold down this button for 4 to 6 seconds to reset the iBMC.
▥	Health indicator	● Steady green: The server is operating properly. ● Blinking red at 1 Hz: A major alarm has been generated on the server. ● Blinking red at 5 Hz: A critical alarm has been generated on the server.
○	NMI button	The NMI button triggers a server to generate a non-maskable interrupt. You can press this button or remotely control it through the iBMC WebUI. **NOTICE** ● Press the NMI button only when the OS is abnormal. Do not press this button when the server is operating properly. ● Before pressing the NMI button, ensure that the OS has the handler for NMI interrupts. Otherwise, the OS may crash. Exercise caution when pressing this button.

Silk Screen	Indicator and Button	State Description
🖧	LOM port connection status indicator	Each indicator shows the status of an Ethernet port on the LOM. ● Steady green: The network port is properly connected. ● Off: The network port is not in use or has failed. **NOTE** ● The indicators correspond to two 10GE and two GE network ports on the mainboard. ● The LOM has a standby power supply and is not powered off after the service system is powered off. If the network ports are properly connected to other working network devices, the network ports are still connected and the indicators are on.

Rear Panel

Figure 4-19 shows the indicators on the rear panel of a server.

Figure 4-19 Indicators on the rear panel

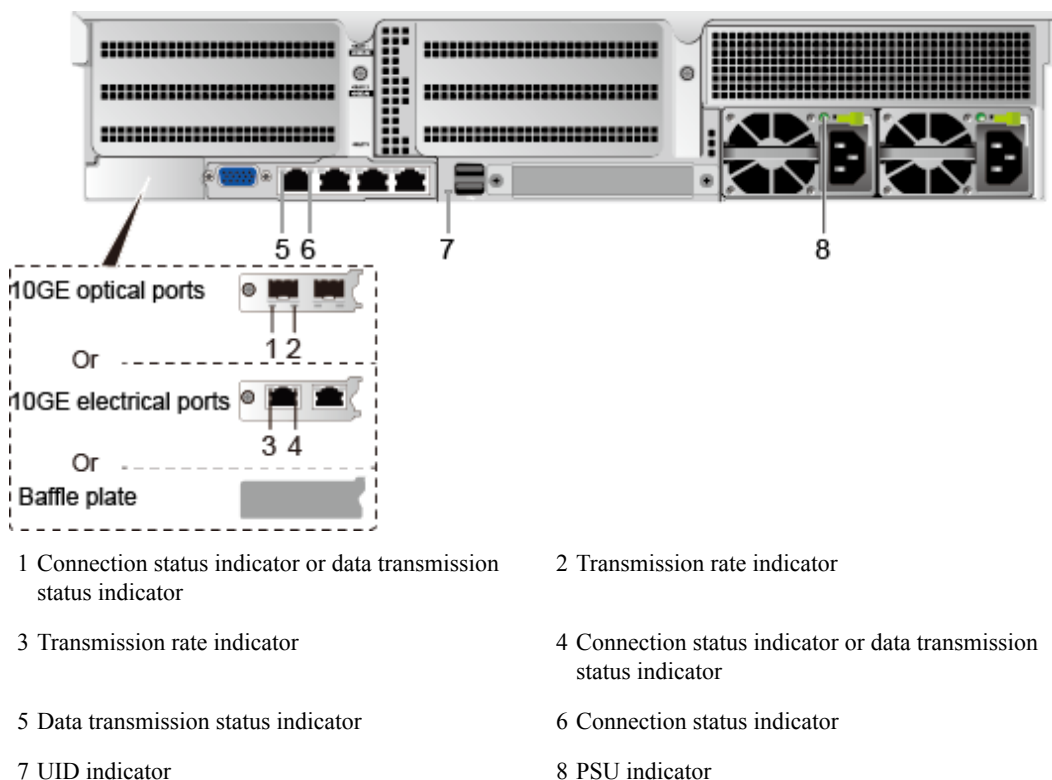| 1 Connection status indicator or data transmission status indicator	2 Transmission rate indicator
3 Transmission rate indicator	4 Connection status indicator or data transmission status indicator
5 Data transmission status indicator	6 Connection status indicator
7 UID indicator	8 PSU indicator

Table 4-7 describes the indicators on the rear panel of a server.

Table 4-7 Description of indicators on the rear panel

Indicator		State Description
10GE electrical port	Transmission rate indicator	• Steady green: The data transmission rate is 10 Gbit/s. • Steady yellow: The data transmission rate is 1 Gbit/s. • Off: The network port is not connected.
	Connection status indicator or data transmission status indicator	• Steady green: The network port is properly connected. • Blinking green: Data is being transmitted. • Off: The network port is not connected.
10GE optical port	Connection status indicator or data transmission status indicator	• Steady green: The network port is properly connected. • Blinking green: Data is being transmitted. • Off: The network port is not connected.
	Transmission rate indicator	• Steady green: The data transmission rate is 10 Gbit/s. • Steady yellow: The data transmission rate is lower than 10 Gbit/s. • Off: The network port is not connected.
GE electrical port	Connection status indicator	• Steady green: The network port is properly connected. • Off: The network port is not connected.
	Data transmission status indicator	• Blinking yellow: Data is being transmitted. • Off: No data is being transmitted.
UID indicator		The UID indicator helps identify and locate a server. You can turn on or off the UID indicator by pressing the UID button or remotely running a command on the iBMC CLI. • Steady blue/Blinking blue: The server is being located. • Off: The server is not being located.

Indicator	State Description

PSU indicator	● Steady green: The power input and output are normal.
	● Steady orange: The input is normal, but no power output is supplied due to overheat protection, overcurrent protection, short circuit protection, output overvoltage protection, or some component failures.
	● Blinking green at 4 Hz: under online upgrade.
	● Blinking green at 1 Hz:
	  – The input is normal, the server is in the standby state, and the PSU is in MV6 mode. (The output voltage is 6.7 V.)
	  – The input is overvoltage or undervoltage.
	  – The PSU is in deep hibernation mode.
	● Off: No AC power is supplied.

SAS/SATA Drive Indicators

Figure 4-20 SAS/SATA drive indicators
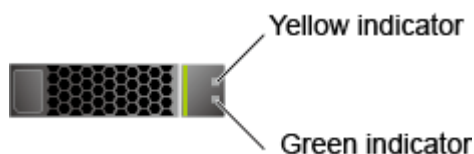
Table 4-8 Description of SAS/SATA drive indicators

Green Indicator	Yellow Indicator	Description
Steady on	Off	The drive in position.
Blinking at 4 Hz	Off	The drive is in the normal read/write state or the primary drive is in the rebuilding state.
Steady on	Blinking at 1Hz	The drive is being located.
Blinking at 1Hz	Blinking at 1Hz	The secondary drive is in the rebuilding state.
Off	Steady on	A member drive in the RAID array is removed.
Steady on	Steady on	The hard disk is faulty.

NVMe SSD Indicators

Figure 4-21 NVMe SSD indicators
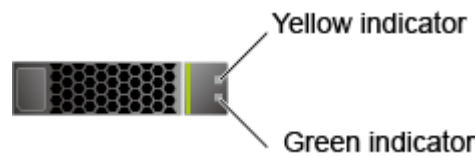
- When the VMD function is enabled and the latest RSTe driver is installed, NVMe SSDs support surprise hot swap. **Table4 NVMe SSD indicators (VMD enabled)** describes the NVMe SSD indicator status.
- When the VMD function is disabled, NVMe SSDs support only orderly hot swap. **Table5 NVMe SSD indicators (VMD disabled)** describes the NVMe SSD indicator status.

Table 4-9 NVMe SSD indicators (VMD enabled)

Green Indicator	Yellow Indicator	State Description
Off	Off	The NVMe SSD cannot be detected.
Steady green	Off	The NVMe SSD is detected and working properly.
Blinking green (2 Hz)	Off	Data is being read from or written to the NVMe SSD.
Off	Blinking yellow (2 Hz)	The NVMe SSD is being located.
Off	Blinking yellow (8 Hz)	The NVMe SSD is rebuilding a secondary drive.
Steady green or off	Steady yellow	The NVMe SSD is faulty.

Table 4-10 NVMe SSD indicators (VMD disabled)

Green Indicator	Yellow Indicator	State Description
Off	Off	The NVMe SSD cannot be detected.
Steady green	Off	The NVMe SSD is detected and working properly.
Blinking green (2 Hz)	Off	Data is being read from or written to the NVMe SSD.

Green Indicator	Yellow Indicator	State Description
Off	Blinking yellow (2 Hz)	The NVMe SSD is being located or hot-swapped.
Off	Blinking yellow (0.5 Hz)	The NVMe SSD completes the hot removal process and is removable.
Steady green or off	Steady yellow	The NVMe SSD is faulty.

FlexIO Indicators

Supported FlexIOs include:

- SM211 (chip: i350) with two GE electrical ports
- SM210 (chip: 5719)/SM212 (chip: i350) with four GE electrical ports
- SM233 (chip: X540) with two 10GE electrical ports
- SM252 (chip: CX3) with one 56G IB optical port
- SM251 (chip: CX3) with two 56G IB optical ports
- SM380 (chip: CX4) with two 25GE optical ports

NOTICE

The electrical ports of the SM211, SM212, and SM233 FlexIOs do not support interconnection with the PoE power supply device (for example, the PoE switch with the POE function enabled). If such a NIC is forcibly connected, the link communication may be abnormal or the NIC may be damaged.

Use the **Huawei Server Compatibility Checker** to check the FlexIOs supported by the server.

The following figures show the indicators on these FlexIOs.

