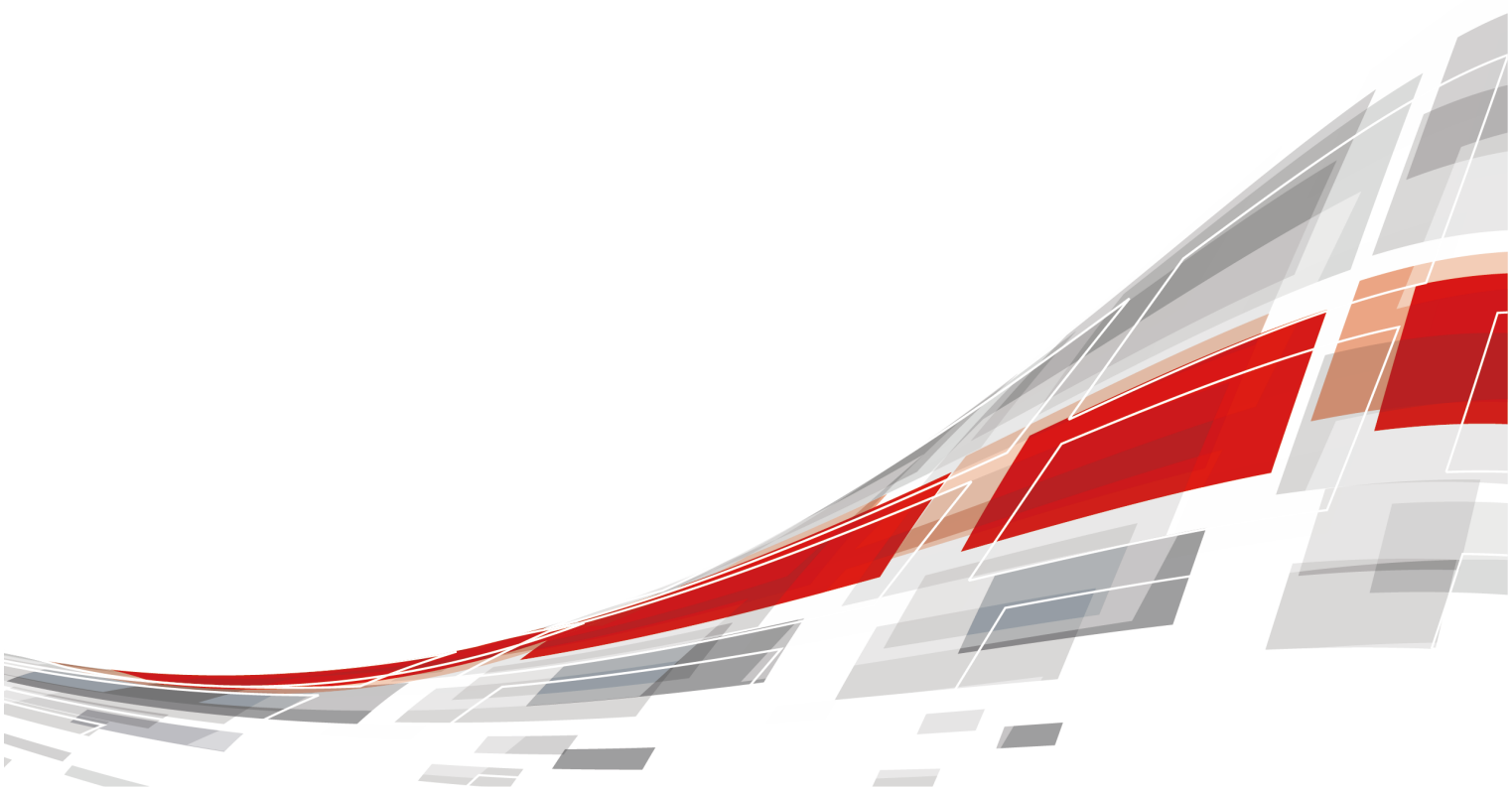
GN560E V7 Liquid-cooled Server

Technical White Paper

Issue 02

Date 2024-09-20



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About This Document

Purpose

This document describes the GN560E V7 liquid-cooled server node in terms of appearance, performance parameters, and component compatibility.

Intended Audience

This document is intended for presales engineers.

Symbol Conventions

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

Symbol	Description
DANGER	Indicates a hazard with a high level of risk which, if not avoided, will result in death or serious injury.
WARNING	Indicates a hazard with a medium level of risk which, if not avoided, could result in death or serious injury.
CAUTION	Indicates a hazard with a low level of risk which, if not avoided, could 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.
NOTE	Supplements the important information in the main text. NOTE is used to address information not related to personal injury, equipment damage, and environment deterioration.

Change History

Issue	Release Date	Change Description
02	2024-09-20	Added **5.12.10 DPU Power Adapter Board**.
01	2024-07-19	This issue is the first official release.

Contents

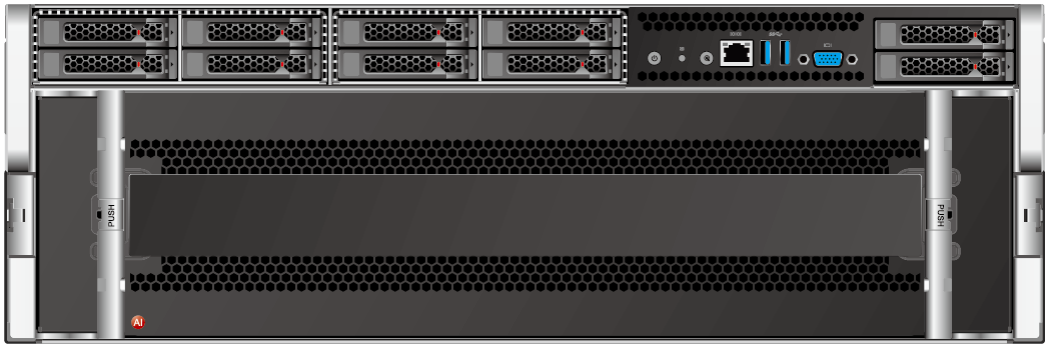
1 Overview

GN560E V7 liquid-cooled server (GN560E V7) is a new-generation AI server designed for the telecom, Internet, finance, Internet Data Center (IDC), and government and enterprise.

This product is ideal for large-scale and ultra-large-scale model training scenarios.

This product features high performance computing, flexible expansion, high reliability, easy management and deployment.

Figure 1-1 Server appearance



2 Features

Performance

- Supports the 4th-generation Intel® Xeon® Scalable processors (Sapphire Rapids). A processor provides up to 60 cores and 120 threads, up to 350 W TDP, a maximum of 4.2 GHz turbo frequency, 2 MB L2 cache and 1.875 MB L3 cache, and four groups of 16 GT/s UPI links between the processors, which deliver supreme processing performance.
- Supports a maximum of 32 DDR5 4800 MT/s registered dual in-line memory modules (RDIMMs), delivering up to 8192 GB total memory capacity (calculated using the maximum capacity of a single memory module: 256 GB). The memory modules feature high speed and availability.
- Supports NVIDIA HGX 8-GPU NVLink modules (Ampere generation or Hopper generation).

Scalability

The server node supports multiple flexible drive and standard PCIe card configuration solutions, providing flexible and scalable space to meet different requirements.

- Up to eight 2.5" front NVMe drives and two 2.5" front SAS/SATA drives.
- In balanced configuration, the server supports a maximum of 13 PCIe 5.0 x16 expansion slots: 8 full-height and half-length PCIe 5.0 x16 slots, 3 half-height and half-length PCIe 5.0 x16 slots, and 2 full-height and 3/4-length PCIe 5.0 x16 slots.
- In high-performance configuration, the server supports a maximum of 12 PCIe 5.0 x16 expansion slots: 8 PCIe 5.0 x16 expansion slots (full-height and half-length) + 4 PCIe 5.0 x8 PCIe expansion slots (2 half-height and half-length + 2 full-height and 3/4-length).

Availability and Serviceability

- The server node supports blind plug-in of both electrical and hydraulic buses, and supports quick plug-in and pull-out maintenance of the server.
- The HGX 8-GPU NVLink module supports separate maintenance.
- Carrier-class components with process expertise ensure high system reliability.

- The server node supports hot-swappable SAS/SATA/NVMe drives. SAS/SATA drives support RAID 0/1. The supported RAID levels vary according to the RAID controller card model. The server node also uses a supercapacitor to protect the RAID cache data against power failures.
- The iBMC WebUI, UID/HLY indicators on the front panel, and fault diagnosis LEDs allow simplified O&M, efficient troubleshooting, and higher availability.
- The onboard Intelligent Baseboard Management Controller (iBMC) can continuously monitor system parameters, trigger alarms, and take recovery measures to minimize system downtime.

Manageability and Security

- The built-in iBMC monitors server node operating status and provides remote management.
- Supports BIOS menu passwords to ensure the security of system startup and system management.
- The integrated Unified Extensible Firmware Interface (UEFI) improves setup, configuration, and update efficiency and simplifies fault clearance.
- Intel Execute Disable Bit (EDB) function prevents certain types of malicious buffer overflow attacks when working with a supported OS.
- Intel® Trusted Execution Technology prevents malicious software attacks based on hardware, prevents the firmware on the device from being maliciously modified, and prevents unauthorized boot block execution.
- The trusted platform module (TPM) and trusted password module (TCM) provide advanced encryption functions, such as digital signature and remote authentication.
- The secure boot based on the chip Root of Trust (RoT) implements level-by-level firmware verification starting from the hardware RoT and builds a complete secure boot chain.
- Intel® Software Guard Extensions (Intel®SGX) technology allows applications to run in their own independent space without being affected by other software running in the system, thereby enhancing security.
- Meets the following requirements in NIST SP 800-147B:
  - The BIOS firmware digital signature update mechanism is supported. During the upgrade, the digital signature is verified to prevent unauthorized BIOS firmware upgrade.
  - The flash security protection mechanism is supported to prevent unauthorized modification of the flash memory in the OS.

Energy efficiency

- The server is configured with a DC/DC PSU, and the power module efficiency is up to 97.5%.
- Supports two optional liquid cooling options: CPU + VRD + HGX 8-GPU module liquid cooling and CPU + VRD + DIMM + HGX 8-GPU module liquid cooling.
- Efficient voltage regulator-down (VRD) power supplies for boards minimize the energy loss from DC-to-DC power conversion.

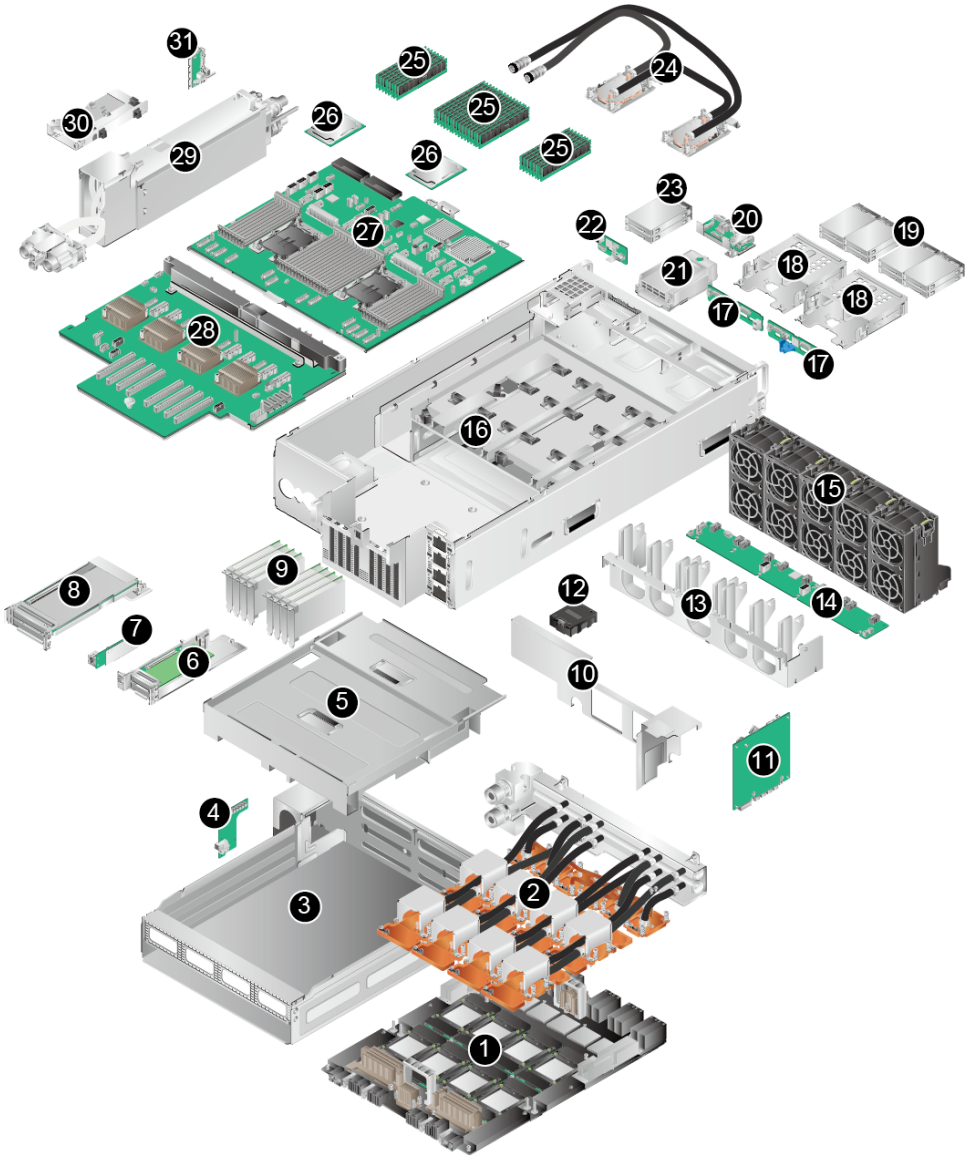
- Area-based, Proportional-Integral-Derivative (PID) intelligent fan speed adjustment and intelligent CPU frequency scaling optimize heat dissipation and reduce overall system power consumption.
- The improved thermal design with energy-efficient fans ensures optimal heat dissipation and reduces system power consumption.
- Staggered spinup of drives reduces the server boot power consumption.

Liquid-Cooled Node Reliability

- The liquid-cooled connector between the liquid-cooled server node and the liquid separator in the cabinet adopts the blind-plug quick-plug connector. The interface is self-sealed and no drip leakage occurs.
- The liquid-cooled server node supports liquid leakage monitoring.
- The liquid-cooled server node supports self-isolation of the leakage. When a single node is faulty, it would not affect normal operation of other nodes in the cabinet.
- The liquid-cooled server node supports leakage shutdown. When a single node has a leakage fault, the shut-off valve will shut off the inlet and outlet working fluids of the leaking node.

3 Physical Structure

Figure 3-1 Physical structure



1	HGX GPU module	2	GPU module liquid cooling heat sink
3	GPU sub-node chassis	4	Leakage detector board
5	GPU sub-node air duct	6	I/O module 2
7	BMC GE port module	8	I/O module 1
9	PCIe I/O expansion cards	10	Air duct
11	48V Power interface board	12	Supercapacitor
13	Fan Module Bracket	14	Fan management board
15	Fan Modules	16	Chassis
17	4 x 2.5" drive backplanes	18	Drive cages
19	Drives	20	O&M module
21	PSU	22	2 x 2.5" drive backplane
23	Drives	24	CPU liquid cooling heat sink
25	DIMMs	26	Processors
27	Mainboard	28	PCIe switch module
29	Floating component	30	RAID controller card bracket (optional)
31	Leakage interface board	-	-

4 Logical Structure

Figure 4-1 Logical structure of the high-performance configuration

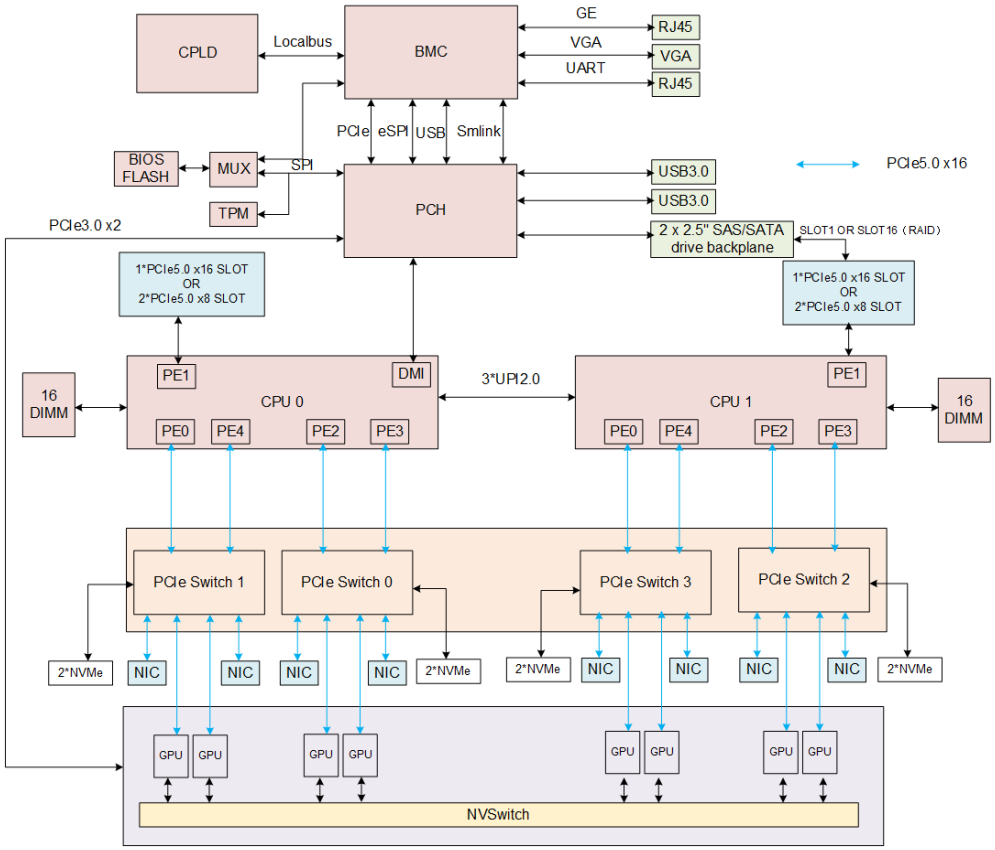
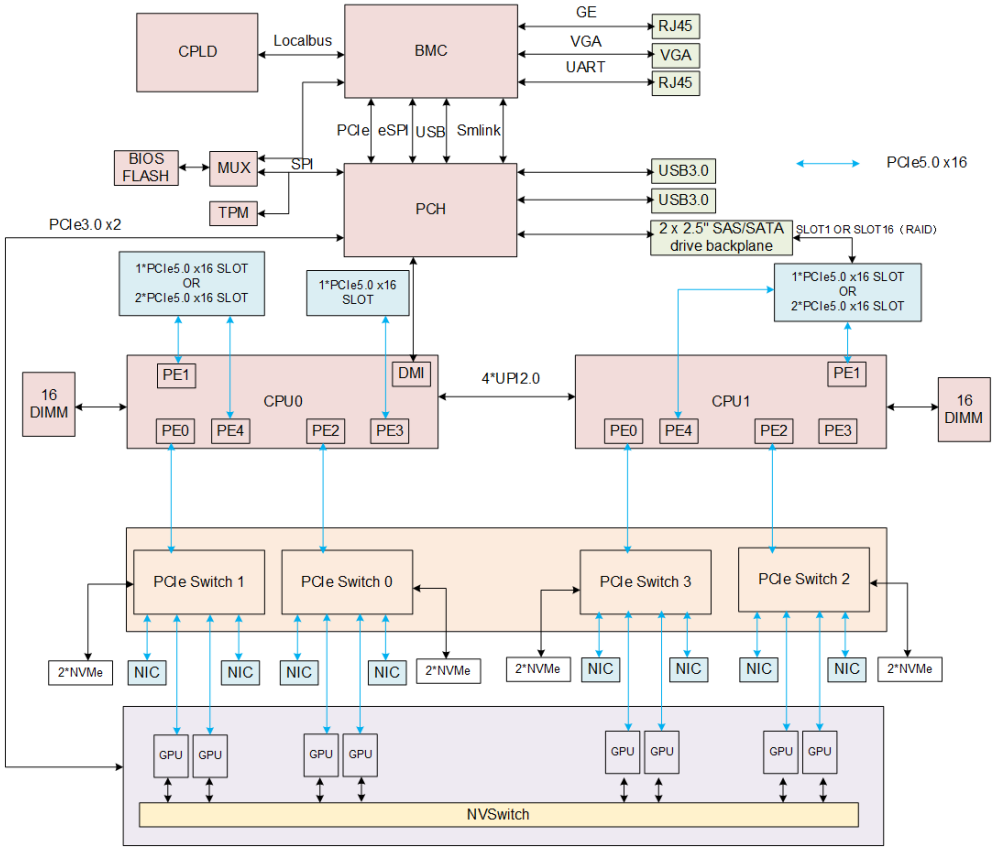


