DH121C V6 Server Node

Technical Specifications

Issue   01
Date   2022-03-30
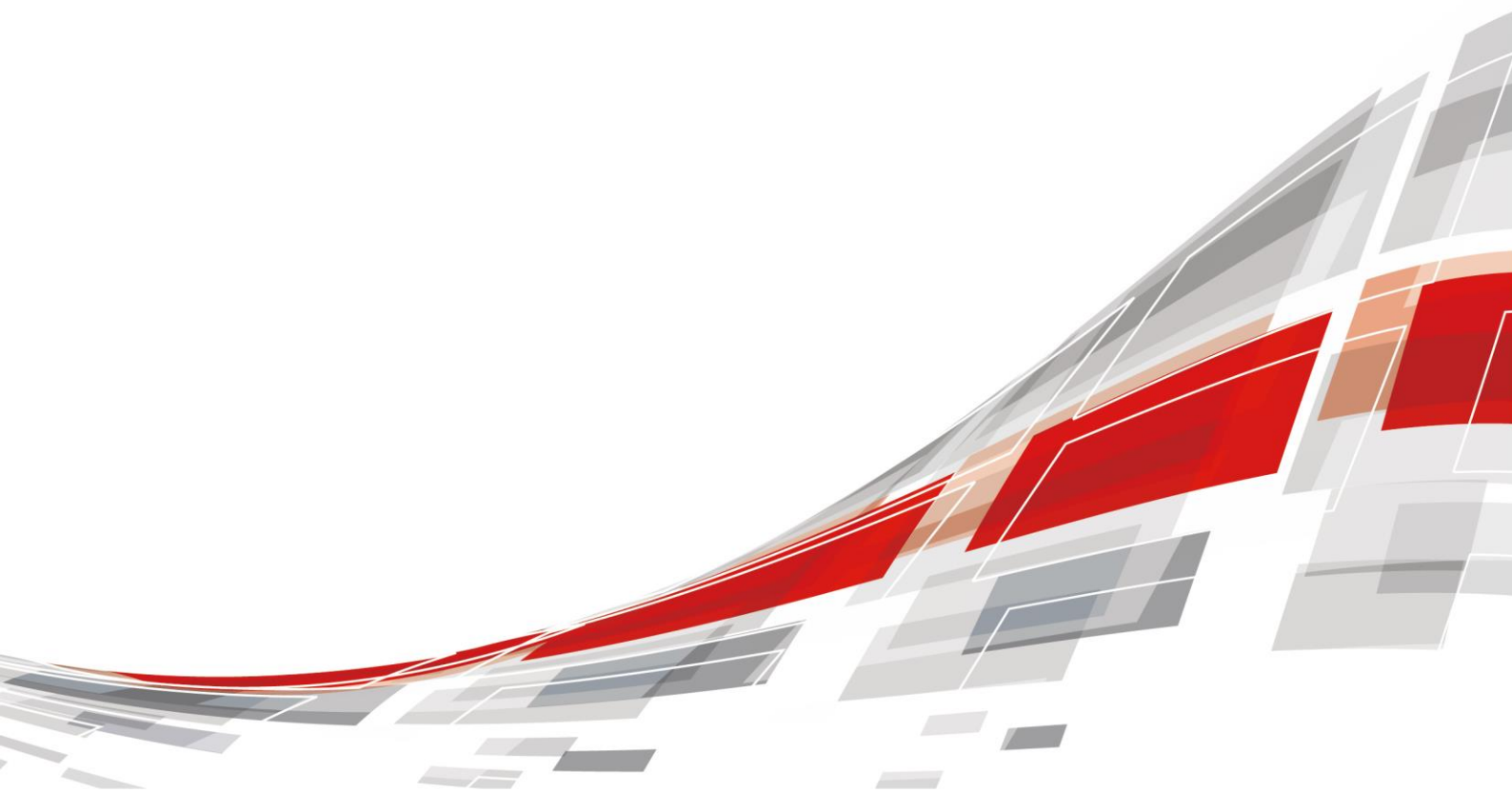
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Contents

About This Document

Purpose

This document describes the DH121C V6 servers 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
01	2022-03-30	This issue is the first official release.

1 Product Overview

DH121C V6 server node (DH121C V6) is a 1 U liquid-cooled server node with big capacity memory on the basis of the latest 3rd Gen Intel® Xeon® Scalable processors (Ice Lake).

Optimized for public cloud, internet, high-performance computing (HPC), and compute-intensive enterprise services, DH121C V6 features high-density computing capability and flexible expansion ability.

DH121C V6 features high performance computing, flexible expansion, high reliability, easy management and deployment.

Figure 1-1 DH121C V6 (example: configured without drives)

2 Product Features

Performance and Scalability

- Powered by the third-generation Intel® Xeon® Scalable processors (Ice Lake), the server provides up to 38 cores, 3.0 GHz frequency, a 57 MB L3 cache, and up to three 11.2 GT/s UPI links between the processors, which deliver supreme processing performance.
  - It supports up to two processors with 76 cores and 152 threads to maximize the concurrent execution of multithreaded applications.
  - The L2 cache capacity is increased. Each core exclusively occupies 1.25 MB L2 cache, and at least 1.5 MB L3 cache.
  - Intel Turbo Boost Technology 2.0 allows processor cores to run faster than the frequency specified in the Thermal Design Power (TDP) configuration if they are operating below power, current, and temperature specification limits.
  - Intel hyper-threading technology enables each processor core to run up to two threads, improving parallel computation capability.
  - The hardware-assisted Intel® Virtualization Technology (Intel® VT) allows operating system (OS) to better use hardware to address virtualization workloads.
  - Intel® Advanced Vector Extensions 512 (Intel AVX-512) significantly accelerates floating-point performance for computing-intensive applications.
  - Intel DL Boost (VNNI) is supported to improve the performance of deep learning applications.
  - The Intel® SGX and Intel®® TME security features provide fine-grained data protection through application isolation in the memory, and defend against physical attacks through full memory encryption.
- The server supports a maximum of 32 memory modules in the following memory forms:
  - The server supports a maximum of 32 DDR4 ECC 3200 MT/s DIMMs. The DDR4 ECC DIMMs support Registered Dual In-line Memory Modules (RDIMMs), which provide high speed and availability. A server supports a maximum memory capacity of 8192 GB and a maximum memory bandwidth of 400 GB/s in theory.
  - The server supports a maximum of 16 Intel® Optane™ Persistent Memory Module 200 series (PMem modules for short), which must be used with the DDR4 modules. When the DDR4 modules are used together, the server supports a maximum of 12 TB memory capacity (calculated based on a maximum of 256 GB capacity per DDR4 memory module and a maximum of 512 GB capacity per PMem module).
- Integrated Intel I/O technology incorporates the PCIe 4.0 controller into the Intel® Xeon® Scalable processor, shortening the I/O latency and improving overall system performance.

- The server supports up to three PCIe 3.0 slots.
- The server supports up to 12 NVMe drives.

Availability and Serviceability

- Carrier-class components with process expertise ensure high system reliability and availability.
- The server provides simplified O&M and efficient troubleshooting through the UID/HLY indicators on the front panel and iBMC WebUI.
- The iBMC monitors system parameters in real time, triggers alarms, and performs recovery actions in case of failures, minimizing system downtime.
- For more information about the warranty in the Chinese market, see Warranty.

Manageability and Security

- The built-in iBMC monitors server operating status and provides remote management.
- A password is required for accessing the BIOS, ensuring system boot and management security.
- The Network Controller Sideband Interface (NC-SI) feature allows a network port to function as both a management network port and a service port, maximizing the return on investment for customers. This feature is disabled by default and can be enabled on the iBMC or BIOS.

☐ NOTE

The service port with NC-SI enabled supports the following configuration:
- Configuring any network port on the FlexIO card 1, FlexIO card 2, or PCIe NIC (with NC-SI enabled).
- Enabling, disabling, and setting a virtual local area network (VLAN) ID for this port. The VLAN ID is 0 and disabled by default.
- Configuring IPv4 addresses (IPv4 address, subnet mask, and gateway) and IPv6 addresses (IPv6 address, prefix length, and gateway) for this port.

- 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.
- The Intel® Converged Boot Guard & Trusted Execution Technology (Intel CBnT) prevents malicious software attacks based on hardware, prevents the firmware from being maliciously modified, and prevents the execution of unauthorized boot blocks. It also allows applications to run in their own independent space without being affected by other software running in the system, thereby enhancing security.
- The secure boot based on the chip RoT implements level-by-level firmware verification starting from the hardware RoT and builds a complete secure boot chain.
- The trusted platform module (TPM) and trusted cryptography module (TCM) provide advanced encryption functions, such as digital signatures and remote authentication.
- The following requirements in NIST SP 800-147B are met:

  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

- Supports CPU liquid cooling heat dissipation.
- 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.
- The server is protected with power capping and power control measures.
- Staggered spinup of drives reduces the server boot power consumption.
- Intel® Intelligent Power Capability allows a processor to be powered on or off based on service requirements.
- Low-voltage Intel® Xeon® Scalable processors consume less energy, ideally suitable for data centers and telecommunications environments constrained by power and thermal limitations.

3 Physical Structure

Figure 3-1 Physical structure (configured without SDI V3 NICs or drives)
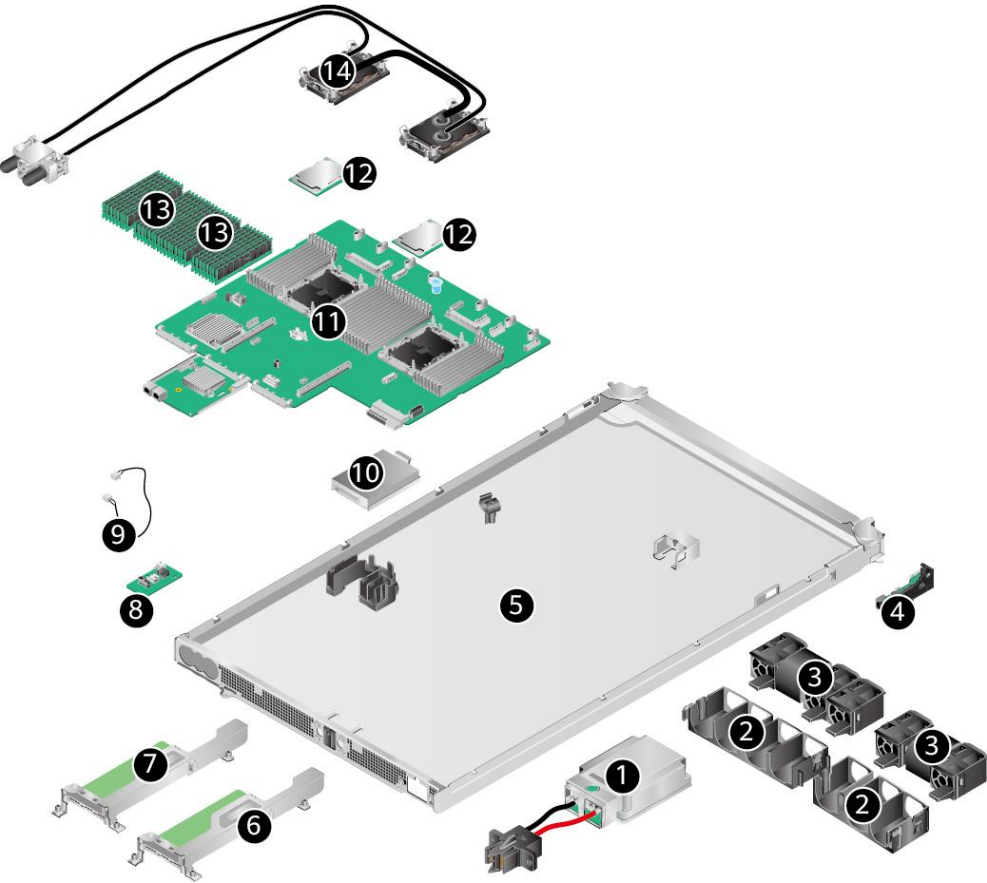
1	PSUs	2	Fan module brackets
3	Fan modules	4	Left O&M port module
5	Chassis	6	PCIe riser module 2
7	PCIe riser module 1	8	Leakage detection card
9	Leakage detection cable	10	Built-in SATA drive

11	Mainboard	12	Processor
13	Memory	14	Liquid cooling module

Figure 3-2 Physical structure (configured with SDI V3 NICs, but without drives)
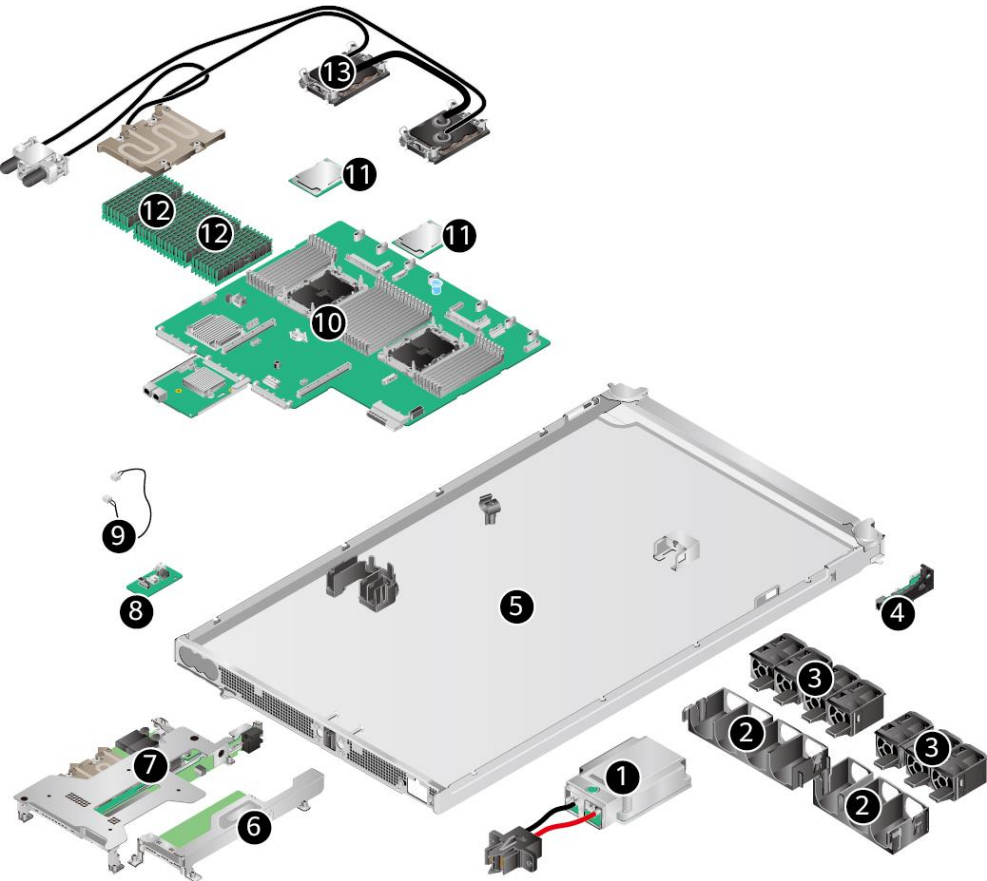
1	PSUs	2	Fan module brackets
3	Fan modules	4	Left O&M port module
5	Chassis	6	PCIe riser module 2
7	PCIe riser module 1	8	Leakage detection card
9	Leakage detection cable	10	Mainboard
11	Processor	12	Memory
13	Liquid cooling module	-	-