Figure 4-22 SM211 with two GE electrical ports
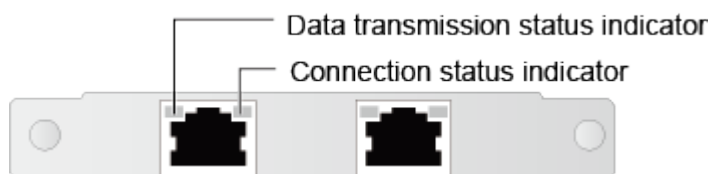
Figure 4-23 SM210/SM212 with four GE electrical ports

Figure 4-24 SM233 with two 10GE electrical ports

Figure 4-25 SM252 with one 56G IB optical port
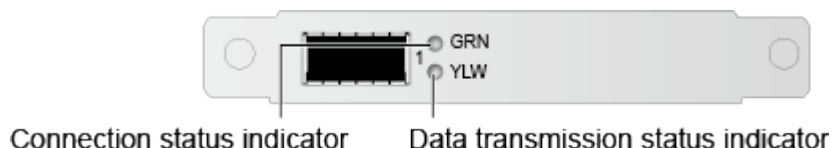
Figure 4-26 SM251 with two 56G IB optical ports
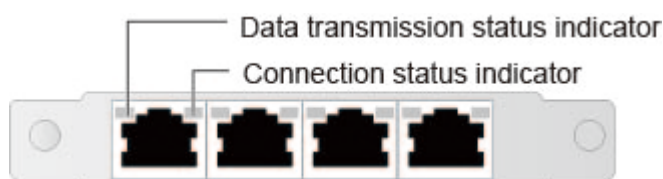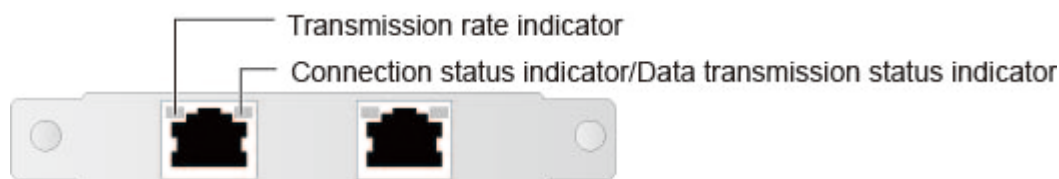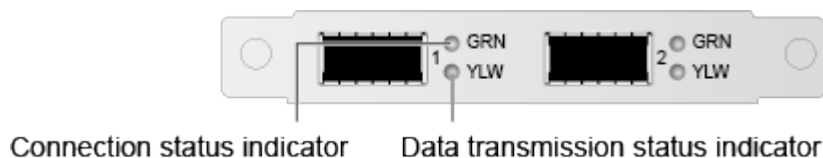

Figure 4-27 SM380 with two 25GE optical ports
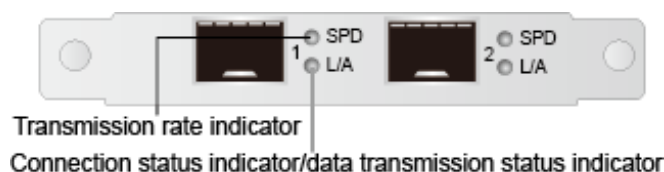
Table 4-11 Description of FlexIO indicators

NIC Type	Indicator	State Description
● FlexIO with two GE electrical ports ● FlexIO with four GE electrical ports	Data transmission status indicator	● Blinking yellow: Data is being transmitted. ● Off: No data is being transmitted.
	Connection status indicator	● Steady green: The network port is properly connected. ● Off: The network port is not connected.
FlexIO with two 10GE electrical ports	Transmission rate indicator	● Steady green: The data transmission rate is 10 Gbit/s. ● Steady yellow: The data transmission rate is 1 Gbit/s. ● Off: The data transmission rate is 10/100 Mbit/s.

NIC Type	Indicator	State Description
	Connection status indicator or data transmission status indicator	• Steady green: The network port is properly connected. • Blinking green: Data is being transmitted. • Off: No data is being transmitted or the network port is not connected.
• FlexIO with one 56G IB optical port • FlexIO with two 56G IB optical ports	Connection status indicator	• Steady green: The physical link is normal. • Blinking green: The physical link is abnormal. • Off: No physical link is set up.
	Data transmission status indicator	• Steady yellow: The logical link is normal but no data is being transmitted. • Blinking yellow: Data is being transmitted. • Off: No logical link is set up.
FlexIO with two 25GE optical ports	Transmission rate indicator	• Steady green: The data transmission rate is 25 Gbit/s. • Steady yellow: The data transmission rate is 10 Gbit/s. • Off: The network port is not connected.
	Connection status indicator or data transmission status indicator	• Steady green: The network port is properly connected. • Blinking green: Data is being transmitted. • Off: The network port is not connected.

4.4 Riser Cards and PCIe Slots

Figure 4-28, **Figure 4-29**, **Figure 4-30**, **Figure 4-31**, **Figure 4-32**, and **Figure 4-33** show the riser cards supported by the server.

Figure 4-28 Riser card 1 (universal)
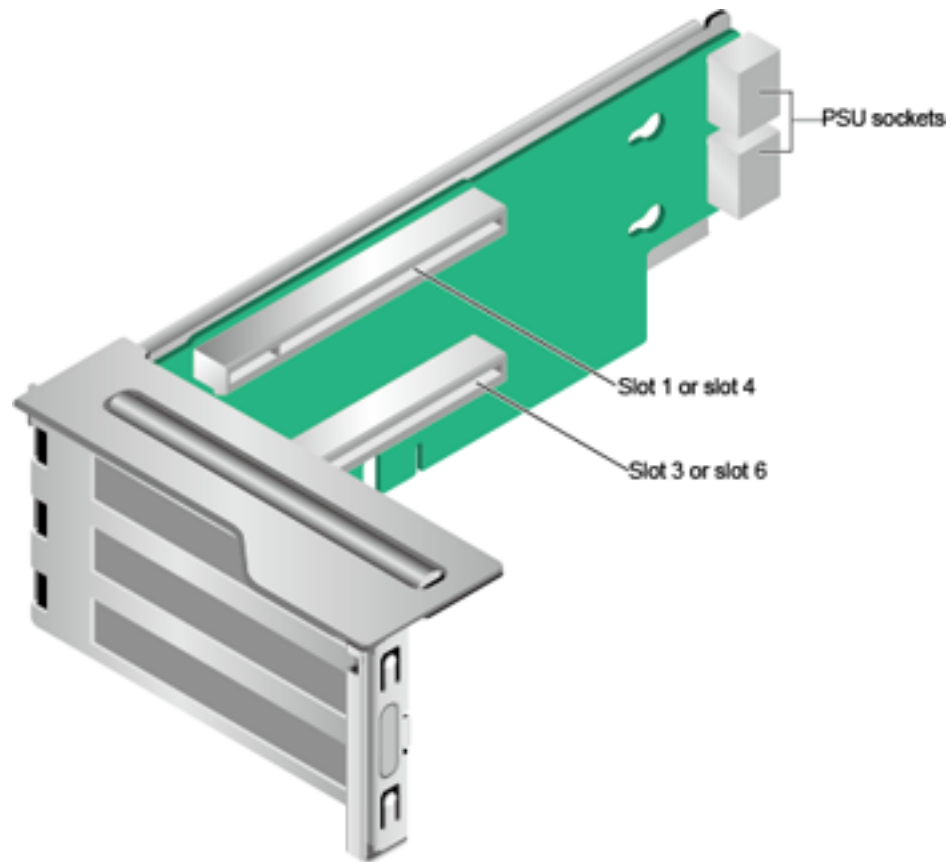
When installed in I/O module 1, this riser card provides slots 1 and 3. When installed in I/O module 2, this riser card provides slots 4 and 6.

Figure 4-29 Riser card 2 (universal)
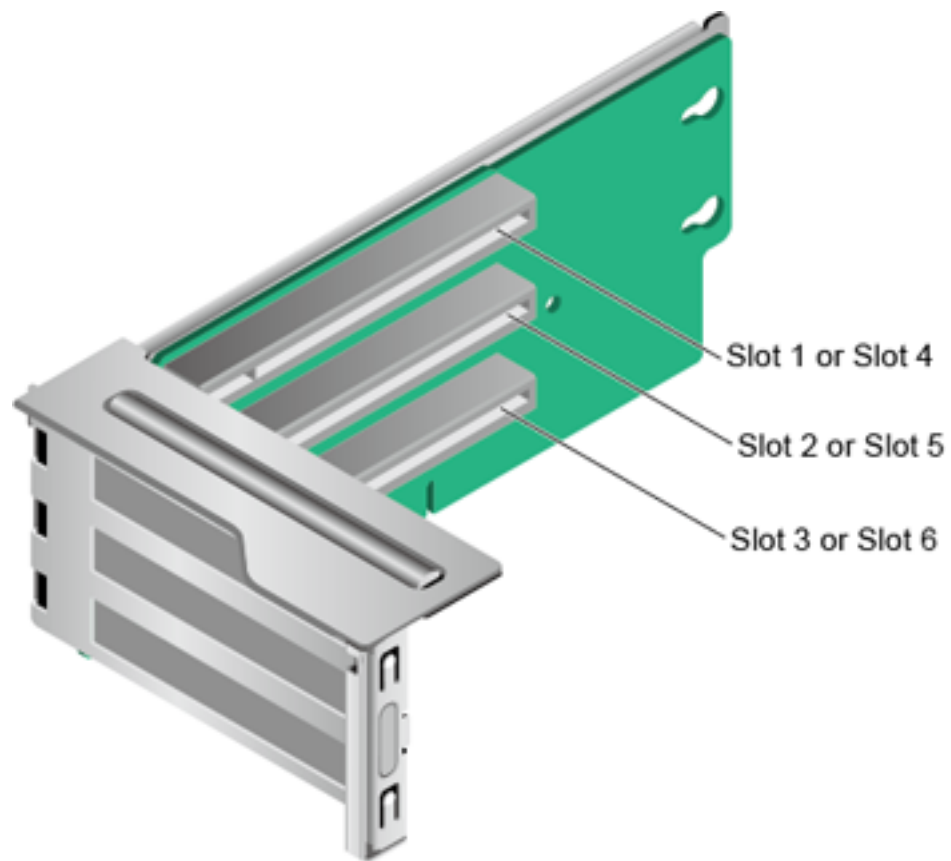
When installed in I/O module 1, this riser card provides slots 1 to 3. When installed in I/O module 2, this riser card provides slots 4 to 6.

Figure 4-30 Riser card 3 (dedicated for ES3000 V3 SSDs)
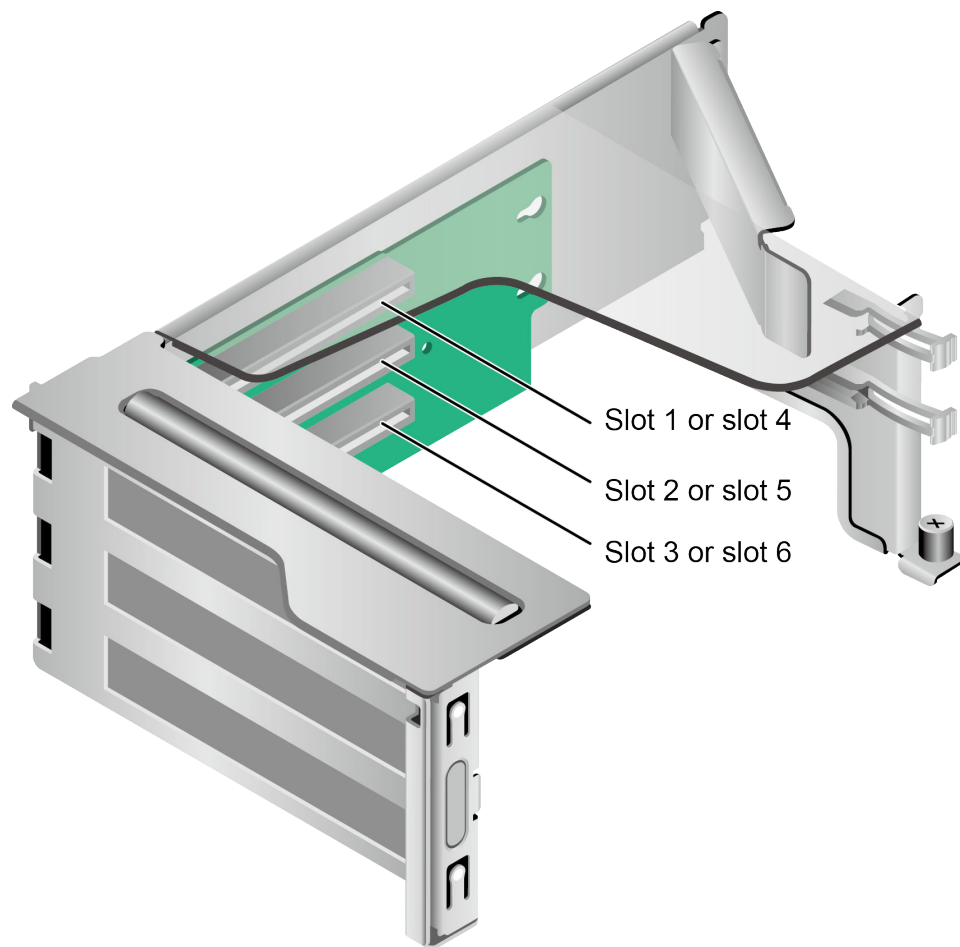
When installed in I/O module 1, this riser card provides slots 1 to 3. When installed in I/O module 2, this riser card provides slots 4 to 6.