Figure 4-2 Logical structure of the balanced configuration



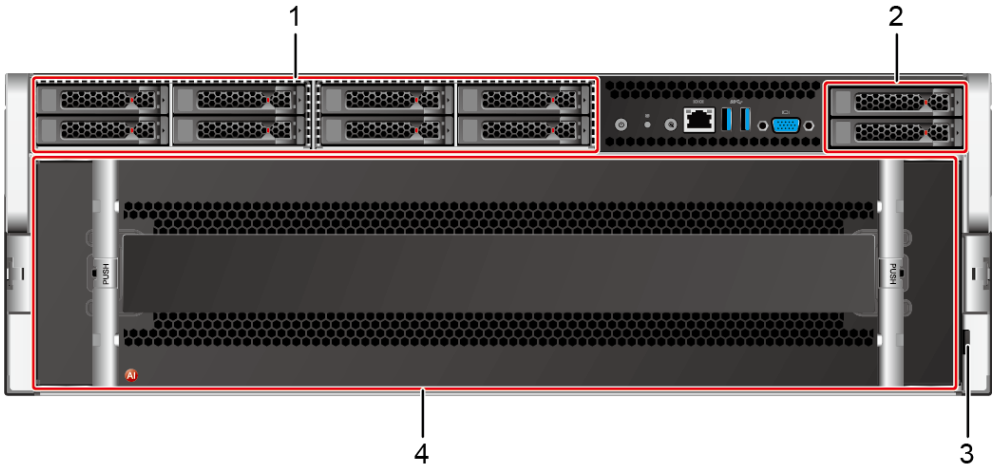
- Supports two 4th-generation Intel® Xeon® Scalable processors (Sapphire Rapids).
- Supports 32 DDR5 DIMMs.
- In the high-performance configuration, the processors are interconnected through three sets of UPI (UltraPath Interconnect) buses, and in the balanced configuration, the processors are interconnected through four sets of UPI buses. Each bus reaches a maximum transmission rate of 16 GT/s.
- The PCIe bus of the processor is connected to the hard disk backplane and PCIe components through cables, PCBs, high-speed connectors, etc.
- The server can expand up to 8 PCIe 5.0 x4 NVMe hard drives and supports a maximum of 13 PCIe 5.0 x16 slots. The corresponding PCIe slots support PCIe standard cards of different specifications.
- The BMC management chip integrated on the mainboard supports ports such as a video graphic array (VGA) port, a management network port, and a serial port.

5 Hardware Description

5.1 Front Panel

5.1.1 Appearance

Figure 5-1 Front view

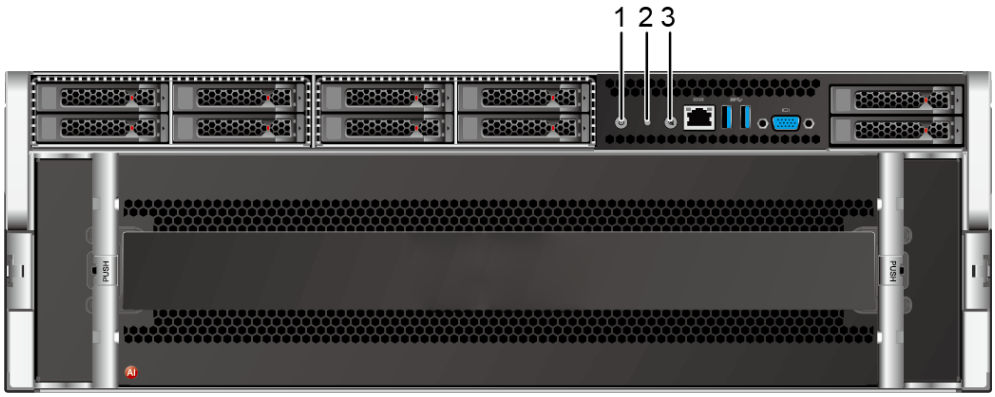


1	NVMe drives	2	SAS/SATA drives
3	Slide-out label plate (with an SN label)	4	GPU sub-node chassis

5.1.2 Indicators and Buttons

Indicator and Button Positions

Figure 5-2 Indicators and buttons on the front panel



1	Power button/indicator	2	Health status indicator
3	UID button/indicator	-	-

Indicator and Button Descriptions

Table 5-1 Description of indicators and buttons on the front panel

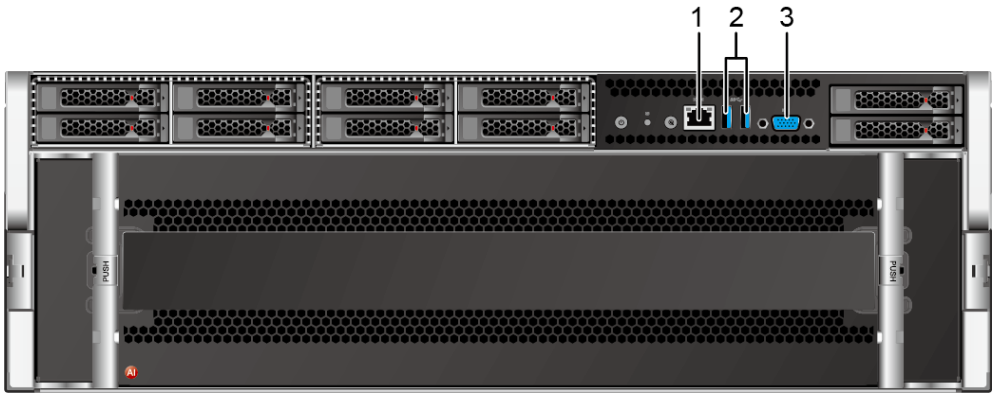
Silkscreen	Indicator and Button	Description
	Power button/ indicator	Power button: ● When the device is powered on, you can press this button to gracefully shut down the OS. **NOTE** For different OSs, you may need to shut down the OS as prompted. ● When the server node is powered on, you can hold down this button for 6 seconds to forcibly power off the device. ● When the power indicator is steady yellow, you can press this button to power on the server node. Power indicator: ● Off: The device is powered off. ● Steady green: The device is powered on. ● Blinking yellow: PSU button is locked temporarily. Do not perform operation. When the device is powered on and management system is turning on, PSU button is locked. ● Steady yellow: The device is on standby.
	Health status indicator	● Off: The device is powered off or is faulty. ● Blinking red at 1 Hz: A major alarm has been generated on the device. ● Blinking red at 5 Hz: A critical alarm has been generated on the device. ● Steady green: The device is operating properly.

Silkscreen	Indicator and Button	Description
	UID button/ indicator	The UID button/indicator helps identify and locate a device. UID button: ● You can control the UID indicator status by pressing the UID button or using the iBMC. ● 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. UID indicator: ● Off: The device is not being located. ● Blinking or steady blue: The device is being located. **NOTE** ● After the iBMC is initialized, the UID indicator blinks a maximum of 255 seconds and then turns off by default. You can press the UID button to locate the device. ● When the UID indicator status is set to the blinking mode on iBMC, the indicator blinks for a maximum of 255 seconds and turns steady on.

5.1.3 Ports

Port Positions

Figure 5-3 Ports on the front panel



1	Serial port	2	USB ports
3	VGA port	-	-

Port Descriptions

Table 5-2 Ports on the front panel

Port	Type	Quantity	Description
Serial port	RJ45	1	A port used for debugging. By default, it serves as the OS serial port. You can also set it as the iBMC serial port on the iBMC CLI. **NOTE** The port is a 3-wire serial communication port, and its default baud rate is 115,200 bit/s.
USB ports	USB 3.0	2	Used to connect to a USB 3.0 device. **NOTE** ● Before connecting an external USB device, ensure that the USB device functions properly; otherwise, it may adversely impact the server. ● The USB 3.0 port can be used to supply power to low-power peripherals. However, the USB 3.0 port must comply with the USB specifications. To run advanced peripherals, such as external CD/DVD drives, an external power supply is required.
VGA port	DB15	1	Used to connect a display terminal, such as a monitor or KVM.

5.1.4 Installation Positions

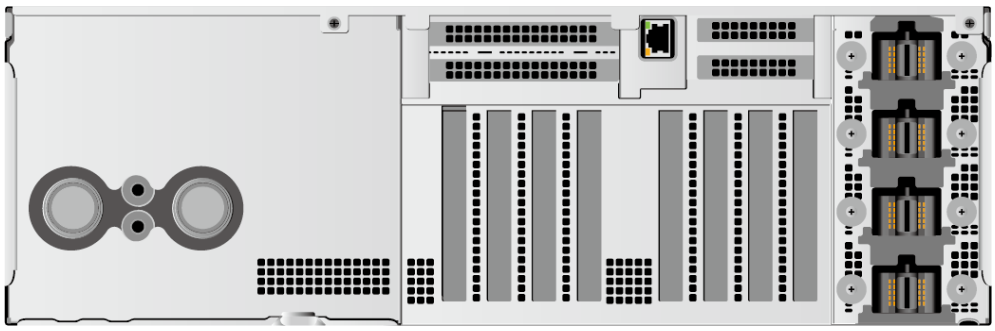
The GN560E V7 is installed in the FusionPoD for AI rack-scale server liquid cooling cabinet, which can house up to 8 GN560E V7. Determine the number of server nodes configured according to actual power consumption.

Figure 5-4 Positions and slots of server node

5.2 Rear Panel

5.2.1 Appearance

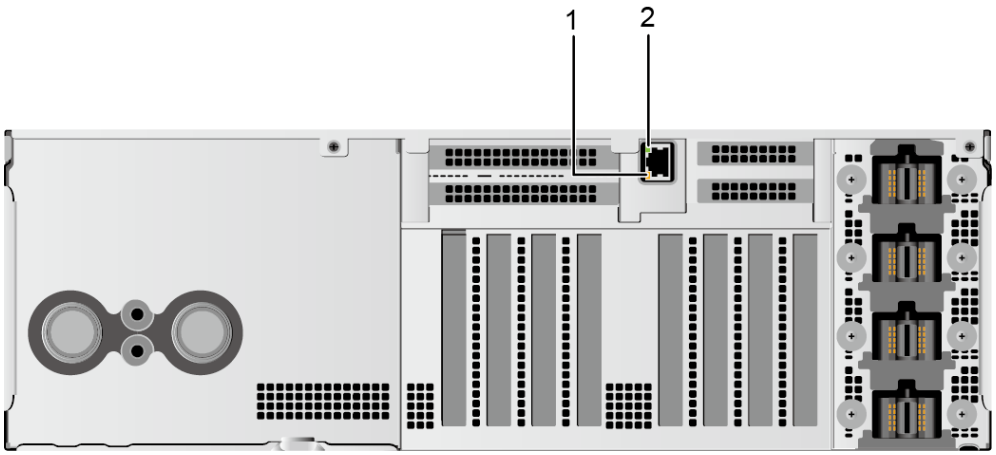
Figure 5-5 Rear view



5.2.2 Indicators and Buttons

Indicator Positions

Figure 5-6 Indicators on the rear panel



1	Data transmission status indicator of the management network port	2	Connection status indicator of the management network port

Indicator Description

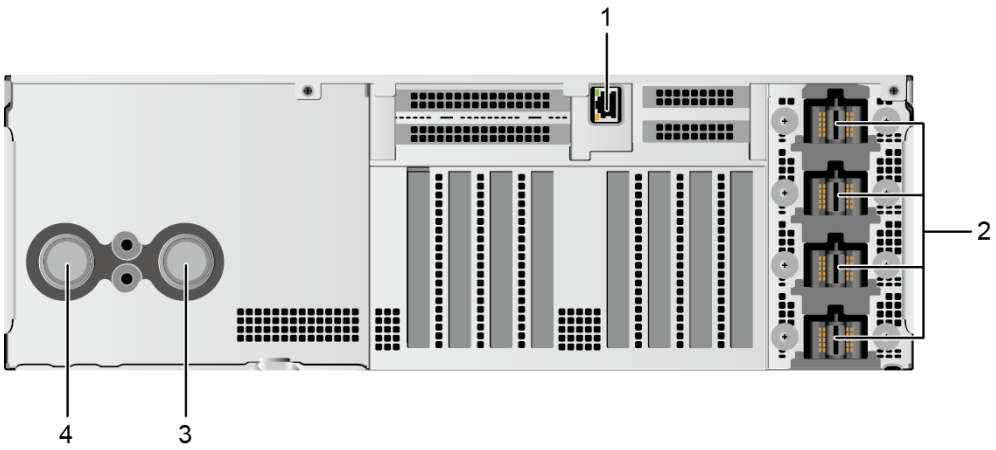
Table 5-3 Description of indicators on the rear panel

Silkscreen	Indicator	Description
-	Data transmission status indicator of the management network port	• Off: No data is being transmitted. • Blinking yellow: Data is being transmitted.
-	Connection status indicator of the management network port	• Off: The network is not connected. • Steady green: The network is properly connected.

5.2.3 Ports

Port Positions

Figure 5-7 Ports on the rear panel



1	Management network port	2	PSU sockets
3	Water outlet	4	Water inlet

Port Descriptions

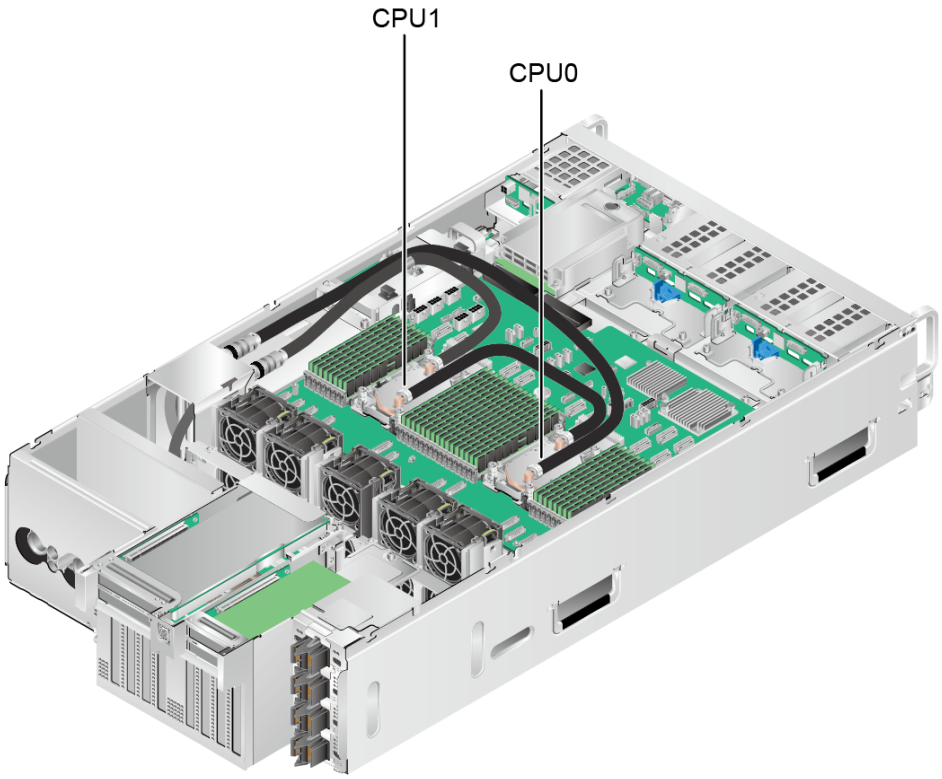
Table 5-4 Ports on the rear panel

Port	Type	Quantity	Description
Management network port	RJ45	1	Used to manage server nodes. **NOTE** The management network port is a GE port that supports 100 Mbit/s and 1000 Mbit/s auto-negotiation.
PSU sockets	-	4	Used to connect busbar in the cabinet.

5.3 Processors

- Supports two 4th-generation Intel® Xeon® Scalable processors (Sapphire Rapids).
- Processors of the same model must be used in a server node.
- For details about component options, consult the local sales representatives.

Figure 5-8 Positions of the processors



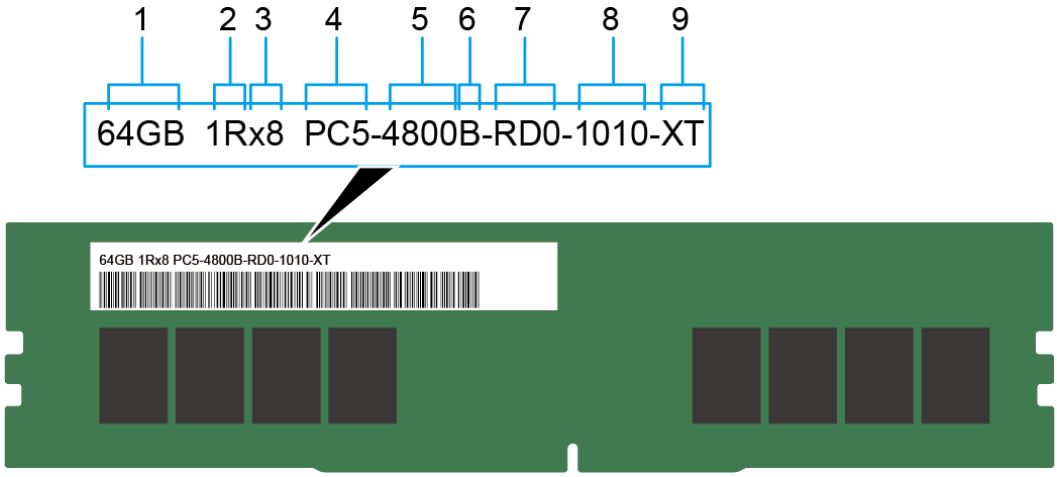
5.4 Memory

5.4.1 DDR5 Memory

5.4.1.1 Memory Identifier

You can determine the memory module properties based on the label attached to the memory module.

