



White Paper for meta brain[®]

NF5688G7 Series Servers

Powered by Intel Processors

For NF5688-M7-A0-R0-00 and NF5688-M7-C0-R0-00

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Applicable Model

Model	Maintenance	Cooling
NF5688-M7-A0-R0-00	Rear access	Air cooling
NF5688-M7-C0-R0-00	Rear access	Liquid cooling

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Abstract

This document describes the NF5688G7 Intel-based server's appearance, features, performance parameters, and software and hardware compatibility, providing in-depth information of the server.

Intended Audience

This document is intended for pre-sales engineers.

Symbol Conventions

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

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

Revision History

Version	Date	Description of Changes
V1.0	2024/04/17	Initial release

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1 Product Overview

The NF5688G7 Intel-based system is a 6U AI server. It delivers a new generation of training platform compatible with multiple architectures. It features superior performance, extreme scalability and flexible deployment. A single server can provide up to 16 PFLOPS of AI computing power and extreme computing power density, making it ideal for ultra-large data center deployment in application scenarios such as ultra-large model training, AIGC, meta-universe, natural language understanding (NLU), and recommendation.

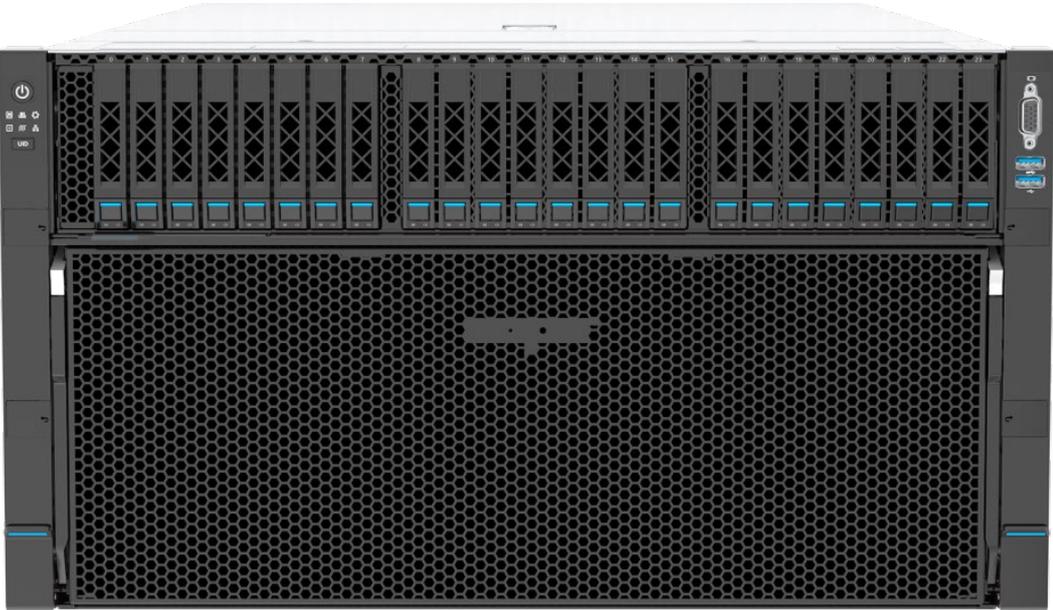
Based on an advanced topology, the system can house two 4th Gen Intel Xeon Scalable processors (Sapphire Rapids) and 8 NVIDIA Hopper 700 W GPUs in a 6U space, delivering unparalleled computing power density. With NVIDIA NVSwitch interconnect fabric, any two GPUs can have direct P2P data communication. The server supports a total GPU memory capacity of 640 GB and a total GPU memory bandwidth of 26.8 TB/s. It accommodates 12 PCIe 5.0 x16 expansion slots (NF5688-M7-A0-R0-00) or 11 PCIe 5.0 x16 expansion slots (NF5688-M7-C0-R0-00), achieving an ultimate GPU:IB for computing:IB for storage devices ratio of 8:8:2. The system supports up to 4.0 Tbps network bandwidth and 128 TB NVMe SSDs, which can meet the demand for parallel training of super-large models with trillion-level parameters. The discrete 12 V PSUs for the motherboard and 54 V PSUs for the GPUs offer a higher system energy efficiency ratio over the predecessor; layered and isolated air flow to the GPU and to the motherboard brings optimal cooling efficiency. In addition, the excellent and reliable redundancy design, including 12 V PSUs with 1+1 redundancy, 54 V PSUs with 3+3 redundancy, and motherboard fan modules with N+1 redundancy and rear fan modules with N+1 redundancy for cooling, makes the system perfect for data center deployment, providing customers with unprecedented reliability and stability.

NF5688-M7-C0-R0-00 is a liquid-cooled server that adopts cold-plate liquid cooling for the motherboard (CPUs and DIMMs) and GPUs on the basis of the air-cooled server NF5688-M7-A0-R0-00, solving the problem of poor heat dissipation of high-power GPUs and CPUs. It can help customers build high-performance and low-PUE (Power Usage Effectiveness) green data centers and smart computing centers, meeting the market demand for low-carbon liquid-cooled AI servers in the context of the "Dual Carbon" strategy.

In addition, the motherboard (CPUs and DIMMs)/GPU cold-plate liquid cooling system of NF5688-M7-C0-R0-00 adopts an even-flow design to meet the cooling needs of the motherboard and GPU modules. It supports up to 45°C (113°F) liquid inlet temperature, and reduces the number of rear fans, which lowers the power consumption and noise of the system, and achieves the best cooling efficiency. The system is equipped with a liquid leakage detection function, and the ISBMC can

continuously monitor the system parameters and liquid leakage, trigger alarms and execute protective measures to avoid downtime and other problems caused by liquid leakage.