Figure 4-31 Riser card 4 (dedicated for GPUs)
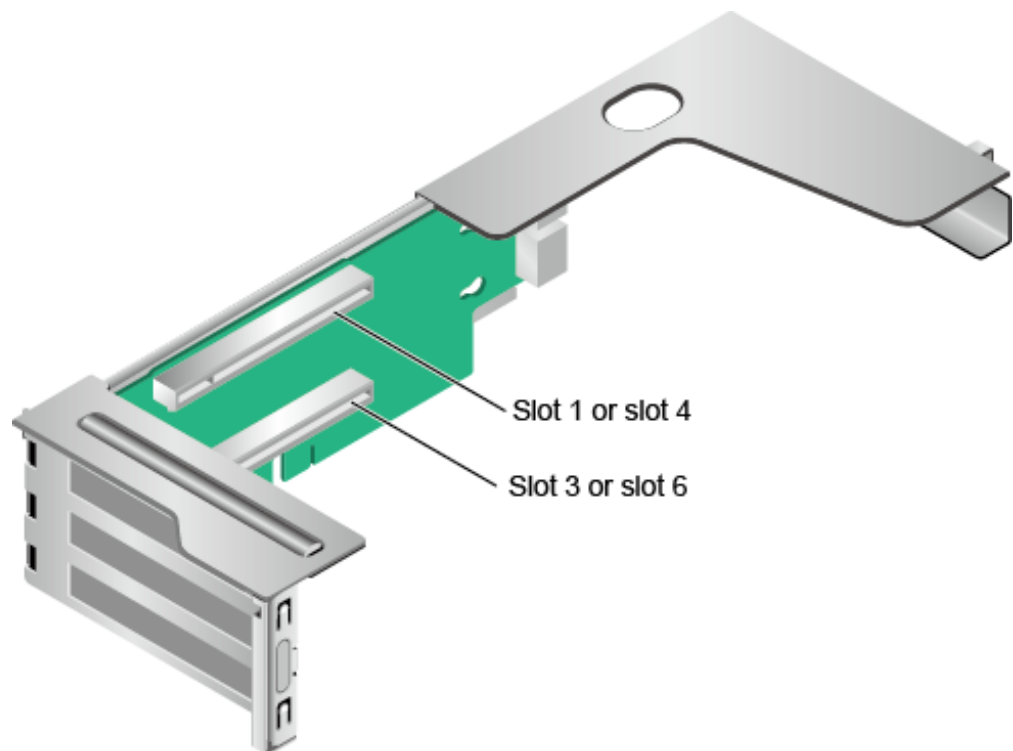
When installed in I/O module 1, this riser card provides slots 1 and 3. When installed in I/O module 2, this riser card provides slots 4 and 6.

Figure 4-32 Riser card 5
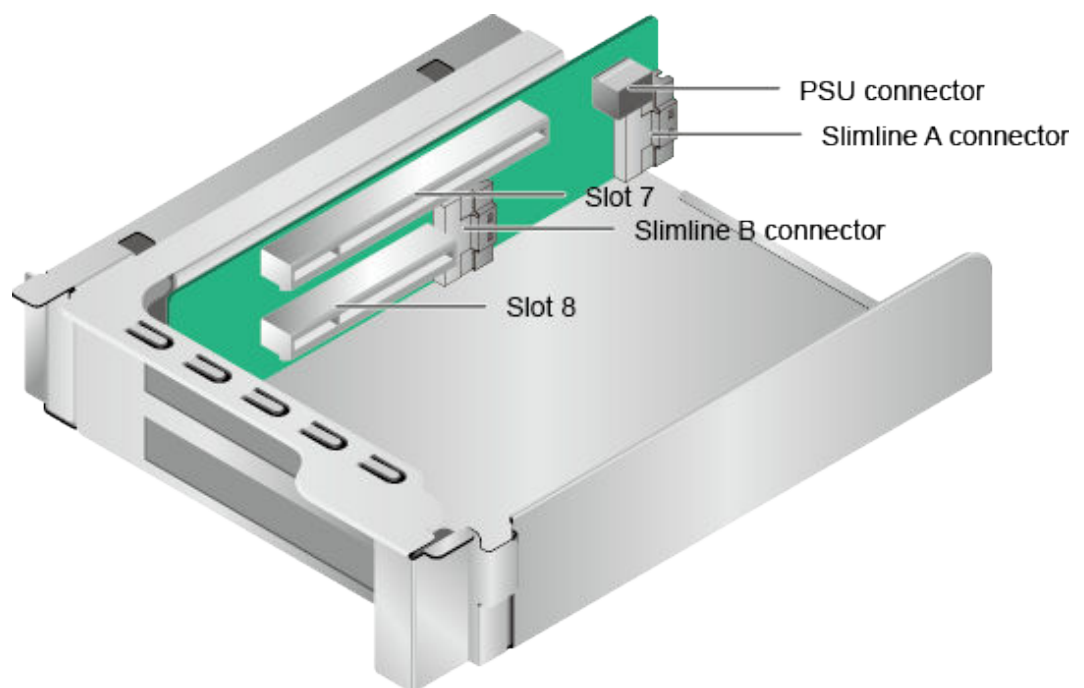
Figure 4-33 Riser card 6
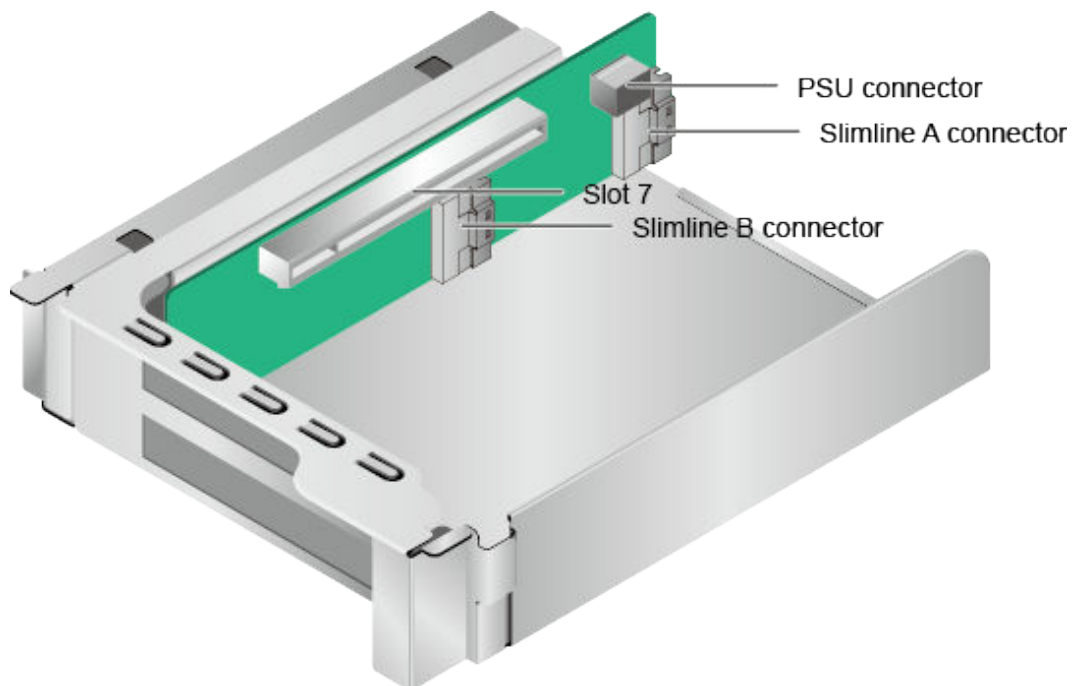
Figure 4-34 shows the PCIe slots on the rear panel.

Figure 4-34 PCIe slots

I/O module 1 provides slots 1 to 3, I/O module 2 provides slots 4 to 6, and I/O module 3 provides slots 7 and 8.

- If I/O module 1 uses a 2-slot PCIe riser module (PRM), slot 2 is unavailable.

- If I/O module 2 uses a 2-slot PRM, slot 5 is unavailable.

- If I/O module 3 uses a 1-slot PRM, slot 8 is unavailable.

Table 4-12 describes the PCIe slots.

□NOTE

If CPU 2 is not installed, the PCIe slots provided by I/O modules 2 and 3 and the FlexIO are unavailable.