Figure 5-9 Memory identifier



No.	Description	Example
1	Capacity	• 16 GB • 32 GB • 64 GB • 128 GB • 256 GB
2	rank(s)	• 1R = Single rank • 2R = Dual rank • 4R = Quad rank • 8R = Octal rank
3	Data width on the DRAM	• x4: 4-bit • x8: 8-bit
4	Type of the memory interface	• PC5 = DDR5
5	Maximum memory speed	• 4800MT/s
6	Memory delay parameter (CL-nRCD-nRP)	• A = 34-34-34 • B = 40-40-40 • C = 42-42-42
7	DIMM type	• Reference design for version RDIMM D0
8	SPD version	• 10: SPD version • 10: SPD versions from Byte 192 to Byte 447
9	Temperature class	• Extended temperature grade (XT): 0°C to 95°C (32°F to 203°F) • Normal temperature grade (NT): 0ºC to 85ºC (32ºF to 185ºF)

5.4.1.2 Memory Subsystem Architecture

The server node provides 32 memory slots. Each processor integrates eight memory channels.

Install the memory modules in the primary memory channels first. If the primary memory channel is not populated, the memory modules in secondary memory channel cannot be used.

Table 5-5 Channels

CPU	Memory Channel	DIMM
CPU0	A (primary)	DIMM000(A)
	A	DIMM001(I)
	B (primary)	DIMM010(B)
	B	DIMM011(J)
	C (primary)	DIMM020(C)
	C	DIMM021(K)
	D (primary)	DIMM030(D)
	D	DIMM031(L)
	E (primary)	DIMM040(E)
	E	DIMM041(M)
	F (primary)	DIMM050(F)
	F	DIMM051(N)
	G (primary)	DIMM060(G)
	G	DIMM061(O)
	H (primary)	DIMM070(H)
	H	DIMM071(P)
CPU 1	A (primary)	DIMM100(A)
	A	DIMM101(I)
	B (primary)	DIMM110(B)
	B	DIMM111(J)
	C (primary)	DIMM120(C)
	C	DIMM121(K)
	D (primary)	DIMM130(D)
	D	DIMM131(L)
	E (primary)	DIMM140(E)
	E	DIMM141(M)
	F (primary)	DIMM150(F)
	F	DIMM151(N)
	G (primary)	DIMM160(G)

CPU	Memory Channel	DIMM
	G	DIMM161(O)
	H (primary)	DIMM170(H)
	H	DIMM171(P)

5.4.1.3 Memory Compatibility

Observe the following rules when configuring DDR5 memory modules:

NOTICE

- A server must use DDR5 memory modules of the same part number (P/N code), and the memory speed is the lower one of the following two speed values:
  - Memory speed supported by a CPU
  - Maximum operating speed of a DIMM.
- The DDR5 memory modules of different types (RDIMM and RDIMM-3DS) and specifications (capacity, bit width, rank, and height) cannot be used together.
- For details about component options, consult the local sales representatives.

- The memory module can be used with the 4th-generation Intel® Xeon® Scalable processors (Sapphire Rapids). The maximum memory capacity supported by all processor models is the same.
- The calculation formula of total memory capacity supported is as follows: the total memory capacity equals the capacity sum of all DDR5 memory modules.
- For details about the type of a single memory module, consult the local sales representatives.
- The maximum number of memory modules supported depends on the memory module type and number of ranks.

Table 5-6 DDR5 memory parameters

Parameter	Specifications				
Capacity of a DDR5 memory (GB)	16	32	64	128	256
Type	RDIMM	RDIMM	RDIMM	RDIMM-3DS	RDIMM-3DS
Rated speed (MT/s)	4800	4800	4800	4800	4800
Operating voltage (V)	1.1	1.1	1.1	1.1	1.1
Maximum number of DDR5 DIMMs of a server	32	32	32	32	32

Parameter		Specifications				
Maximum DDR5 memory capacity of the server (GB)		512	1024	2048	4096	8192
Actual speed (MT/s)	1DPC[a]	4800	4800	4800	4800	4800
	2DPC	4400	4400	4400	4400	4400

- a: DIMM per channel (DPC) indicates the number of memory modules per channel.
- The information listed in this table is for reference only. For details, consult the local sales representative.

5.4.1.4 Memory Module Installation Rules

Observe the following rules when configuring DDR5 memory modules:

- At least one DDR5 DIMM must be configured if the server uses SPR CPUs (excluding HBM CPUs). SPR HBM CPUs can be configured without memory module.
- The memory modules configured must be DDR5 RDIMMs.
- The memory modules must be configured with the same number of ranks.
- Install filler memory modules in vacant slots.

5.4.1.5 Positions of Memory Modules

A server node supports up to 32 DDR5 memory modules. To maximize performance, it is advised to use balanced memory configuration.

Observe the memory module installation rules when configuring memory modules. For details, see the memory configuration guide on the technical support website.

NOTICE

Memory slots of CPU 0 is configured with one DDR5 memory module at least.

Figure 5-10 Memory module installation positions

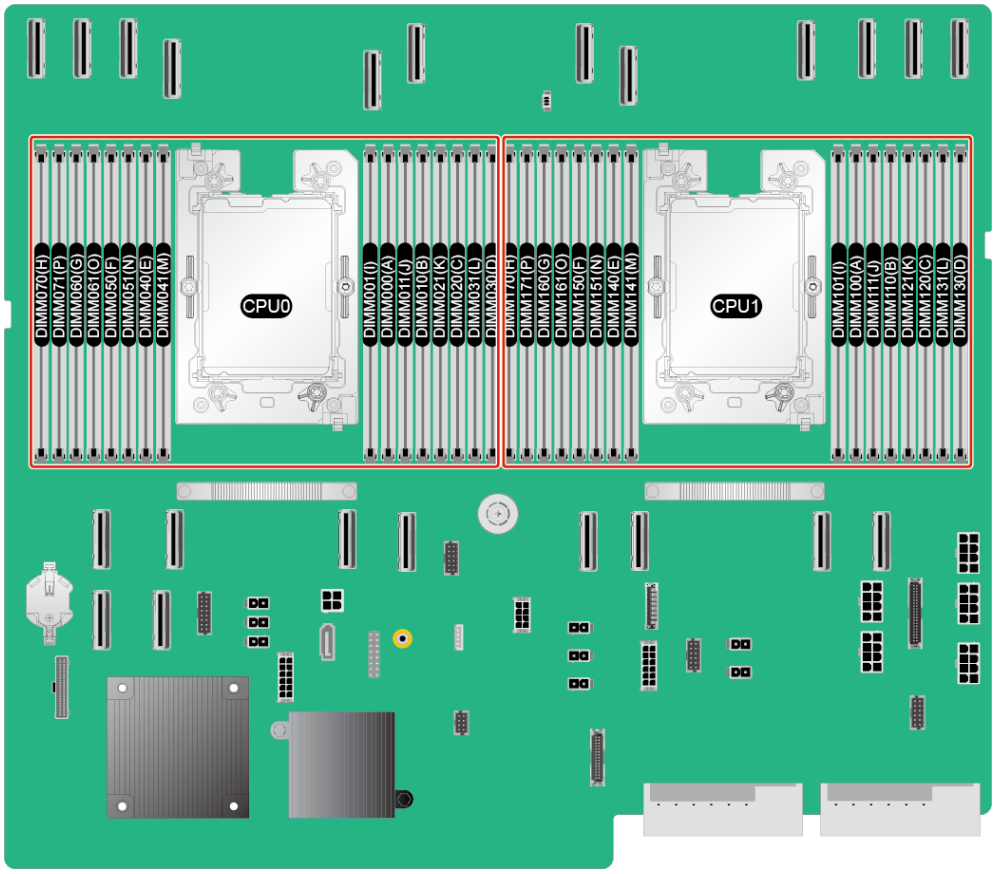


Figure 5-11 DDR5 memory module installation guidelines

CPU	Channel	DIMM Slot	Number of DIMMs						
			2	4	8	12	16	24	32
CPU0	A	DIMM000(A)	●	●	●	●	●	●	●
		DIMM001(I)						●	●
	B	DIMM010(B)					●	●	●
		DIMM011(J)							●
	C	DIMM020(C)			●	●	●	●	●
		DIMM021(K)						●	●
	D	DIMM030(D)				●	●	●	●
		DIMM031(L)							●
	E	DIMM040(E)			●	●	●	●	●
		DIMM041(M)						●	●
	F	DIMM050(F)				●	●	●	●
		DIMM051(N)							●
	G	DIMM060(G)		●	●	●	●	●	●
		DIMM061(O)						●	●
	H	DIMM070(H)					●	●	●
		DIMM071(P)							●
CPU1	A	DIMM100(A)	●	●	●	●	●	●	●
		DIMM101(I)						●	●
	B	DIMM110(B)					●	●	●
		DIMM111(J)							●
	C	DIMM120(C)			●	●	●	●	●
		DIMM121(K)						●	●
	D	DIMM130(D)				●	●	●	●
		DIMM131(L)							●
	E	DIMM140(E)			●	●	●	●	●
		DIMM141(M)						●	●
	F	DIMM150(F)				●	●	●	●
		DIMM151(N)							●
	G	DIMM160(G)		●	●	●	●	●	●
		DIMM161(O)						●	●
	H	DIMM170(H)					●	●	●
		DIMM171(P)							●

5.4.1.6 Memory Protection Technologies

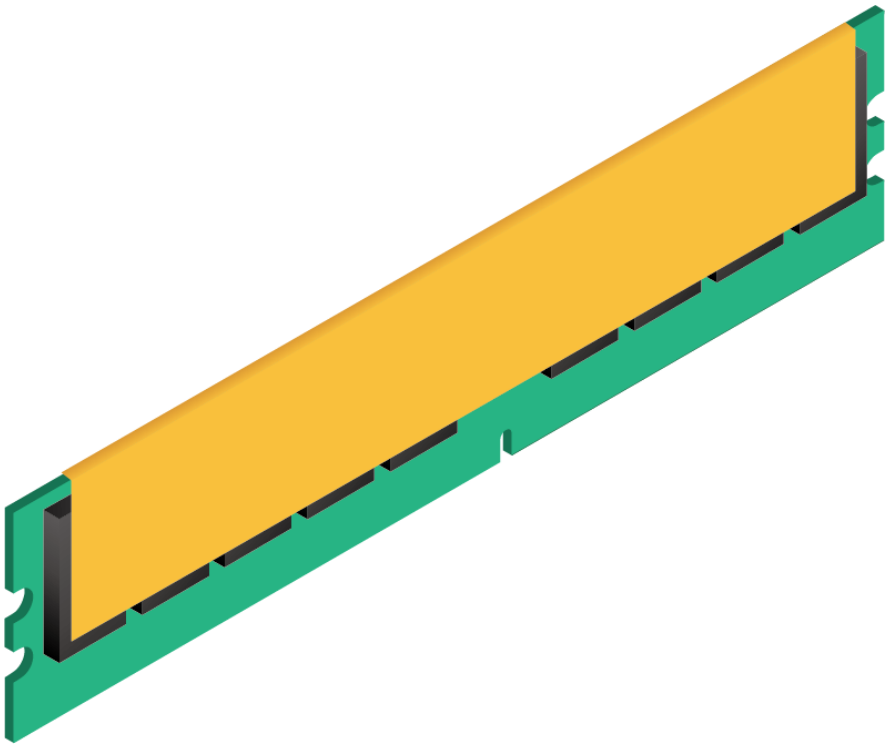
DDR5 DIMMs support the following memory protection technologies:

- ECC
- Memory Mirroring
- Memory Single Device Data Correction (SDDC)
- Failed DIMM Isolation
- Memory Thermal Throttling
- Command/Address Parity Check and Retry
- Memory Demand/Patrol Scrubbing
- Memory Data Scrambling
- Post Package Repair (PPR)
- Write Data CRC Protection
- Adaptive Data Correction - Single Region (ADC-SR)
- Adaptive Double Device Data Correction - Multiple Region (ADDDC-MR)
- Partial Cache Line Sparing (PCLS, HBM CPU only)

5.4.1.7 (Optional) Liquid Cooling for DIMMs

Supports memory liquid cooling.

Figure 5-12 DIMM appearance



5.5 Storage

5.5.1 Drive Configurations and Drive Numbering

5.5.1.1 10 x 2.5" Drive Configuration

Drive Configuration

Table 5-7 Drive Configuration

Configuration	Front Drive	Drive Management Mode
10 x 2.5" drive configuration (8 x NVMe + 2 x SAS/SATA)	• Front drives (10 x 2.5"): – Slots 0 to 7 support only NVMe drives. – Slots 8 to 9 support only SAS/SATA drives.	• SAS/SATA drive: 1 x PCIe RAID controller card • SATA drive: PCH • NVMe drive: PCIe Switch
For details about component options, consult the local sales representatives.		

Drive Numbering

NOTICE

The drive numbers identified by the RAID controller card vary depending on the cabling of the RAID controller card. This section uses the drive numbers identified by a RAID controller card that adopts the default cabling described in "Internal Cabling" in the server *Maintenance and Service Guide*.

- Drive numbers of the 10 x 2.5" drive configuration (8 x NVMe + 2 x SAS/SATA) in **Table 5-7**.

Figure 5-13 Drive numbering

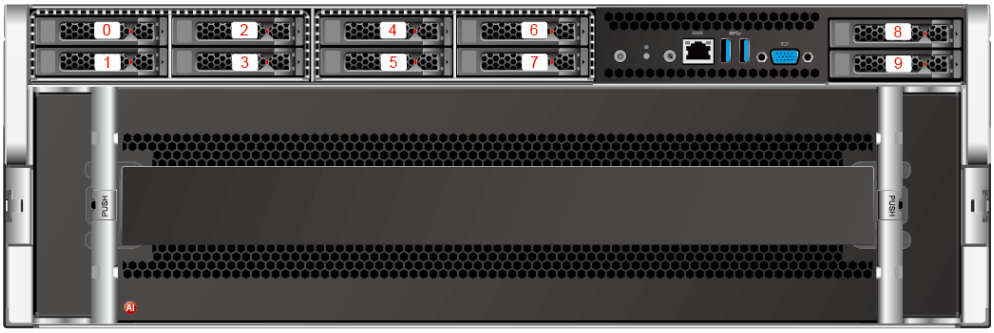


Table 5-8 Drive numbering

Drive Number	Drive Number Displayed on the iBMC WebUI	Drive Number Identified by the RAID Controller Card
0	0	-
1	1	-
2	2	-
3	3	-
4	4	-
5	5	-
6	6	-
7	7	-
8	8	0
9	9	1

5.5.2 Drive Indicators

SAS/SATA Drive Indicators

Figure 5-14 SAS/SATA drive indicators

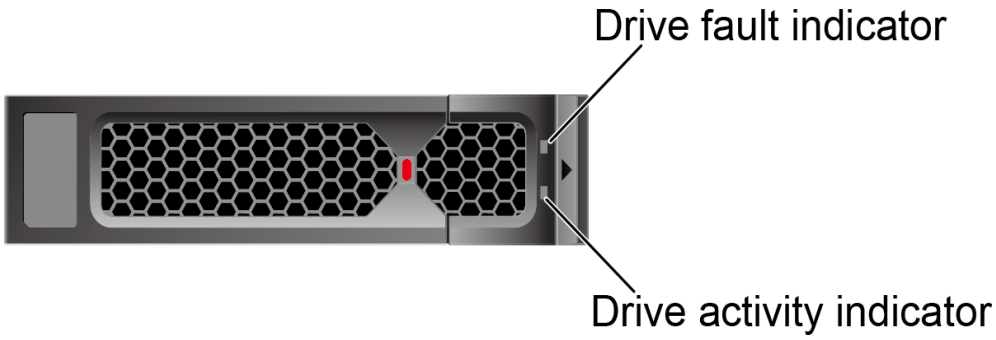


Table 5-9 SAS/SATA drive indicator description

Active Indicator (Green)	Fault Indicator (Red/Blue)	State Description
Off	Off	The drive is not detected.
Steady on	Off	The drive is detected.

Active Indicator (Green)	Fault Indicator (Red/Blue)	State Description
Blinking at 4 Hz	Off	Data is being read or written properly, or data on the primary drive is being rebuilt.
Steady on	Blinking blue at 4 Hz	The drive is being located.
Blinking at 1 Hz	Blinking red at 1 Hz synchronously	Data on the secondary drive is being rebuilt.
Off	Red steady on	A drive in a RAID array is removed.
Steady on	Red steady on	The drive is faulty.

NVMe Drive Indicators

Figure 5-15 NVMe drive indicators

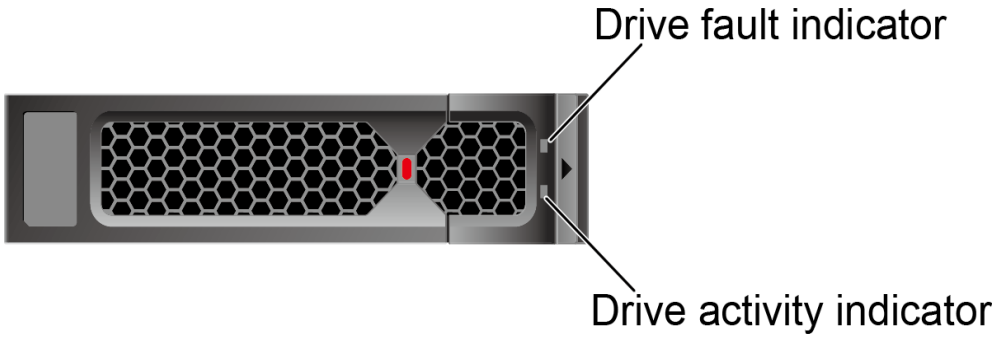


Table 5-10 NVMe drive indicator description

Active Indicator (Green)	Fault Indicator (Red/Blue)	State Description
Off	Off	The NVMe drive is not detected.
Steady on	Off	The NVMe drive is detected and operating properly.
Blinking at 4 Hz	Off	Data is being read from or written to the NVMe drive.
Steady on/Blinking	Blinking blue at 4 Hz	The NVMe drive is being located.
Blinking at 1 Hz	Blinking red at 1 Hz synchronously	Data on the NVMe secondary drive is being rebuilt.
Steady on/Off	Red steady on	The NVMe drive is faulty.