Figure 1-1 NF5688G7 Intel-based System



2 Features

2.1 Scalability and Performance

- Features the 4th Gen Intel Xeon Scalable processors (Sapphire Rapids), with up to 56 cores per processor, a max base frequency of 2.6 GHz, a max Turbo frequency of 3.8 GHz, an L3 cache up to 2.8 MB per core, and 3 UPI links per CPU at up to 16 GT/s, delivering unrivaled processing performance.
 - With the processor cache hierarchy optimization, a larger L2 cache of private 1 MB per core is provided, so that memory data can be put and processed directly in L2 cache, improving the memory access performance and reducing the demand for L3 cache capacity.
 - Supports Intel Turbo Boost Technology 2.0 and automatically scales CPU speeds up to the max Turbo frequency at peak workloads, allowing processor cores to exceed the thermal design power (TDP) for a limited time.
 - Supports Intel Hyper-Threading Technology, allowing up to 2 threads to run on each core to improve the performance of multi-threaded applications.
 - Supports Intel Virtualization Technology that provides hardware assist to the virtualization software, allowing the operating system to better use hardware to handle virtualized workloads.
 - Supports Intel Advanced Vector Extensions 512 (Intel AVX-512), significantly accelerating the workloads that are strongly floating point compute intensive.
- Supports up to 32 DDR5 ECC DIMMs (4,800 MT/s, RDIMMs), delivering superior speed, high availability, and a memory capacity up to 4 TB.
- Flexible drive configurations provide elastic and expandable storage solutions to meet different capacity and upgrade requirements.
- Delivers all-SSD configuration, bringing higher I/O performance over all-HDD configuration or HDD-SSD mixing configuration.
- Offers 24 Gbps serial attached SCSI (SAS 4.0), doubling the data transfer rate of internal storage of 12 Gbps SAS (SAS 3.0) solution and maximizing the performance of storage I/O-intensive applications.

- With the Intel integrated I/O technology, the processors integrate the PCIe 5.0 controller to significantly reduce I/O latency and enhance overall system performance.
- Brand new CXL 2.0 technology built on PCIe 5.0 enables resource sharing among different PCIe devices.
- Up to 12 PCIe 5.0 expansion slots (populated with up to 11 PCIe expansion cards).
- One hot-plug OCP 3.0 slot that can flexibly support one 10/25/100 Gb OCP 3.0 card.

2.2 Availability and Serviceability

- Supports hot-swap SAS/SATA/NVMe drives and RAID cards with RAID levels 0/1/1E/10/5/50/6/60, RAID cache and data protection enabled by the super-capacitor in case of power failures. Supported RAID levels vary with RAID cards.
- SSDs are much more reliable than traditional HDDs, increasing system uptime.
- The BMC management network port on the rear panel enables local ISBMC O&M, improving O&M efficiency.
- Up to 2 hot-swap 12 V PSUs with 1+1 redundancy and 6 hot-swap 54 V PSUs with 3+3 redundancy; 6 hot-swap motherboard fan modules with N+1 redundancy, and 6 rear hot-swap fan modules (NF5688-M7-A0-R0-00) or 5 rear hot-swap fan modules (NF5688-M7-C0-R0-00) with N+1 redundancy, improving system availability.
- The ISBMC monitors system parameters in real time and sends alerts in advance, enabling technicians to take appropriate measures in time to ensure stable system operation and minimize system downtime.
- Online memory diagnosis helps service technicians quickly locate the failed DIMMs, improving maintenance efficiency.

2.3 Manageability and Security

- The ISBMC monitors system operating status and enables remote management.
- The Network Controller Sideband Interface (NC-SI) feature allows a network port to serve as a management port and a service port. The NC-SI feature is disabled by default and can be enabled/disabled through the BIOS or ISBMC.
- The industry-standard UEFI improves the efficiency of setup, configuration and update, and simplifies the error handling process.

- Intel Platform Firmware Resilience (PFR) further protects BMC and BIOS firmware from malicious tampering, detects and automatically restores corrupted firmware, thus avoiding intrusions into the system.
- Trusted Platform Module (TPM) 2.0 and Trusted Cryptography Module (TCM) provide advanced encryption.
- Intel Trusted Execution Technology provides enhanced security through hardware-based resistance to malicious software attacks.
- The firmware update mechanism based on digital signatures prevents unauthorized firmware updates.
- UEFI Secure Boot protects the system from malicious bootloaders.
- Hierarchical password protection in BIOS ensures system boot and management security.
- BIOS Secure Flash and BIOS Lock Enable (BLE) reduce attacks from malicious software on the BIOS flash region.
- Dual-image mechanism for BMC and BIOS recovers firmware upon detection of corrupted firmware.
- BMC Secure Boot protects BMC from malicious tampering.
- Flexible BMC access control policies improve BMC management security.
- Chassis intrusion detection enhances physical security.



NOTE

The NC-SI port supports the following features:

- The NC-SI port can be bonded to any network port of the OCP 3.0 card or of PCIe NIC that supports NC-SI.
- Supports the enablement/disablement and configuration of Virtual Local Area Network ID (VLAN ID). VLAN is disabled by default.
- Supports IPv6 and IPv4 addresses. IP address, subnet mask, default gateway, and prefix length of IPv6 address can be configured.