Table 4-12 PCIe slot description

PCIe Device	CPU	PCIe Standard	Connector Width	Bus Bandwidth	Port Number	Root Port (B/D/F)	Device (B/D/F)	Slot Size
Slot 1	CPU 1	PCIe 3.0	x16	• 2-slot PRM: x16 • 3-slot PRM: x8	Port 2A	3A/00/0	3B/00/0	Full-height full-length
Slot 2	CPU 1	PCIe 3.0	x16	• 2-slot PRM: N/A • 3-slot PRM: x8	Port 2C	3A/02/0	3E/00/0	Full-height full-length
Slot 3	CPU 1	PCIe 3.0	x16	x8	Port 3A	5D/00/0	5E/00/0	Full-height half-length
Slot 4	CPU 2	PCIe 3.0	x16	• 2-slot PRM: x16 • 3-slot PRM: x8	Port 1A	85/00/0	86/00/0	Full-height full-length
Slot 5	CPU 2	PCIe 3.0	x16	• 2-slot PRM: N/A • 3-slot PRM: x8	Port 1C	85/02/0	89/00/0	Full-height full-length
Slot 6	CPU 2	PCIe 3.0	x16	x8	Port 2C	AE/02/0	B0/00/0	Full-height half-length
Slot 7	CPU 2	PCIe 3.0	x16	• 1-slot PRM: x16 • 2-slot PRM: x8	Port 3A	D7/00/0	D8/00/0	Half-height half-length
Slot 8	CPU 2	PCIe 3.0	x8	• 1-slot PRM: N/A • 2-slot PRM: x8	Port 3C	D7/02/0	DB/00/0	Half-height half-length
RAID controller card	CPU 1	PCIe 3.0	x8	x8	Port 1C	17/02/0	1D00/0	-

PCIe Device	CPU	PCIe Standard	Connector Width	Bus Bandwidth	Port Number	Root Port (B/D/F)	Device (B/D/F)	Slot Size
Flex IO	CPU 2	PCIe 3.0	x8	x8	Port 2A	AE/00/0	AF/00/0	-
LOM	CPU1	PCIe3.0	x8	x8	Port1A	17/00/0	1A/00/0	-

NOTE

- B/D/F stands for Bus/Device/Function Number.
- **Root Port (B/D/F)** indicates the B/D/F of a CPU internal PCIe root port. **Device (B/D/F)** indicates the B/D/F (displayed on the OS) of an LOM or external PCIe port.
- The PCIe slots that support full-height full-length PCIe cards are backwards compatible with full-height half-length or half-height half-length PCIe cards.
- The PCIe slots that support PCIe x16 cards are backwards compatible with PCIe x8, PCIe x4, and PCIe x1 cards.
- All slots support PCIe cards of up to 75 W. The power of a PCIe card depends on its model. Use the **Huawei Server Compatibility Checker** to check PCIe cards supported by the server. For PCIe cards not listed in the **Huawei Server Compatibility Checker**, contact your local Huawei sales personnel.
- This table lists the default values of **B/D/F**. If CPUs are not installed in all sockets or a PCIe card with a PCI bridge is configured, the values of **B/D/F** may differ.
- The table lists the **B/D/F** allocation when CPUs are in full configuration.
- SP520, SP521, and SP522 do not support diskless server configuration at present. If servers are sold using the diskless configuration, PXE boot is recommended.

PCIe GPU Configuration Rules

- A two-slot PRM in I/O module 1 or 2 can house a maximum of one single-slot or dual-slot PCIe x16 GPU in slot 1 or 4.
- A one-slot PRM in I/O module 3 can house a maximum of one single-slot half-height half-length PCIe x16 GPU.
- A three-slot PRM in I/O module 1 or 2 does not support GPUs.
- A two-slot PRM in I/O module 3 does not support GPUs.
- The server supports a maximum of two dual-slot GPUs or three single-slot GPUs. All GPUs except half-height half-length P4 GPUs must be installed in dedicated riser cards.

4.5 Physical Structure

Figure 4-35 shows the components of a server.

Figure 4-35 2288H V5 components
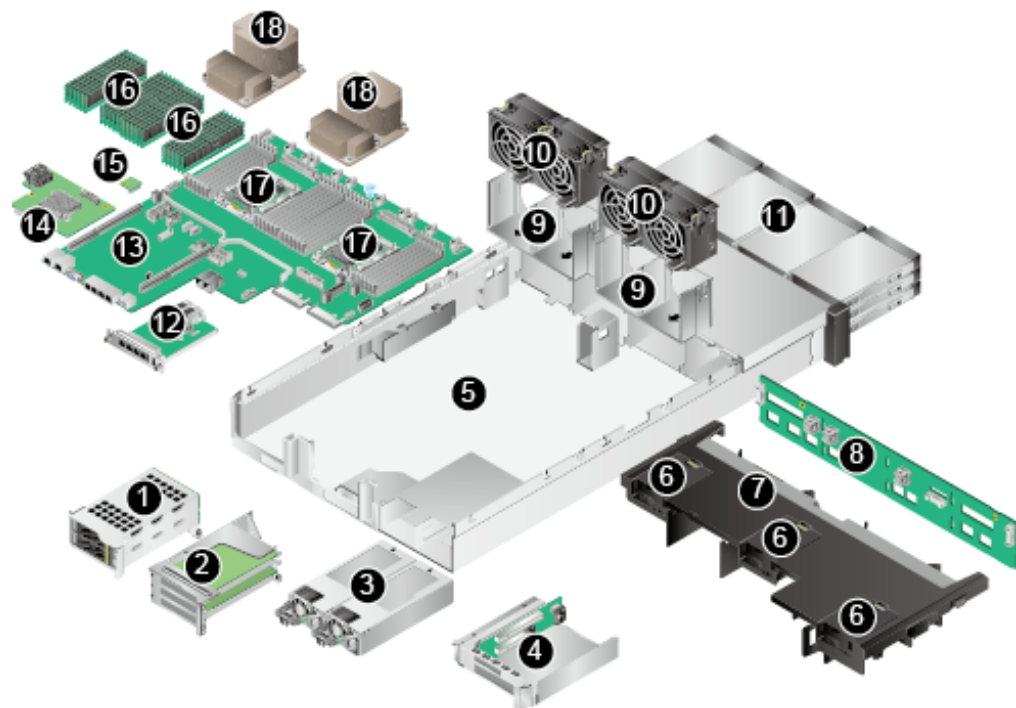
1	I/O module 1	2	I/O module 2
3	PSU	4	I/O module 3
5	Chassis	6	Supercapacitor tray
7	Air duct	8	Front drive backplane
9	Fan module bracket	10	Fan module
11	Front drive	12	FlexIO
13	Mainboard	14	RAID controller card
15	TPM/TCM	16	DIMM
17	CPU	18	Heat sink

5 Product Specifications

5.1 Technical Specifications

Table 5-1 Technical specifications

Item	Specifications
Form factor	2U rack server
CPU	One or two Intel® Xeon® Scalable processors (Skylake, Cascade Lake) ● 28 cores per processor (2.7 GHz) ● Maximum frequency: 3.8 GHz (four cores) ● Two UPI links: 10.4 GT/s maximum transmission speed per link ● Minimum L3 cache capacity per core: 1.375 MB ● Maximum thermal design power (TDP): 205 W
Chipset	Intel C621 / Intel C622

Item	Specifications
Memory	- A maximum of 24 DDR4 RDIMMs or LRDIMMs - RDIMM: twenty-four 32 GB RDIMMs for two CPUs, with a maximum memory capacity of 768 GB - LRDIMM: twenty-four 64 GB LRDIMMs for two CPUs, with a maximum memory capacity of 1536 GB - LRDIMM: twenty-four 128 GB LRDIMMs for two CPUs, with a maximum memory capacity of 3072 GB - The maximum memory speed of DIMMs is 2933MT/s. - DDR4 memory protection technologies: Error Checking and Correcting (ECC), Mirrored Channel Mode, Single Device Data Correction (SDDC), Rank Sparing Mode, Lockstep and so on. **NOTE** DDR4 DIMMs in one server must be of the same model, type (RDIMM or LRDIMM), and specifications (capacity, bit width, number of ranks, and height).

Item	Specifications
Storage	● Supports various drive configurations. For details, see **Table 6-3**. ● Supports two M.2 SSD modules. **NOTE** ● An M.2 SSD is used as a boot device for installing an OS. Small-capacity M.2 SDDs (such as 32 GB or 64 GB SSDs) have short endurance and do not support logging. If a small-capacity M.2 SSD is used as the boot device, a dedicated log drive or log server is required for logging. For example, you can dump VMware logs in either of the following ways: -Redirect **/scratch**. For details, visit **https://kb.vmware.com/s/article/1033696.** -Configure syslog. For details, visit **https://kb.vmware.com/s/article/2003322.** ● M.2 SSDs have short endurance and cannot be used as data storage devices. M.2 SSDs have write-through risks in a short time, and cannot be used in frequent data erase operations. SSDs or HDDs with enterprise-level high DWPD can be used for data storage. ● Installing write-intensive service software on M.2 SSDs will accelerate the write life consumption and result in perpetual damage of M.2 SSDs. Therefore, M.2 SSDs cannot be used for such services. ● M.2 SSDs cannot be used in cache scenarios. ● The OS drive letter can be set to sda only when M.2 SSD modules are used with SR130/SR130-M/SR760IT-M screw-in RAID controller cards. If other RAID controller cards are used, the OS drive letter cannot be sda. ● Supports drive hot swap. **NOTE** When the VMD function is enabled and the latest RSTe driver is installed, NVMe SSDs support surprise hot swap. When the VMD function is disabled, NVMe SSDs support only orderly hot swap. ● Supports RAID 0, 1, 10, 1E, 5, 50, 6, and 60, provides a supercapacitor to protect cache data from power failures, and supports RAID level migration, drive roaming, self-diagnosis, web-based configuration, VROC, and NVMe RAID function. ● Allows a SAS card or SAS RAID controller card (with a maximum of 4 GB cache) to be configured on the mainboard to improve drive storage performance and ensure user data security. **NOTE** If the BIOS is in Legacy mode, the server does not support a 4K drive as the system boot drive.

Item	Specifications

Network ports	The server supports the following mainboards:
	
	● The mainboard integrates an NIC chip with two GE electrical ports.
	
	● The mainboard integrates an NIC chip with two 10GE electrical ports and two GE electrical ports.
	
	● The mainboard integrates an NIC chip with two 10GE optical ports and two GE electrical ports.
	
	NOTE
	
	● Two 10GE electrical or optical LOM ports (provided by the PCH), supporting NC-SI, WOL, and PXE
	
	● Two GE electrical LOM ports (provided by the PCH), supporting NC-SI, WOL, and PXE
	
	● The FlexIOs provide the following network ports:
	
	  ● Two GE electrical ports, supporting NC-SI, WOL, and PXE
	
	  ● Four GE electrical ports, supporting NC-SI, WOL, and PXE
	
	  ● Two 10GE electrical ports, supporting NC-SI, WOL, and PXE
	
	  ● One 56G IB optical port, not supporting NC-SI, WOL, or PXE
	
	  ● Two 56G IB optical ports, not supporting NC-SI, WOL, or PXE
	
	  ● Two 25GE optical ports, supporting NC-SI, WOL, and PXE
	
	NOTE
	
	● The LOM chip is X722. The 10GE electrical ports and GE electrical ports provided by the LOM do not support interconnection with the PoE power supply device (for example, the PoE switch with the POE function enabled). If such a LOM is forcibly connected, the link communication may be abnormal or the LOM may be damaged.
	
	● The electrical ports of the FlexIOs do not support interconnection with the PoE power supply device (for example, the PoE switch with the POE function enabled). If such a NIC is forcibly connected, the link communication may be abnormal or the NIC may be damaged.
	
	● If a server is forcibly powered off, the NC-SI function of LOM ports will be unavailable and you need to refresh the iBMC WebUI to restore the function. The WOL function will also be unavailable.