5.5.3 RAID Controller Card

The RAID controller card supports RAID configuration, RAID level migration, and drive roaming.

- For details about component options, consult the local sales representatives.
- For details about the RAID controller card, see the server *RAID Controller Card User Guide*.

5.6 Network

5.6.1 PCIe NICs

Standard PCIe NIC support network expansion function.

- The number of NICs can be flexibly configured. Users can select NICs as required.
- For details about component options, consult the local sales representatives.
- For details about the standard PCIe NIC, see the documents of the standard PCIe NIC.

5.7 I/O Expansion

5.7.1 PCIe Cards

PCIe cards provide ease of expandability and connection.

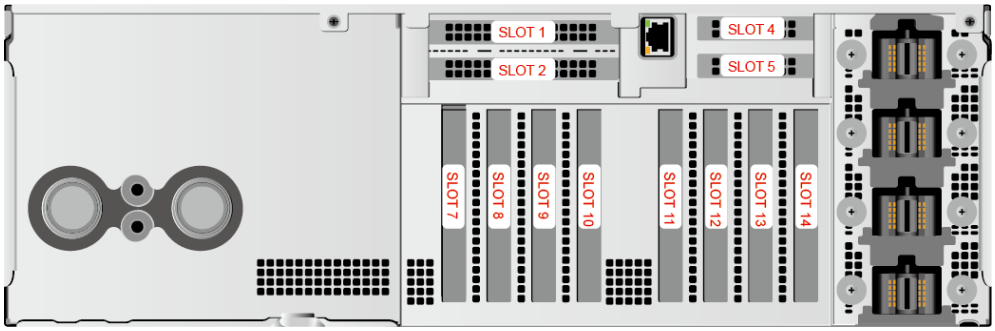
- In balanced configuration, the server supports a maximum of 13 PCIe 5.0 x16 expansion slots: 8 full-height and half-length PCIe 5.0 x16 slots, 3 half-height and half-length PCIe 5.0 x16 slots, and 2 full-height and 3/4-length PCIe 5.0 x16 slots.
- In high-performance configuration, the server supports a maximum of 12 PCIe 5.0 x16 expansion slots: 8 PCIe 5.0 x16 expansion slots (full-height and half-length) + 4 PCIe 5.0 x8 PCIe expansion slots (2 half-height and half-length + 2 full-height and 3/4-length).
- For details about component options, consult the local sales representatives.
- When IB cards are used to build an IB network, ensure that the IPoIB modes of the IB cards at both ends of the network are the same. For details, contact technical support.

5.7.2 PCIe Slots

PCIe Slot Positions

- PCIe Slot Positions

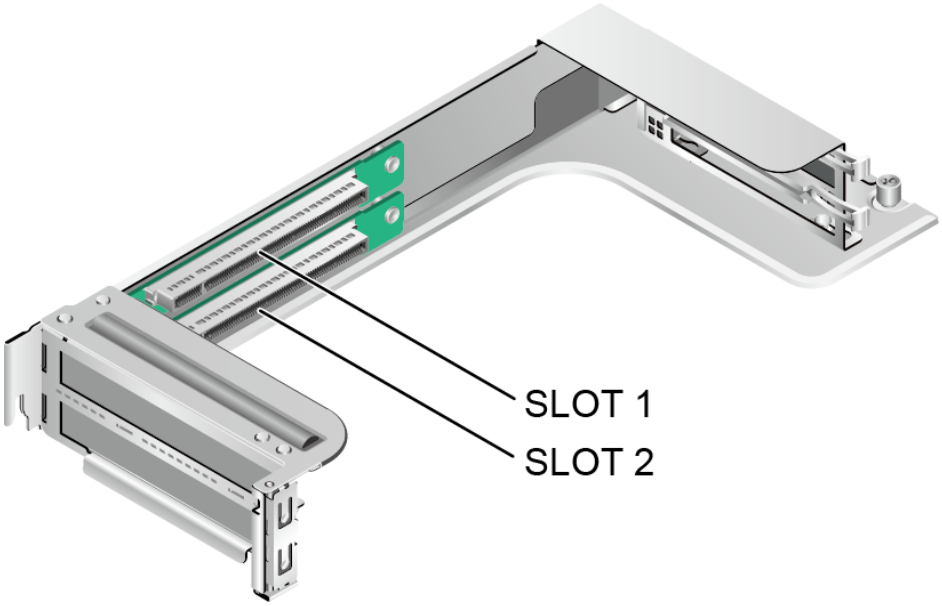
Figure 5-16 PCIe Slots



PCIe CEM Modules

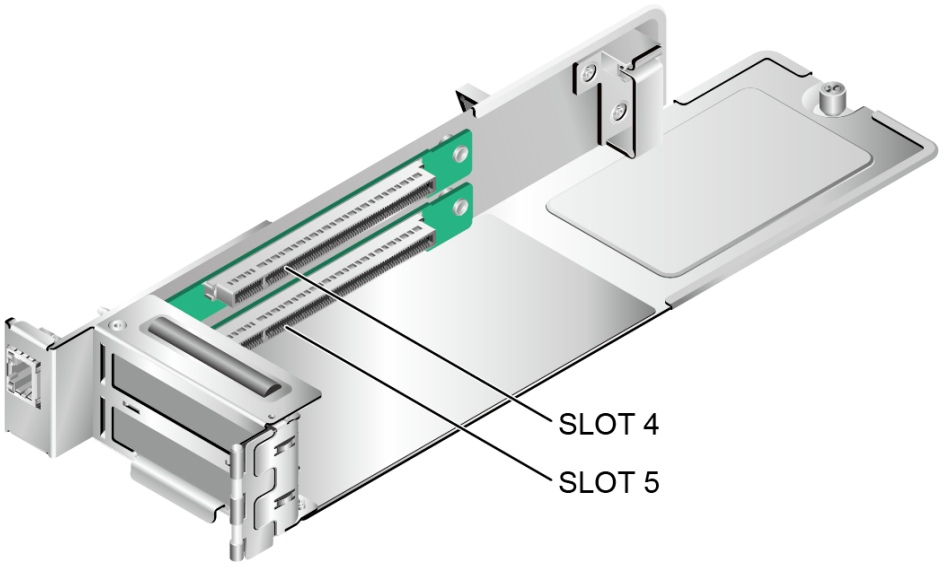
- Full-height 3/4-length PCIe CEM module
  - PCIe CEM module configured with PCIe NICs
    The PCIe CEM module provides PCIe slots 1 and 2.

    Figure 5-17 PCIe CEM module



- Half-height half-length PCIe CEM modules
  - PCIe CEM module configured with PCIe NICs
    The PCIe CEM module provides PCIe slots 4 and 5.

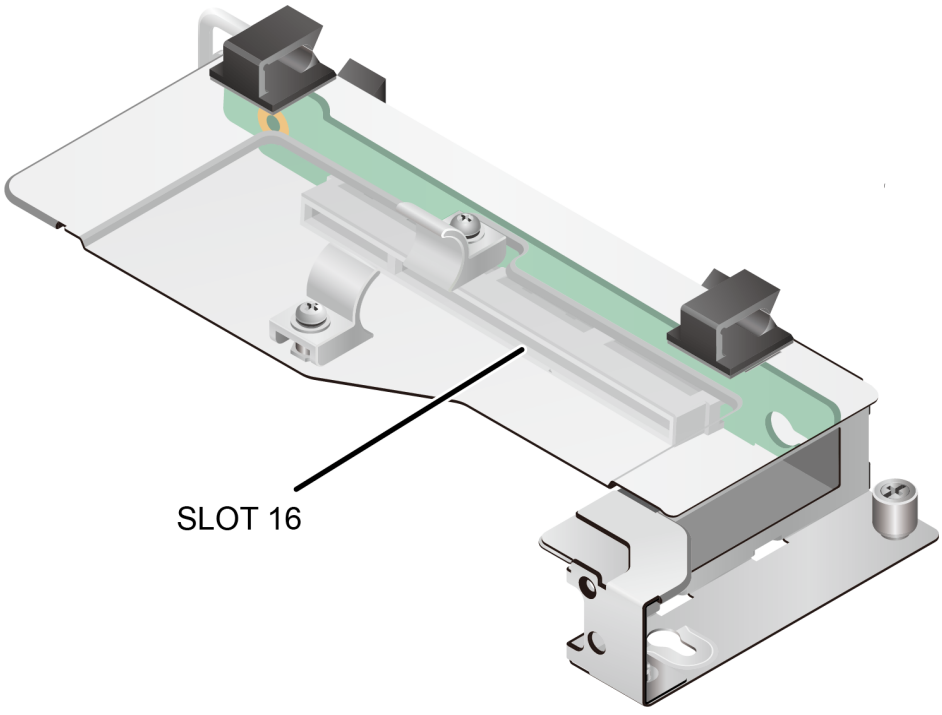
Figure 5-18 PCIe CEM module



– PCIe CEM module configured with a RAID controller card

  When this PCIe CEM module is installed on the right side of the server node chassis, the provided PCIe slot is Slot 16.

Figure 5-19 PCIe CEM module

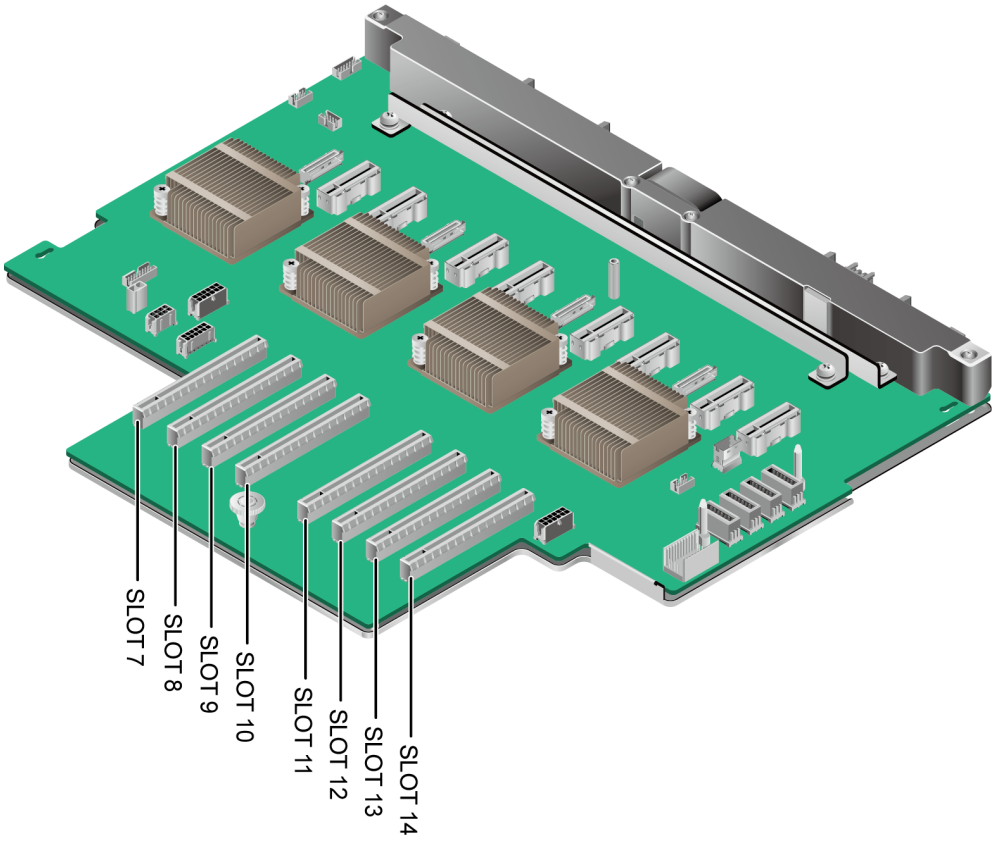


PCIe switch board

- PCIe switch board

  The PCIe switch board provides PCIe slots 7 to 14.

Figure 5-20 PCIe switch board



5.7.3 PCIe Slot Description

Table 5-11 PCIe slot description

PCIe Slot	CPU	PCIe Standards	Connector Width	Bus Width	Port Number	Slot Size
Slot1	CPU1	PCIe 5.0	x16 or x8	x16 or x8	CPU1-PE1	FH3/4L
Slot2	CPU1	PCIe 5.0	x16 or x8	x16 or x8	CPU1-PE1	FH3/4L
Slot4	CPU0	PCIe 5.0	x16 or x8	x16 or x8	CPU0-PE1	HHHL
Slot5	CPU0	PCIe 5.0	x16 or x8	x16 or x8	CPU0-PE1	HHHL
Slot7	CPU1-SW3	PCIe 5.0	x16	x16	CPU1-PE4	FHHL
Slot8	CPU1-SW3	PCIe 5.0	x16	x16	CPU1-PE0	FHHL

PCIe Slot	CPU	PCIe Standards	Connector Width	Bus Width	Port Number	Slot Size
Slot9	CPU1-SW2	PCIe 5.0	x16	x16	CPU1-PE3	FHHL
Slot10	CPU1-SW2	PCIe 5.0	x16	x16	CPU1-PE2	FHHL
Slot11	CPU0-SW1	PCIe 5.0	x16	x16	CPU0-PE4	FHHL
Slot12	CPU0-SW1	PCIe 5.0	x16	x16	CPU0-PE0	FHHL
Slot13	CPU0-SW0	PCIe 5.0	x16	x16	CPU0-PE3	FHHL
Slot14	CPU0-SW0	PCIe 5.0	x16	x16	CPU0-PE2	FHHL
Slot16	CPU1	PCIe 5.0	x8	x8	CPU1-PE1	HHHL
● The PCIe x16 slots are compatible with PCIe x16, PCIe x8, PCIe x4, and PCIe x1 cards. The PCIe cards are not forward compatible, which means the bandwidth of PCIe slots cannot be less than that of PCIe cards. ● Power supply capability of any slot can support PCIe card. The power of PCIe card varies according to the model of PCIe card.						

Server Bus/Device/Function Number (B/D/F) Information

The B/D/F information of the server may change with PCIe card configurations. You can obtain the B/D/F information of the server using the following methods:

- BIOS serial port log: If the serial port log has been collected, you can query the B/D/F information of the server by searching for the keyword **dumpiio**.
- The following describes how to obtain the B/D/F information on different OSs.
  - Linux OS: You can obtain the B/D/F information of the server running the **lspci -vvv** command.

    NOTE

    If the OS does not support the **lspci** command by default, obtain the **pci-utils** package from the **yum** source and install it to make the OS support the command.
  - Windows OS: After installing the **pci-utils** package, run the **lspci** command to obtain the B/D/F information of the server.
  - VMware OS: The **lspci** command is supported by default. You can directly obtain the B/D/F information of the server using the **lspci** command.

5.8 Liquid Cooling Heat Sink

The node is cooled by a liquid-cooled heat sink.

Figure 5-21 Appearance of the CPU liquid-cooled heat sink

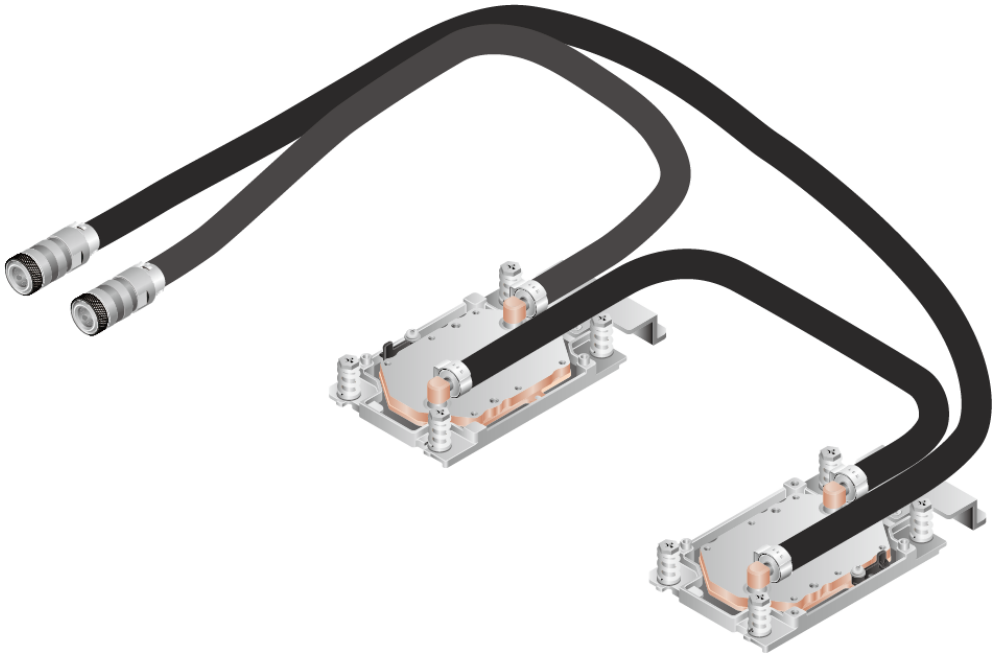


Figure 5-22 Appearance of the CPU with memory liquid-cooled heat sink

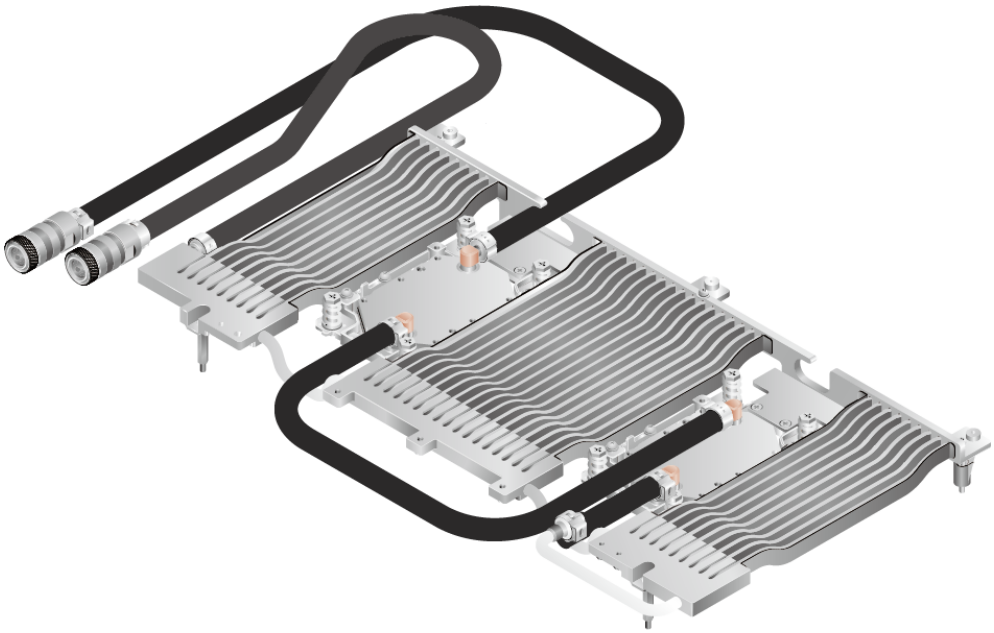
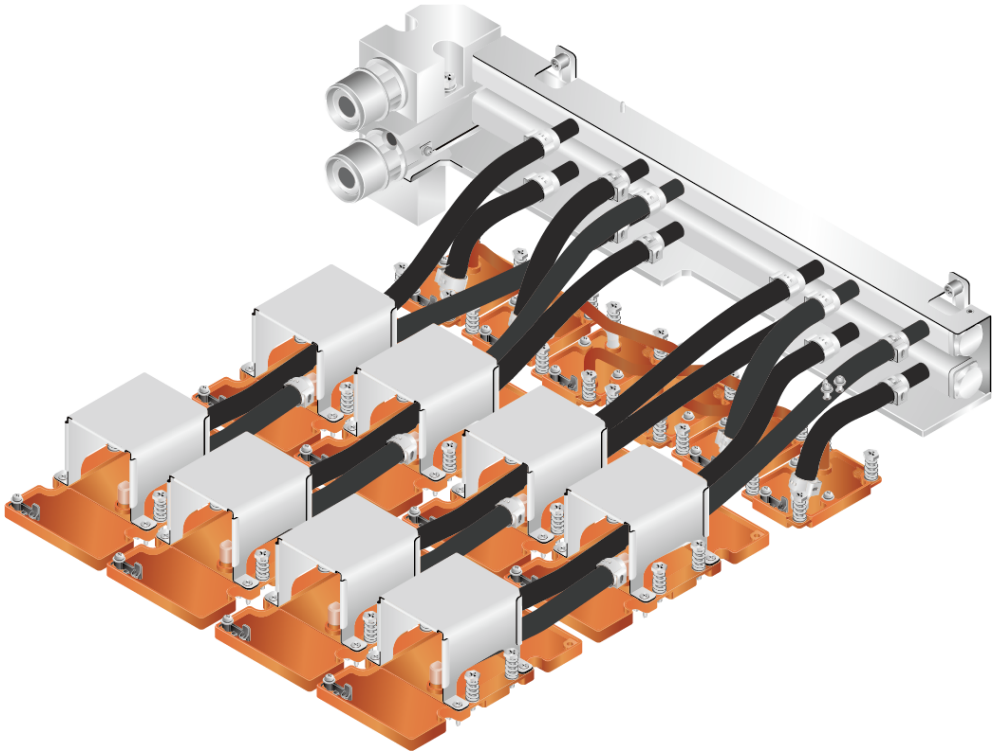