Figure 3-3 Physical structure (configured with SDI V3 NICs and 12 NVMe drives)
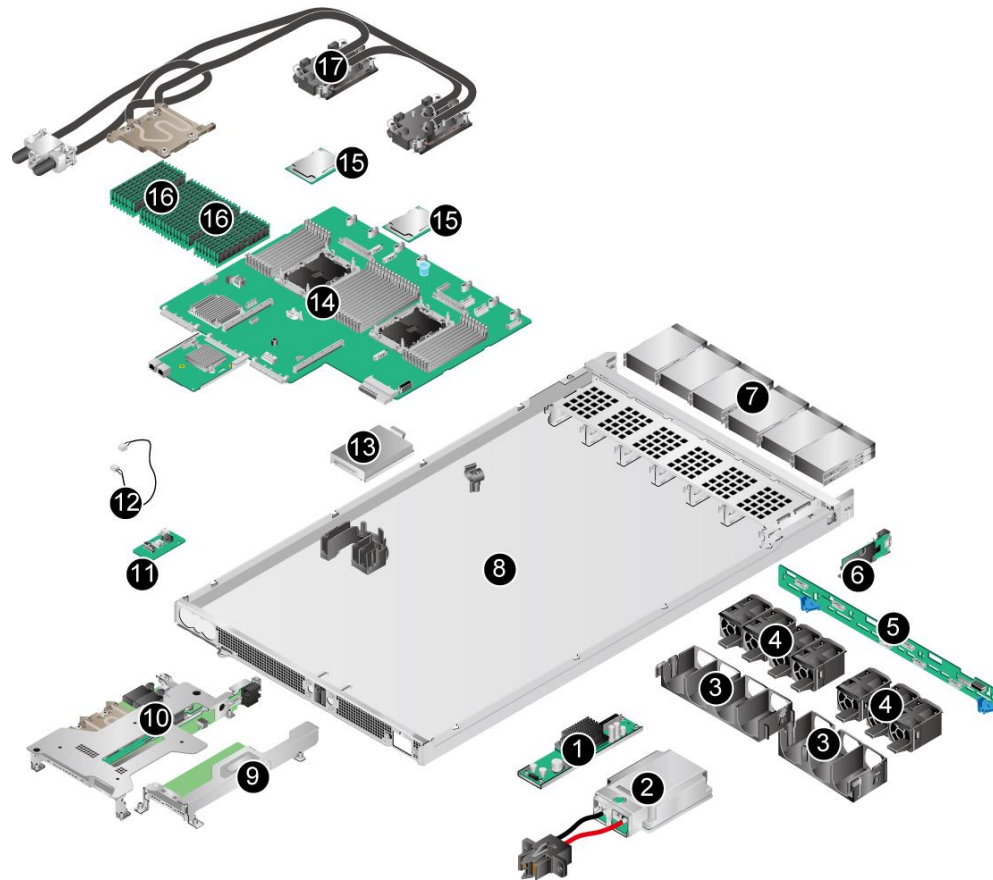
1	Extend PSU	2	Primary PSU
3	Fan module brackets	4	Fan modules
5	Front-drive backplane	6	Left O&M port module
7	Front drives	8	Chassis
9	PCIe riser module 2	10	PCIe riser module 1
11	Leakage detection card	12	Leakage detection cable
13	Built-in drive	14	Mainboard
15	Processor	16	Memory
17	Liquid cooling module	-	-

4 Logical Structure

Figure 4-1 Logical structure
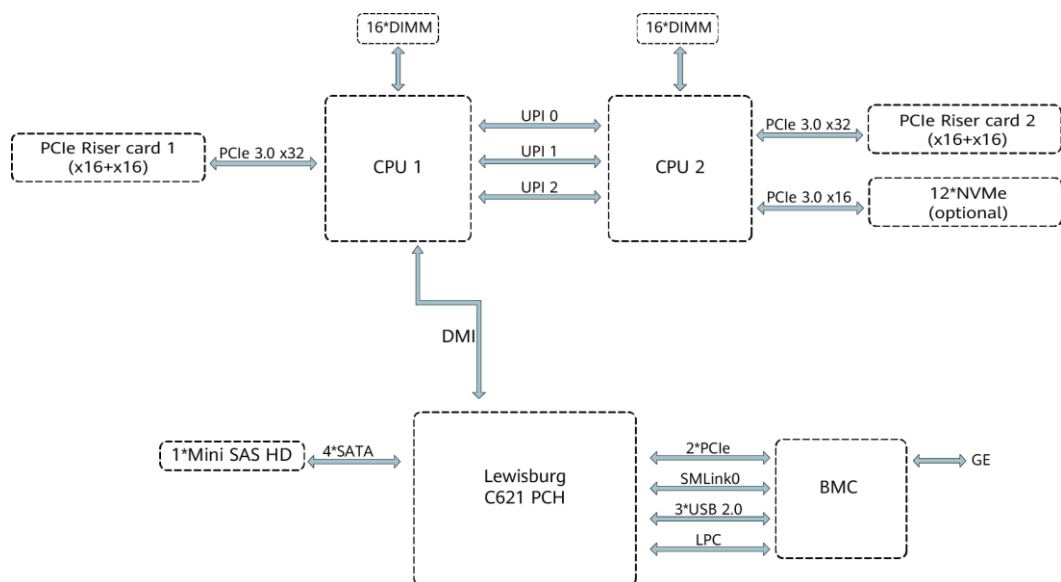
- Two third-generation Intel® Xeon® Scalable processors (Ice Lake).
- 32 DIMMs. Each processor supports 16 DIMMs.
- The processors interconnect with each other through three UltraPath Interconnect (UPI) links at a speed of up to 11.2 GT/s.
- Processors connect PCIe riser cards with PCIe bus, and PCIe riser cards support PCIe slots.
- Use C621 PCH (Platform Controller Hub).
- iBMC management chip supports management network ports.

5 Hardware Description

5.1 Front Panel

5.1.1 Appearance

- Configured without drives.

Figure 5-1 Front view
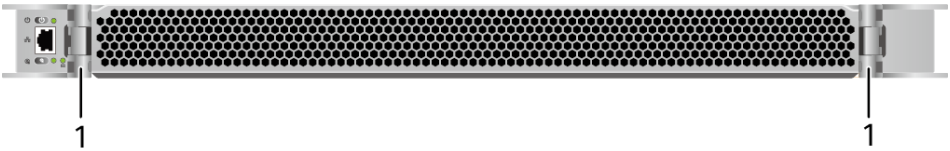
1	Ejector lever	-	-

- Configured with 12 NVMe drives.

Figure 5-2 Front view
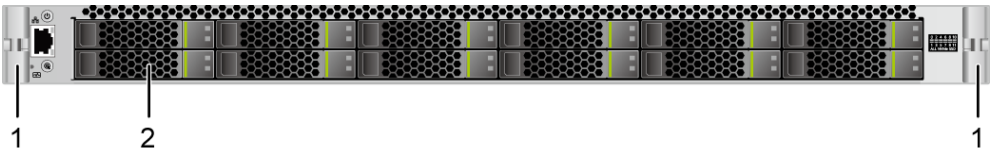
1	Ejector lever	2	Front drives

5.1.2 Indicators and Buttons

Indicator and Button Positions

- Configured without drives.

Figure 5-3 Front panel indicators and buttons
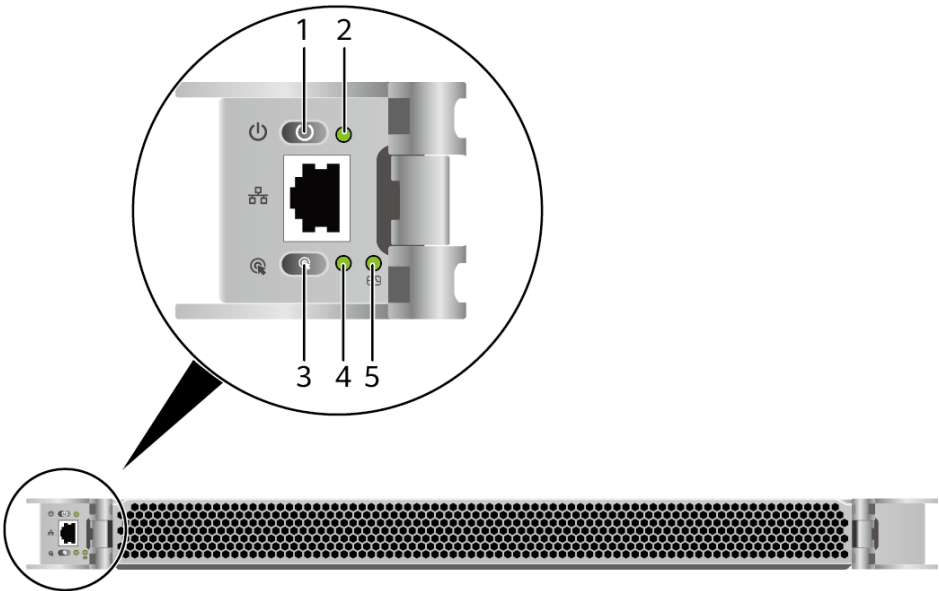
1	PSU button	2	Power indicator
3	UID button	4	UID indicator
5	Health status indicator	-	-

- Configured with 12 NVMe drives.

Figure 5-4 Front panel indicators and buttons
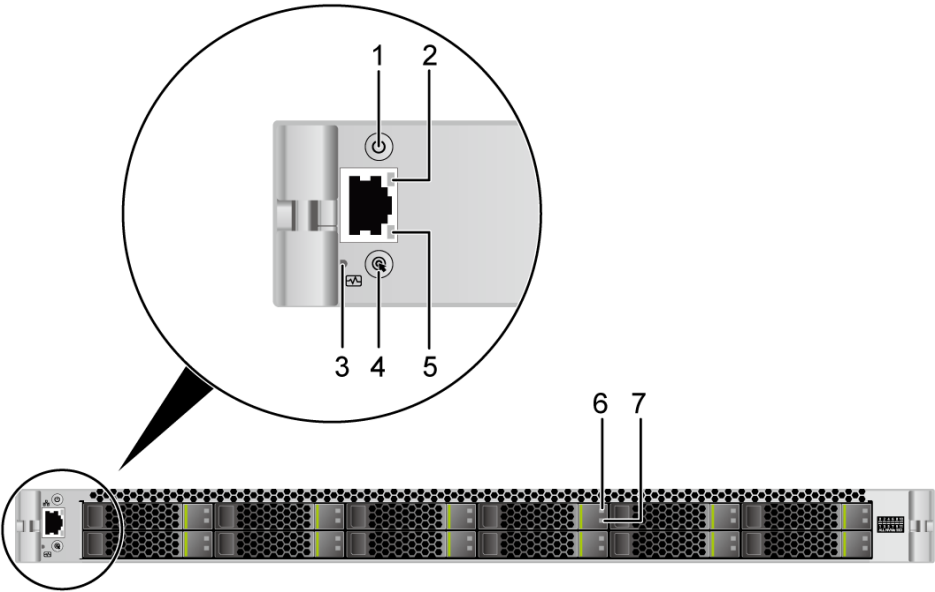
1	PSU button	2	Data transmission status indicator of the management network port
3	Health status indicator	4	UID button
5	Connection status indicator of the management network port	6	Hard drive fault indicator
7	Hard drive active indicator	-	-

Indicator and Button Descriptions

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

Silkscreen	Indicators and Buttons	Description
⏻	PSU button	• When the server node is powered on, you can press this button to gracefully shut down the OS. • When the server node is powered on, you can hold down this button for 6 seconds to forcibly power off the server node. • When the power indicator is steady yellow, you can press this button to power on the server node.
-	Power indicator	• Off: The device is not powered on. • 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 the iBMC management system is turning on, the PSU button is locked.

Silkscreen	Indicators and Buttons	Description
		• Steady yellow: The device is on standby.
	UID button	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	UID indicator is used to locate devices yet to be operated. 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.
	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.
-	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.

For details about hard drive indicator descriptions, see 5.6.3 Hard Drive Indicator.

5.1.3 Ports

Port Positions

- Configured without drives.

Figure 5-5 Ports on the front panel

| 1 | Management network port | - | - |

- Configured with 12 NVMe drives.

Figure 5-6 Ports on the front panel

| 1 | Management network port | - | - |

Port Descriptions

Table 5-2 Ports on the front panel descriptions

Name	Type	Quantity	Description
Management network port	1000BASE-T	1	It is used for managing server nodes. **NOTE** - The management network port is a GE port that supports 100 Mbit/s and 1000 Mbit/s auto-negotiation. - This management network port is only used for client direct connection in on-site maintenance and network cables are not allowed to use in other scenarios.

5.1.4 Installation Positions

FusionPoD 600 rack-scale server board-level liquid cooling cabinet or FusionPoD 600 rack-scale full liquid cooling cabinet can house up to 32 DH121C V6. The number of configured server nodes depends on the actual power consumption.

Figure 5-7 Slots of DH121C V6 (example: configured without drives)
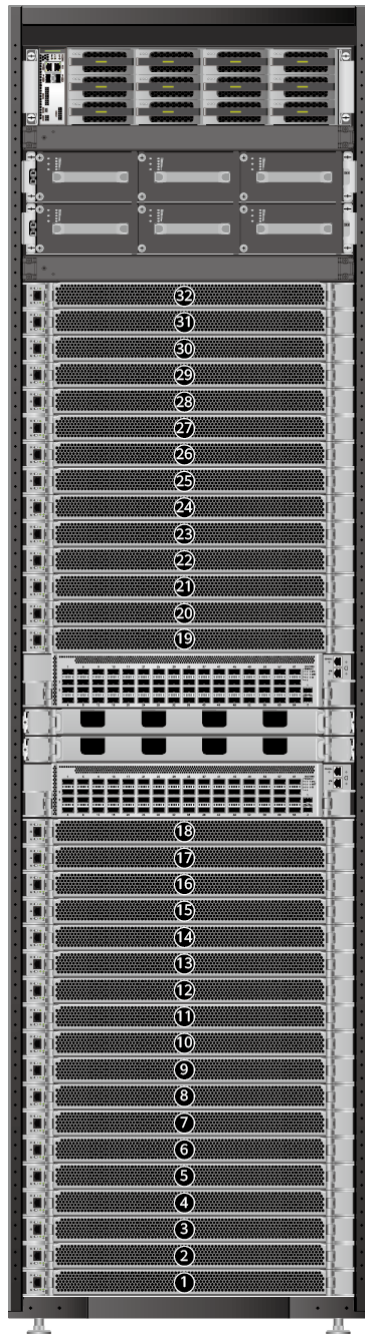
5.2 Rear Panel

5.2.1 Appearance

Figure 5-8 Rear view

5.2.2 Ports

Port Position

Figure 5-9 Ports on the rear panel:
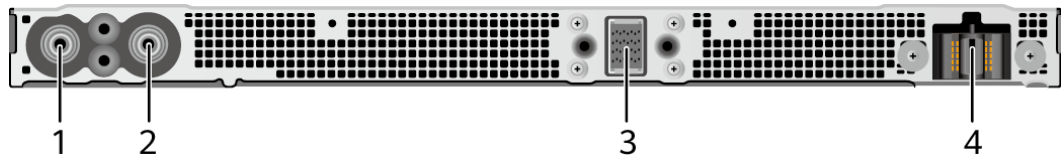
1	Water inlet	2	Water outlet
3	Service signal port	4	48 V PSU socket

Port Descriptions

Table 5-3 Ports on the rear panel

Name	Type	Quantity	Description
Service signal port	-	1	Used to connect cable backplane in the cabinet.
PSU port	-	1	Used to connect Busbar in the cabinet.