Item	Specifications
RAID controller card	The RAID controller card does not occupy a standard PCIe slot, which improves system scalability.
	The RAID controller card supports RAID level migration and drive roaming. The server supports the following RAID controller cards:
	● LSI SAS3008 (SR130): supports RAID 0, 1, 10, and 1E, and does not support out-of-band iBMC management.
	● LSI SAS3008 (SR130-M): supports the IT mode and iBMC out-of-band management, but does not support RAID arrays.
	● LSI SAS3108 (SR430C-M): supports RAID 0, 1, 10, 5, 50, 6, and 60, supports a supercapacitor for power-off protection, and support out-of-band iBMC management.
	● Broadcom SAS3508 (SR450C-M 2G/4G): supports RAID 0, 1, 10, 5, 50, 6, and 60, a supercapacitor for power-off protection, and out-of-band iBMC management.
	● Broadcom SAS3408 (SR150-M): supports RAID 0, 1, and 10, and out-of-band iBMC management, but does not support power-off protection.
	● Broadcom SAS3416 (SR760-M): supports RAID 0, 1, and 10, and out-of-band iBMC management, but does not support power-off protection.
	● Broadcom SAS3416 (SR760IT-M): supports the IT mode and iBMC out-of-band management, but does not support RAID arrays.
	● Broadcom SAS3516 (SP460C-M): supports RAID 0, 1, 10, 5, 50, 6, and 60, a supercapacitor for power-off protection, and out-of-band iBMC management.
	NOTE
	● Intel SoftRAID is supported if the drives are connected to the server through the PCH rather than through RAID controller cards.
	● Intel SoftRAID is available only on a server with the Intel RSTe driver.
	● Intel SoftRAID supports RHEL 7.3, RHEL 7.4, Windows Server 2012 R2, and Windows Server 2016.
	● If Intel SoftRAID is configured for a server, the BIOS can be set only to the Legacy or UEFI mode and the OS can be installed only on a SATA drives.
	● If the VROC key is installed, the VMD function is enabled, and the required driver is installed, servers can use the VROC function of Intel CPUs to configure RAID groups for NVMe disks.
	● The information here is for reference only. To obtain more information, use the **Huawei Server Compatibility Checker**.

Item	Specifications
PCIe slots	● Ten PCIe 3.0 slots, among which one is a dedicated PCIe slot for a RAID controller card, one is a dedicated PCIe slot for a FlexIO, and the other eight are standard PCIe slots. The specifications of the standard PCIe slots are as follows: I/O modules 1 and 2 provide the following PCIe slots: – Two standard full-height full-length PCIe 3.0 x16 slots (bandwidth: PCIe 3.0 x8) and one standard full-height half-length PCIe 3.0 x16 slot (bandwidth: PCIe 3.0 x8) – One standard full-height full-length PCIe 3.0 x16 slot and one standard full-height half-length PCIe 3.0 x16 slot (bandwidth: PCIe 3.0 x8) I/O module 3 provides the following PCIe slots: – One standard half-height half-length PCIe 3.0 x16 slot (bandwidth: PCIe 3.0 x8) and one standard half-height half-length PCIe 3.0 x8 slot – One standard half-height half-length PCIe 3.0 x16 slot ● One Huawei SSD card, which greatly improves I/O performance for search, cache, and download services ● P4, P100, and M10 GPUs **NOTE** ● Use the **Huawei Server Compatibility Checker** to check the PCIe cards supported by your server. For not listed PCIe cards, contact a local Huawei sales representative or Huawei technical support. ● SP520, SP521, and SP522 do not support diskless server configuration at present. If servers are sold using the diskless configuration, PXE boot is recommended.
Ports	● Two USB 2.0 ports, one USB 3.0 port, and one DB15 VGA port on the front panel **NOTE** Only servers with eight 2.5-inch drives and twenty-four 2.5-inch drives provide the VGA port and USB 3.0 port on the front panel. ● Two USB 3.0 ports, one DB15 VGA port, one RJ45 serial port, one system management port, two GE electrical ports, and two 10GE electrical ports or two 10GE optical ports on the rear panel ● One built-in USB 3.0 port and two built-in SATA ports **NOTE** ● The front USB 3.0 ports are connected to the built-in USB 3.0 port through a USB signal cable. ● USB port cannot be used for installing OSs.
Fan modules	Four hot-swappable fan modules, allowing single fan failure **NOTE** The fans on one server must be of the same model.

Item	Specifications
System management	- UEFI - iBMC Uses an independent port. Supports SNMPv1/SNMPv2c/SNMPv3 and IMPI 2.0, and Redfish 1.0, and provides the GUI, virtual KVM, virtual media, Serial Over LAN (SOL), intelligent power supply, remote control, and hardware monitoring features. - NC-SI - Supports Huawei eSight management software and integration with third-party management systems, such as VMware vCenter, Microsoft SystemCenter, and Nagios.
Security	- Power-on password - Administrator password - TPM (available in and out of China)/TCM (available only in China) - Front bezel (optional) The front bezel is installed on the front panel and comes with a security lock to prevent unauthorized operations on drives.
Video card	The mainboard integrates an SM750 graphics card, providing 32 MB memory and supporting a maximum resolution of 1920 x 1200 at 60 Hz with 16 M colors. **NOTE** - The maximum resolution 1920 x 1200 is supported only when a compatible graphics card driver is installed. Otherwise, only the default resolution supported by the OS is available. - On a server that provides front and rear VGA ports, if only one VGA port is connected to a monitor, the display effect may be affected.

5.2 Physical and Environmental Specifications

Physical Specifications

Table 5-2 Physical specifications

Item	Specifications
Dimensions (H x W x D)	- Chassis with 3.5-inch drives: 86.1 mm x 447 mm x 748 mm (3.39 in. x 17.60 in. x 29.45 in.) - Chassis with 2.5-inch drives: 86.1 mm x 447 mm x 708 mm (3.39 in. x 17.60 in. x 27.87 in.)

Item	Specifications
Installation space	The server fits into a universal cabinet compliant with the IEC 297 standard. ● Cabinet width: 19 in. ● Cabinet depth: ≥ 1000 mm (39.37 in.) Requirements for guide rail installation: ● L-shaped guide rails: apply only to a Huawei cabinet. ● Adjustable guide rails: apply to a cabinet with a distance of 543.5 mm to 848.5 mm (21.40 in. to 33.41 in.) between the front and rear mounting bars. ● Holding rails: apply to a cabinet with a distance of 610 mm to 914 mm (24.02 in. to 35.98 in.) between the front and rear mounting bars.
Weight in full configuration	Net weight: ● With eight 2.5-inch front drives and four 2.5-inch rear drives: 25.1 kg (55.35 lb) ● With twelve 3.5-inch front drives, four 3.5-inch rear drives, and four 2.5-inch rear drives: 34.1 kg (75.19 lb) ● With twenty-four 2.5-inch front drives and four 2.5-inch rear drives: 29.4 kg (64.83 lb) ● With twenty-five 2.5-inch front drives, two 3.5-inch rear drives, and four 2.5-inch rear drives: 30.5 kg (67.25 lb) Packaging weight: 5 kg (11.03 lb)
Power consumption	The power consumption varies with the server configuration. Use the **Huawei Server Power Calculator** to calculate the power consumption.
Acoustic noise	The data listed in the following is the declared A-weighted sound power levels (LWAd) and declared average bystander position A-weighted sound pressure levels (LpAm) when the server is operating in a 23°C (73.4°F) ambient environment. Noise emissions are measured according to ISO 7779 (ECMA 74) and declared according to ISO 9296 (ECMA 109). ● Idle: 　– LWAd: 5.64 Bels 　– LpAm: 42.2 dBA ● Operating: 　– LWAd: 6.08 Bels 　– LpAm: 46.8 dBA **NOTE** The actual sound level generated by a server varies by server configuration, workload, and ambient temperature.

Environmental Specifications

● **Temperature**

- Operating temperature: 5°C to 45°C (41°F to 113°F) (ASHRAE CLASS A2 to A4 compliant). For details, see **Table 5-3**.

- Storage temperature: –40°C to +65°C (–40°F to +149°F).

- Temperature change rate: < 20°C/h (36°F/h).

Table 5-3 Operating temperature specifications

Model	Maximum Operating Temperature 30°C (86°F)	Maximum Operating Temperature 35°C (95°F) (ASHRAE CLASS A2 Compliant)	Maximum Operating Temperature 40°C (104°F) (ASHRAE CLASS A3 Compliant)	Maximum Operating Temperature 45°C (113°F) (ASHRAE CLASS A4 Compliant)
Server with eight 2.5-inch drives	Supports all configurations.	Does not support V100 GPUs.	- Does not support PCIe SSD cards. - Does not support passive cooling GPUs.	- Does not support PCIe SSD cards. - Does not support passive cooling GPUs. - Does not support rear drives. - Does not support standard IB and OPA cards. - Supports only Intel® Xeon® Platinum 8153, Gold 6152/6140/6126/5118/5215, Silver 4216/4215/4214, and other CPUs whose power is less than 105W.

Model	Maximum Operating Temperature 30°C (86°F)	Maximum Operating Temperature 35°C (95°F) (ASHRAE CLASS A2 Compliant)	Maximum Operating Temperature 40°C (104°F) (ASHRAE CLASS A3 Compliant)	Maximum Operating Temperature 45°C (113°F) (ASHRAE CLASS A4 Compliant)
Server with twelve 3.5-inch drives (expander)	Supports all configurations.	Does not support P100 and M60 GPUs.	● Does not support PCIe SSD cards. ● Does not support passive cooling GPUs. ● Does not support rear drives. ● Does not support built-in drives.	N/A
Server with twelve 3.5-inch drives (pass-through)	Supports all configurations.			
Server with 8 x 2.5-inch SAS/SATA + 12 x 2.5-inch NVMe drives	Supports all configurations.	Supports all configurations.	N/A	
Server with twenty-four 2.5-inch drives (pass-through)	Supports all configurations.	Does not support P100 and M60 GPUs.	● Does not support PCIe SSD cards. ● Does not support passive cooling GPUs. ● Does not support rear drives. ● Does not support built-in drives.	

Model	Maximum Operating Temperature 30°C (86°F)	Maximum Operating Temperature 35°C (95°F) (ASHRAE CLASS A2 Compliant)	Maximum Operating Temperature 40°C (104°F) (ASHRAE CLASS A3 Compliant)	Maximum Operating Temperature 45°C (113°F) (ASHRAE CLASS A4 Compliant)
Server with twenty-four 2.5-inch NVMe SSDs	Supports all configurations.	Does not support P100 and M60 GPUs, and rear drives.	N/A	
Server with twenty-five 2.5-inch drives (expander)	Supports all configurations.	Does not support P100 and M60 GPUs.	• Does not support PCIe SSD cards. • Does not support passive cooling GPUs. • Does not support rear drives.	

NOTE

- If one fan fails, the highest operating temperature of the server is 5°C (9°F) lower than that in normal cases.

- When GPUs are used, the failure of one fan may result in performance deterioration.

- If three P4 GPU cards or fewer are configured, the maximum operating temperature is 35°C (95°F). If four P4 GPU cards or more are configured, the maximum working temperature is 30°C (86°F).