CAUTION

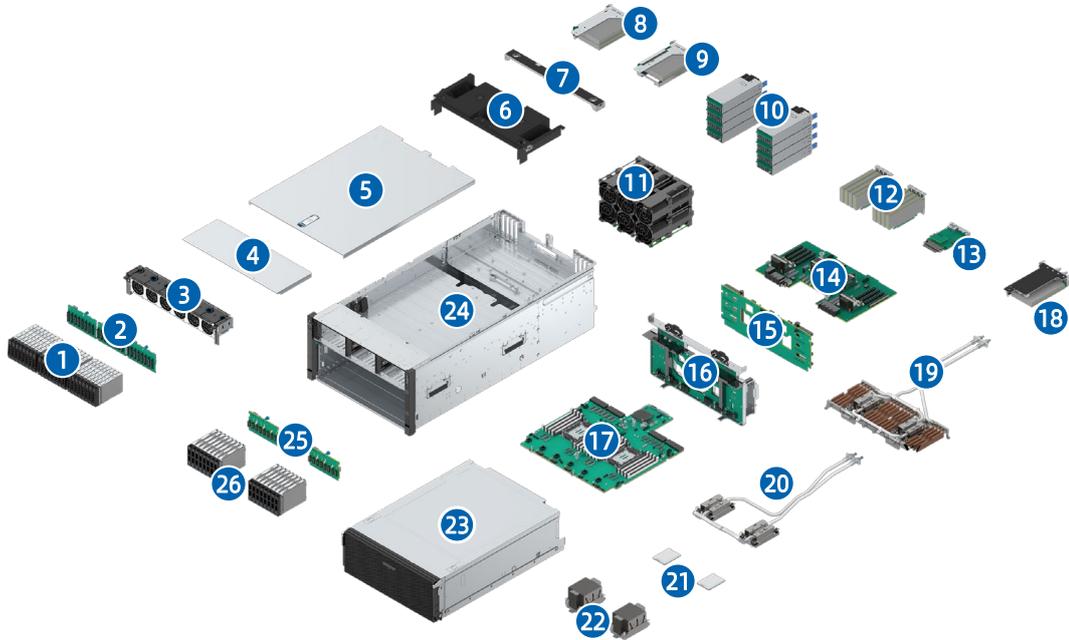
UEFI mode is supported by default. If Legacy mode is needed, contact our customer service.

2.4 Energy Efficiency

- Equipped with 80 Plus Titanium PSUs of different power efficiency levels, with power efficiency up to 96% at a load of 50%.
- Supports two 12 V PSUs with 1+1 redundancy and six 54 V PSUs with 3+3 redundancy, supports AC/DC power input, improving power conversion efficiency.
- Features the high-efficiency single-board voltage regulator-down (VRD) solution, reducing DC-DC conversion loss.
- Supports Proportional-Integral-Derivative (PID) intelligent fan speed control and intelligent CPU frequency scaling, conserving energy.
- Offers a fully-optimized system cooling design with energy-efficient cooling fans, lowering energy consumption from system cooling.
- Provides power capping and power control measures.
- Supports staggered spin-up of drives, reducing power consumption during server startup.
- Supports Intel Intelligent Power Capability (IIPC) to optimize energy usage in the processor cores by turning computing functions on only when needed.
- Supports the 4th Gen Intel Xeon Scalable processors (Sapphire Rapids), consuming less energy per core, improving energy efficiency, and reducing operation cost per unit.