5.3 Processors

- Two third-generation Intel® Xeon® Scalable processors (Ice Lake).
- Processors of the same model must be used in a server.
- For details about component options, consult the local sales representatives.

Figure 5-10 Processor position
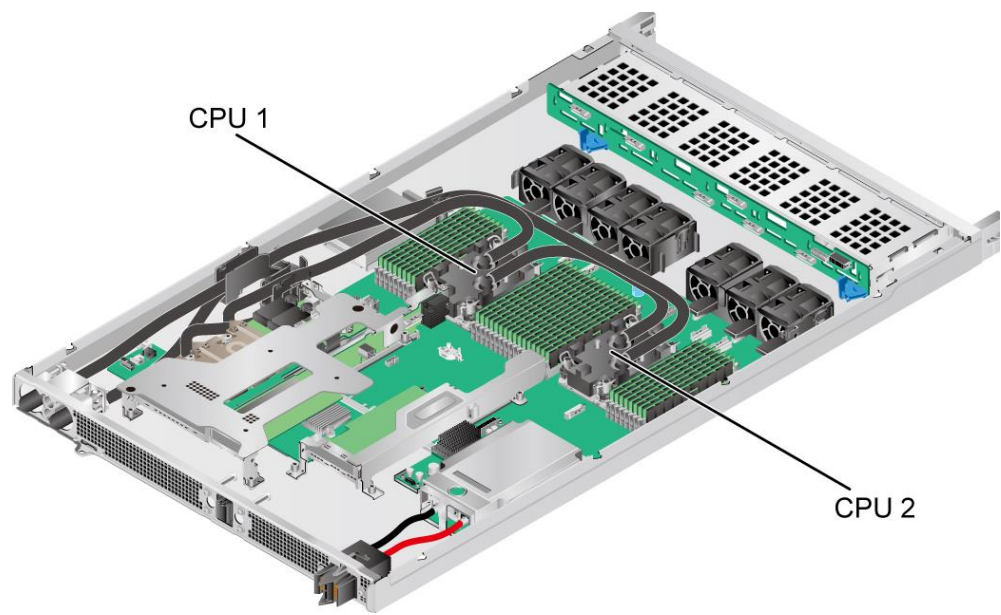
5.4 DIMM (DDR4)

5.4.1 Memory ID

You can determine the memory module properties based on the label attached to the memory module and the following figures and tables.

Figure 5-11 Memory ID
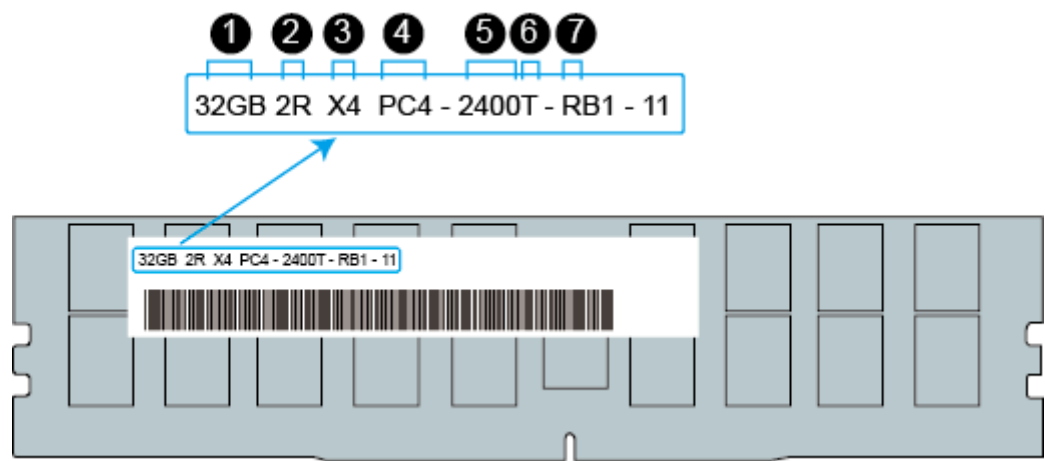
No.	Description	Example
1	Capacity	• 16 GB • 32 GB

No.	Description	Example
		• 64 GB
2	Rank	• 1R: single-rank • 2R: dual-rank • 4R: quad-rank • 8R: octa-rank
3	Data width on DRAM	• X4: 4-bit • X8: 8-bit
4	Memory generation	• PC3 = DDR3 • PC4 = DDR4
5	Maximum memory speed	• 2400MT/S • 2666MT/S • 2933MT/S • 3200MT/S
6	CAS latency	• T=CAS 17-17-17 • W=CAS 20-20-20 • Y=CAS 21-21-21 • AA=CAS 22-22-22
7	DIMM type	• R: RDIMM

5.4.2 Memory Subsystem Architecture

DH121C V6 provides 32 memory slots. Each CPU 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 channels cannot be used.

Table 5-4 Channels

CPU	Memory Channel	Memory Slot
CPU1	Channel A (primary)	DIMM000(A)
	Channel A	DIMM001(I)
	Channel B (primary)	DIMM010(B)
	Channel B	DIMM011(J)
	Channel C (primary)	DIMM020(C)
	Channel C	DIMM021(K)
	Channel D (primary)	DIMM030(D)
	Channel D	DIMM031(L)

CPU	Memory Channel	Memory Slot
	Channel E (primary)	DIMM040(E)
	Channel E	DIMM041(M)
	Channel F (primary)	DIMM050(F)
	Channel F	DIMM051(N)
	Channel G (primary)	DIMM060(G)
	Channel G	DIMM061(O)
	Channel H (primary)	DIMM070(H)
	Channel H	DIMM071(P)
CPU2	Channel A (primary)	DIMM100(A)
	Channel A	DIMM101(I)
	Channel B (primary)	DIMM110(B)
	Channel B	DIMM111(J)
	Channel C (primary)	DIMM120(C)
	Channel C	DIMM121(K)
	Channel D (primary)	DIMM130(D)
	Channel D	DIMM131(L)
	Channel E (primary)	DIMM140(E)
	Channel E	DIMM141(M)
	Channel F (primary)	DIMM150(F)
	Channel F	DIMM151(N)
	Channel G (primary)	DIMM160(G)
	Channel G	DIMM161(O)
	Channel H (primary)	DIMM170(H)
	Channel H	DIMM171(P)

5.4.3 Memory Compatibility Information

Observe the following rules when configuring DDR4 memory modules:

NOTICE

- Nodes of a same server must use DDR4 memory with the same Part No. (P/N Code) and the same operating speed, no less than any of the minimum value of the following parameters.
- Memory speed supported by a CPU.
- Maximum operating speed of a memory module.
- Mixed use of different specifications(storage, bit width, rank, height and so on) of DDR4 memory is not supported.
- For details about component options, consult the local sales representatives.

- The memory can be used with the Intel® Xeon® Scalable Ice Lake processors. 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 sum of storage of all DDR4 memory.

NOTICE

The total memory capacity cannot exceed the maximum memory capacity supported by the CPUs.

- Maximum number of memory depends on the type of CPU, type of memory, number of ranks and operating voltage.

NOTE

Each memory channel supports a maximum of 8 ranks. The number of memory modules supported by each channel varies depending on the number of ranks supported by each channel:

Number of memory modules supported by each channel ≤ Number of ranks supported by each memory channel/Number of ranks supported by each memory module.

Table 5-5 DDR4 memory specifications

Parameter		Memory		
Maximum capacity per DDR4 module (GB)		16	32	64
Rated speed (MT/s)		3200	3200	3200
Rank		Dual rank	Dual rank	Dual rank
Operating voltage (V)		1.2	1.2	1.2
Maximum number of DDR4 modules in a node		32	32	32
Maximum DDR4 memory capacity of the node (GB)[a]		512	1024	2048
Maximum operating speed (MT/s)	1DPC[b]	3200	3200	3200
	2DPC	3200	3200	3200
- a: Maximum DDR4 memory capacity supported is the value in full memory				

Parameter	Memory
configuration.	

- c: 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.

5.4.4 Memory Installation Rules

- Observe the following when configuring DDR4 modules:
    - Do not use memory modules with different specifications together.
    - Install filler memory modules in vacant slots.
    - Install the DIMMs with big capacity in primary channels and the DIMMs with small capacity in secondary channels, and ensure DIMMs are fully configured or symmetrically installed along CPUs.
- Observe the following rules when configuring DDR4 modules in a specific operating mode:
    - Installation rules for the memory sparing mode
        - Comply with the general installation guidelines.
        - The spare configuration of each channel must be valid.
        - Different channels can have different spare configurations.
        - Each populated channel must have a spare rank.
    - Installation rules for the memory mirroring mode
        - Comply with the general installation guidelines.
        - Each processor supports four integrated memory controllers (IMCs), and each IMC has two channels for installing memory modules. The installed memory modules must be identical in size and organization.
        - For a multi-processor configuration, each processor must have a valid memory mirroring configuration.
    - Installation rules for the memory patrol mode
        - Comply with the general installation guidelines.

5.4.5 Memory Installation Positions

DH121C V6 supports up to 32 DDR4 modules. To maximize performance, it is recommended to use balanced memory configuration.

NOTICE

Memory slots of CPU1 must be configured with at least one DDR4 module.

Figure 5-12 Memory installation position
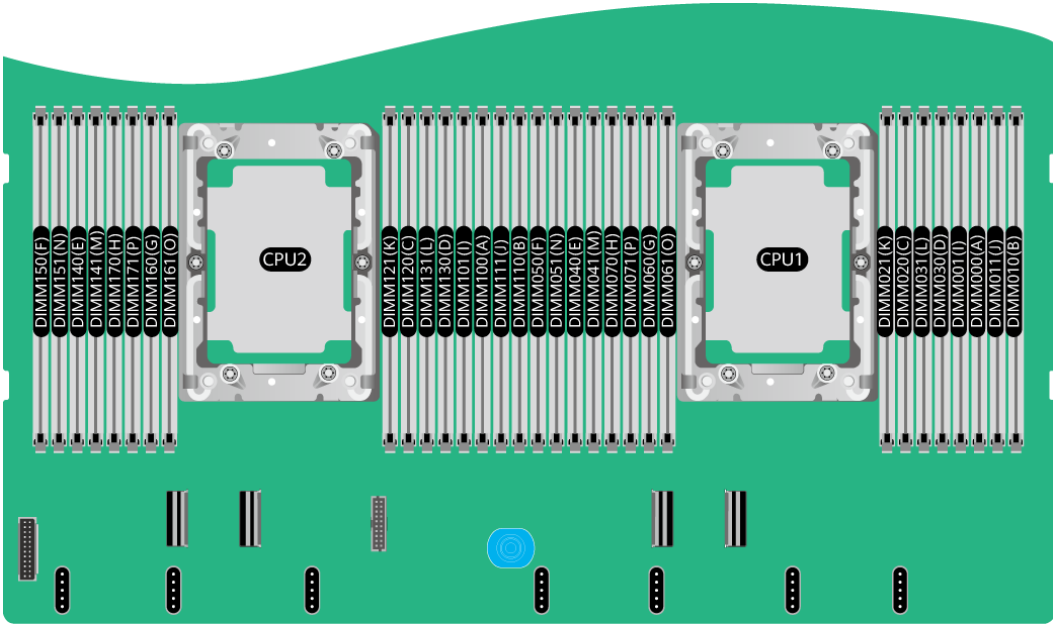
Figure 5-13 Installation principles for DDR4 memory installation

Processor	Channel	DIMM Slot	DIMMs (√: Recommended o: Not recommended)							
			√	√	√	√	√	√	o	√
			2	4	8	12	16	24	24	32
CPU1	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)								•
CPU2	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)								•

5.4.6 Memory Protection Technologies

The following memory protection technologies are supported:

- ECC
- Memory Mirroring
- Memory Single Device Data Correction (SDDC, +1)
- Failed DIMM Isolation
- Memory Thermal Throttling

- Command/Address Parity Check and Retry

- Memory Demand/Patrol Scrubbing

- Memory Data Scrambling

- Memory Multi Rank Sparing

- Post Package Repair (PPR)

- Write Data CRC Protection

- Adaptive Data Correction - Single Region (ADC-SR)

- Adaptive Double Device Data Correction - Multiple Region(ADDDC-MR, +1)

5.5 PMem Modules

5.5.1 Memory ID

Figure 5-14 Memory ID
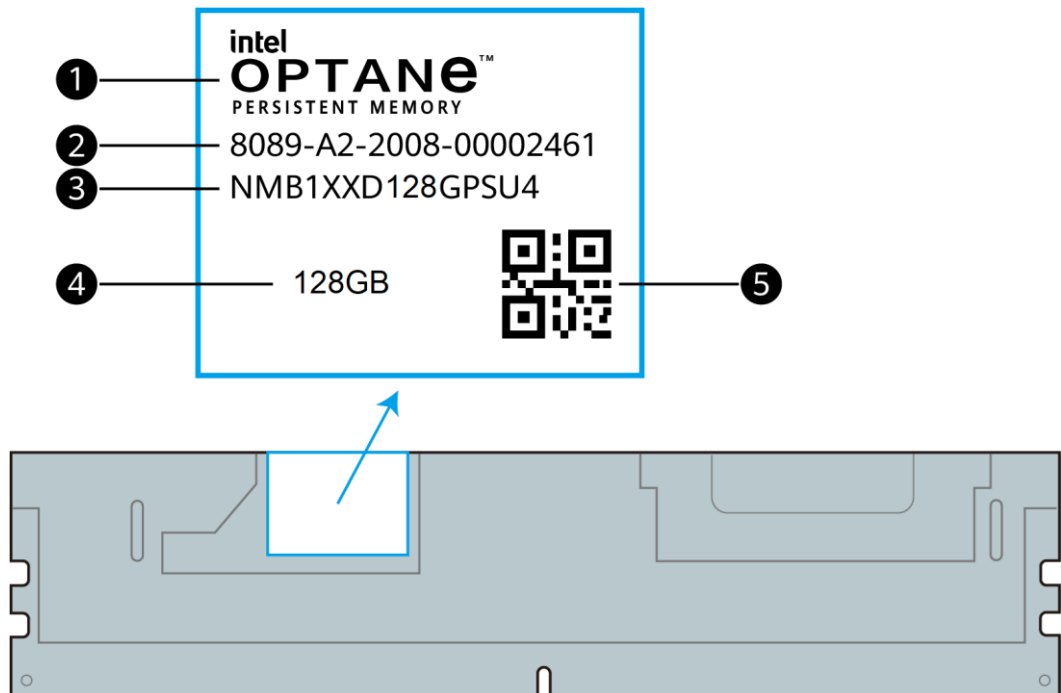
No.	Description	Example
1	Component	Intel Optane^{TM} Persistent Memory
2	Serial number	8089-A2-2008-00002461
3	Model	NMB1XXD128GPSU4
4	Capacity	128GB
5	Serial number QR code	8089-A2-2008-00002461

5.5.2 Memory Subsystem Architecture

DH121C V6 provides 32 memory slots. Each CPU integrates eight memory channels, and each channel supports only one PMem module.