- V100 GPU cards can be installed only on a 2288H V5 server with eight 2.5-inch drives, and the maximum operating temperature is 30°C (86°F).

- **Humidity**

  - Operating humidity: 8% RH to 90% RH (non-condensing)

  - Storage humidity: 5% to 95% RH (non-condensing)

  - Humidity change rate: < 20% RH/h

- **Air volume**

  204 CFM

- **Altitude**

  - ≤ 3050 m (10006.44 ft). According to the ASHRAE standards of 2015, for altitudes above 950 m (3116.79 ft), the highest operating temperature decreases by 1°C (1.8°F) for every increase of:

    - 300 m (984.24 ft) in altitude when the server configuration complies with Class A2 standards.

- 175 m (575.14 ft) in altitude when the server configuration complies with Class A3 standards.
- 125 m (410.10 ft) in altitude when the server configuration complies with Class A4 standards.
    - HDDs are not supported when the altitude is higher than 3000 m (9842.4 ft).
- **Corrosive gaseous contaminant**
    - Copper corrosion rate test requirement: The corrosion product thickness growth rate is lower than 300 Å/month (meeting level G1 requirements of the ANSI/ISA-71.04-2013 standard on gaseous corrosion).
    - Silver corrosion rate test requirement: The corrosion product thickness growth rate is lower than 200 Å/month.
- **Particle contaminant**
    - The equipment room environment meets the requirements of ISO 14664-1 Class 8.

        You are advised to hire a professional organization to monitor particle contaminants in the equipment room.
    - The equipment room is free from explosive, conductive, magnetic conductive, and corrosive dust.

6 Component Compatibility

Use the **Huawei Server Compatibility Checker** to check the software and hardware supported by the server.

6.1 CPU

One or two Intel® Xeon® Scalable processors (Skylake, Cascade Lake)

- 28 cores per processor (2.7 GHz)
- Maximum frequency: 3.8 GHz (four cores)
- Two UPI links: 10.4 GT/s maximum transmission speed per link
- Minimum L3 cache capacity per core: 1.375 MB
- Maximum thermal design power (TDP): 205 W

📖**NOTE**

- For details about component options, consult a local Huawei sales representative.
- Do not combine CPUs of different types on one server.
- For details about CPUs, visit **https://www.intel.com/content/www/us/en/homepage.html**.

6.2 Memory

Memory Configuration Rules

- DDR4 DIMMs of different types (RDIMMs and LRDIMMs) cannot be installed on one server.

- The server supports a DDR4 DIMM of 8 GB, 16 GB, 32 GB, 64 GB, or 128 GB.

  When fully populated with DDR4 DIMMs (24 x 128 GB DDR4 DIMMs), it provides a maximum memory capacity of 3072 GB.

- The DDR4 DIMMs can be used with Skylake CPUs or Cascade Lake CPUs. The maximum memory capacity varies depending on the CPUs used:

  - Skylake CPU

    - The M series CPUs support 1.5 TB/socket.

    - The non-M series CPUs support 768 GB/socket.

  - Cascade Lake CPU

    - The L series CPUs support 4.5 TB/socket.

    - The M series CPUs support 2 TB/socket.

    - Other models of CPUs support 1 TB/socket.

- The total memory capacity of a server is calculated as follows:

  Total memory capacity = Total capacity of all DDR4 DIMMs

- Each channel supports up to eight ranks.

  NOTE

  > A channel supports more than eight ranks for LRDIMMs, because a quad-rank LRDIMM generates the same electrical load as a single-rank RDIMM on a memory bus.

- The maximum number of DIMMs that can be installed on a server varies by processor type, DIMM type, number of ranks, and operating voltage. For details, see **Maximum number of DIMMs** in the following tables.

  NOTE

  > Restriction of the number of ranks supported by each channel on the maximum number of DIMMs supported by each channel:
  >
  > (Number of DIMMs supported by each channel) ≤ (Number of ranks supported by each memory channel)/(Number of ranks supported by each DIMM)

- All DIMMs operate at the same speed, which is the smaller value of:

  - Memory speed supported by a CPU

  - Lowest maximum operating speed for the selected memory configuration. For details, see **Maximum operating speed** in the following tables.

**Table 6-1** Configuration rules for DDR4 DIMMs

Item		Specifications
Rated speed (MT/s)		2933[c]
Operating voltage (V)		1.2
Maximum number of DIMMs[a]		24
Maximum capacity per DIMM (GB)		128
Maximum total memory capacity (GB)		3072[b]
Maximum operating speed (MT/s)	One DIMM per channel	2933[c]

Item		Specifications
	Two DIMMs per channel	2666

- a: The maximum number of DIMMs in this table is based on two-CPU configuration. If the server uses one CPU, the maximum number of DIMMs is half the values given in this table.
- b: The maximum memory capacity varies depending on the type of CPUs used. The maximum memory capacity in this table is calculated as the server is configured with 24 DDR4 DIMM.
- c: At present, only when Cascade Lake CPUs are configured, the rated speed and maximum working speed of DIMMs can reach 2933 MT/s. When Skylake CPUs are configured, the rated speed and maximum working speed of DIMMs are 2666 MT/s.

Memory Slot Configuration Rules

Figure 6-1 shows the DIMM slot numbers and positions.

Figure 6-1 DIMM slots
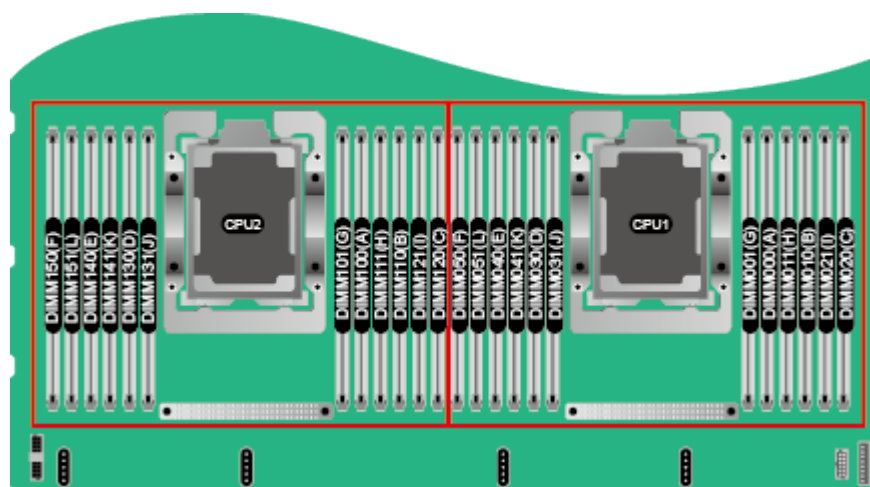
- The server supports DDR4 DIMMs of 8, 16, 32, 64, and 128 GB. A server fully configured with DDR4 DIMMs provides up to 3072 GB memory.
- The server provides 24 DIMM slots. Each CPU supports six channels. **Table 6-2** lists channels for each CPU.

Table 6-2 Channels

CPU	Channel	DIMM
CPU 1	A	DIMM000(A)
		DIMM001(G)

CPU	Channel	DIMM
	B	DIMM010(B)
		DIMM011(H)
	C	DIMM020(C)
		DIMM021(I)
	D	DIMM030(D)
		DIMM031(J)
	E	DIMM040(E)
		DIMM041(K)
	F	DIMM050(F)
		DIMM051(L)
CPU 2	A	DIMM100(A)
		DIMM101(G)
	B	DIMM110(B)
		DIMM111(H)
	C	DIMM120(C)
		DIMM121(I)
	D	DIMM130(D)
		DIMM131(J)
	E	DIMM140(E)
		DIMM141(K)
	F	DIMM150(F)
		DIMM151(L)

DIMM Installation Rules

NOTICE

At least one DDR4 DIMM must be configured in slots supported by CPU 1.

Balanced DIMM configuration can deliver the optimal memory performance. Unbalanced configuration reduces memory performance and is not recommended.

In unbalanced DIMM configuration, DIMMs are not evenly configured for memory channels and (or) processors.

- Unbalanced DIMM configuration for channels: Five, seven, nine, ten, or eleven DIMMs for a processor.
- Unbalanced DIMM configuration for processors: Different number of DIMMs are configured for the processors.

Figure 6-2 DDR4 DIMM installation rules (one CPU)

Figure 6-3 DDR4 DIMM installation rules (two CPUs)

Memory Protection Technologies

DDR4 DIMM supports the following memory protection technologies:

- ECC

- Mirrored Channel Mode

- SDDC

- Rank Sparing Mode

- Lockstep

- Failed DIMM Isolation

- Memory Thermal Throttling

- Memory Address Parity Protection

- Memory Demand and Patrol Scrubbing

- Device Tagging

- Data Scrambling

Supported DIMMs

☐NOTE

For details about component options, consult a local Huawei sales representative.

6.3 Storage

Table 6-3 lists drive configurations supported by the server.

☐NOTE

The following table is for reference only. For details about component options, consult a local Huawei sales representative.

Table 6-3 Drive configurations

Configuration	Maximum Front Drives	Maximum Rear Drives	Maximum Internal Drives	SATA/SAS Drive Management Mode
Server with eight 2.5-inch front drives[1]	8 (SAS/ SATA drive)	I/O module 3: 4 (NVMe SSD)	-	One RAID controller card
Server with twelve 3.5-inch front drives (expander) (1)	12 (SAS/ SATA drive)	• I/O module 1: 2 (SAS/ SATA drive) • I/O module 2: 2 (SAS/ SATA drive)[3] • I/O module 3: 4 (SAS/ SATA drive or NVMe SSD)[2]	4 (SAS/ SATA drive) [4]	One RAID controller card
Server with twelve 3.5-inch front drives (expander) (2)	12 (SAS/ SATA drive)	• I/O module 1: 2 (SAS/ SATA drive) • I/O module 3: 4 (NVMe SSD)	-	Two RAID controller cards

Configuration	Maximum Front Drives	Maximum Rear Drives	Maximum Internal Drives	SATA/SAS Drive Management Mode
Server with twelve 3.5-inch front drives (pass-through) (1)[5]	12 (SAS/ SATA drive)	• I/O module 1: 2 (SAS/ SATA drive) • I/O module 2: 2 (SAS/ SATA drive) • I/O module 3: 4 (NVMe SSD)	-	One RAID controller card
Server with twelve 3.5-inch front drives (pass-through) (2)	12 (SATA drive)	I/O module 3: 4 (NVMe SSD)	-	PCH[7]
Server with twelve 3.5-inch front drives (pass-through) (3)	12 (SAS/ SATA drive)	I/O module 3: 4 (NVMe SSD)	4 (SAS/ SATA drive)	Two RAID controller cards
Server with 8 x 2.5-inch SAS/ SATA + 12 x 2.5-inch NVMe drives	20 • Slots 0 to 7: 8 (SAS/ SATA drive)[6] • Slots 8 to 19: 12 (NVMe SSD)	I/O module 3: 4 (NVMe SSD)	-	One RAID controller card/PCH[7]
Server with twenty-four 2.5-inch front drives (pass-through)[1]	24 (SAS/ SATA drive)	I/O module 3: 4 (NVMe SSD)	-	Three RAID controller cards (one for eight drives)

Configuration	Maximum Front Drives	Maximum Rear Drives	Maximum Internal Drives	SATA/SAS Drive Management Mode
Server with twenty-four 2.5-inch front NVMe SSDs[1]	24 ● Slots 0 to 3: 4 (SAS/SATA drive or NVMe SSD) ● Slots 4 to 23: 20 (NVMe SSD)	I/O module 3: 4 (NVMe SSD)	-	One RAID controller card
Server with twenty-five 2.5-inch front drives (expander) (1) [1]	25 (SAS/SATA drive)	● I/O module 1: 2 (SAS/SATA drive) ● I/O module 3: 4 (SAS/SATA drive or NVMe SSD)[2]	-	One RAID controller card
Server with twenty-five 2.5-inch front drives (expander) (2) [1]	25 (SATA or SAS drive)	● I/O module 1: 2 (SAS/SATA drive) ● I/O module 3: 4 (NVMe SSD)	-	Two RAID controller cards

Configuration	Maximum Front Drives	Maximum Rear Drives	Maximum Internal Drives	SATA/SAS Drive Management Mode

- [1]: The front drives of an 8-drive, 24-drive, or 25-drive (expander) server and I/O module 3 can only be 2.5-inch. Drives of servers with other configurations and I/O modules can be 2.5-inch or 3.5-inch.