3 System Parts Breakdown

Figure 3-1 Exploded View



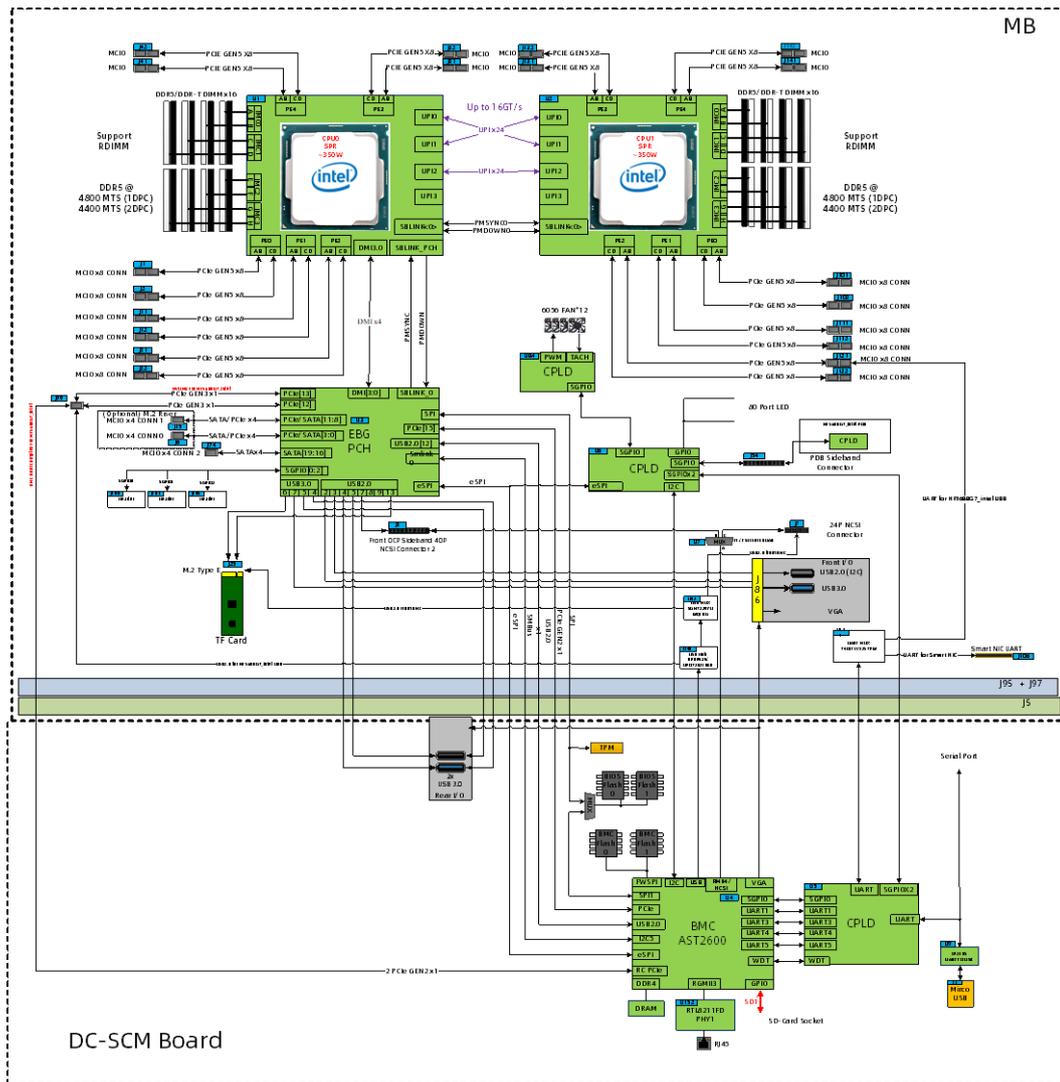
Item	Feature	Item	Feature
1	2.5-Inch Drive Module	14	Switch Board
2	2.5-Inch Drive Backplane	15	PDB (with rear fan connectors)
3	Motherboard Fan Module	16	Midplane
4	Middle Top Cover	17	Motherboard
5	Rear Top Cover	18	PCIe Riser Module (PCIe expansion card × 1 + motherboard liquid-cooling tubes)
6	Air Duct Module	19	Motherboard Liquid-Cooling Module (CPU + DIMM)
7	Reinforcement Crossbar	20	Motherboard Liquid-Cooling Module (CPU)
8	PCIe Riser Module (for up to 2 PCIe expansion cards)	21	CPU
9	PCIe Riser Module (PCIe expansion card × 1 OCP 3.0 card × 1)	22	Heatsink
10	PSU (12 V PSU × 2 +54 V PSU × 6)	23	GPU Box