The PMem modules must be used with the DDR4 DIMMs.

Table 5-6 Channels

CPU	Memory Channel	Memory Slot
CPU1	Channel A (primary)	DIMM000(A)
	Channel A	DIMM001(I)
	Channel B (primary)	DIMM010(B)
	Channel B	DIMM011(J)
	Channel C (primary)	DIMM020(C)
	Channel C	DIMM021(K)
	Channel D (primary)	DIMM030(D)
	Channel D	DIMM031(L)
	Channel E (primary)	DIMM040(E)
	Channel E	DIMM041(M)
	Channel F (primary)	DIMM050(F)
	Channel F	DIMM051(N)
	Channel G (primary)	DIMM060(G)
	Channel G	DIMM061(O)
	Channel H (primary)	DIMM070(H)
	Channel H	DIMM071(P)
CPU2	Channel A (primary)	DIMM100(A)
	Channel A	DIMM101(I)
	Channel B (primary)	DIMM110(B)
	Channel B	DIMM111(J)
	Channel C (primary)	DIMM120(C)
	Channel C	DIMM121(K)
	Channel D (primary)	DIMM130(D)
	Channel D	DIMM131(L)
	Channel E (primary)	DIMM140(E)

CPU	Memory Channel	Memory Slot
	Channel E	DIMM141(M)
	Channel F (primary)	DIMM150(F)
	Channel F	DIMM151(N)
	Channel G (primary)	DIMM160(G)
	Channel G	DIMM161(O)
	Channel H (primary)	DIMM170(H)
	Channel H	DIMM171(P)

5.5.3 Memory Compatibility Information

Observe the following rules when configuring PMem modules:

NOTICE

- The PMem modules must be used with the DDR4 DIMMs.
- For details about component options, consult the local sales representatives.

- The memory can be used with the third-generation Intel® Xeon® Scalable Ice Lake processors. The maximum memory capacity supported by all processor models is the same.
- The PMem module supports the App Direct Mode (AD) and Memory Mode (MM). The calculation formula of total memory capacity supported is as follows:
  - When the PMem modules work in the AD mode

    Total memory capacity = Total capacity of all PMem modules + Total capacity of all DDR4 modules
  - When the PMem modules work in the MM mode

    Total memory capacity = Total capacity of all PMem modules (DDR4 modules are used as cache, and the capacity is not calculated.)
- For details about the capacity type of a single memory module, contact the local sales representatives.
- The maximum number of memory modules supported depends on the memory type and rank quantity.

□ NOTE

Each memory channel supports a maximum of 8 ranks. The number of memory modules supported by each channel varies depending on the number of ranks supported by each channel:

Number of memory modules supported by each channel ≤ Number of ranks supported by each memory channel/Number of ranks supported by each memory module.

Table 5-7 PMem module parameters

Parameter	Value

Parameter	Value
Capacity per PMem module (GB)	128
Rated speed (MT/s)	3200
Operating voltage (V)	1.2
Maximum number of PMem modules of the server	16
Maximum DDR4 memory capacity of the server (GB)[a]	2048
Actual rate (MT/s)	3200
• a: The maximum supported PMem memory capacity depends on the working mode of the PMem modules. • The information listed in this table is for reference only. For details, consult the local sales representative.	

5.5.4 Memory Installation Rules

- Observe the following when configuring PMem modules:
    - The DDR4 DIMMs used with the PMem modules include RDIMMs and LRDIMMs.
    - The Part No. (P/N Code) of PMem modules on the same server node need to be the same.
    - The Part No. (P/N Code) of DDR4 DIMMs used with the PMem modules on the same server node need to be the same.
- Observe the following rules when configuring PMem modules in a specific operating mode:
    - AD mode:

        The ratio of DDR4 modules to PMem modules is recommended to be between 1:1 and 1:8 on the same server node.
    - MM mode:

        The ratio of DDR4 modules to PMem modules is recommended to be between 1:4 and 1:16 on the same server node.

5.5.5 Memory Installation Positions

DH121C V6 supports up to 16 PMem modules, and the PMem modules must be used with the DDR4 DIMMs.

Figure 5-15 Memory installation position
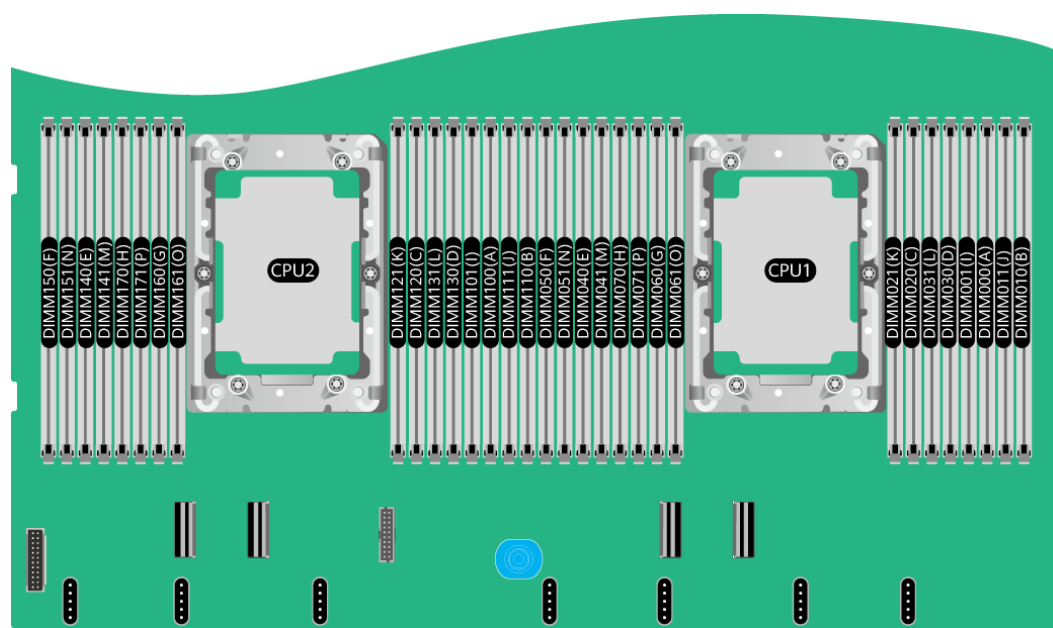
Figure 5-16 Installation principles for PMem modules

Processor	Channel		DIMM Slot	Installation Principle (●: DDR4 ○: PMem)								
				AD	MM	AD	AD	AD	MM	AD	MM	AD
				8+8		12+2	16+2	16+8		16+16		24+4
CPU1	IMC0	A	DIMM000(A)	●		●	●	●		●		●
			DIMM001(I)			○	○	○		○		●
		B	DIMM010(B)	○		●	●	●		●		○
			DIMM011(J)								○	
	IMC1	C	DIMM020(C)	●		●	●	●		●		●
			DIMM021(K)				○	○		○		●
		D	DIMM030(D)	○		○	●	●		●		●
			DIMM031(L)								○	●
	IMC2	E	DIMM040(E)	●		●	●	●		●		●
			DIMM041(M)				○	○		○		●
		F	DIMM050(F)	○		●	●	●		●		○
			DIMM051(N)								○	
	IMC3	G	DIMM060(G)	●		●	●	●		●		●
			DIMM061(O)				○	○		○		●
		H	DIMM070(H)	○			●	●		●		●
			DIMM071(P)								○	●
CPU2	IMC0	A	DIMM100(A)	●		●	●	●		●		●
			DIMM101(I)			○	○	○		○		●
		B	DIMM110(B)	○		●	●	●		●		○
			DIMM111(J)								○	
	IMC1	C	DIMM120(C)	●		●	●	●		●		●
			DIMM121(K)				○	○		○		●
		D	DIMM130(D)	○		○	●	●		●		●
			DIMM131(L)								○	●
	IMC2	E	DIMM140(E)	●		●	●	●		●		●
			DIMM141(M)				○	○		○		●
		F	DIMM150(F)	○		●	●	●		●		○
			DIMM151(N)								○	
	IMC3	G	DIMM160(G)	●		●	●	●		●		●
			DIMM161(O)				○	○		○		●
		H	DIMM170(H)	○			●	●		●		●
			DIMM171(P)								○	●

5.5.6 Memory Protection Technologies

PMem modules support the following memory protection technologies:

- PMem module Error Detection and Correction
- PMem module Device Failure Recovery (SDDC)
- PMem module Package Sparing (DDDC)
- PMem module Patrol Scrubbing
- PMem module Address Error Detection
- PMem module Data Poisoning (Corrupt Data Containment)
- PMem module Viral
- PMem module Address Range Scrub (ARS)
- PMem module Error Injection
- DDR-T Command and Address Parity Check and Retry
- DDR-T Read Write Data ECC Check and Retry
- PMem module Faulty DIMM Isolation
- PMem module Error Reporting

5.6 Storage

5.6.1 Drive Configurations

Table 5-8 Drive configurations

Configuration	Maximum Number of Front Drives	Maximum Number of Built-in Drives	Maximum Number of Rear Drives	Drive Management Mode
Configured without front drives.	-	- 1 – Only SATA drives are supported.	-	PCH pass-through

Configured with 12 NVMe drives.	- 12
	  – Only NVMe drives are supported.
		- 1
		  – Only SATA drives are supported.
			-	SATA drive: PCH pass-through
				NVMe drive: CPU pass-through

For details about component options, consult the local sales representatives.				

5.6.2 Hard Drive Number

- Built-in drive

Figure 5-17 Built-in drive
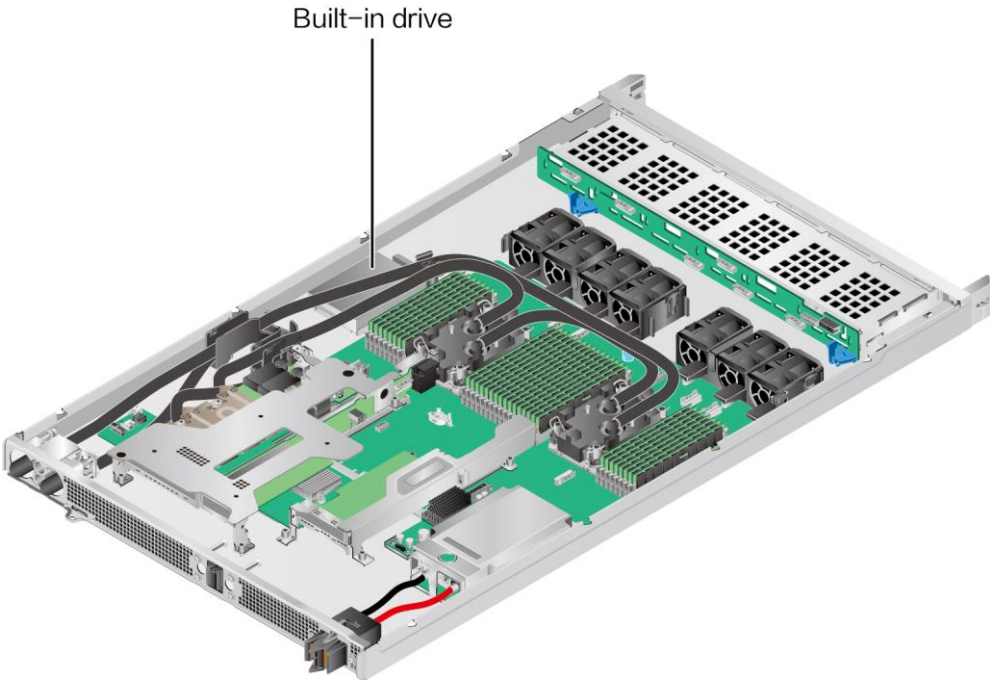
Table 5-9 Built-in drive number

Physical Slot	iBMC Screen Display
HDD24	Disk24

- Front drives

Figure 5-18 Front drives

Table 5-10 Front drive number

Physical Number	iBMC Screen Display
0	0
1	1
2	2
3	3
4	4

Physical Number	iBMC Screen Display
5	5
6	6
7	7
8	8
9	9
10	10
11	11

5.6.3 Hard Drive Indicator

NVMe Drive Indicator

Figure 5-19 NVMe drive indicator
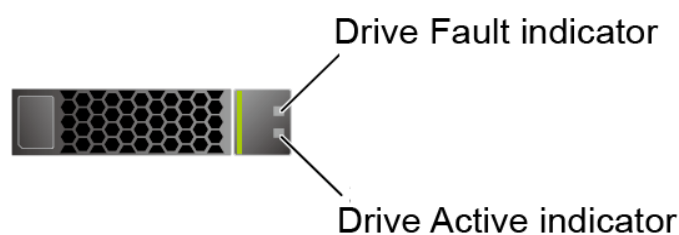
- When Volume Management Device (VMD) function is enabled, and new VMD driver is installed, NVMe drives support surprise hot swap.

Table 5-11 NVMe drive indicators (VMD enabled)

Activity Indicator (Green)	Fault Indicator (Yellow)	Description
Off	Off	The NVMe drive is not detected.
Steady on	Off	The NVMe drive is detected and operating properly.
Blinking at 2 Hz	Off	Data is being read from or written to the NVMe drive.
Off	Blinking at 2 Hz	The NVMe drive is being located.
Off	Blinking at 8 Hz	The data on the secondary NVMe drive is being rebuilt.
Steady on/off	Steady on	The NVMe drive is faulty.

- If the VMD function is disabled, the NVMe drives support only orderly hot swap.

Table 5-12 NVMe drive indicators (VMD disabled)

Activity Indicator (Green)	Fault Indicator (Yellow)	Description
Off	Off	The NVMe drive is not detected.
Steady on	Off	The NVMe drive is detected and operating properly.
Blinking at 2 Hz	Off	Data is being read from or written to the NVMe drive.
Off	Blinking at 2 Hz	The NVMe drive is being located or hot-swapped.
Off	Blinking at 0.5 Hz	The NVMe drive has completed the hot swap process and is removable.
Steady on/off	Steady on	The NVMe drive is faulty.

5.7 Network

5.7.1 PCIe NICs

PCIe labeled NICs provide network expansion capability and support NC-SI.

The SDI V3 consists of a main card and two expansion cards. Expansion NIC 1 supports the SP583 NIC and SP682 NIC, and expansion NIC 2 supports the SP385 NIC and SP382 NIC.

For details about component options, consult the local sales representatives.