- [2]: For a server with twelve 3.5-inch front drives (expander) 1 and a server with twenty-five 2.5-inch drives (expander) 1, I/O module 3 supports SAS/SATA drives only when SR760-M (Broadcom SAS3416), SR760IT-M (Broadcom SAS3416) or SP460C-M (Broadcom SAS3516) RAID controller cards are configured.

- [3]: For a server with twelve 3.5-inch drives (expander) (1), I/O module 2 cannot be configured with drives when an SP460C-M (Broadcom SAS3516) RAID controller card is configured.

- [4]: For a server with twelve 3.5-inch front drives (expander) 1, internal drives are supported only when SR760-M (Broadcom SAS3416), SR760IT-M (Broadcom SAS3416) or SP460C-M (Broadcom SAS3516) RAID controller cards are configured.

- [5]: SR760-M (Broadcom SAS3416) or SR760IT-M (Broadcom SAS3416) RAID controller cards must be configured for a server with twelve 3.5-inch front drives (pass-through) (1).

- [6]: The drives in slots 0 to 7 can be managed by the RAID controller card or PCH. If the PCH manages the drives, slots 0 to 7 support only SATA drives.

- [7]: The SoftRAID function can be used to manage SATA drives that are connected through PCH.

- If the VROC key is installed on a server that is equipped with NVMe SSDs, the VROC function can be used to manage NVMe SSDs.

  NOTE
  - Servers that can accommodate twenty-four 2.5-inch NVMe SSDs do not support the Intel RSTe and VROC functions.
  - The server can use the SoftRAID and VROC functions only after the VMD function is enabled and the latest RSTe driver is installed.
  - The list of OSs supported by the soft RAID and VROC functions can be obtained in the **Huawei Server Compatibility Checker**.
  - The VROC and VMD functions and features require the support of the following software: BIOS later than 090, BMC later than 312, and the latest drive backplane CPLD.

The following figures show the drive slot numbers for these configurations.

- Server with eight 2.5-inch front drives

Figure 6-4 Server with eight 2.5-inch front drives
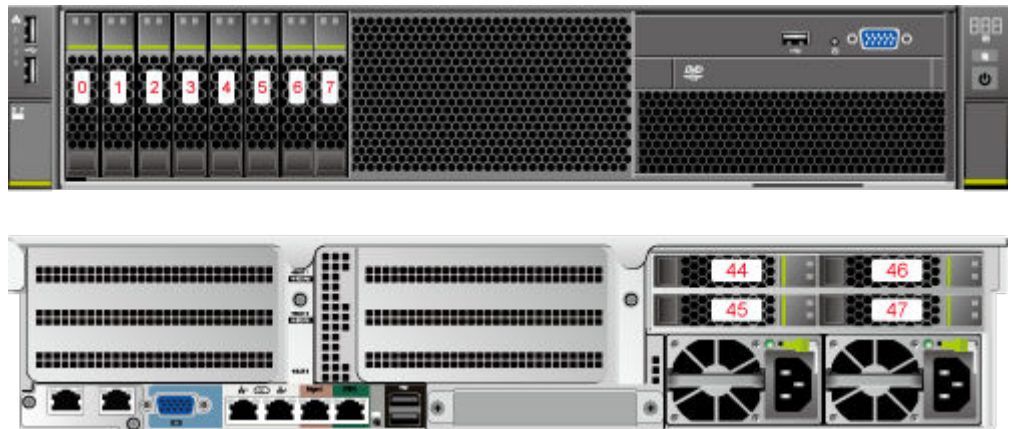
- Server with twelve 3.5-inch front drives (expander) (1)

Figure 6-5 Server with twelve 3.5-inch front drives (expander) (1)

- Server with twelve 3.5-inch front drives (expander) (2)

Figure 6-6 Server with twelve 3.5-inch front drives (expander) (2)

- Server with twelve 3.5-inch front drives (pass-through) (1)

Figure 6-7 Server with twelve 3.5-inch front drives (pass-through) (1)

- Server with twelve 3.5-inch front drives (pass-through) (2)

Figure 6-8 Server with twelve 3.5-inch front drives (pass-through) (2)
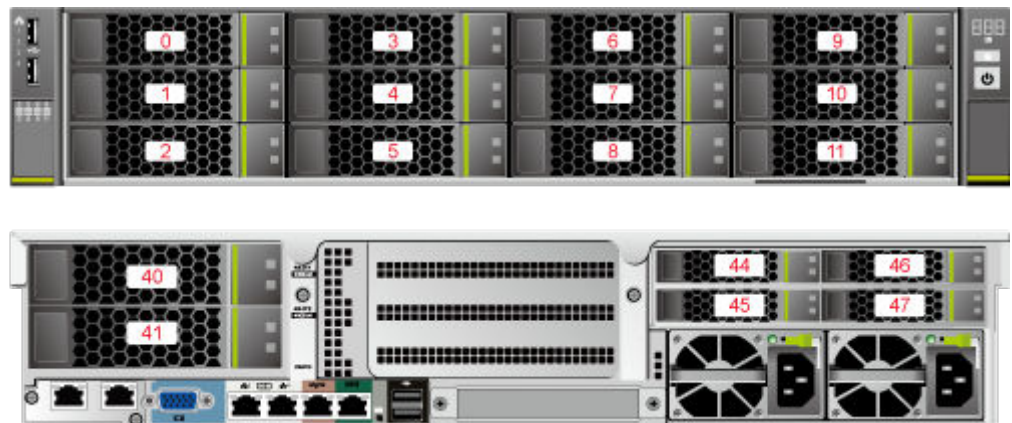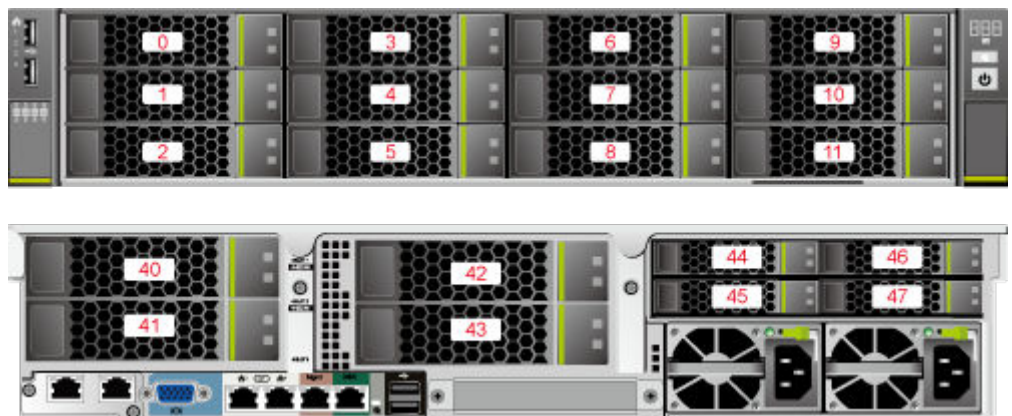

- Server with twelve 3.5-inch front drives (pass-through) (3)

Figure 6-9 Server with twelve 3.5-inch front drives (pass-through) (3)

- Server with 8 x 2.5-inch SAS/SATA + 12 x 2.5-inch NVMe drives

Figure 6-10 Server with 8 x 2.5-inch SAS/SATA + 12 x 2.5-inch NVMe drives
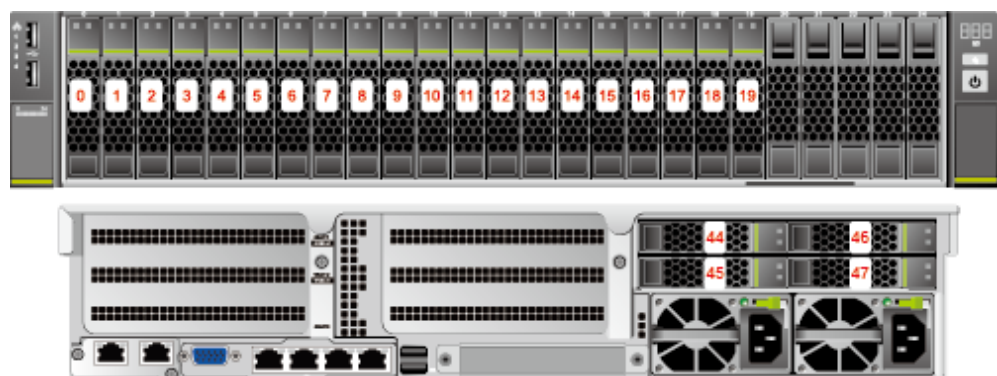
- Server with twenty-four 2.5-inch front drives (pass-through)

Figure 6-11 Server with twenty-four 2.5-inch front drives (pass-through)
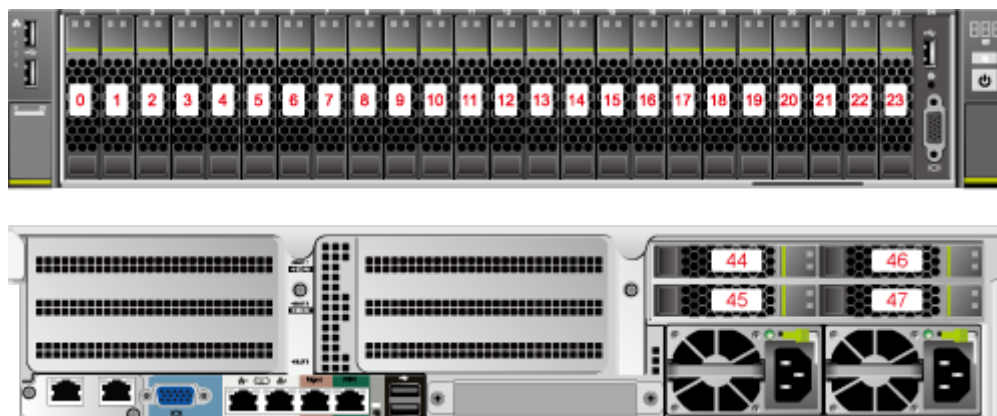
- Server with twenty-four 2.5-inch front NVMe SSDs