11	Rear Fan Module	24	Chassis
12	LP Card	25	E3.S Drive Backplane
13	DC-SCM Board	26	E3.S SSD

4 Logical Diagram

4.1 System Logical Diagram

Figure 4-1 Motherboard Logical Diagram

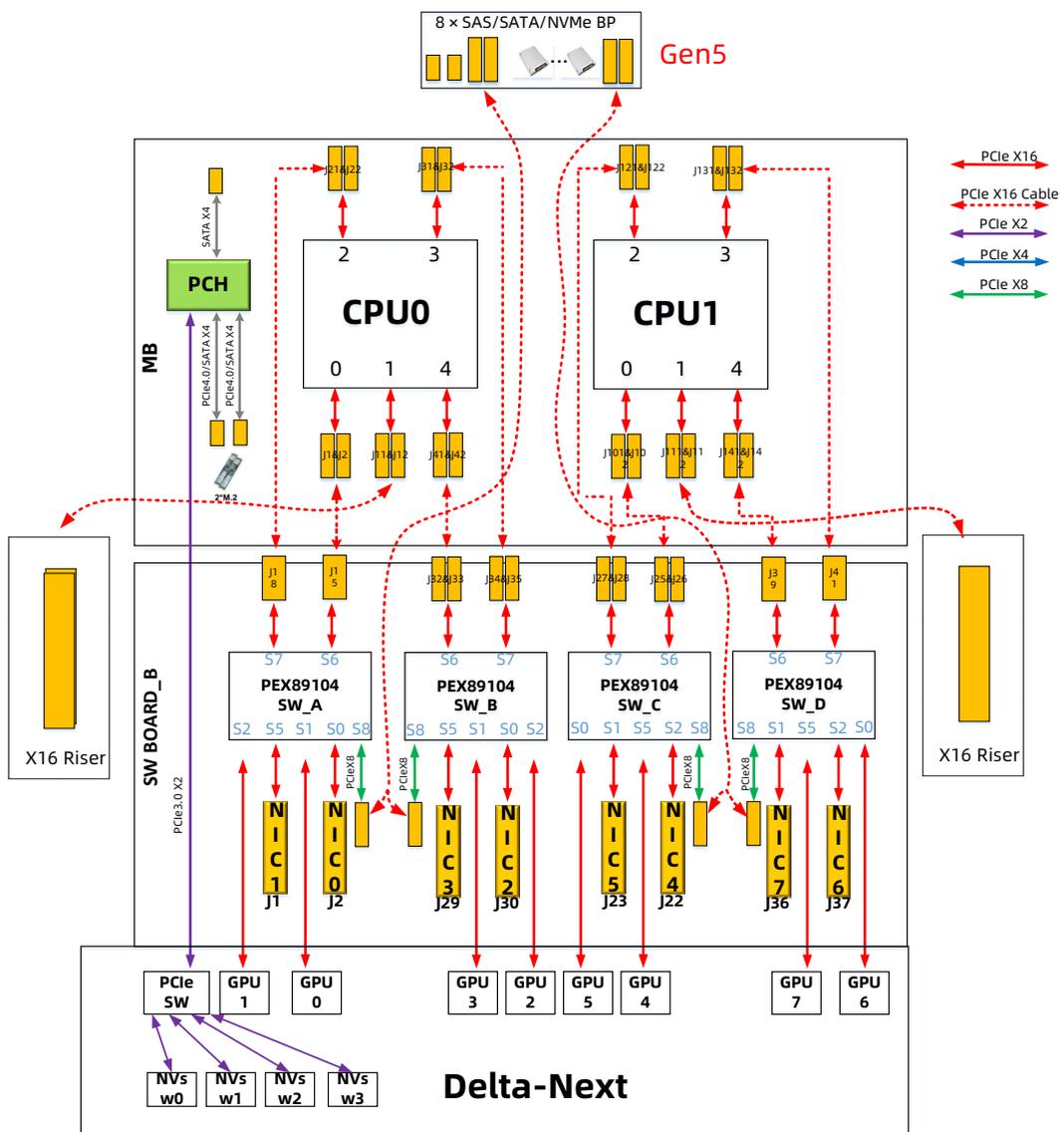


- Two 4th Gen Intel Xeon Scalable processors (Sapphire Rapids).
- Up to 32 DIMMs.
- Up to 3 UPI links per CPU at up to 16 GT/s.
- Up to 12 PCIe 5.0 expansion slots. CPU0 supports 1 single-host OCP 3.0 card or CPU0 and CPU1 support 1 socket-direct OCP 3.0 card.

- Multiple local storage configurations are supported through different drive backplanes.
- The motherboard integrates the Emmitsburg (EBG) Platform Controller Hub (PCH) to support 3 USB 3.0 ports, 1 USB 2.0 port, eight 2.5-inch SATA 3.0 drives or 2 SATA M.2 or 2 NVMe M.2 SSDs, and 1 or 2 TF cards via 1 TF card adapter.
- The DC-SCM board integrates an AST2600 management chip and supports 1 VGA port, 1 BMC management network port, 1 system/BMC serial port, 1 TF card slot, and other connectors.

4.2 PCIe Logical Diagram

Figure 4-2 PCIe Topology Logical Diagram



- The PCIe switch employs Broadcom's latest Atlas2 104-lane PCIe switch chip in internal Synthetic Switch mode (iSSw) mode.
- PE0/PE2/PE3/PE4 of each CPU is connected to 2 PCIe switches, and each PCIe switch has 2 uplink ports and 6 downlink ports; the 6 downlink ports can be connected to 2 GPUs, 2 NICs and 2 NVMe drives, maximizing PCIe utilization.
- The system can be equipped with NVIDIA Hopper HGX 8-GPU baseboard in application scenarios of large-scale AI training such as search, recommendation, Natural Language Processing (NLP), Computer Vision (CV) and autopilot. It can meet the computing power demand of large-scale AI training applications and match the AI application needs of cloud service, Intelligent Virtual Assistant (IVA), finance and education and research.

5 Hardware Description

5.1 Front Panel

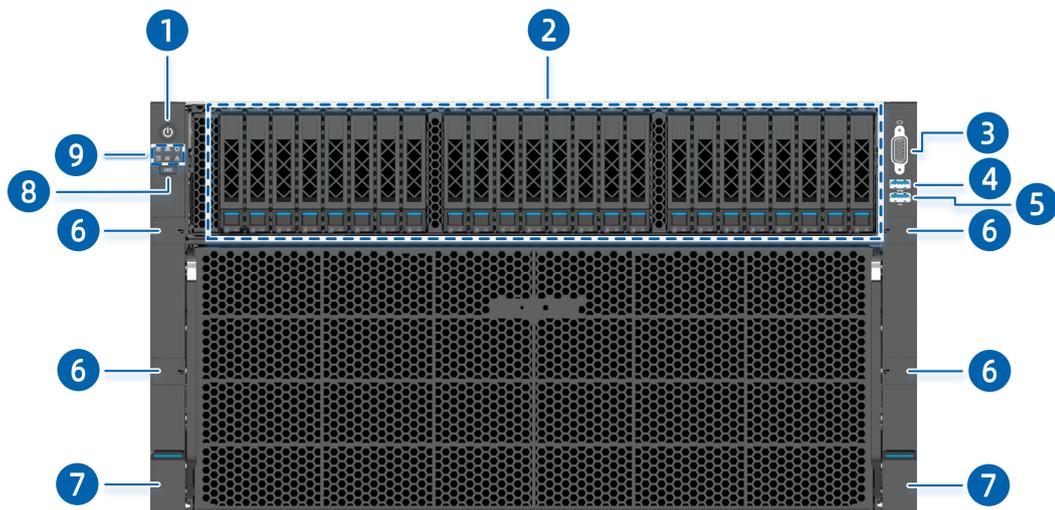


NOTE

Applicable model: NF5688-M7-A0-R0-00 and NF5688-M7-C0-R0-00.