Table 5-13 NICs supported by the node

NIC Model	Chip Model	Network Port Type	Network Port Quantity	API Type	NC-SI/WOL/ PXE
SP385	ConnectX-5	25GE-KR	2	Gen-Z	√
SP583	Hi1822	25GE-KR	4	Gen-Z	√
FBGF-NIC-R1S2	ConnectX-6 Dx	25GE-KR	2	SFP28	√
SDI V3 (with 1 x SDI V3 main card, 1 x expansion card SP382,	• SDI V3 main card: Hi1620S • SP382: Connect	• SDI V3 main card: 10GE-KR • SP382:	• SDI V3 main card: 1 • SP382: 2 • SP682: 2	• SDI V3 main card: SFP+ • SP382: SFP28	• SDI V3 main card: × • SP382: √ • SP682: √

| NIC Model	Chip Model	Network Port Type	Network Port Quantity	API Type	NC-SI/WOL/ PXE
and 1 x expansion card SP682)	X-5 • SP682: Connect X-6	25 GE-KR • SP682: 25 GE-KR		• SP682: SFP28	
SDI V3 (with 1 x SDI V3 main card, 1 x expansion card SP382, and 1 x expansion card SP682)	• SDI V3 main card: Hi1620S • SP583: Hi1822 • SP385: Connect X-5	• SDI V3 main card: 10GE-KR • SP583: 25GE-KR • SP385: 25GE-KR	• SDI V3 main card: 1 • SP583: 4 • SP385: 2	• SDI V3 main card: SFP+ • SP583: Gen-Z • SP385: Gen-Z	• SDI V3 main card: × • SP583: √ • SP385: √
Note: "√" indicates that NC-SI/WOL/PXE is supported. "×" indicates that NC-SI/WOL/PXE is not supported.					

Figure 5-20 SP385
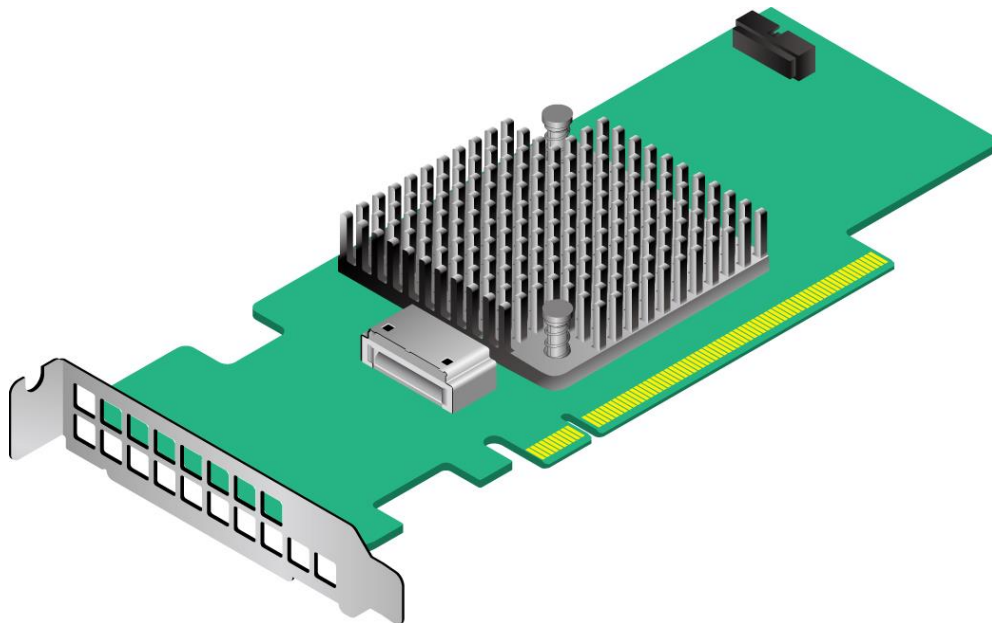
Figure 5-21 SP583
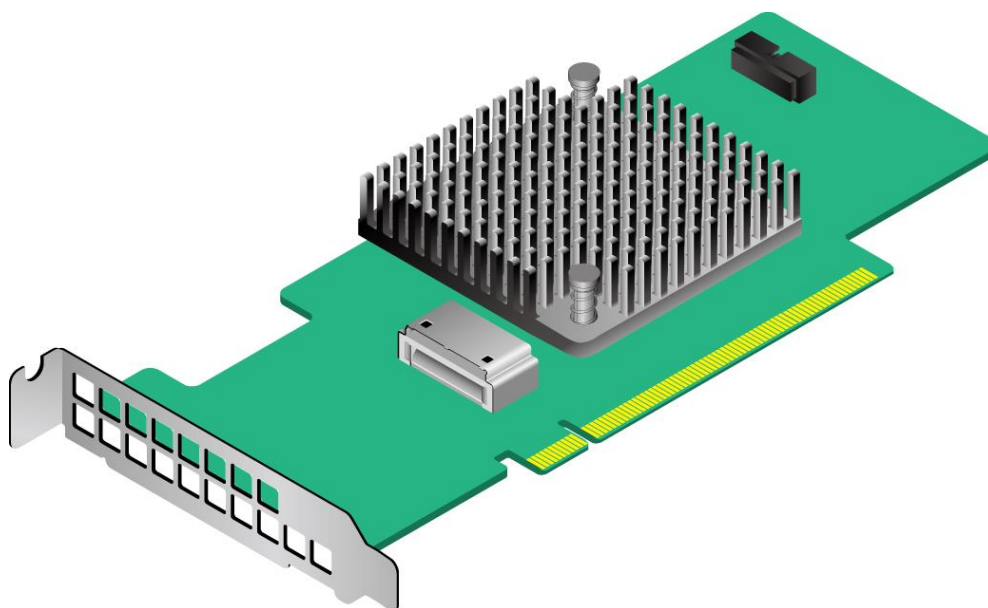
**Figure 5-22** SP382
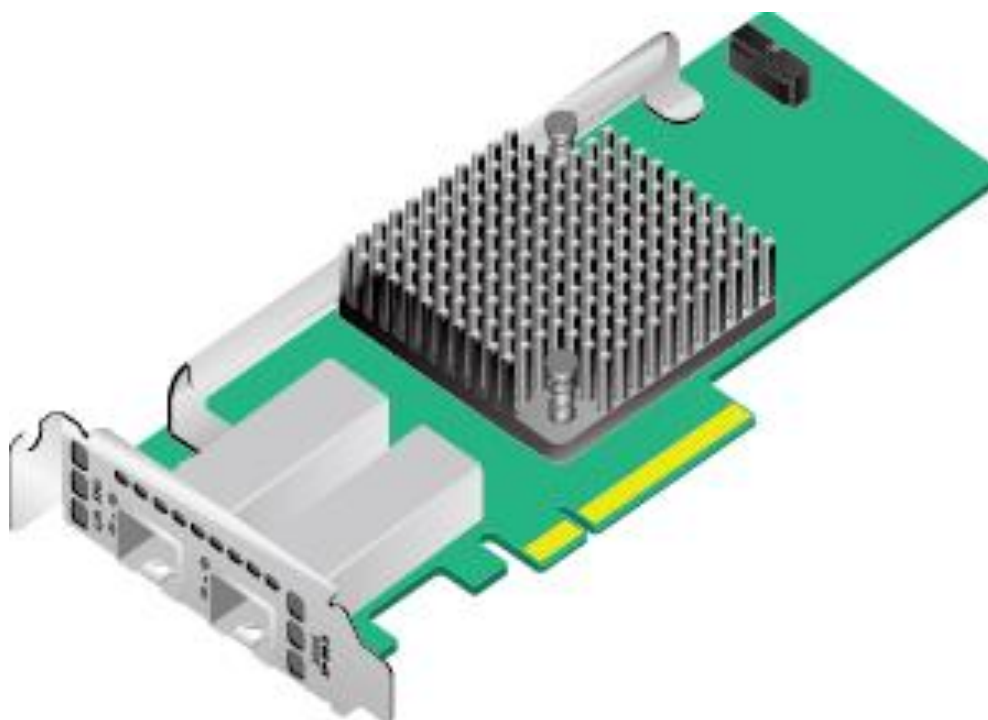
Figure 5-23 SP682
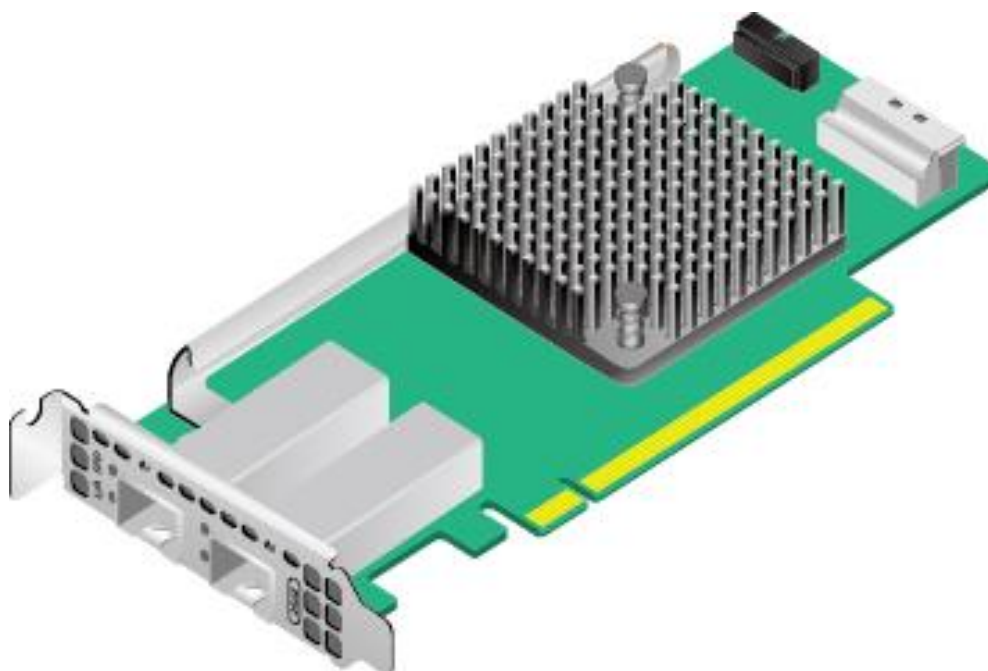
Figure 5-24 FBGF-NIC-R1S2
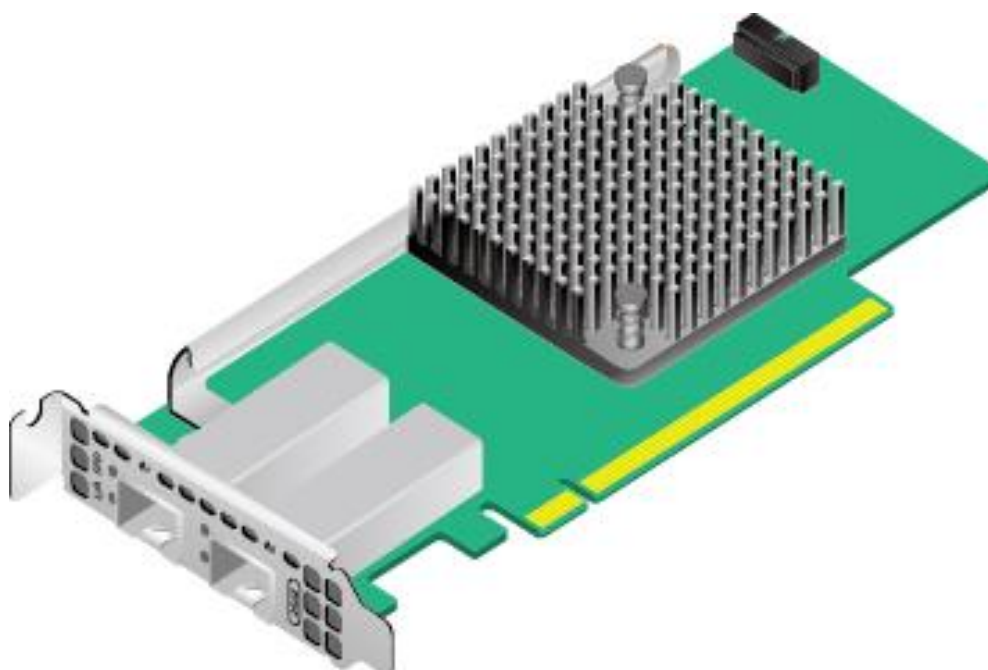
Figure 5-25 SDI V3 main card
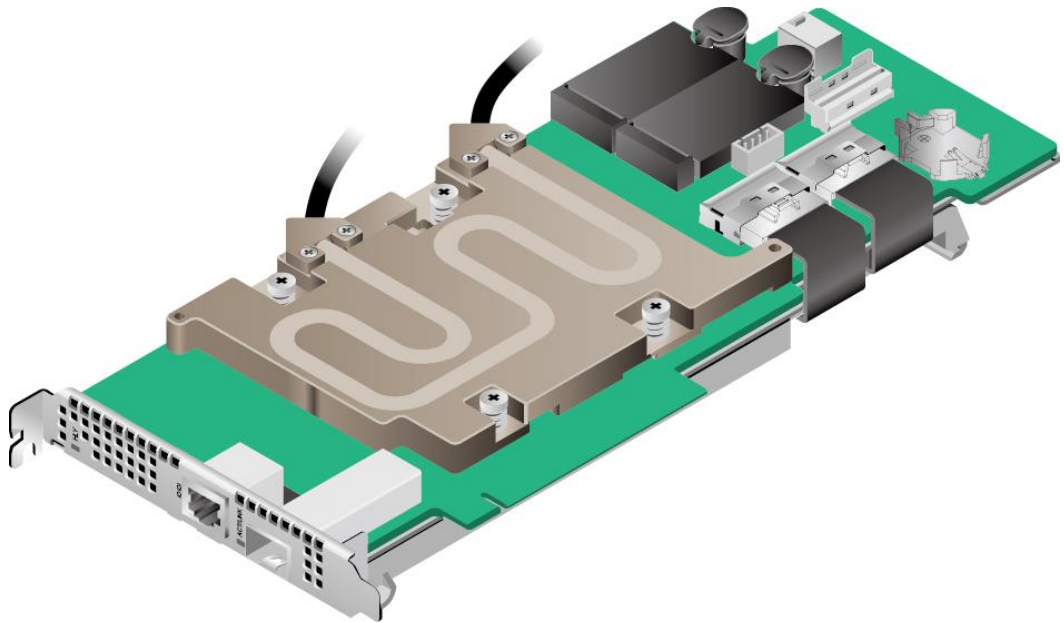
5.8 I/O Expansion

5.8.1 PCIe Card

PCIe card provides system ports expansion function.

For details about component options, consult the local sales representatives.

5.8.2 PCIe slots

📖 NOTE

- The mainboard supports 5 types of PCIe riser cards.
- When PCIe riser module 1 is configured with PCIe riser card 1, PCIe riser module 2 must be configured with PCIe riser card 1.
- When PCIe riser module 1 is configured with PCIe riser card 2, PCIe riser card 3 or PCIe riser card 4, PCIe riser module 2 must be configured with PCIe riser card 5.

- PCIe riser module 1

  The PCIe riser module 1 supports PCIe riser card 1, PCIe riser card 2, PCIe riser card 3 and PCIe riser card 4, providing the PCIe slots shown in Figure 5-26 and Figure 5-27 respectively.