Figure 5-23 Appearance of the GPU module liquid-cooled heat sink (example: A800 Module)

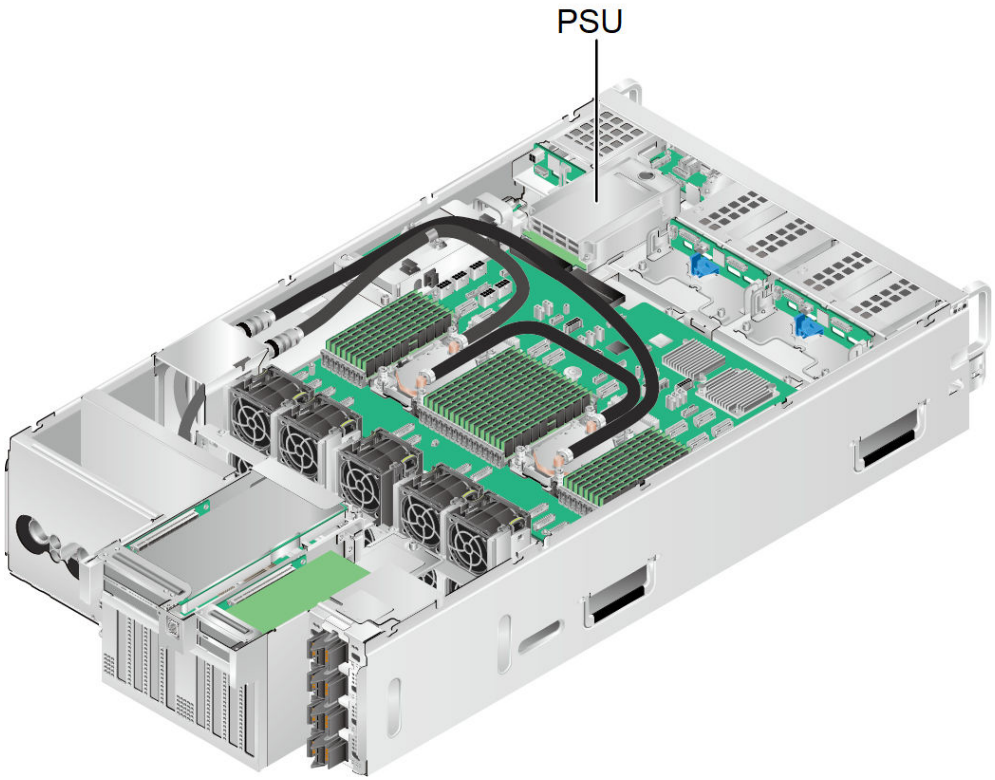


5.9 Leakage detection cable and leakage shut-off valve

The leakage detection cable is used to detect leakage in the server node. When leakage occurs in the server node, it can be quickly reported to the customer network management system through iBMC. At the same time, the shut-off valve can be used to shut off the inlet and outlet of the leaking node.

5.10 PSU

Figure 5-24 Position of the PSU



5.11 Fan Modules

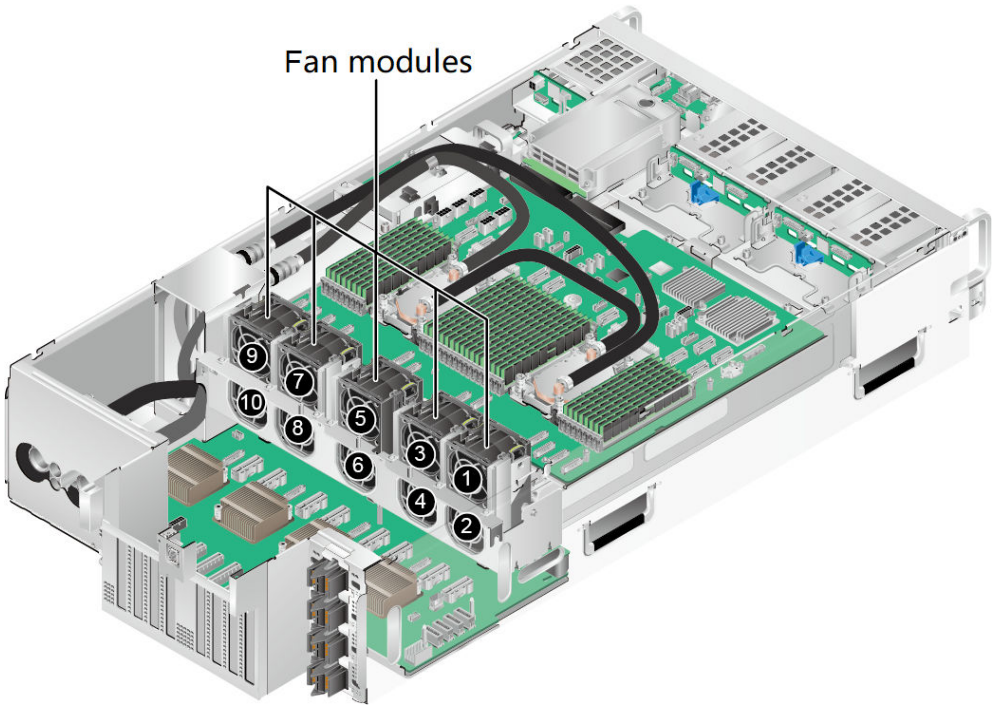
- Ten fan modules are supported.
- The fan module supports N+1 redundancy, which means that the server node can work normally when a single fan module fails.
- Supports single faulty fan.

NOTICE

The temperature is 5ºC (9ºF) lower than the rated value when a single fan is faulty.

- Supports intelligent fan speed adjustment.
- Fan modules configured in a server node must have the same Part No. (P/N Code).

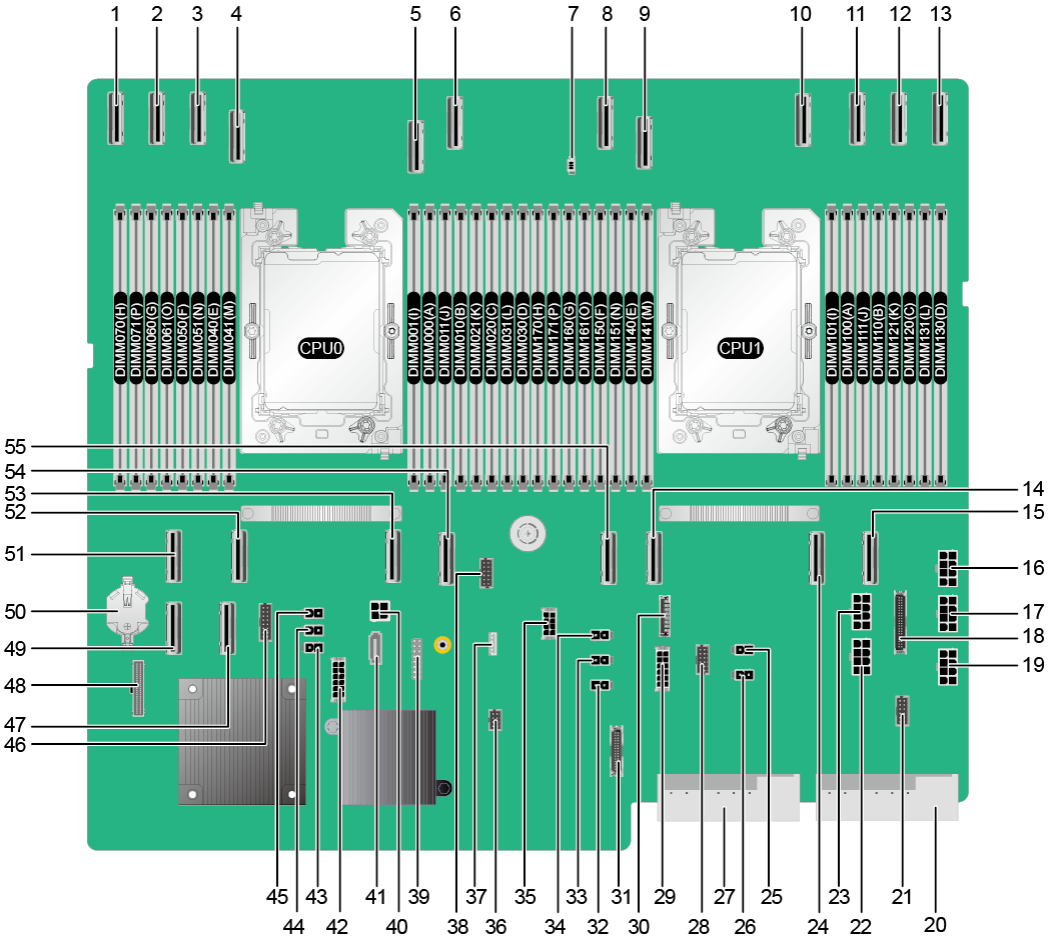
Figure 5-25 Positions of the fan modules



5.12 Boards

5.12.1 Mainboard

Figure 5-26 Mainboard



1	CPU0 southbound MCIO connector (J51)	2	CPU0 southbound MCIO connector (J52)
3	CPU0 southbound MCIO connector (J50)	4	CPU0 southbound MCIO connector (J49)
5	CPU0 southbound MCIO connector (J46)	6	CPU0 southbound MCIO connector (J31)
7	Intrusion sensor connector (S12801)	8	CPU1 southbound MCIO connector (J61)
9	CPU1 southbound MCIO connector (J62)	10	CPU1 southbound MCIO connector (J60)
11	CPU1 southbound MCIO connector (J59)	12	CPU1 southbound MCIO connector (J58)
13	CPU1 southbound MCIO connector (J57)	14	CPU1 northbound MCIO connector (J64)

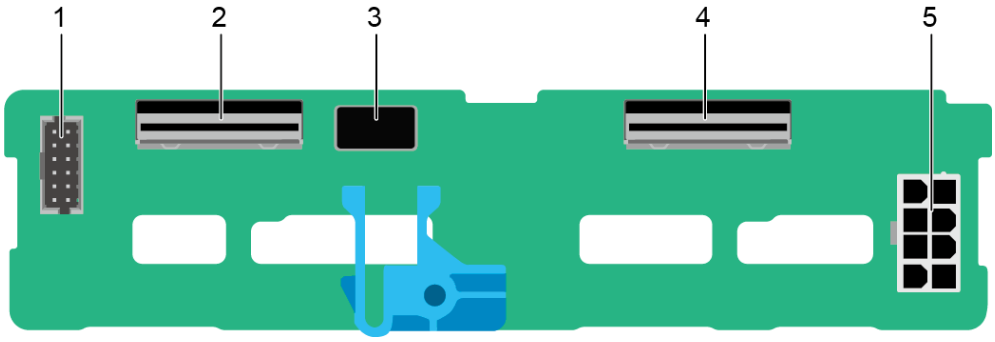
15	CPU1 northbound MCIO connector (J66)	16	Drive backplane power connector (J10402)
17	Drive backplane power connector (J10403)	18	Drive backplane low-speed signal connector (J10201)
19	Drive backplane power connector (J10401)	20	Mainboard power input connector (J6096)
21	Fan low-speed signal connector (J6606)	22	Fan power connector (J10408)
23	Fan power connector (J10409)	24	CPU1 northbound MCIO connector (J65)
25	CEM power connector (J69)	26	CEM power connector (J10405)
27	Mainboard power input connector (J6095)	28	48V Power adapter board low-speed signal connector (J10208)
29	PCIe Switch board power connector VCC_12V (J10406)	30	48V Power adapter board low-speed signal connector (J39)
31	O & M interface connector (J10206)	32	CEM power connector (J72)
33	CEM power connector (J71)	34	CEM power connector (J70)
35	PCIe Switch board power connector STBY_12V (J10411)	36	PCIe Switch board low-speed signal connector (J10202)
37	VROC Key connector (J8201)	38	NC-SI connector (J6607)
39	TPM connector	40	2 * SAS/SATA drive backplane power connector (J68)
41	SATA connector	42	PCIe Switch board power connector VCC_12V (J10404)
43	CEM power connector (J73)	44	CEM power connector (J37)
45	CEM power connector (J36)	46	O & M interface connector (J10205)
47	PCH MCIO connector (J43)	48	O & M board USB & VGA connector (J10207)

49	PCH MCIO connector (J40)	50	Coin battery connector (U8)
51	CPU0 northbound MCIO connector (J53)	52	CPU0 northbound MCIO connector (J54)
53	CPU0 northbound MCIO connector (J55)	54	CPU0 northbound MCIO connector (J56)
55	CPU1 northbound MCIO connector (J63)	-	-

5.12.2 Drive Backplanes

- 4 x 2.5" (4 x NVMe/SAS/SATA) drive backplane

Figure 5-27 4 x 2.5" (4 x NVMe/SAS/SATA) drive backplane

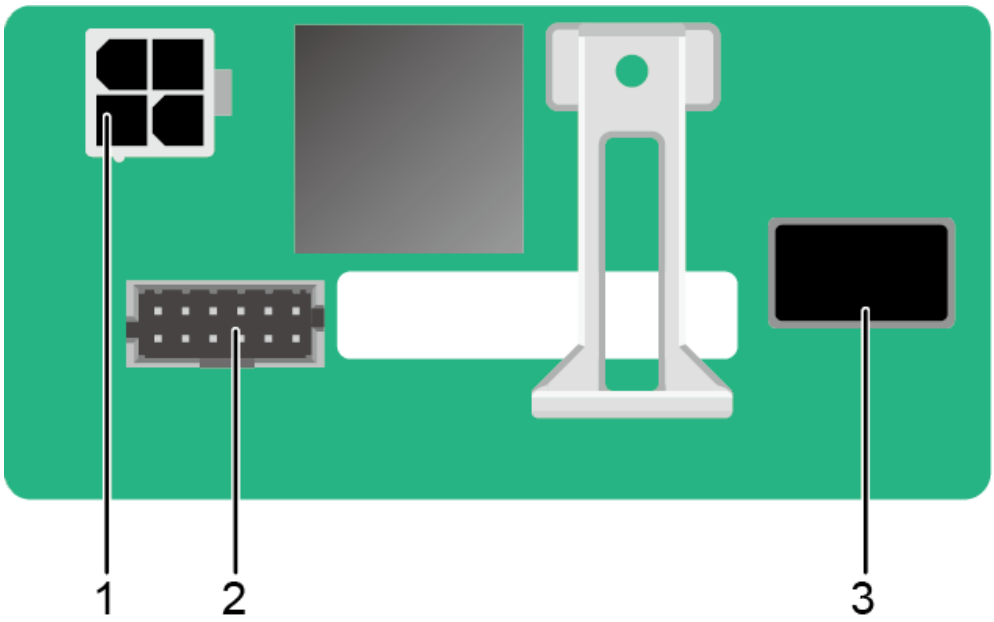


No.	Connector	Managed Drive Slots
1	Drive backplane low-speed signal connector (J1601)	-
2	MCIO Connector (J402)	Slots 2 to 3 (front drive backplane 1) Slots 6 to 7 (front drive backplane 2)
3	Slimline X4 Connector (J1)[a]	-
4	MCIO Connector (J401)	Slots 0 to 1 (front drive backplane 1) Slots 4 to 5 (front drive backplane 2)
5	Drive backplane power connector (J2)	-

No.	Connector	Managed Drive Slots
a: Not used yet.		