5.1.1 24 × 2.5-Inch Drive Configuration

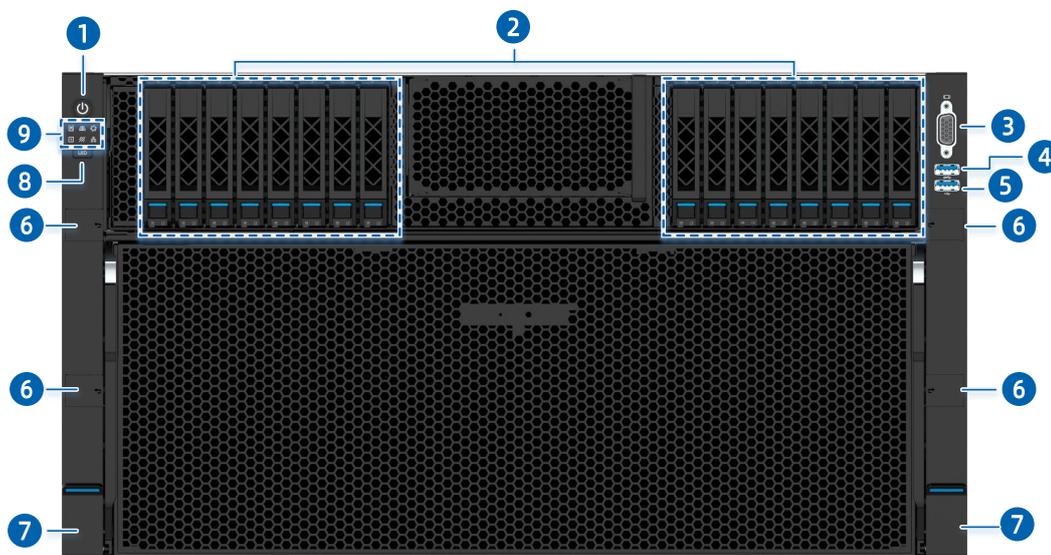
Figure 5-1 Front View



Item	Feature
1	Power Button and LED
2	2.5-Inch Drive Bay × 24
3	VGA Port
4	USB 3.0 Port
5	USB 2.0 Port
6	Server Fixing Screw Cover × 4
7	Ear Latch × 2
8	UID/BMC RST Button and LED
9	LEDs

5.1.2 16 × 2.5-Inch Drive Configuration

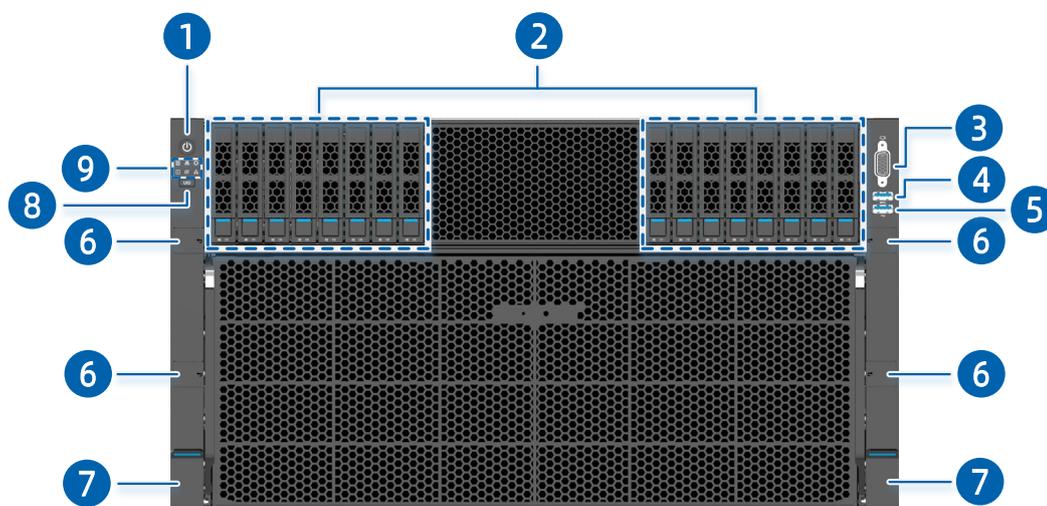
Figure 5-2 Front View



Item	Feature
1	Power Button and LED
2	2.5-Inch Drive Bay × 16
3	VGA Port
4	USB 3.0 Port
5	USB 2.0 Port
6	Server Fixing Screw Cover × 4
7	Ear Latch × 2
8	UID/BMC RST Button and LED
9	LEDs