Figure 5-26 PCIe riser card 1
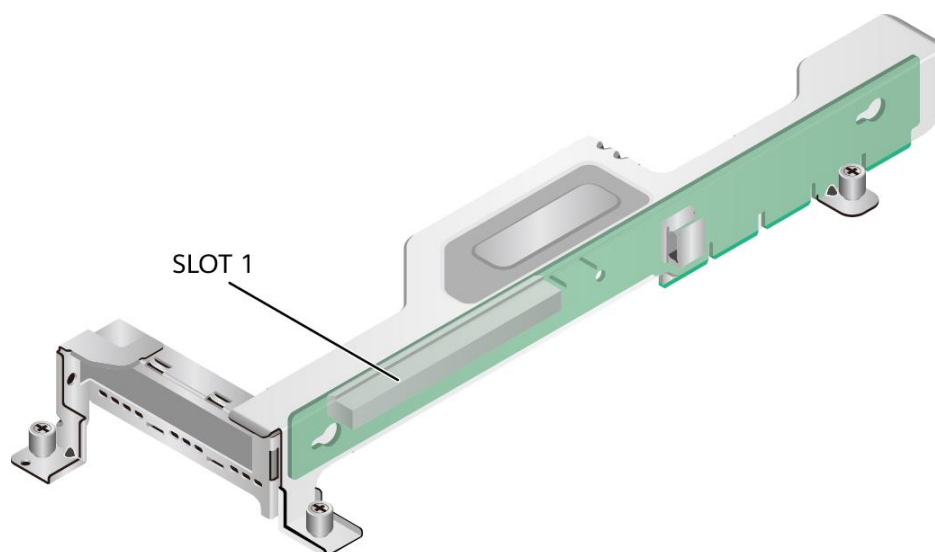
Figure 5-27 PCIe riser card 2
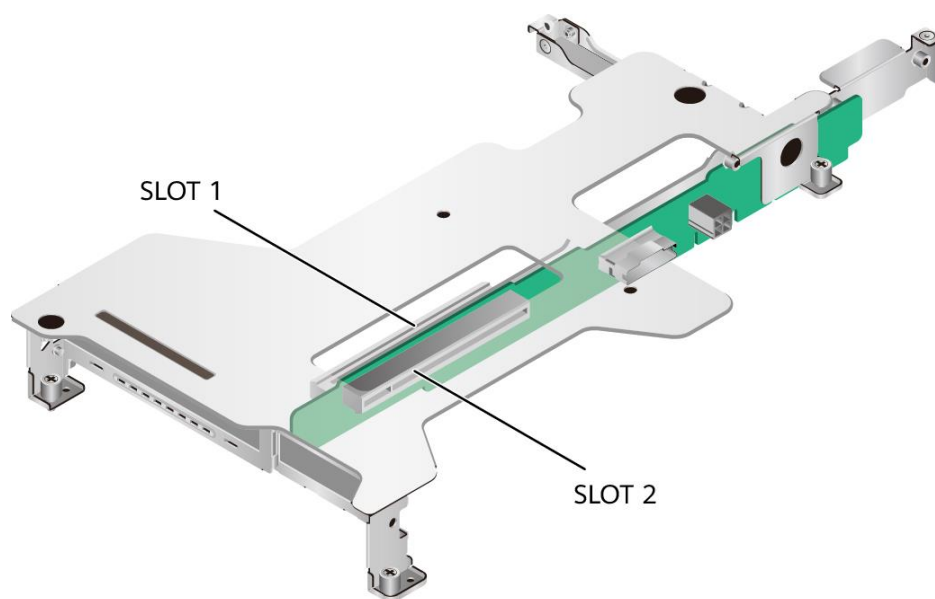
Figure 5-28 PCIe riser card 3

SLOT 1

SLOT 2
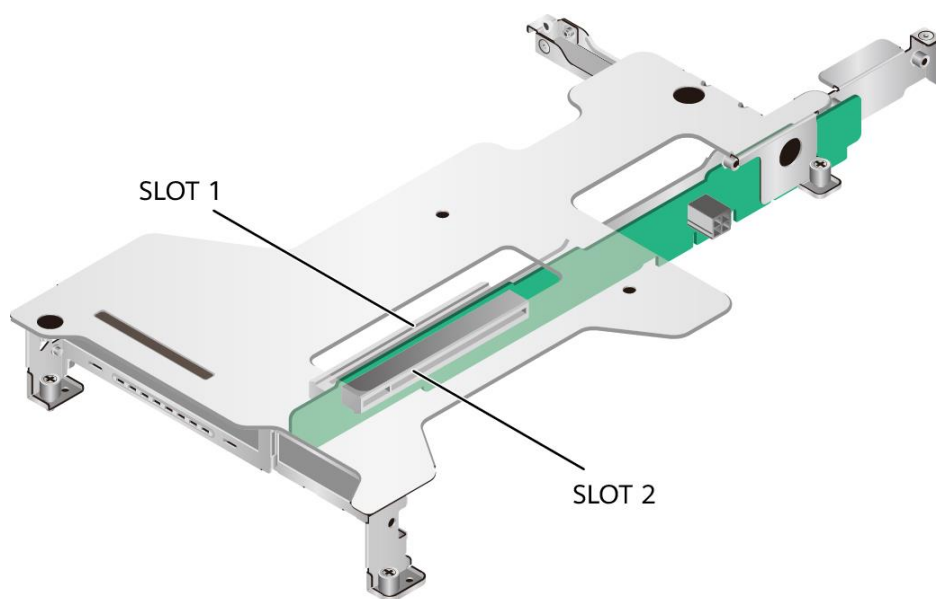
Figure 5-29 PCIe riser card 4

SLOT 1

SLOT 2
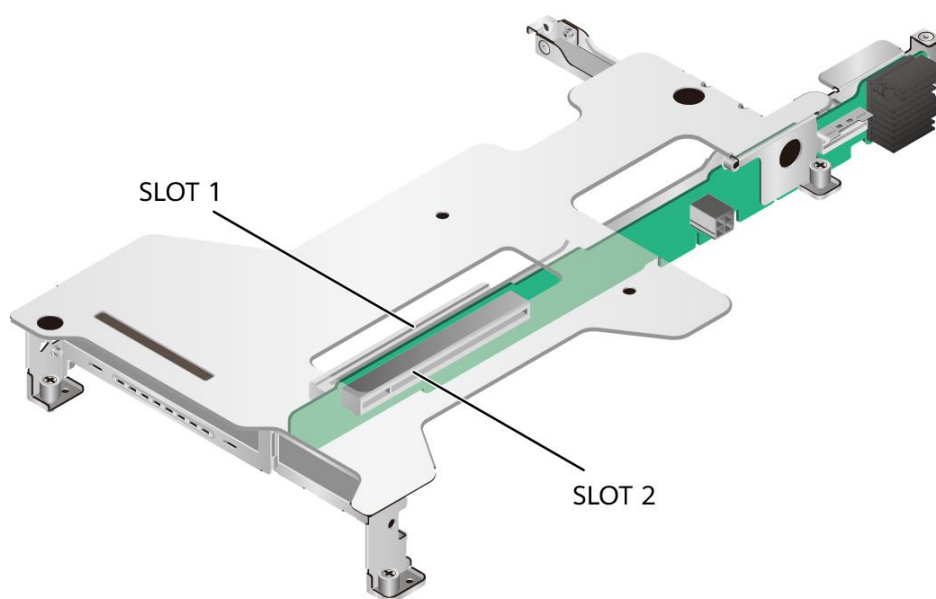
- PCIe riser module 2

  PCIe riser module 2 supports PCIe riser card 1 and PCIe riser card 5, providing the PCIe slots as shown in Figure 5-30 and Figure 5-31 respectively.

Figure 5-30 PCIe riser card 1
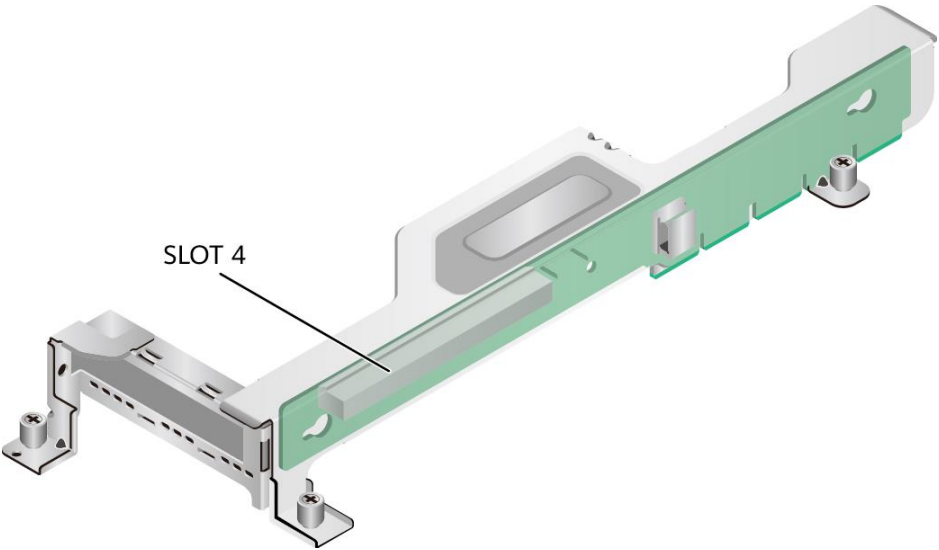
Figure 5-31 PCIe riser card 5
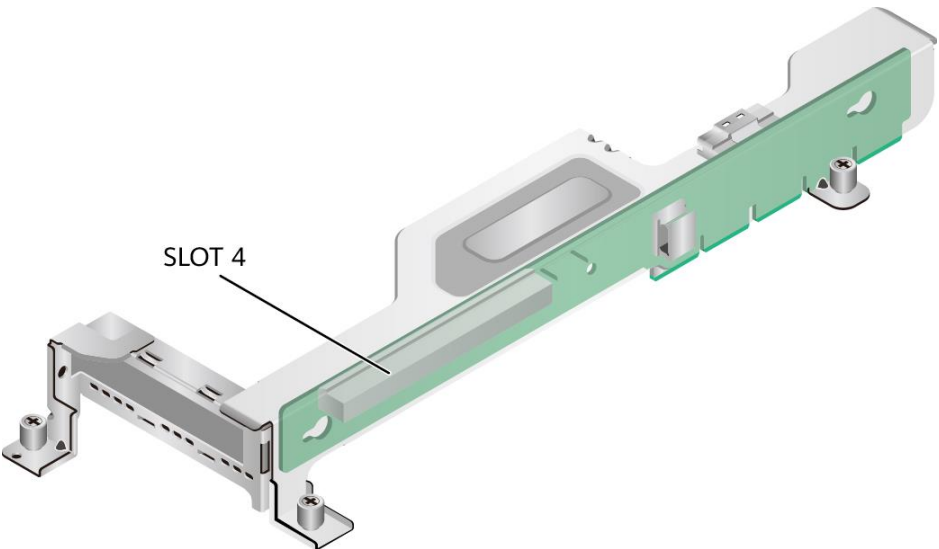
5.8.3 PCIe Slot Description

Table 5-14 PCIe slot description (without SDI V3 configuration)

PCIe Slots	CPU	PCIe Standard	Connector Width	Bus Width	Port Number	Root Port (B/D/F)	Device (B/D/F)	Device Size
Slot1	CPU1	PCIe 3.0	x16	x8	Port1 A	3 A /00/0	3 B /00/0	Half-height half-leng

PCIe Slots	CPU	PCIe Standard	Connector Width	Bus Width	Port Number	Root Port (B/D/F)	Device (B/D/F)	Device Size
								th
Slot 4	CPU2	PCIe 3.0	x16	x8	Port0 A	-	-	Half-height half-length

- The B/D/F (Bus/Device/Function Number) is the default value when the server is fully configured with PCIe components. The value may differ if the server is not fully configured with PCIe cards or if a PCIe card with a PCI bridge is configured.
- Root Port (B/D/F) indicates the B/D/F of an internal PCIe root port of the processor.
- Device (B/D/F) indicates B/D/F (Bus address) of onboard or expansion PCIe device on the OS.
- 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.

Table 5-15 PCIe slot description (configuring SDI V3+SP583+SP385)

PCIe Slots	CPU	PCIe Standard	Connector Width	Bus Width	Port Number	Root Port (B/D/F)	Device (B/D/F)	Device Size
Slot1	CPU1	PCIe 3.0	x16	x16	Port2 A	5D/02/0	3E/00/0	Full-height and full-length
Slot 2	CPU1	PCIe 3.0	x16	x8	Port1 A	3 A /00/0	3B/00/0	Half-height half-length
Slot 4	SDI-CPU	PCIe 3.0	x16	x8	-	-	-	Half-height half-length

- The B/D/F (Bus/Device/Function Number) is the default value when the server is fully configured with PCIe components. The value may differ if the server is not fully configured with PCIe cards or if a PCIe card with a PCI bridge is configured.
- Root Port (B/D/F) indicates the B/D/F of an internal PCIe root port of the processor.
- Device (B/D/F) indicates B/D/F (Bus address) of onboard or expansion PCIe device on the OS.

PCIe Slots	CPU	PCIe Standard	Connector Width	Bus Width	Port Number	Root Port (B/D/F)	Device (B/D/F)	Device Size

- 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.

Table 5-16 PCIe slot description (configured with SDI V3 NICs, but without drives)

PCIe Slots	CPU	PCIe Standard	Connector Width	Bus Width	Port Number	Root Port (B/D/F)	Device (B/D/F)	Device Size
Slot 1	CPU1	PCIe 3.0	x16	x16	Port1A	3 A /00/0	3 B /00/0	Full-height and full-length
Slot 2	CPU1	PCIe 3.0	x16	x8	Port2A	5D/02/0	3E/00/0	Half-height half-length
Slot 4	SDI-CPU	PCIe 3.0	x16	x8	-	-	-	Half-height half-length

- The B/D/F (Bus/Device/Function Number) is the default value when the server is fully configured with PCIe components. The value may differ if the server is not fully configured with PCIe cards or if a PCIe card with a PCI bridge is configured.
- Root Port (B/D/F) indicates the B/D/F of an internal PCIe root port of the processor.
- Device (B/D/F) indicates B/D/F (Bus address) of onboard or expansion PCIe device on the OS.
- 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.
- Slot sizes for full-height, half-length PCIe slots are backwards compatible with half-height, half-length 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.

Table 5-17 PCIe slot description (configured with SDI V3 and 12 NVMe drives)

PCIe Slots	CPU	PCIe Standard	Connector Width	Bus Width	Port Number	Root Port (B/D/F)	Device (B/D/F)	Device Size
Slot1	CPU1	PCIe 3.0	x16	x16	Port1 A	3 A /00/0	3B/00/0	Full-height and full-length
Slot 2	CPU1	PCIe 4.0	x16	x8	Port2 A	5D/02/0	3E/00/0	Half-height half-length
Slot 4	SDI-CPU	PCIe 3.0	x16	x8	-	-	-	Half-height half-length

- The B/D/F (Bus/Device/Function Number) is the default value when the server is fully configured with PCIe components. The value may differ if the server is not fully configured with PCIe cards or if a PCIe card with a PCI bridge is configured.
- Root Port (B/D/F) indicates the B/D/F of an internal PCIe root port of the processor.
- Device (B/D/F) indicates B/D/F (Bus address) of onboard or expansion PCIe device on the OS.
- 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.
- Slot sizes for full-height, half-length PCIe slots are backwards compatible with half-height, half-length 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.

5.9 PSUs

- Configured without drives.

  Supports one 48 V to 12 V PSU.