- 2 x 2.5" (2*SAS/SATA) drive backplane

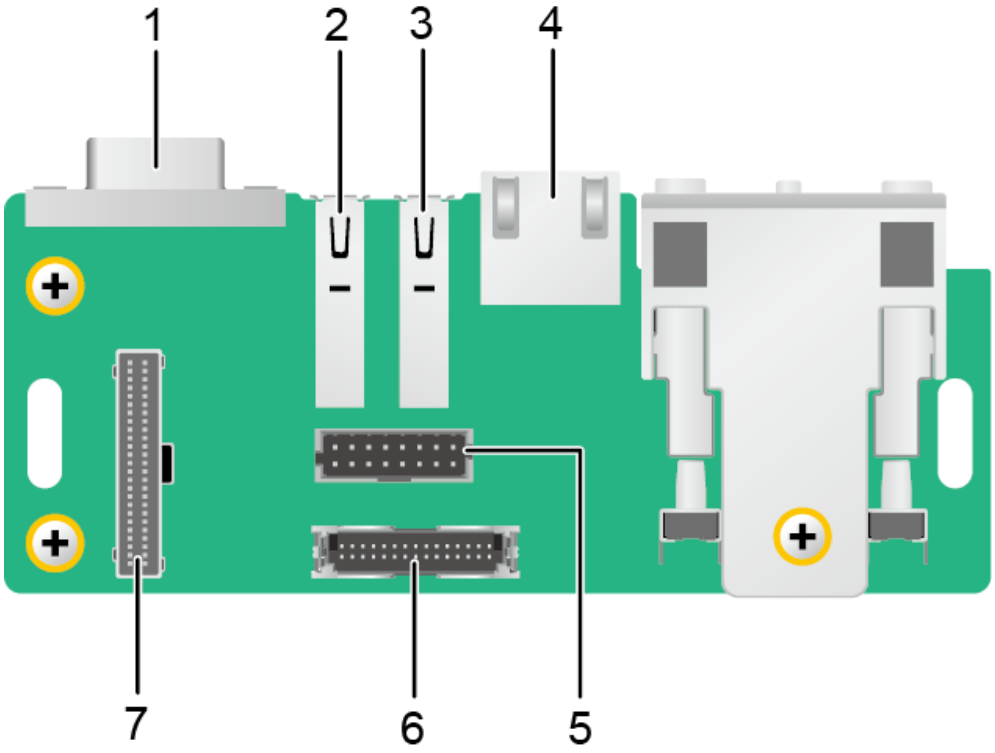
Figure 5-28 2 x 2.5" (2*SAS/SATA) drive backplane



No.	Connector	Managed Drive Slots
1	Drive backplane power connector (J1001)	-
2	Drive backplane low-speed signal connector (J801)	-
3	Slimline X4 connector (J401)	Slot8~Slot9

5.12.3 O & M interface board

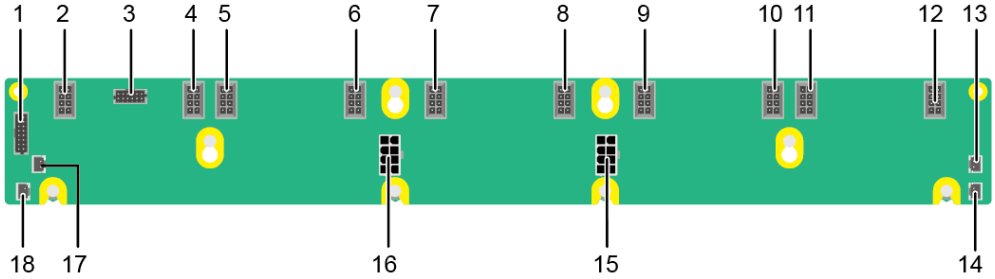
Figure 5-29 O & M interface board



1	VGA connector (J501)	2	USB connector (J401)
3	USB connector (J402)	4	RJ45 serial port connector (J702)
5	Mainboard low-speed signal connector (J601)	6	Mainboard low-speed signal connector (J701)
7	Mainboard low-speed signal connector (J1)	-	-

5.12.4 Fan management board

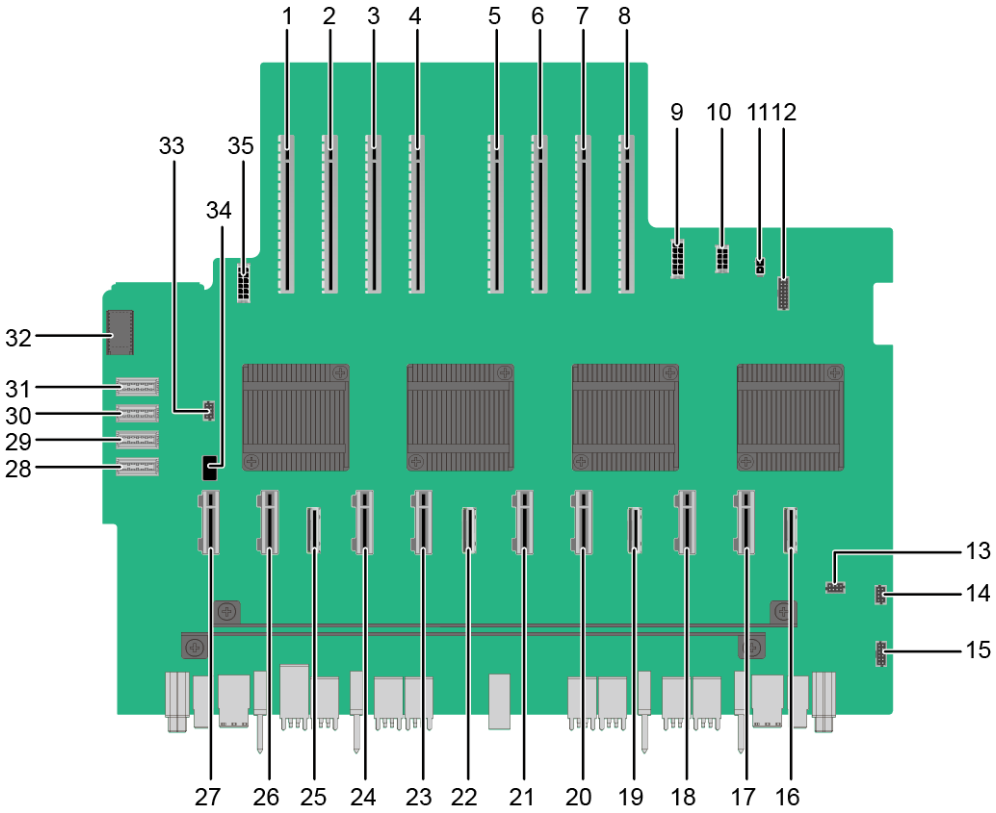
Figure 5-30 Fan management board



1	PCIe Switch board low-speed signal connector (J2201)	2	Fan connector (FAN10 / J10)
3	Low-speed signal connector (J16)	4	Fan connector (FAN9 /J9)
5	Fan connector (FAN8 /J8)	6	Fan connector (FAN7 /J7)
7	Fan connector (FAN6 /J6)	8	Fan connector (FAN5 /J5)
9	Fan connector (FAN4/J4)	10	Fan connector (FAN3 /J3)
11	Fan connector (FAN2 /J2)	12	Fan connector (FAN 1/J1)
13	Immersed Rope Connector (J12)	14	Water sensor connector (J11)
15	Fan management board power connector (J14)	16	Fan management board power connector (J15)
17	Immersed Rope Connector (J1502)	18	Immersed Rope Connector (J1501)

5.12.5 PCIe switch board

Figure 5-31 PCIe switch board

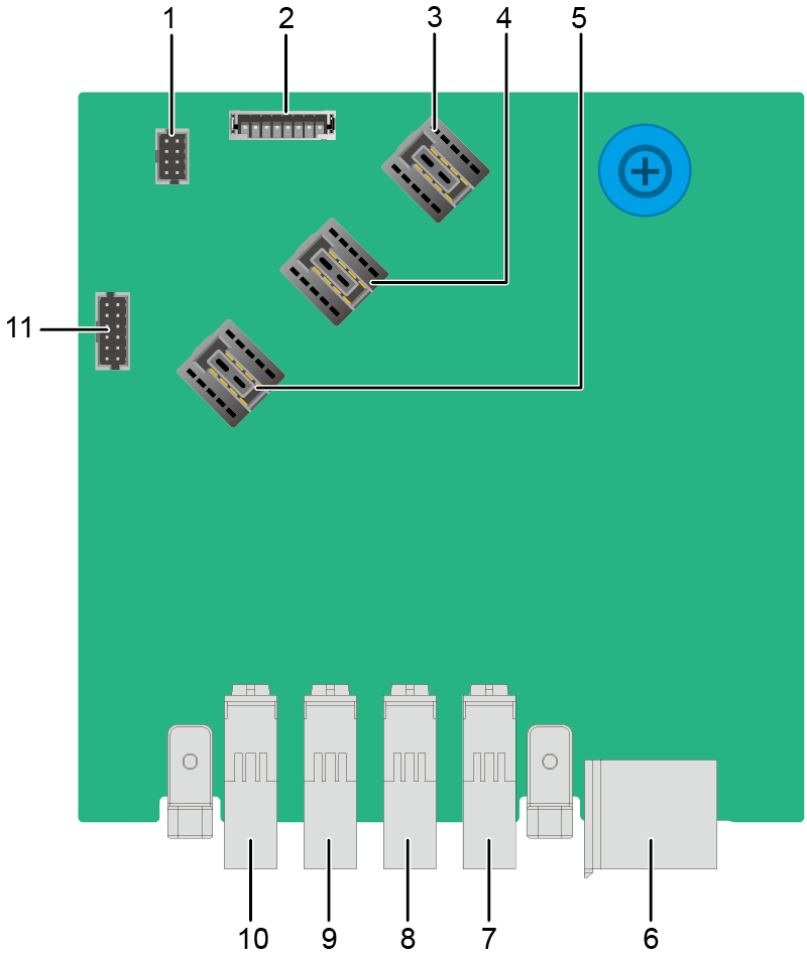


1	PCIe NIC card connector (J20)	2	PCIe NIC card connector (J37)
3	PCIe NIC card connector (J49)	4	PCIe NIC card connector (J50)
5	PCIe NIC card connector (J54)	6	PCIe NIC card connector (J55)
7	PCIe NIC card connector (J56)	8	PCIe NIC card connector (J43)
9	PCIe SW board power connector VCC _ 12V (J44)	10	PCIe SW board power connector STBY _ 12V (J18)
11	PCIe SW board power connector STBY_12V[a]	12	Fan board to PCIe SW board low speed connector (J57)
13	Flow Regulator Connector (J29)	14	Flow Regulator Valve Connector (J30)
15	Low speed connector of leakage interface board (J53)	16	MCIO High Speed Connector (J16)
17	UBCDD High Speed Connector (J127)	18	UBCDD High Speed Connector (J126)
19	MCIO High Speed Connector (J17)	20	UBCDD High Speed Connector (J125)
21	UBCDD High Speed Connector (J124)	22	MCIO High Speed Connector (J15)
23	UBCDD High Speed Connector (J123)	24	UBCDD High Speed Connector (J122)
25	MCIO High Speed Connector (J14)	26	UBCDD High Speed Connector (J121)
27	UBCDD High Speed Connector (J120)	28	48V Power Adapter Board Supply Connector (J46)
29	48V Power Adapter Board Supply Connector (J48)	30	48V Power Adapter Board Supply Connector (J47)
31	48V Power Adapter Board Supply Connector (J64)	32	48V Power Adapter Board Low Speed Connector (J100)
33	Motherboard Low Speed Connector (J19)	34	Board to PCIe SW board Slimline X4 connector (J38)

35	PCIe SW board power connector VCC _ 12V (J45)	-	-
a: reserved connector.			

5.12.6 48V Power interface board

Figure 5-32 48V Power interface board



1	48V Power Interface Board Connector (J1001)	2	Motherboard Low Speed Connector (J1003)
3	Power Supply Connector (J5)	4	Power Supply Connector (J6)
5	Power Supply Connector (J7)	6	PCIe SW card low-speed connector (J8)
7	PCIe SW board power connector (J4)	8	PCIe SW board power connector (J3)

9	PCIe SW board power connector (J2)	10	PCIe SW board power connector (J1)
11	Reserved Connector (J1002)	-	-

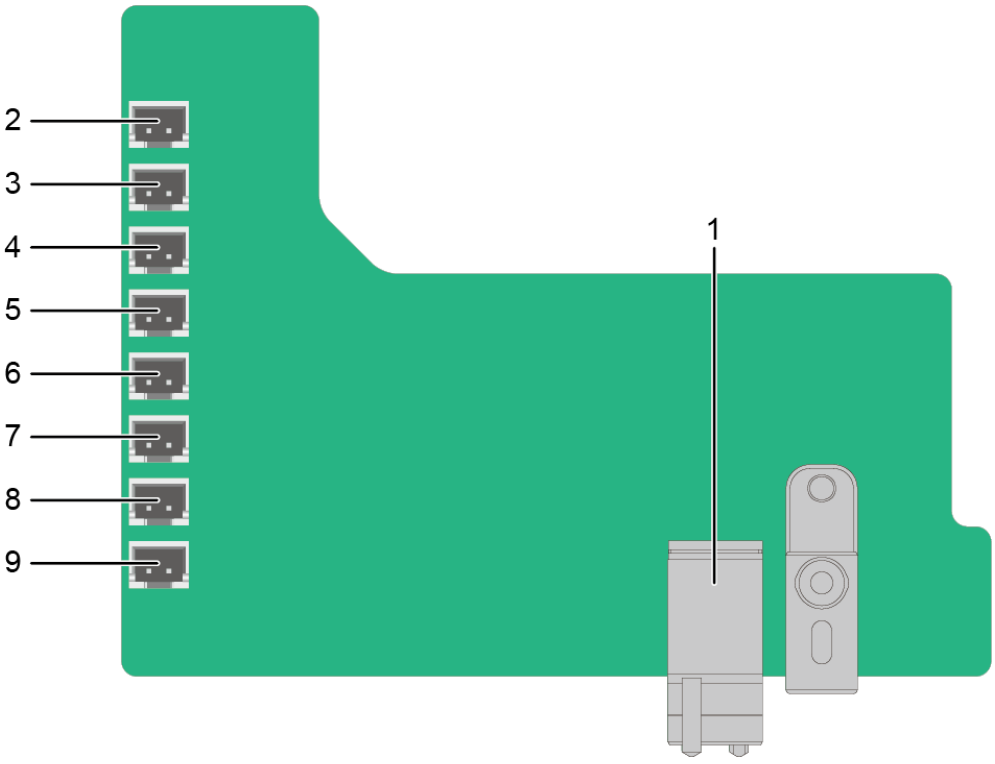
5.12.7 GE board

Figure 5-33 GE board

1	Motherboard Low Speed Connector (J402)	2	GE management connector (J401)

5.12.8 Leakage detector

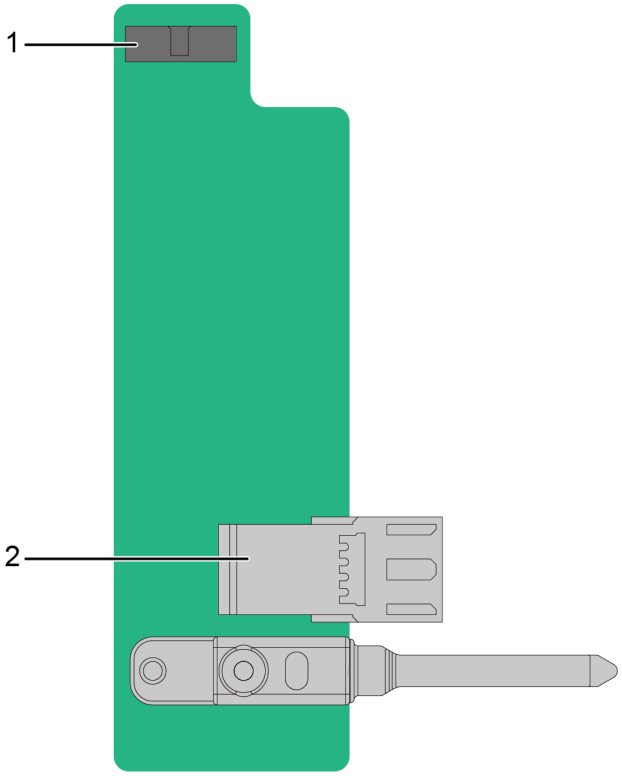
Figure 5-34 Leakage detector



1	Leakage Interface Board Connector (J1)	2	Immersed Rope Connector (J2)
3	Immersed Rope Connector (J3)	4	Immersed Rope Connector (J4)
5	Immersed Rope Connector (J5)	6	Immersed Rope Connector (J6)
7	Immersed Rope Connector (J7)	8	Immersed Rope Connector (J8)
9	Immersed Rope Connector (J9)	-	-

5.12.9 Leakage interface board

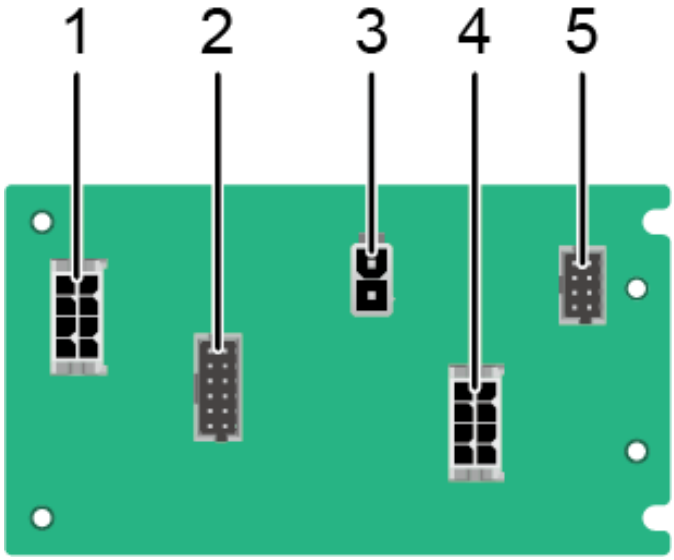
Figure 5-35 Leakage interface board



1	PCIe Switch board low-speed connector (J2)	2	Leakage detector board connector (J1)

5.12.10 DPU Power Adapter Board

Figure 5-36 DPU power adapter board



1	DPU ATX power input connector (DPU PWR2/J2)	2	DPU UART signal connector (UART CONN/J5)
3	DPU main power input connector (DPU PWR1/J3)	4	12 V power input connector (12V PWR IN/J1)
5	DPU spurious signal connector (DPU CONN/J4)	-	-

6 Specifications

6.1 Technical Specifications

Table 6-1 Technical specifications

Component	Specifications
Form factor	4U liquid-cooled GPU server node
Chipset	Emmitsburg PCH
Processors	Supports two processors. ● Supports the 4th-generation Intel® Xeon® Scalable processors (Sapphire Rapids). ● Built-in memory controller and eight DIMM channels per processor. ● Built-in PCIe controller, supporting PCIe 5.0 and 80 lanes per processor. ● Supports up to four UltraPath Interconnect (UPI) buses between processors, providing up to 16 GT/s transmission per channel. ● Up to 60 cores. ● Max. 4.2 GHz turbo frequency ● Min. 1.875 MB L3 cache per core. ● Max. 350 W thermal design power (TDP). **NOTE** The preceding information is for reference only. For details, consult the local sales representative.