Figure 6-12 Server with twenty-four 2.5-inch front NVMe SSDs
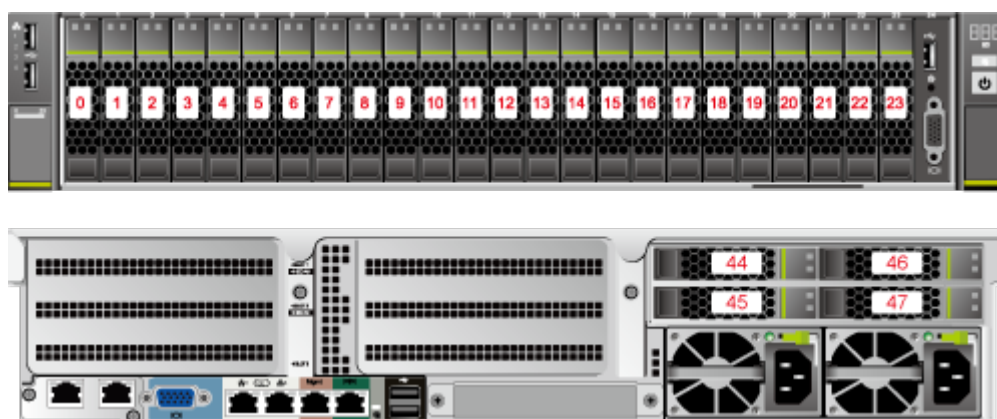
- Server with twenty-five 2.5-inch front drives

Figure 6-13 Server with twenty-five 2.5-inch front drives

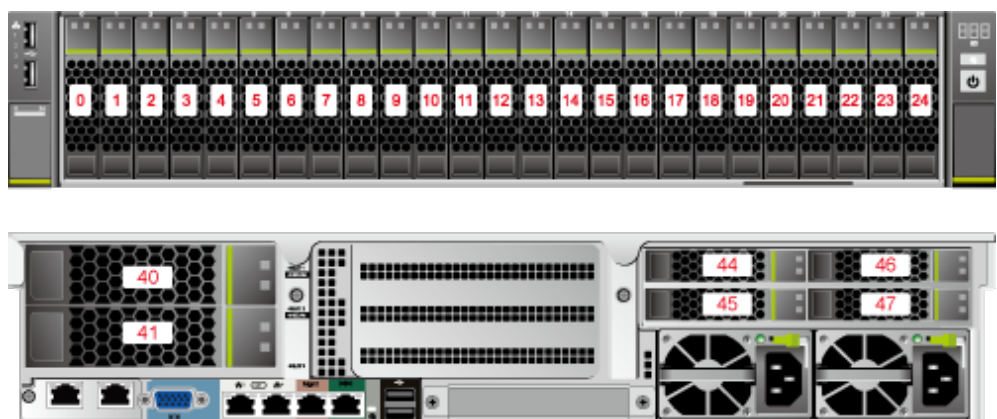**Table 6-4** lists the comparison between RAID levels in performance and drive usage.

Table 6-4 RAID level comparison

RAID Level	Reliability	Read Performance	Write Performance	Drive Usage
RAID 0	Low	High	High	100%
RAID 1	High	High	Low	50%
RAID 5	Relatively high	High	Medium	(N – 1)/N
RAID 6	Relatively high	High	Medium	(N – 2)/N
RAID 10	High	High	Medium	50%
RAID 1E	High	Medium	Medium	50%
RAID 50	High	High	Relatively high	(N – M)/N
RAID 60	High	High	Relatively high	(N – M x 2)/N
Note: N indicates the number of member drives in a RAID array, and M indicates the number of spans in a RAID array.				

6.4 I/O Expansion

The server supports a wide range of PCIe cards. You can choose PCIe cards based on their type and transmission speed:

- Fiber Channel (FC) host bus adapter (HBA)
- Converged network adapter (CNA)
- Network expansion card
- SSD card

☐**NOTE**

For details about component options, consult a local Huawei sales representative.

6.5 PSU

Table 6-5 lists the PSUs supported by the server.

Table 6-5 Supported PSUs

PSU Model	Rated Power	Rated Input Voltage
550 W AC Platinum PSU	550 W	● AC: 100 V to 240 V ● HVDC: 192 V to 288 V
900 W AC Platinum PSU	900 W	● AC: 100 V to 240 V ● HVDC: 192 V to 288 V

PSU Model	Rated Power	Rated Input Voltage
1500 W AC Platinum PSU	1500 W	• AC: 100 V to 240 V • HVDC: 192 V to 288 V
1500 W HVDC PSU	1500 W	• AC: 200 V to 277 V • HVDC: 260 V to 400 V
1200 W DC PSU	1200 W	DC: -48 V to -60 V

□NOTE

- The PSUs are hot-swappable and work in 1+1 redundancy mode.
- **Table 6-5** is for reference only. Use the **Huawei Server Compatibility Checker** to check the components supported.
- Do not combine PSUs of different models on one server.
- The PSUs provide short-circuit protection. The PSUs that support dual input live wires provide double-pole fuse.
- If the input voltage ranges from 100 V to 132 V AC, the output power of the 1500 W AC Platinum PSU decreases to 1000 W, and the 550 W AC Platinum PSU is not affected.
- The power of a 1500 W AC Platinum PSU can reach 1700 W. When two such PSUs are installed, they can be used as 1700 W PSUs.

6.6 OS and Software Support

Use the **Huawei Server Compatibility Checker** to check the components supported.

7 System Management

The server uses Huawei's proprietary iBMC to implement remote server management. The iBMC complies with IPMI 2.0 and provides highly reliable hardware monitoring and management.

The iBMC supports the following features and protocols:

- KVM and text console redirection
- Remote virtual media
- IPMI
- SNMP
- Redfish 1.0
- Browser-based login

Table 7-1 describes the features of the iBMC.

Table 7-1 iBMC features

Feature	Description
Management interface	Integrates with any standard management system through the following interfaces or protocols: - IPMI - CLI - HTTPS - SNMP - Redfish
Fault detection	Detects and accurately locates faults in hardware, for example, an FRU.
Alarm management	Supports alarm management and reports alarms using the SNMP trap, Simple Mail Transfer Protocol (SMTP), and syslog service to ensure 24/7 operating.
Integrated virtual KVM	Provides remote maintenance measures for troubleshooting.

Feature	Description
Integrated virtual media	Virtualizes local media devices, images, USB keys, and folders into media devices on a remote server, simplifying OS installation. (The virtual DVD-ROM drive supports a maximum transmission rate of 8 MB/s.)
WebUI	Provides a user-friendly graphical user interface (GUI), simplifying users' configuration and query operations.
Fault reproduction	Reproduces faults to help diagnose them quickly.
Screen snapshots and screen videos	Views screenshots and videos without login, facilitating routine preventive maintenance inspection (PMI).
Domain Name Service (DNS)/Active Directory (AD)	Supports DNS and AD, simplifying network and configuration management.
Dual-image backup	If software fails, it starts again from a backup image.
Asset management	Supports intelligent asset management.
Intelligent power management	Uses power capping to increase deployment density, and uses dynamic energy saving to reduce operating expenditure.
IPv6	Supports IPv6 to ensure sufficient IP addresses.
Network Controller Sideband Interface (NC-SI)	Supports NC-SI, allowing you to access the iBMC through the service network port.

8 Warranty

According to the *Huawei Warranty Policy for Servers & Storage Products* (*Warranty Policy* for short), Huawei provides a three-year warranty for the server, a one-year warranty for DVD drives and batteries, and a three-month warranty for software media.

The *Warranty Policy* stipulates warranty terms and conditions, including the available services, response time, terms of service, and disclaimer.

The warranty terms and conditions may vary by country, and some services and/or parts may not be available in all countries. For more information about warranty services in your country, contact Huawei technical support or a local Huawei representative office.

9 Certifications

Country/Region	Certification	Standards
Europe	WEEE	2002/96/EC, 2012/19/EU
Europe	RoHS	2002/95/EC, 2011/65/EU, EN 50581:2012
Europe	REACH	EC No. 1907/2006
Europe	CE	Safety: EN 60950-1:2006+A11:2009+A1:2010+A12:2011 EMC: ● EN 55022:2010 ● CISPR 22:2008 ● EN 55024:2010 ● CISPR 24:2010 ● ETSI EN 300 386 V1.6.1:2012 ● ETSI ES 201 468 V1.3.1:2005
China	CCC	GB4943.1-2011 GB9254-2008 (Class A) GB17625.1-2012
China	RoHS	SJ/T-11363-20006 SJ/T-11364-20006 GB/T 26572-2011
Australia	C-tick	AS/NZS CISPR22:2009
America	FCC	FCC Part 15 (Class A)

Country/Region	Certification	Standards
America	NTRL-UL	UL 60950-1, 2nd Edition, 2011-12-19 (Information Technology Equipment - Safety - Part 1: General Requirements) CSA C22.2 No.60950-1-07, 2nd Edition, 2011-12 (Information Technology Equipment-Safety-Part 1: General Requirements)
Canada	IC	ICES-003 Class A
Canada	NRTL-UL	UL 60950-1, 2nd Edition, 2011-12-19 (Information Technology Equipment-Safety-Part 1: General Requirements)
Nigeria	SONCAP	IEC 60950-1: 2005 (2nd Edition) + A1:2009 EN 60950-1: 2006+A11:2009+A1:2010 + A12:2011
Kingdom of Saudi Arabia (KSA)	SASO	IEC 60950-1: 2005 (2nd Edition) + A1:2009 EN 60950-1: 2006+A11:2009+A1:2010 + A12:2011
Global	CB	IEC 60950-1
Japan	VCCI	VCCI V-4:2012
Saudi, Nigeria, Tanzania, Uganda, Kuwait, Algeria, Botswana, Qatar, Egypt	Multi-country_certificate	IEC 60950-1: 2005 (2nd Edition) + A1:2009 EN 60950-1: 2006+A11:2009+A1:2010 + A12:2011

10 Nameplate Models

Certified Model	Remarks
H22H-05	Global model
H22H-05-I10	For India only
H22H-05-I12	For India only

11 References

For more information about the product, see the following:

- **Server Data Sheet**
- **Server Documentation**
- **Huawei Server Information Self-Service Platform**