Figure 5-32 The location of PSU (configured without drives)

PSU
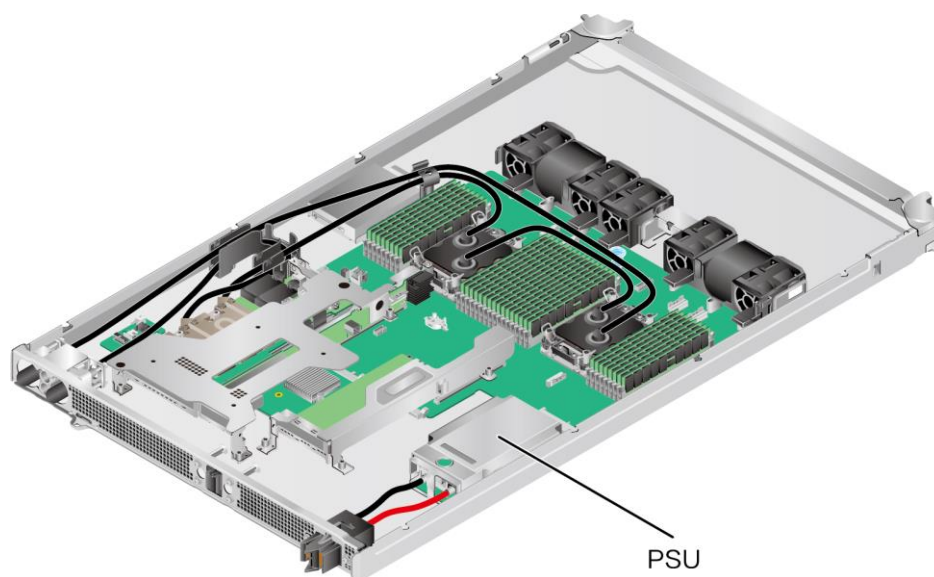
- Configured with 12 NVMe drives.
  Supports one 48 V to 12 V PSU.

Figure 5-33 The location of PSU (configured with 12 NVMe drives)

PSU
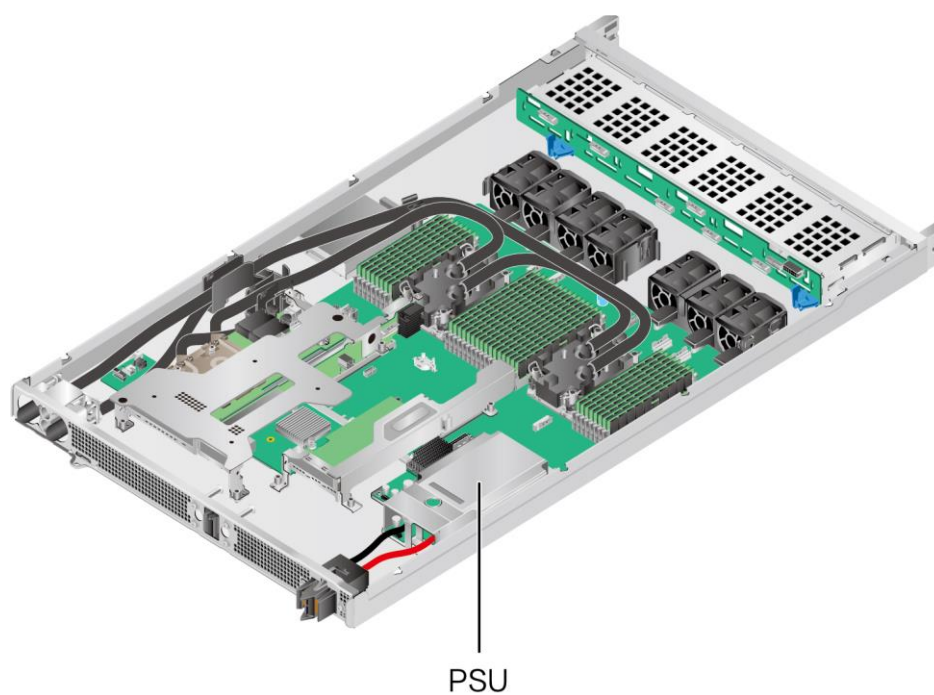
5.10 Fan Module

- No hard drive configuration supports five fan modules.
- The 12 x NVMe drive configuration supports seven fan modules.
- Supports single faulty fan.

NOTICE

The temperature is 5°C (9°F) lower than the rated value when a single fan is faulty.

- The fan speed can be adjusted.
- Fan modules configured in a server node must have the same Part No. (P/N Code).

Figure 5-34 The location of fan module (configured without drives)
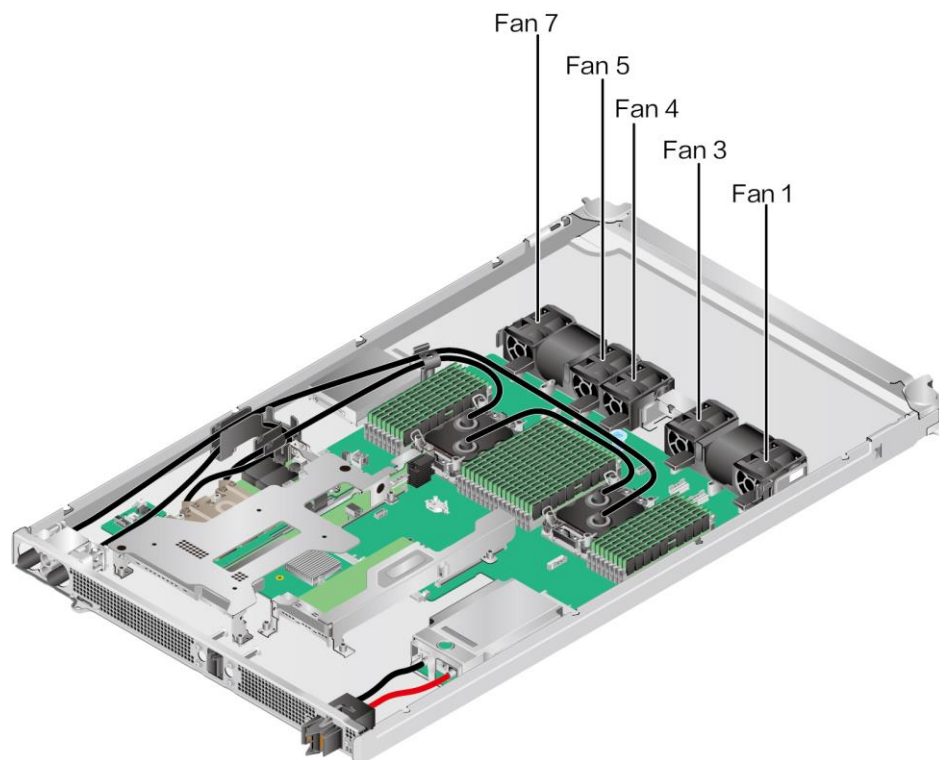
Figure 5-35 The location of fan module (12 NVMe drives)
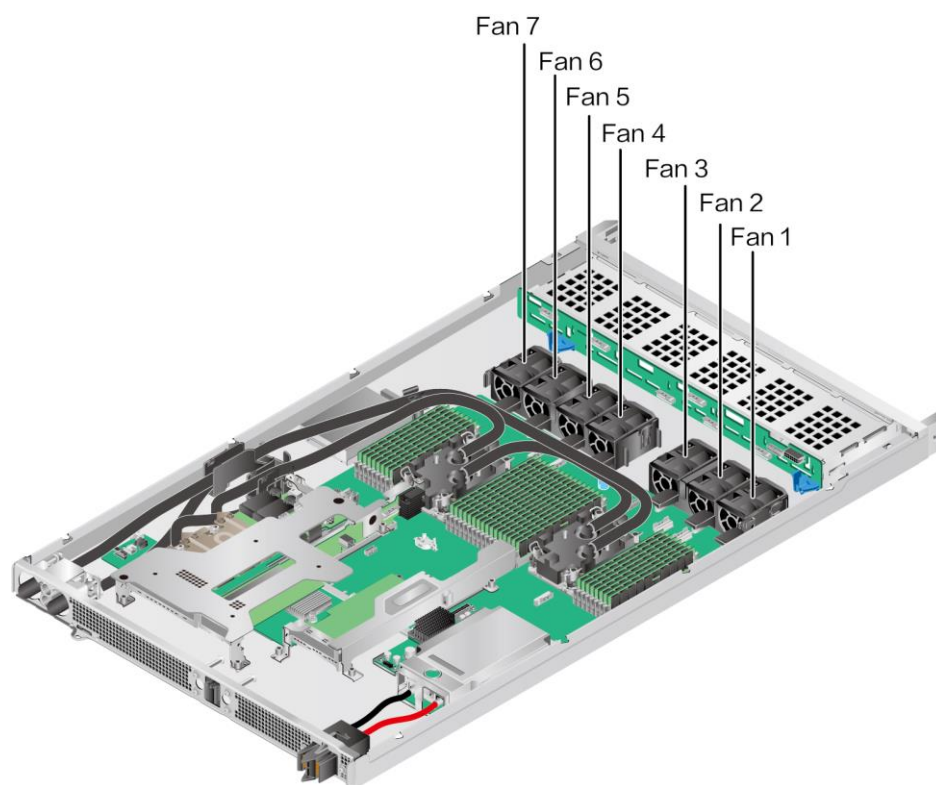
5.11 Board

5.11.1 Mainboard

Figure 5-36 Mainboard
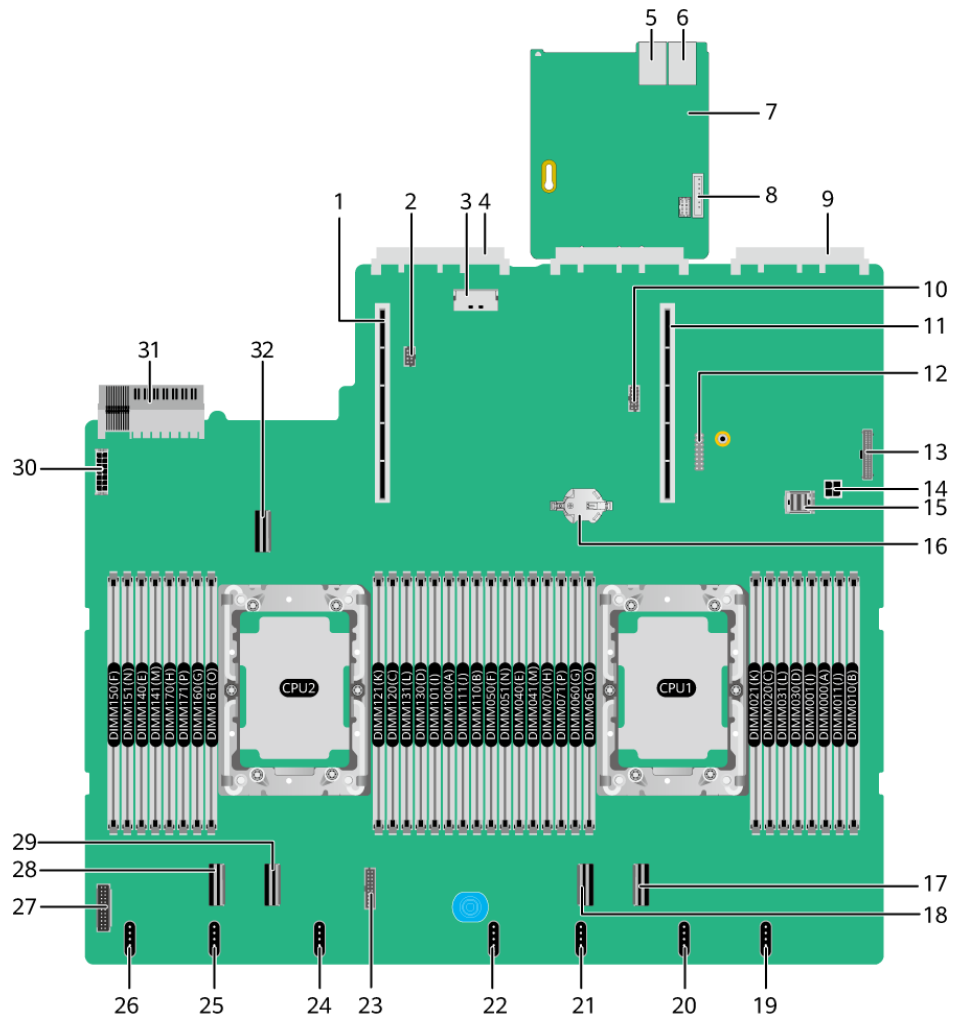
1	PCIe riser2 slot (J51)	2	Leakage detector signal connector (J2002)
3	OCP 3.0 NIC 2 Slimline 7 connector (J31)	4	OCP 3.0 NIC 2 connector (J109)
5	Serial port (J6020)	6	iBMC management network port (J6019)
7	iBMC management board	8	SDI serial port connector (J6025)
9	OCP 3.0 NIC 1 connector (J108)	10	NC-SI connector (J114)
11	PCIe riser1 slot (J50)	12	TPM snap-on interface (J10)

13	Right mounting ear connector (J113)	14	Mini SAS power connector (J64)
15	Mini SAS HD connector (J6)	16	Cell battery holder (U9)
17	Slimline 1 connector (J11)	18	Slimline 2 connector (J84)
19	Fan module 7 connector (J99)	20	Fan module 6 connector (J98) [a]
21	Fan module 5 connector (J96)	22	Fan module 4 connector (J94)
23	Front hard drive backplane low-speed signal connector (J75)	24	Fan module 3 connector (J92)
25	Fan module 2 connector (J101) [a]	26	Fan module 1 connector (J67)
27	Left mounting ear connector (J113)	28	Slimline 4 connector (J12)
29	Slimline 3 connector (J85)	30	Front 14-pin power connector (J26)[a]
31	Power module connector (J56)	32	Slimline 5 connector (J30)
• a: The port is reserved.			

5.11.2 Drive Backplane

Front-drive backplane

Figure 5-37 Backplane configured with 12 NVMe drives
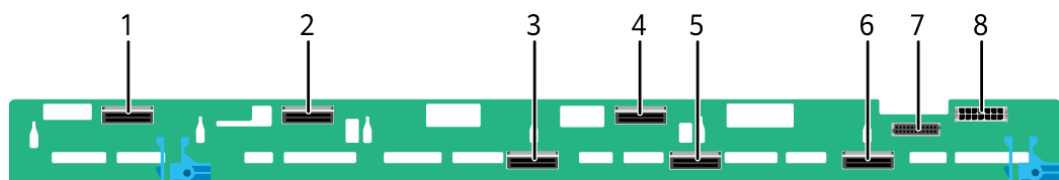
1	Slimline A connector (SLIMLINE A/J33)	2	Slimline B connector (SLIMLINE B/J3)
3	Slimline C connector (SLIMLINE C/J2)	4	Slimline D connector (SLIMLINE D/J5)
5	Slimline E connector (SLIMLINE E/J4)	6	Slimline E connector (SLIMLINE F/J17)
7	Low-speed signal connector (J1)	8	Power connector (J30)

6 Specifications

6.1 Technical Specifications

Table 6-1 Technical specifications

Component	Specifications
Form factor	1 U liquid-cooled server node
Chip Set	Intel $^{®}$ C621
Processor	Two processors • Third-generation Intel® Xeon® Scalable processors (Ice Lake). • Each processor integrates a memory controller, supporting eight memory channels. • Built-in PCIe controller, supporting PCIe 4.0 and 64 lanes per processor • 3-socket UltraPath Interconnect (UPI) bus interconnection with up to 11.2 GT/S transmission speed per bus. • Up to 38 cores. • UP to 3.0 GHz. • Min. 1.5 MB L3 cache per core • Up to 300 W TDP

Memory	Supports 32 memory module slots.
	• Up to 32 DDR4 modules.
	  – The memory module type can be either RDIMM or LRDIMM.
	  – Max. 3200 MT/s memory speed.