Component	Specifications
Memory	● Up to 32 DDR5 DIMMs. – Supports RDIMM or RDIMM-3DS. – Max. 4800 MT/s memory speed. – The DDR5 DIMMs of different types (RDIMM and RDIMM-3DS) and specifications (capacity, bit width, rank, and height) cannot be used together. – A server node must use DDR5 DIMMs of the same P/N code. **NOTE** The preceding information is for reference only. For details, consult the local sales representative.
Storage	● Supports a variety of drive configurations. Supports up to 10 front drives, including 8x2.5" NVMe drives and 2x2.5" SAS/SATA drives. ● Supports hot-swappable SAS/SATA/NVMe U.2 drives. **NOTE** When NVMe drives are configured: ● Before using the VMD function, contact technical support engineers of the OS vendor to check whether the OS supports the VMD function. If yes, check whether the VMD driver needs to be manually installed and check the installation method. ● Surprise hot swap is supported if the VMD function is enabled and the latest Intel VMD driver is installed. ● Supports a variety of RAID controller cards. For details, consult the local sales representative. – The RAID controller card supports RAID configuration, RAID level migration, and drive roaming. – The RAID controller card supports a supercapacitor for power-off protection to ensure user data security. – The PCIe RAID controller card occupies one PCIe slot. For details about the RAID controller card, see the server *RAID Controller Card User Guide*.
Network	Standard PCIe NIC support network expansion function. ● Supports a maximum of 12 standard PCIe NICs, which can be configured as required. ● Supports multiple standard PCIe NICs. For details, consult your local sales representative.
I/O expansion	Up to 13 standard PCIe slots. For details, see **5.7.2 PCIe Slots** and **5.7.3 PCIe Slot Description**.

Component	Specifications
Ports	Supports a variety of ports. ● Ports on the front panel: – One RJ45 serial port – Supports one VGA port. – Two USB 3.0 ports ● Ports on the rear panel: – One iBMC management network port – Four PSU sockets – Supports one liquid-cooling port.
System Management	● Supports UEFI. ● Supports iBMC. ● Supports integration with third-party management systems.
Security feature	● Supports power-on password. ● Supports an administrator password. ● Supports TPM (for China and outside China)/TCM (only for China) ● Supports secure boot.

6.2 Environmental specifications

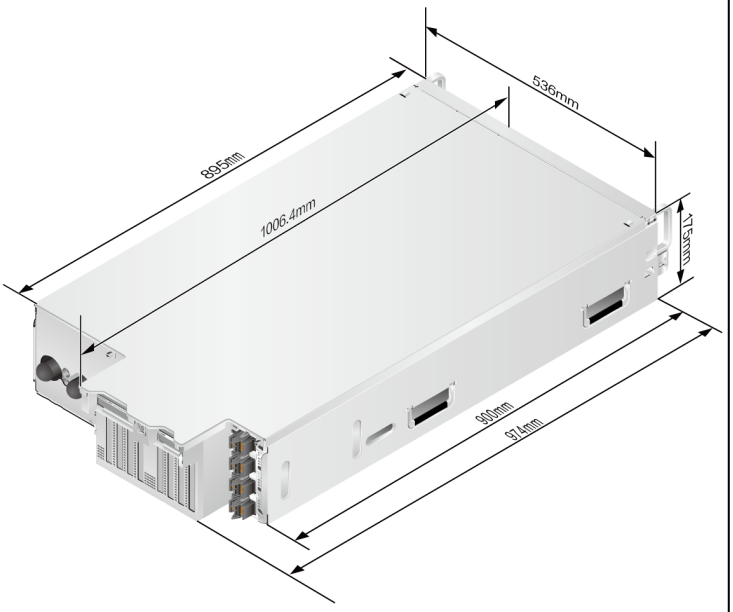
Table 6-2 Environmental specifications

Item	Specifications
Temperature	● Operating temperature: 5ºC to 40ºC (41ºF to 104ºF) (ASHRAE Classes A1 to A3 compliant) ● Storage temperature (within three months): –30ºC to +60ºC (–22ºF to +140ºF) ● Storage temperature (within six months): -15ºC to +45ºC (5ºF to 113ºF) ● Storage temperature (within one year): -10ºC to +35ºC (14ºF to 95ºF) ● Maximum temperature change rate: 20ºC (36ºF) per hour, 5ºC (9ºF) per 15 minutes **NOTE** ● The maximum operating temperature is 5ºC (9ºF) lower than the rated value when a single fan is faulty. ● Empty working medium inside the equipment for long-term storage.

Item	Specifications
Maximum air volume required by a single node for heat dissipation (CFM)	400
Relative Humidity (RH, non-condensing)	● Operating humidity: 8% to 90% ● Storage humidity (within three months): 8% to 85% ● Storage humidity (within six months): 8% to 80% ● Storage humidity (within one year): 20% to 75% ● Maximum change humidity rate: 20% per hour
Operating altitude	≤ 3050 m (10,006.56 ft) ● When the configuration complies with ASHRAE Class A1 and A2, and the altitude is above 900 m (2952.76 ft), the operating temperature decreases by 1ºC (1.8ºF) for every increase of 300 m (984.25 ft). ● When the server configuration complies with ASHRAE Class A3 standards and the altitude is above 900 m (2,952.76 ft.), the operating temperature decreases by 1ºC (1.8ºF) for every increase of 175 m (574.15 ft.).
Corrosive airborne contaminants	Maximum corrosion product thickness growth rate: ● Copper corrosion rate test: 300 Å/month (meeting level G1 requirements of the ANSI/ISA-71.04-2013 standard on gaseous corrosion) ● Silver corrosion rate test: 200 Å/month
Particle contaminant	● Meets the requirements of ISO 14664-1 Class 8 ● There is no explosive, conductive, magnetic, or corrosive dust in the equipment room. **NOTE** It is recommended that the particulate pollutants in the equipment room be monitored by a professional organization.

6.3 Physical Specifications

Table 6-3 Physical specifications

Indicator	Description
Dimensions (H x W x D)	175mm×536mm×1006.4mm **Figure 6-1** Physical dimensions  **NOTE** See **Figure 6-1** for methods of measuring physical dimensions of the chassis.
Full configuration weight	Net eight: Maximum weight for a server with ten 2.5" front drives: 80 kg
Power consumption	The power consumption parameters vary with server configurations, including the configurations complying with energy-related products (ErP) requirements.

7 Software and Hardware Compatibility

For details about the OS and hardware, consult your local sales representative.

NOTICE

- If incompatible components are used, the device may be abnormal. Such a fault is beyond the scope of technical support and warranty.
- The performance of servers is closely related to application software, basic middleware software, and hardware. The slight differences of the application software, middleware basic software, and hardware may cause performance inconsistency between the application layer and test software layer.
  - If the customer has requirements on the performance of specific application software, contact technical support to apply for proof of concept (POC) tests in the pre-sales phase to determine detailed software and hardware configurations.
  - If the customer has requirements on hardware performance consistency, specify the specific configuration requirements (for example, specific drive models, RAID controller cards, or firmware versions) in the presales phase.

8 Safety Instructions

8.1 Security

General Statement

- Comply with local laws and regulations when installing equipment. These safety instructions are only a supplement.
- The "DANGER", "WARNING", and "CAUTION" information in this document does not represent all the safety instructions, but supplements to the safety instructions.
- Observe all safety instructions provided on device labels.
- Operators of special types of work (such as electricians, operators of electric forklifts, and so on.) must be certified or authorized by the local government or authority.

⚠ WARNING

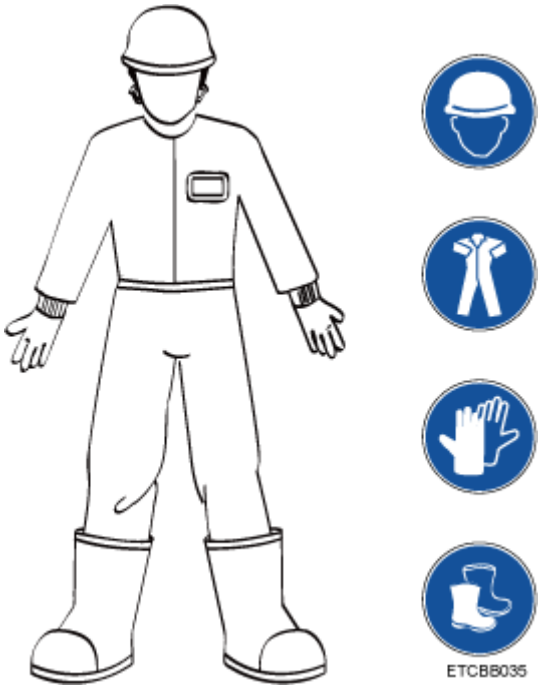
If this device works in a residential environment, the wireless interference may be generated.

Human Safety

- This device is not suitable for use in places where children may be present.
- Only certified or authorized personnel are allowed to install device.
- Discontinue any dangerous operations and take protective measures. Report anything that could cause personal injury or device damage to a project supervisor.
- Do not move devices or install cabinets and power cables in hazardous weather conditions.

- For lifting or carrying hardware, ensure load limits and manpower provisions conform to legal specifications. Check the maximum device weight and arrange required personnel.
- Wear clean protective gloves, ESD clothing, a protective hat, and protective shoes, as shown in **Figure 8-1**.

Figure 8-1 Protective clothing



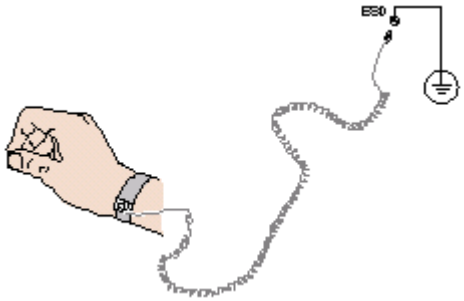
- Before touching a device, wear ESD clothing and gloves (or wrist strap), and remove any conductive objects (such as watches and jewelry). **Figure 8-2** shows conductive objects that must be removed before you touch a device.

Figure 8-2 Removing conductive objects

Figure 8-3 shows how to wear an ESD wrist strap.

a. Secure the ESD wrist strap around your wrist.
b. Fasten the strap buckle and ensure that the ESD wrist strap is in contact with your skin.
c. Insert the ground terminal attached to the ESD wrist strap into the jack on the grounded cabinet or chassis.

Figure 8-3 Wearing an ESD wrist strap



- Exercise caution when using tools.
- Use a stacker when lifting hardware above shoulder height.
- Avoid any contact with high-voltage cables.
- Properly ground a device before powering it on.
- Do not use the ladder unsupervised. Have someone else hold the ladder steady to prevent accidents.
- Do not look into optical ports without eye protection.

Equipment Safety

- Use the recommended power cables at all times.
- Use power cables only for dedicated servers. Do not use them for other devices.
- Use dedicated power cables to ensure equipment and personal safety.
- When moving a device, hold the bottom of the device. Do not hold the handles of the installed modules, such as the PSUs, fan modules, drives, and the mainboard. Handle devices with care. Handle the equipment with care.
- Exercise caution when using tools that could cause damage to devices.
- Ground a device before powering it on. Otherwise, high voltage leakage current may cause device damage.

Chemical Safety

- Hazard of liquid working medium: Swallows of or repeated exposure to the working medium may cause personal injury. If discomfort occurs, seek medical attention immediately.
- Precaution for handling liquid working medium: Do not eat, drink, or smoke during work. Wash skin thoroughly after work.
- Personal protection:
  - Eye and face surface protection: Use safety glasses with side protection.
  - Skin protection: Use chemical protective gloves suitable for this substance during long-term or frequent repeated exposure. Use chemical protective clothing to resist this substance when exposure is prolonged or repeated.
  - Respiratory system protection: Wear a respiratory protection device when exposure time is likely to exceed the specified limit value.
- First aid measures:
  - Inhalation: Move the person to a place with fresh air and keep him/her breathing comfortably. You are advised to consult a doctor.

  - Skin contact: Immediately rinse the skin with water and remove contaminated clothing and shoes. You are advised to consult a doctor.
  - Eye contact: Rinse eyes thoroughly with water for a few minutes. You are advised to consult a doctor.
  - Ingestion: Do not induce vomiting. Seek medical treatment immediately.
- Waste disposal:
  - Send the contents or containers to an approved waste treatment plant for disposal.

Transportation Precautions

Improper transportation may damage equipment. Contact the manufacturer for precautions before attempting transportation.

Transportation precautions include but are not limited to:

- The logistics company engaged to transport the device must be reliable and comply with international standards for transporting electronics. Ensure that the equipment being transported is always kept upright. Take necessary precautions to prevent collisions, corrosion, package damage, damp conditions and pollution.
- Transport each device in its original packaging.
- If the original packaging is unavailable, package heavy, bulky parts (such as chassis and blades) and fragile parts (such as PCIe cards and optical modules) separately.

  NOTE

  For details about the components supported by the server, consult the local sales representatives.
- Ensure that all devices are powered off before transportation.

Maximum Weight Carried by a Person

CAUTION

The maximum weight allowed to be carried by a person is subject to local laws or regulations. The markings on the device and the descriptions in the documentation are for reference only.

Table 8-1 lists the maximum weight a person is permitted to carry as stipulated by a number of organizations.

Table 8-1 Maximum weight carried per person

Organization	Weight (kg/lb)
European Committee for Standardization (CEN)	25/55.13
International Organization for Standardization (ISO)	25/55.13

Organization	Weight (kg/lb)
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

For more information about safety instructions, see *Server Safety Information*.

8.2 Maintenance and Warranty

For details about maintenance, see **Customer Support Service**.

For details about warranty, see **Warranty**.

9 System Management

The server the new-generation Intelligent Baseboard Management Controller (iBMC), which complies with Intelligent Platform Management Interface 2.0 (IPMI 2.0) specifications and provides highly reliable hardware monitoring and management.

The iBMC supports the following features and protocols:

- Various management interfaces

  The iBMC provides the following standard interfaces to meet various system integration requirements:
  - DCMI 1.5
  - IPMI 1.5/IPMI 2.0 interface
  - Command-line interface
  - Redfish interface
  - Hypertext Transfer Protocol Secure (HTTPS)
  - Simple Network Management Protocol (SNMP)
- Fault monitoring and diagnosis

  Faults can be detected and rectified in advance to ensure 24/7 stable running of the device.
  - The iBMC allows screenshots and videos to be created when the system breaks down, facilitating cause analysis of the system breakdown.
  - Screen snapshots and screen recordings make scheduled inspection, operation recording, and audit easy.
  - The fault diagnose management (FDM) function supports component-based precise fault diagnosis, facilitating component fault locating and replacement.
  - The iBMC supports the reporting of alarms through syslog packets, trap packets, and emails, helping the upper-layer NMS platform to collect the fault information about the server.
- Security management methods
  - Software image backup improves system security. Even if the running software completely breaks down, the system can be started from the backup image.
  - Diversified user security control interfaces are provided to ensure user login security.

  - Multiple certificates can be imported and replaced to ensure data transmission security.
- System maintenance interface
  - Supports virtual keyboard, video, and mouse (KVM) and virtual media functions to facilitate remote maintenance.
  - Supports out-of-band RAID monitoring and configuration to improve RAID configuration efficiency and management capabilities.
  - Smart Provisioning provides a convenient operation interface for installing the OS, configuring RAID, and performing the upgrade without a CD-ROM.
- Various network protocols
  - Supports NTP to improve the device time configuration capability and synchronizes the network time.
  - Supports domain management and directory services to simplify the server management network.
- Intelligent power management

  The iBMC uses dynamic power saving to reduce operational expenditure (OPEX).
- License Management

  License management allows advanced features to be used by authorized users.

  Compared with the standard edition, the iBMC advanced edition provides more advanced features, such as:
  - OS deployment using Redfish.
  - Original intelligent diagnosis data collection using Redfish.

10 Certification

Country/Region	Certification	Standards
China	RoHS	GB/T 26572-2011 SJ/T 11364-2014
Europe	WEEE	2012/19/EU
Europe	REACH	EC NO.1907/2006
Europe	CE	Safety: EN 62368-1:2014+A11:2017 EMC: EN 55032 EN 55035 EN IEC 61000-3-2 EN 61000-3-3 ETSI EN 300 386 RoHS: EN IEC 63000:2018

11 Waste Product Recycling

If product users need product recycling service provided by xFusion after products are scrapped, contact technical support for services.

A Appendix

A.1 Product SN

The serial number (SN) on the right of the server front panel uniquely identifies a device. The SN is required when you contact technical support. There are two types of SNs, as shown in **Figure A-1** and **Figure A-2**.

- SN example 1

Figure A-1 SN example 1

Table A-1 SN description

No.	Description
1	SN ID (two characters), which is **21**.
2	Material identification code (eight characters), that is, the processing code.
3	Vendor code (two characters), that is, the code of the processing place.

No.	Description
4	Year and month (two characters). ● The first character indicates the year. – Digits 1 to 9 indicate years 2001 to 2009 respectively. – Letters A to H indicate years 2010 to 2017 respectively. – Letters J to N indicate years 2018 to 2022 respectively. – Letters P to Y indicate years 2023 to 2032 respectively. **NOTE** The years from 2010 are represented by upper-case letters excluding I, O, and Z because the three letters are similar to the digits 1, 0, and 2. ● The second character indicates the month. – Digits 1 to 9 indicate January to September respectively. – Letters A to C indicate October to December respectively.
5	Serial number (six characters)
6	RoHS compliance status (one character). **Y** indicates RoHS compliant.
7	Internal model, that is, product name.

- SN example 2

Figure A-2 SN example 2

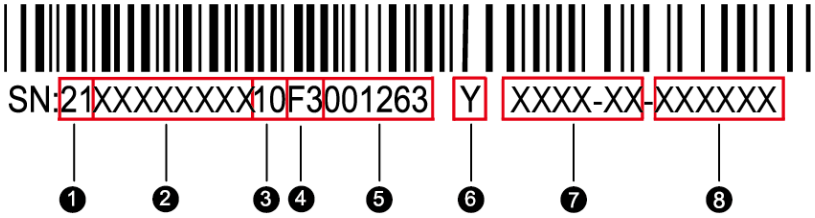


Table A-2 SN description

No.	Description
1	SN ID (two characters), which is **21**.
2	Material identification code (eight characters), that is, the processing code.
3	Vendor code (two characters), that is, the code of the processing place.

No.	Description
4	Year and month (two characters). ● The first character indicates the year. – Digits 1 to 9 indicate years 2001 to 2009 respectively. – Letters A to H indicate years 2010 to 2017 respectively. – Letters J to N indicate years 2018 to 2022 respectively. – Letters P to Y indicate years 2023 to 2032 respectively. **NOTE** The years from 2010 are represented by upper-case letters excluding I, O, and Z because the three letters are similar to the digits 1, 0, and 2. ● The second character indicates the month. – Digits 1 to 9 indicate January to September respectively. – Letters A to C indicate October to December respectively.
5	Serial number (six characters)
6	RoHS compliance status (one character). **Y** indicates RoHS compliant.
7	Nameplate (six characters).
8	Serial number. The number of digits depends on the actual product.

A.2 Nameplate

Certified Model	Remarks
GN560E V7	Global

A.3 RAS Features

The server supports a variety of Reliability, Availability, and Serviceability (RAS) features. You can configure these features for better performance.

For details about RAS features configuration, see the server *BIOS Parameter Reference*.