5.1.3 16 × E3.S Drive Configuration

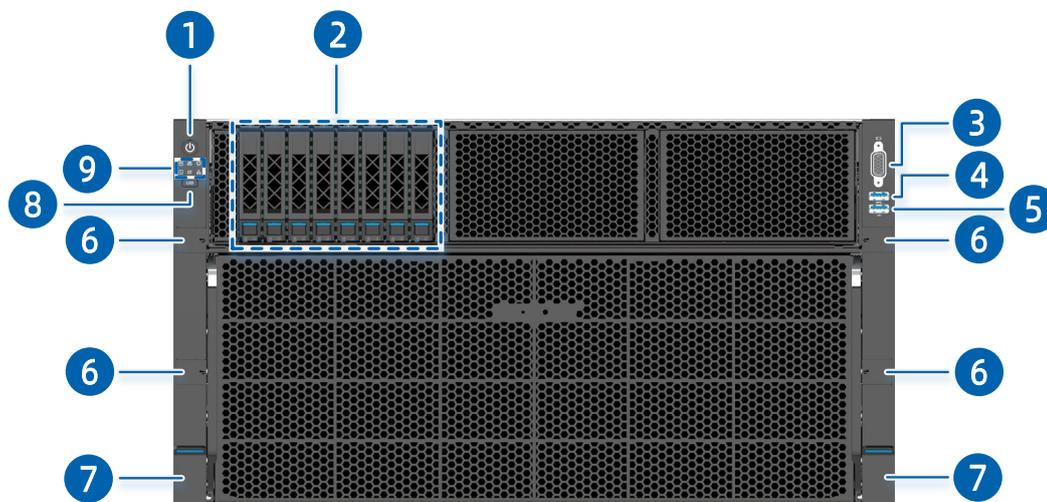
Figure 5-3 Front View



Item	Feature
1	Power Button and LED
2	E3.S Drive Bay × 16
3	VGA Port
4	USB 3.0 Port
5	USB 2.0 Port
6	Server Fixing Screw Cover × 4
7	Ear Latch × 2
8	UID/BMC RST Button and LED
9	LEDs

5.1.4 8 × 2.5-Inch Drive Configuration

Figure 5-4 Front View

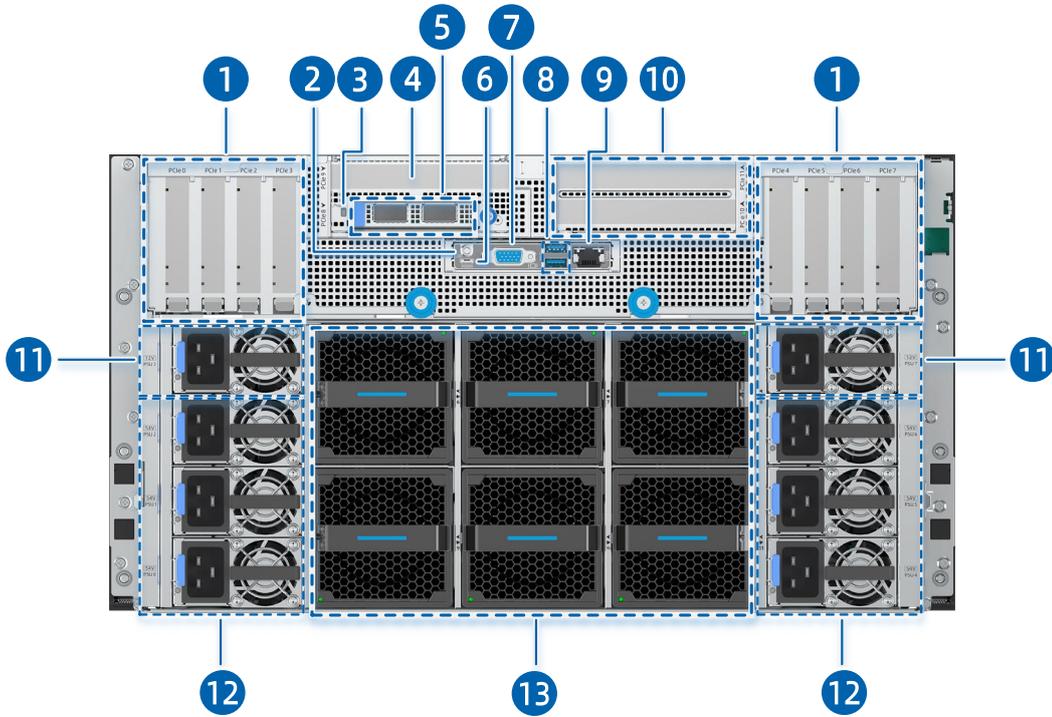


Item	Feature
1	Power Button and LED
2	2.5-Inch Drive Bay × 8
3	VGA Port
4	USB 3.0 Port
5	USB 2.0 Port
6	Server Fixing Screw Cover × 4
7	Ear Latch × 2
8	UID/BMC RST Button and LED
9	LEDs