Component	Specifications

	– The DDR4 module of different types (RDIMM or LRDIMM) and specifications (capacity, bit width, rank, and height) cannot be used together.
	– A server must use DDR4 module of the same part number (P/N code).
	• Up to 16 PMem modules.
	  – The PMem modules must be used with the DDR4 modules, and each channel supports only one PMem module.
	  – The PMem modules work in the AD mode or MM mode.
	  – Max. 3200 MT/s memory speed.
	  – PMem modules of different specifications (capacity and rank) cannot be used together.

Storage	• One 2.5" built-in SATA drive. • Twelve 2.5" front NVMe drives.
Network	• SP385 NIC. • SP583 NIC. • SP382 NIC. • SP682 NIC. • FBGF-NIC-R1S2 NIC. • SDI V3 NIC
I/O Expansion	Supports Three PCIe 3.0 expansion slots. • Three standard PCIe expansion slots. For details, see 5.8.2 PCIe slots and 5.8.3 PCIe Slot Description.

Port	• Ports on the front panel:
	  – One RJ45 management port.
	• Ports on the rear panel:
	  – One high-speed signal port.
	  – One power socket.
	  – One liquid-cooling port.
	• Built-in ports:
	  – One SATA drive port.

System Management	• UEFI • iBMC • NC-SI • Integration with third-party management systems • Integration with FusionDirector
Security	• Power-on password.

Component	Specifications
	• Administrator password. • Secure boot. • Tamper-evident TPM (for China and outside China)/TCM (only for China).

6.2 Environmental Specifications

Table 6-2 Environmental specifications

Item	Specifications

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

The maximum air volume required for heat dissipation for a single node	101.1 CFM
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 humidity change rate: 20%/h
Altitude	≤ 3050 m • When the configuration complies with ASHRAE Class A1 and A2, and the operating altitude is above 900 m (2952.76 ft), the operating temperature decreases by 1°C (1.8°F) 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 1°C

Item	Specifications
	(1.8°F) for every increase of 175 m (574.15 ft).
Corrosive airborne contaminant	Maximum growth rate of the corrosion product thickness: • 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

Item	Description
Dimensions (H x W x D)	43.2 mm×536 mm×900 mm (1.70 in. x 21.10 in. x 35.43 in.)

Full configuration weight	• Net weight
	  – Maximum weight (configured without 12 NVMe drives): 16 kg (35.27 lb)
	  – Maximum weight (configured with 12 NVMe drives): 16.9 kg (37.26 lb)
	• Packing material weight: 8.7 kg (19.18 lb)

Energy 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, contact the local sales representatives.

NOTICE

If incompatible components are used, the device may be abnormal. Such a fault is beyond the scope of technical support and warranty.

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.
- This product is a Class A device. Take protective measures before operating this product in a residential area as it is likely to cause radio interference.

Personal Safety

- Only certified or authorized personnel are allowed to install equipment.
- 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 equipment 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
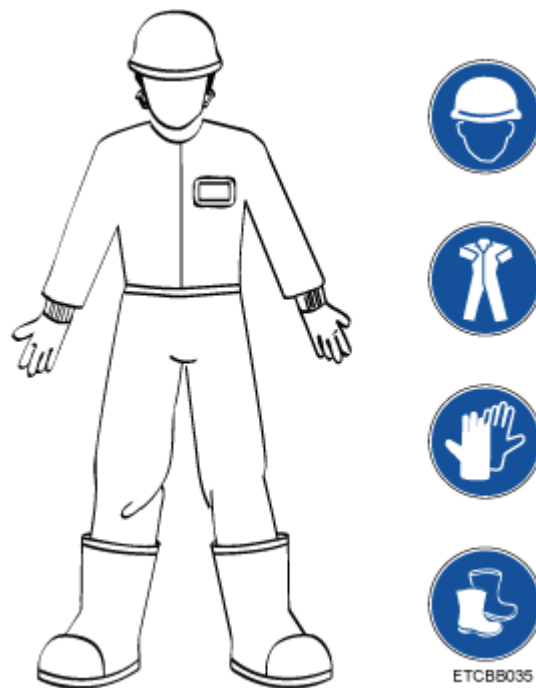
- Before touching a device, wear ESD clothing and gloves (or wrist strap), and remove any conductive objects (such as watches and jewelry). Figure 8-2 shows conductive objects that must be removed before you touch a device.

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
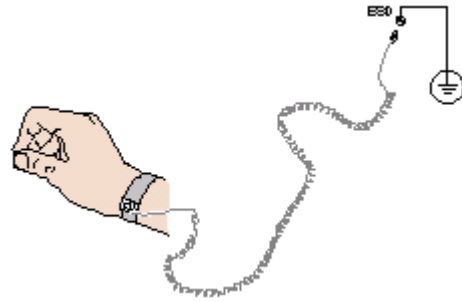
- Exercise caution when using tools that could cause personal injury.
- If the installation position of a device is higher than the shoulders of the installation personnel, use a vehicle such as a lift to facilitate installation. Prevent the device from falling down and causing personal injury or damage to the device.
- The equipment is powered by high-voltage power sources. Direct or indirect contact (especially through damp objects) with high-voltage power sources may result in serious injury or death.
- Ground the equipment before powering it on. Otherwise, high voltage leakage current may cause personal injury.
- When a ladder is used, ensure that another person holds the ladder steady to prevent accidents.
- Do not look into optical ports without eye protection when installing, testing, or replacing optical cables.

Equipment Safety

- Use the recommended power cables at all times.
- Power cables are used only for dedicated servers. Do not use them for other devices.
- Before operating equipment, wear ESD clothes and gloves to prevent electrostatic-sensitive devices from being damaged by ESD.
- 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 the equipment with care.
- Exercise caution to prevent damage to the device when using tools during installation or maintenance.
- Connect the primary and secondary power cables to different power distribution units (PDUs) to ensure reliable system operation.
- Ground a device before powering it on. Otherwise, high voltage leakage current may cause device damage.

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, damp, pollution, or package damage.

- 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, contact 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 single 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 one 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
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 xFusion Super-Care Services.

For details about warranty, see xFusion Warranty Policy.

9 System Management

The product integrates the latest iBMC intelligent management system (iBMC), which is a remote server management system. It has hardware monitor and management function with high reliability.

The main features of iBMC are as follows:

- Multiple management interfaces for system integration

  The iBMC provides the following standard interfaces to meet various system integration requirements:

  - Data Center Manageability Interface (DCMI) V1.5
  - Intelligent Platform Management Interface (IPMI) V1.5/V2.0
  - Command-line interface (CLI)
  - Redfish interface
  - Hypertext Transfer Protocol Secure (HTTPS) interface
  - Simple Network Management Protocol (SNMP) interface

- Fault monitoring and diagnosis

  The iBMC detects hidden risks and ensures stable, uninterrupted 24/7 system operation by providing the following features:

  - System breakdown screenshots and video playback: helping identify the cause of system breakdown
  - Screen snapshots and videos: simplifying routine preventive maintenance, recording, and auditing
  - Fault diagnosis & management (FDM): providing precise fault diagnosis based on components, facilitating positioning and replacement of faulty parts
  - Report of alarms by syslog, trap, and email: facilitating report of server alarms to the upper-layer network management system (NMS) and helping users learn about server alarms in a timely manner

- Security management

  - The iBMC uses image mirroring to improve system security. Even if the running software breaks down, the system can start from the backup image.
  - Diversified user security control interfaces ensure login security.
  - The iBMC supports import and replacement of multiple types of certificates to ensure data transmission security.

- System maintenance interfaces

- The iBMC supports keyboard, video, and mouse (KVM) and virtual media to facilitate remote maintenance.
- Smart Provisioning implements DVD-free OS installation, RAID configuration, and upgrades, simplifying server installation and configuration.

- Diversified network protocols
  - The iBMC supports the Network Time Protocol (NTP) to facilitate time settings and ensure time synchronization.
  - The iBMC supports domain management and directory services to simplify network management.
- Intelligent power supply management
  - Power capping helps improve deployment density.
  - Dynamic energy saving helps reduce the operating expense (OPEX).
- License management

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

  The advanced edition of the iBMC provides the following features:
  - Deploy OS through the Redfish interface.
  - Collect the original data of intelligent diagnostics through the Redfish interface.

For details about iBMC, see FusionPoD Server Node iBMC User Guide.

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.

Figure A-1 SN example

Table A-1 SN description

SN	Description
1	SN ID (two characters), which can only be 21.
2	Material identification code (eight digits), that is, processing code.
3	Vendor code (two digits), that is, the code of the processing place.

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.

SN	Description
	– Letters A to C indicate October to December, respectively.
5	Sequence number (six characters).
6	RoHS compliance (one character). Y indicates environmental-friendly processing.
7	Internal model, that is, product name.

A.2 Operating Temperature Limitations

Table A-2 Operating temperature limitations

Configuration	Maximum Operating Temperature 35°C (95°F)	Maximum Operating Temperature 40°C (104°F)
-	• All options supported	• All options supported
Note: When a single fan is faulty, the maximum operating temperature is 5°C (9°F) lower than the rated value.		

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 *FusionPoD Server Node BIOS Parameter Reference (V5)* or *FusionPoD Server Node BIOS Parameter Reference (V6)*

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.

Module Name	Feature	Description
	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.
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 FRB (fault resilient boot)	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.

Module Name	Feature	Description
	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
CPU N 12V (V)	CPU N 12 V input voltage	Mainboard N indicates the CPU number. The value is 1 or 2.
CPU N Core Rem (°C)	CPU N core temperature	Mainboard N indicates the CPU number. The value is 1 or 2.
CPU N DDR VDDQ (V)	Memory 1.2 V voltage	Mainboard N indicates the CPU number. The value is 1 or 2.
CPU N DDR VDDQ2 (V)	Memory 1.2 V voltage	Mainboard N indicates the CPU number. The value is 1 or 2.
CPU N DTS	CPU N DTS value	Mainboard N indicates the CPU number. The value is 1 or 2.

Sensor	Description	Component
CPU *N* MEM Temp (°C)	CPU *N* corresponds to memory temperature	Mainboard *N* indicates the CPU number. The value is 1 or 2.
CPU *N* VCCIO (V)	CPU *N* VCCIO voltage	Mainboard *N* indicates the CPU number. The value is 1 or 2.
CPU *N* VDDQ Temp (°C)	CPU *N* VDDQ temperature	Mainboard *N* indicates the CPU number. The value is 1 or 2.
CPU *N* VRD Temp (°C)	CPU *N* VRD temperature	Mainboard *N* indicates the CPU number. The value is 1 or 2.
CPU *N* VSA (V)	CPU *N* VSA voltage	Mainboard *N* indicates the CPU number. The value is 1 or 2.
CPU *N* Margin	CPU *N* Margin	Mainboard *N* indicates the CPU number. The value is 1 or 2.
CPU *N* VCCANA (V)	CPU *N* VCCANA voltage	Mainboard *N* indicates the CPU number. The value is 1 or 2.
CPU *N* P1V8 (V)	SVID 1.8 V voltage	Mainboard *N* indicates the CPU number. The value is 1 or 2.
Disks Temp (°C)	Hard drive temperature	Drive
FAN *N* F Speed (RPM)	Fan *N* front speed	Fan module *N* *N* indicates the fan module number. The value ranges from 1 to 7.
FAN *N* R Speed (RPM)	Fan *N* rear speed	Fan module *N* *N* indicates the fan module number. The value ranges from 1 to 7.
Inlet Temp (°C)	Air inlet temperature	Left O&M port module U2
Outlet Temp (°C)	Air outlet temperature	iBMC position
PCIe 1 CPU Temp (°C)	PCIe 1 CPU core temperature	NIC CPU
PCIe 1 Inlet Temp (°C)	PCIe 1 inlet temperature	NIC CPU
PCIe 2 NIC 0.8 V (V)	NIC 0.8 V voltage	NIC voltage

Sensor	Description	Component
PCIe 2 NIC 1.2 V (V)	NIC 1.2 V voltage	NIC voltage
PCIe2 NIC 1.8 V (V)	NIC 1.8 V voltage	NIC voltage
PCIe 2 NIC 3.3 V (V)	NIC 3.3 V voltage	NIC voltage
PCIe2 NIC Temp (°C)	NIC temperature	NIC temperature
PS1 Chip Temp (°C)	Power1 chip temperature	PSUs
PS1 Inlet Temp (°C)	Power1 inlet temperature	PSUs
PS1 VIN (V)	Input voltage	PSUs
Power (W)	Server input power	PSUs
Power1 (W)	Input power of the PSU	PSUs

B Term

B.1 A-E

B

BMC	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	A hardware device that provides public video, keyboard and mouse (KVM).

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. PCIe is based on the existing PCI system. Therefore, the existing PCI system can be converted into PCIe only by modifying the physical layer without modifying the software. PCIe has a faster rate. It can replace almost all existing internal buses (including AGP and PCI).

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

Serial advanced technology	SATA is the serial structure evolved from parallel bus of ATA.

attachment (SATA)	
Server	A special computer that provides services for clients over a network.
System event log (SEL)	System event log. A non-volatile storage area and associated interfaces for storing system events for later retrieval.

T

Trusted cryptography module (TCM)	Mirco controller of storing keys, passwords and digital certificates. It can ensure the security of data stored in computer to prevent attack from external software or entity theft.
Trusted platform module (TPM)	Root of trust provided by the computer platform is a safe micro processor featuring password function.

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. 1 U = 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

CD	Calendar Day
CE	Conformite Europeenne
CIM	Common Information Model
CLI	Command-Line Interface

D

DC	Direct Current

DDR4	Double Data Rate 4
DDDC	Double Device Data Correction
DEMT	Dynamic Energy Management Technology
DIMM	Dual In-line Memory Module
DRAM	Dynamic Random-Access Memory
DTS	Digital Thermal Sensor
DVD	Digital Video Disc

E

ECC	Error Checking and Correcting
ECMA	European Computer Manufacturer Association
EDB	Execute Disable Bit
EN	European Efficiency
ERP	Enterprise Resource Planning
ETS	European Telecommunication Standards

C.2 F-J

F

FCC	Federal Communications Commission
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

OS	Operating System

C.4 P-T

P

PCIe	Peripheral Component Interconnect Express
PDU	Power Distribution Unit
PHY	Physical Layer
PMBUS	Power Management Bus
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 Extension

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

UEFI	Unified Extensible Firmware Interface
UID	Unit Identification Light
UL	Underwriter Laboratories Inc.
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

W

WEEE	Waste Electrical and Electronic Equipment
WSMAN	Web Service Management