Table A-3 Supported RAS features

Module Name	Feature	Description
CPU	Corrected machine check interrupt (CMCI)	This feature corrects error-triggered interrupts.
Memory	Failed DIMM Isolation	This feature identifies the faulty DIMM, which helps isolate the faulty DIMM from others and replace it.
	Memory Thermal Throttling	This feature automatically adjusts DIMM temperatures to avoid DIMM damage due to overheat.
	Rank Sparing	This feature uses some memory ranks as backup ranks to prevent the system from crashing due to uncorrectable errors.
	Memory Address Parity Protection	This feature detects memory command and address errors.
	Memory Demand and Patrol Scrubbing	This feature provides the memory patrol function for promptly correcting correctable errors upon detection. If these errors are not corrected promptly, uncorrectable errors may occur.
	Memory Mirroring	This feature improves system reliability.
	Single device data correction (SDDC)	This feature provides a single-device, multi-bit error correction capability to improve memory reliability.
	Device Tagging	This feature degrades and rectifies DIMM device faults to improve DIMM availability.
	Data Scrambling	This feature optimizes data stream distribution and reduces the error possibility to improve the reliability of data streams in the memory and the capability to detect address errors.
PCIe	PCIe Advanced Error Reporting	This feature reports PCIe advanced errors and improves server serviceability.
UPI	Intel UPI Link Level Retry	This feature provides a retry mechanism upon errors to improve UPI reliability.
	Intel UPI Protocol Protection via CRC	This feature provides cyclic redundancy check (CRC) protection for UPI packets to improve system reliability.

Module Name	Feature	Description
System	Core disable for fault resilient boot (FRB)	This feature isolates the faulty CPU during startup to improve system reliability and availability.
	Corrupt Data Containment Mode	This feature identifies the memory storage unit that contains corrupted data to minimize the impact on the running programs and improve system reliability.
	Socket disable for fault resilient boot (FRB)	This feature isolates the faulty socket during startup to improve system reliability.
	Architected Error Records	With the eMCA feature, the BIOS collects error information recorded in hardware registers in compliance with UEFI specifications, sends the error information to the OS over the APEI of the Advanced Configuration and Power Interface (ACPI), and locates the error unit, improving system availability.
	Error Injection Support	This feature injects errors to verify various RAS features.
	Machine check architecture (MCA)	This feature provides software recovery for uncorrectable errors, which improves system availability.
	Enhanced MCA (eMCA): Gen2	This feature improves system availability.
	OOB access to MCA registers	The out-of-band system accesses MCA registers by using the Platform Environment Control Interface (PECI). If a fatal error occurs in the system, the out-of-band system collects onsite data to facilitate fault analysis and locating and improve system serviceability.
	BIOS Abstraction Layer for Error Handling	The basic input/output system (BIOS) processes errors and reports the error information to the OS and iBMC in compliance with specifications to improve system serviceability.
	BIOS-based predictive failure analysis (PFA)	The BIOS provides physical unit information for DIMM errors, and the OS traces and predicts errors, and isolates error memory pages.

A.4 Sensor List

Sensor	Description	Component
1711 Core Temp	Core temperature of the 1711 chip	Mainboard
Inlet Temp	Air inlet temperature	O&M module
Outlet Temp	Air outlet temperature	Mainboard
AIM BMC Temp	Module HMC Temperature	AI Module
AIM FPGA Temp	Module FPGA temperature	AI Module
AIM GPU HBM Temp	Module GPU HBM chip temperature	AI Module
AIM GPU Power	Module GPU power	AI Module
AIM GPU Temp	Module GPU chip temperature	AI Module
AIM GPU*N* Status	Module GPU*N* status detection	AI Module *N* indicates the GPU module number. The value ranges from 1 to 8.
AIM GPU*N* Temp	Temperature of module GPU*N* chip	AI Module *N* indicates the GPU module number. The value ranges from 1 to 8.
AIM GPU*N* TLimit	Module GPU*N* TLimit Temperature	AI Module *N* indicates the GPU module number. The value ranges from 1 to 8.
AIM HSC Power	Module HSC power value	AI Module
AIM HSC Temp	Module HSC temperature	AI Module
AIM HSC*N* Power	Module HSC*N* power value	AI Module The *N* value ranges from 1 to 10.
AIM HSCSBY Power	Module Standby HSC power value	AI Module
AIM Inlet Temp	Module air inlet temperature	AI Module
AIM LIMIT Temp	Module TLimit Temperature	AI Module

Sensor	Description	Component
AIM NVSW Temp	Module NVSwitch temperature	AI Module
AIM Outlet Temp	Module air outlet temperature	AI Module
AIM PCIeSW Temp	Module PCIe Switch temperature	AI Module
AIM PEX8800 Temp	Module PCIe Gen4 Switch temperature	AI Module
AIM Retimer Temp	Module Retimer temperature	AI Module
AreaIntrusion	Listening to the unpacking action	Mainboard
CPU*N* 12V	12 V voltage supplied by the mainboard to the CPU	Mainboard *N* indicates the CPU number. The value is **1** or **2**.
CPU*N* Core Temp	CPU core temperature	CPU*N* *N* indicates the CPU number. The value is **1** or **2**.
CPU*N* DTS	Difference between the real-time CPU temperature and the CPU core temperature threshold	CPU*N* *N* indicates the CPU number. The value is **1** or **2**.
CPU*N* FIVRA	CPU FIVRA voltage	Mainboard or CPU *N* *N* indicates the CPU number. The value is **1** or **2**.
CPU*N* FIVRA Temp	CPU FIVRA chip temperature	CPU*N* *N* indicates the CPU number. The value is **1** or **2**.
CPU*N* INFAON	CPU INFAON voltage	CPU*N* *N* indicates the CPU number. The value is **1** or **2**.
CPU*N* INFAON Temp	CPU INFAON chip temperature	CPU*N* *N* indicates the CPU number. The value is **1** or **2**.

Sensor	Description	Component
Cpu*N* Margin	Difference between the real-time CPU temperature and the CPU Tcontrol threshold	Cpu*N* *N* indicates the CPU number. The value is **1** or **2**.
CPU*N* MEM Temp	CPU memory module temperature	Memory module corresponding to CPU *N* *N* indicates the CPU number. The value is **1** or **2**.
CPU*N* Memory	CPU memory status check	Memory module corresponding to CPU *N* *N* indicates the CPU number. The value is **1** or **2**.
CPU*N* PMem Temp	CPU PMem module temperature	PMem memory corresponding to CPU *N* *N* indicates the CPU number. The value is **1** or **2**.
CPU*N* Prochot	CPU Prochot	CPU*N* *N* indicates the CPU number. The value is **1** or **2**.
CPU*N* Status	CPU status detection	CPU*N* *N* indicates the CPU number. The value is **1** or **2**.
CPU*N* UPI Link	CPU UPI link fault diagnosis health status	Mainboard or CPU *N* *N* indicates the CPU number. The value is **1** or **2**.
CPU*N* VCCD	CPU VCCD voltage	CPU*N* *N* indicates the CPU number. The value is **1** or **2**.
CPU*N* VCCD Temp	CPU VCCD chip temperature	CPU*N* *N* indicates the CPU number. The value is **1** or **2**.

Sensor	Description	Component
CPU*N* VCCFA	CPU VCCFA voltage	CPU*N* *N* indicates the CPU number. The value is **1** or **2**.
CPU*N* VCCFA Temp	CPU VCCFA chip temperature	CPU*N* *N* indicates the CPU number. The value is **1** or **2**.
CPU*N* VCCIN	CPU VCCIN voltage	Mainboard *N* indicates the CPU number. The value is **1** or **2**.
CPU*N* VRD Temp	CPU VRD temperature	Mainboard *N* indicates the CPU number. The value is **1** or **2**.
DIMM*N*	DIMM status	DIMM *N* *N* indicates the DIMM slot number.
DISK$	Drive status	Drive
Disks Temp	Maximum drive temperature	Drive
Fan 12V	12 V voltage supplied by the mainboard to the fan board	Fan board
FAN*N* F Speed FAN*N* R Speed	Fan speed	Fan module *N* *N* indicates the fan module number. The value ranges from 1 to 10.
FAN*N* F Status FAN*N* R Status	Fan fault status	Fan module *N* N indicates the fan module number. The value ranges from 1 to 10.
FAN*N* F Presence FAN*N* R Presence	Fan presence	Fan module *N* N indicates the fan module number. The value ranges from 1 to 10.
Front IO 12V	12 V voltage supplied by the mainboard to the front I/O	Drive backplane

Sensor	Description	Component
HDD BP$ Temp	HDD backplane temperature	Drive backplane
HDDBP 12V	12 V voltage supplied by the mainboard to the drive backplane	Drive backplane
HDDBP 5V	The mainboard supplies 5.0 V voltage to the drive backplane.	Drive backplane
IOBoard Temp	PCIe Switch board temperature	PCIe switch board
Mngmnt Health	Management subsystem health status	Management module
PCH PRIM 1V05	PCH 1.05 V voltage	Mainboard
PCH Status	PCH chip fault diagnosis health status	Mainboard
PCH Temp	PCH bridge temperature	Mainboard
PCIe NIC$ Temp	PCIe card chip temperature sensor	PCIe card
PCIe RAID$ Temp	Temperature of the PCIe plug-in RAID controller card	PCIe plug-in RAID controller card
PCIE Status	PCIe status error	PCIe Card
PCIe$ OP Temp	PCIe card optical module temperature sensor	PCIe card
PCIe$ Temp	PCIe card chip temperature sensor	PCIe card
Power	Server input power	PSU
Power Button	Power button pressed status	Mainboard and power button
PS$ Chip Temp	Power supply chip temperature	PSU
PS$ Inlet Temp	PSU air inlet temperature	PSU
PS$ Status	Single PSU fault status	PSU
PS$ Temp Status	PSU temperature status	PSU
PS$ VIN	Single supply input voltage	PSU
PwrCap Status	Power capping status	Mainboard
PwrOk Sig. Drop	Voltage drop status	Mainboard

Sensor	Description	Component
PwrOn TimeOut	Power-on timeout	Mainboard
Raid$ BBU Temp	Temperature of the RAID controller card backup PSUs	Supercapacitor of the RAID controller card
Rear IO 12V	12 V voltage supplied by the mainboard to the rear IO module	PCIe card
RTC Battery	RTC battery status. An alarm is generated when the voltage is lower than 1 V.	RTC battery on the mainboard
SAS Cable	Entity presence	SAS cable
SSD Disk$ Temp	SSD temperature	SSD
SSD MaxTemp	Maximum SSD temperature (reported by BMA)	SSD
UID Button	UID button status	Mainboard
Watchdog2	Watchdog	Mainboard
STBY 1.8V	Mainboard south bridge standby 1.8 V voltage	Mainboard
STBY 3.3V	Mainboard standby 3.3 V voltage	Mainboard
SW*N* VDD0V8	PCIe Switch board Switch chip 0.8 V voltage	PCIe switch board *N* indicates the switch chip number. The value ranges from 1 to 4.
SW*N* VDD1V25	PCIe Switch board Switch chip 1.25 V voltage	PCIe switch board *N* indicates the switch chip number. The value ranges from 1 to 4.
SW*N* VRD Temp	PCIe switch board switch chip VRD temperature	PCIe switch board *N* indicates the switch chip number. The value ranges from 1 to 4.
SYS 3.3V	Mainboard 3.3 V voltage	Mainboard
SYS 5V	Mainboard 5.0 V voltage	Mainboard
ACPI State	ACPI status	None
BMC Boot Up	BMC startup event	
BMC Time Hopping	Time hopping	

Sensor	Description	Component
Boot Error	Boot error	
CPU Usage	CPU usage	
Host Loss	System monitoring software (BMA) link loss detection	
Memory Usage	Memory usage	
NTP Sync Failed	NTP synchronization failure and recovery events	
OAMPort1$ Link	OAM link connectivity	
OAMPort2$ Link	OAM link connectivity	
Op. Log Full	Operation log full or events being cleared	
ProductID Status	Product identification status	
Sec. Log Full	Security log full or events being cleared	
SEL Status	SEL full or clearing events	
SysFWProgress	Software processes and system startup errors	
SysRestart	System restart causes	
System Error	System suspension or restart. Check the background logs.	
System Notice	Hot restart reminder and fault diagnosis program information collection	

B Terms

B.1 A-E

B

baseboard management controller (BMC)	The BMC complies with the Intelligent Platform Management Interface (IPMI). It collects, processes, and stores sensor signals, and monitors the operating status of components. The BMC provides the hardware status and alarm information about the managed objects to the management system so that the management system can implement unified management of the devices.
Busbar	A electrical conductor which can serve as the connection between various circuits.

E

ejector lever	A part on the panel of a device used to facilitate installation or removal of the device.
Ethernet	A baseband local area network (LAN) architecture developed by Xerox Corporation by partnering with Intel and DEC. Ethernet uses the Carrier Sense Multiple Access/Collision Detection (CSMA/CD) access method and allows data transfer over various cables at 10 Mbit/s. The Ethernet specification is the basis for the IEEE 802.3 standard.

B.2 F-J

G

Gigabit Ethernet (GE)	An extension and enhancement of traditional shared media Ethernet standards. It is compatible with 10 Mbit/s and 100 Mbit/s Ethernet and complies with IEEE 802.3z standards.

H

hot swap	Replacing or adding components without stopping or shutting down the system.

B.3 K-O

K

KVM	Keyboard, video and mouse.

B.4 P-T

P

panel	An external component (including but not limited to ejector levers, indicators, and ports) on the front or rear of the server. It seals the front and rear of the chassis to ensure optimal ventilation and electromagnetic compatibility (EMC).
Peripheral Component Interconnect Express (PCIe)	A computer bus PCI, which uses the existing PCI programming concepts and communication standards, but builds a faster serial communication system. Intel is the main sponsor for PCIe. PCIe is used only for internal interconnection. A PCI system can be transformed to a PCIe system by modifying the physical layer instead of software. PCIe delivers a faster speed and can replace almost all AGP and PCI buses.

R

redundancy	A mechanism that allows a backup device to automatically take over services from a faulty device to ensure uninterrupted running of the system.
redundant array of independent disks (RAID)	A storage technology that combines multiple physical drives into a logical unit for the purposes of data redundancy and performance improvement.

S

server	A special computer that provides services for clients over a network.
system event log (SEL)	Event records stored in the system used for subsequent fault diagnosis and system recovery.

B.5 U-Z

U

U	A unit defined in International Electrotechnical Commission (IEC) 60297-1 to measure the height of a cabinet, chassis, or subrack. 1U = 44.45 mm (1.75 in).
UltraPath Interconnect (UPI)	A point-to-point processor interconnect developed by Intel.

C Acronyms and Abbreviations

C.1 A-E

A

AC	alternating current
AES	Advanced Encryption Standard New Instruction Set
ARP	Address Resolution Protocol
AVX	Advanced Vector Extensions

B

BBU	backup battery unit
BIOS	Basic Input Output System
BMC	Baseboard Management Controller

C

CCC	China Compulsory Certification
CD	Calendar Day
CE	Conformite Europeenne
CIM	Common Information Model
CLI	command-line interface

D

DC	Direct Current
DDR5	Double Data Rate 5
DDDC	double device data correction
DEMT	Dynamic Energy Management Technology
DIMM	dual in-line memory module
DRAM	dynamic random-access memory
DVD	Digital Video Disc

E

ECC	error checking and correcting
ECMA	European Computer Manufacturers Association
EDB	Execute Disable Bit
EN	European Efficiency
ERP	enterprise resource planning
ETS	European Telecommunication Standards

C.2 F-J

F

FB-DIMM	Fully Buffered DIMM
FC	Fiber Channel
FCC	Federal Communications Commission
FCoE	Fibre Channel over Ethernet
FTP	File Transfer Protocol

G

GE	Gigabit Ethernet
GPIO	General Purpose Input/Output

GPU	graphics processing unit

H

HA	High Availability
HDD	Hard Disk Drive
HPC	High Performance Computing
HTTP	Hypertext Transfer Protocol
HTTPS	Hypertext Transfer Protocol Secure

I

iBMC	intelligent baseboard management controller
IC	Industry Canada
ICMP	Internet Control Message Protocol
IDC	Internet Data Center
IEC	International Electrotechnical Commission
IEEE	Institute of Electrical and Electronics Engineers
IGMP	Internet Group Message Protocol
IOPS	input/output operations per second
IP	Internet Protocol
IPC	intelligent power capability
IPMB	Intelligent Platform Management Bus
IPMI	Intelligent Platform Management Interface

C.3 K-O

K

KVM	keyboard, video, and mouse

L

LC	Lucent Connector
LRDIMM	load-reduced dual in-line memory module
LED	light emitting diode
LOM	LAN on Motherboard

M

MAC	Media Access Control
MMC	module management controller

N

NBD	Next Business Day
NC-SI	Network Controller Sideband Interface

O

OCP	Open Compute Project

C.4 P-T

P

PCIe	Peripheral Component Interconnect Express
PDU	Power Distribution Unit
PHY	Physical Layer
PMBUS	power management bus
PMem	Persistent Memory
POK	Power OK
PWM	pulse-width modulation
PXE	Preboot Execution Environment

R

RAID	redundant array of independent disks
RAS	Reliability, Availability and Serviceability
RDIMM	registered dual in-line memory module
REACH	Registration Evaluation and Authorization of Chemicals
RJ45	Registered Jack 45
RoHS	Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment

S

SAS	Serial Attached Small Computer System Interface
SATA	Serial Advanced Technology Attachment
SCM	Supply Chain Management
SDDC	single device data correction
SERDES	Serializer/Deserializer
SGMII	Serial Gigabit Media Independent Interface
SMI	Serial Management Interface
SMTP	Simple Mail Transfer Protocol
SNMP	Simple Network Management Protocol
SOL	serial over LAN
SONCAP	Standards Organization of Nigeria-Conformity Assessment Program
SSD	solid-state drive
SSE	Streaming SIMD Extensions

T

TACH	Tachometer Signal
TBT	Turbo Boost Technology
TCG	Trusted Computing Group
TCM	Trusted Cryptography Module
TCO	total cost of ownership

TDP	Thermal Design Power
TELNET	Telecommunication Network Protocol
TET	Trusted Execution Technology
TFM	Trans Flash Module
TFTP	Trivial File Transfer Protocol
TOE	TCP Offload Engine
TPM	Trusted Platform Module

C.5 U-Z

U

UBC	Union Bus Connector
UBC DD	Union Bus Connector Double Density
UDIMM	Unbuffered Dual In-line Memory Module
UEFI	Unified Extensible Firmware Interface
UID	unit identification light
UL	Underwriter Laboratories Inc.
UPI	UltraPath Interconnect
USB	Universal Serial Bus

V

VCCI	Voluntary Control Council for Interference by Information Technology Equipment
VGA	Video Graphics Array
VLAN	virtual local area network
VRD	Voltage Regulator-Down
VROC	Virtual RAID on CPU

W

WEEE	waste electrical and electronic equipment

WSMAN	Web Service Management