5.2 Rear Panel

5.2.1 NF5688-M7-A0-R0-00

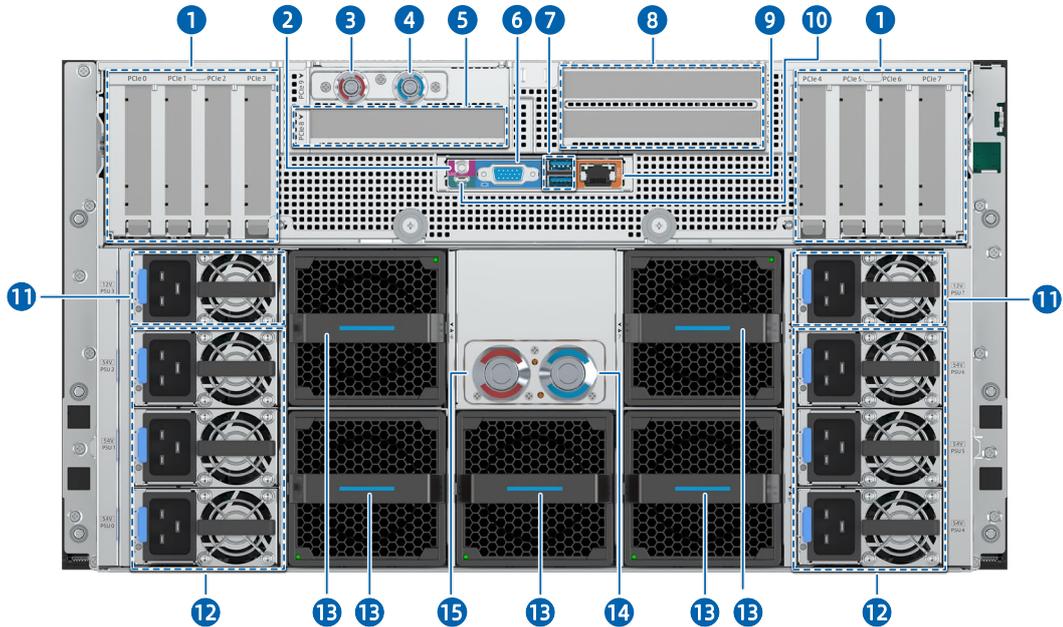
Figure 5-5 Rear View



Item	Feature	Item	Feature
1	LP Card Slot × 8	8	USB 3.0 Port × 2
2	UID/BMC RST Button and LED	9	BMC Management Network Port
3	OCP Hot-Plug Button and LED	10	PCIe Riser Module (PCIe slot 10 and PCIe slot 11)
4	PCIe Slot 9	11	12 V PSU × 2
5	OCP 3.0 Card (occupying PCIe slot 8)	12	54 V PSU × 6
6	System/BMC Serial Port	13	Rear Fan Module × 6
7	VGA Port	-	-

5.2.2 NF5688-M7-C0-R0-00

Figure 5-6 Rear View

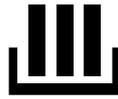


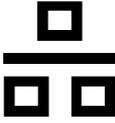
Item	Feature	Item	Feature
1	LP Card Slot × 8	9	BMC Management Network Port
2	UID/BMC RST Button and LED	10	System/BMC Serial Port
3	Motherboard Liquid Outlet	11	12 V PSU × 2
4	Motherboard Liquid Inlet	12	54 V PSU × 6
5	PCIe Slot 8	13	Rear Fan Module × 5
6	VGA Port	14	GPU Liquid Inlet
7	USB 3.0 Port × 2	15	GPU Liquid Outlet
8	PCIe Riser Module (PCIe slot 10 and PCIe slot 11)	-	-

5.3 LEDs and Buttons

Table 5-1 LED and Button Description

Item	Icon	Feature	Description
1		Power Button and LED	<ul style="list-style-type: none"> Power LED: <ul style="list-style-type: none"> Off = No power

Item	Icon	Feature	Description
			<ul style="list-style-type: none"> - Solid green = Power-on state - Solid orange = Standby state • Power button: <ul style="list-style-type: none"> - Press and release the button to power on the system from the standby state. - Press and hold the button for 6 seconds to force a shutdown from the power-on state.
2		System Status LED	<ul style="list-style-type: none"> • Off = Normal • Blinking red (1 Hz) = A warning error is detected on CPU, memory, power supply, drive, fan, etc. • Solid red = A critical error is detected on CPU, memory, power supply, drive, fan, etc.
3		Memory Status LED	<ul style="list-style-type: none"> • Off = Normal • Blinking red (1 Hz) = A warning error occurs • Solid red = A critical error occurs
4		Fan Status LED	<ul style="list-style-type: none"> • Off = Normal • Blinking red (1 Hz) = A warning error occurs • Solid red = A critical error occurs, including fan failure and fan absence
5		Power Status LED	<ul style="list-style-type: none"> • Off = Normal • Blinking red (1 Hz) = A warning error occurs • Solid red = A critical error occurs

Item	Icon	Feature	Description
6		System Overheat LED	<ul style="list-style-type: none"> • Off = Normal • Blinking red (1 Hz) = A warning error occurs, including Proc Hot, resulting in CPU throttling • Solid red = A critical error occurs, including CPU Thermal Trip/PCH Hot/MEM Hot, etc.
7		Network Status LED	<ul style="list-style-type: none"> • Off = No network connection • Blinking green = Network connected with data being transmitted • Solid green = Network connected without data being transmitted <p>Note: It only indicates the status of the self-developed OCP card.</p>
8		UID/BMC RST Button and LED	<ul style="list-style-type: none"> • UID/BMC RST LED: <ul style="list-style-type: none"> - Blinking blue (4 Hz) = PFR authentication failed and the system cannot be recovered - Solid blue = The UID LED is activated by the UID button or via the BMC - Gradually turning blue within 2 seconds and then gradually turning off within 2 seconds = PFR is booting normally (Note: The server can be powered on only after this LED turns off.) • UID/BMC RST button: <ul style="list-style-type: none"> - Press and release the button to activate the UID LED. - Press and hold the button for 6 seconds to force a BMC reset.



NOTE

- Warning error: Errors that result in redundancy degradation or failure, and other errors that have a minor impact on the business and require attention.
- Critical error: Errors that result in system crash or restart, or part failure, and other errors that have a major impact on the business and require immediate attention.

5.4 Port Description

Table 5-2 Port Description

Item	Port	Description
1	VGA Port	Enables you to connect a display terminal to the system, for example, a monitor.
2	USB 3.0 Port	Enables you to connect a USB 3.0 device to the system.
3	USB 2.0 Port	Enables you to connect a USB 2.0 device to the system.
4	BMC/System Serial Port	<ul style="list-style-type: none">• Enables you to capture system or BMC logs and debug the BMC.• Enables you to print system logs.
5	BMC Management Network Port	Enables you to manage the server. Note: It is a Gigabit Ethernet port that supports 10 Mbps, 100 Mbps and 1,000 Mbps auto-negotiation.
6	OCP Network Port	Enables you to connect the system to the network.

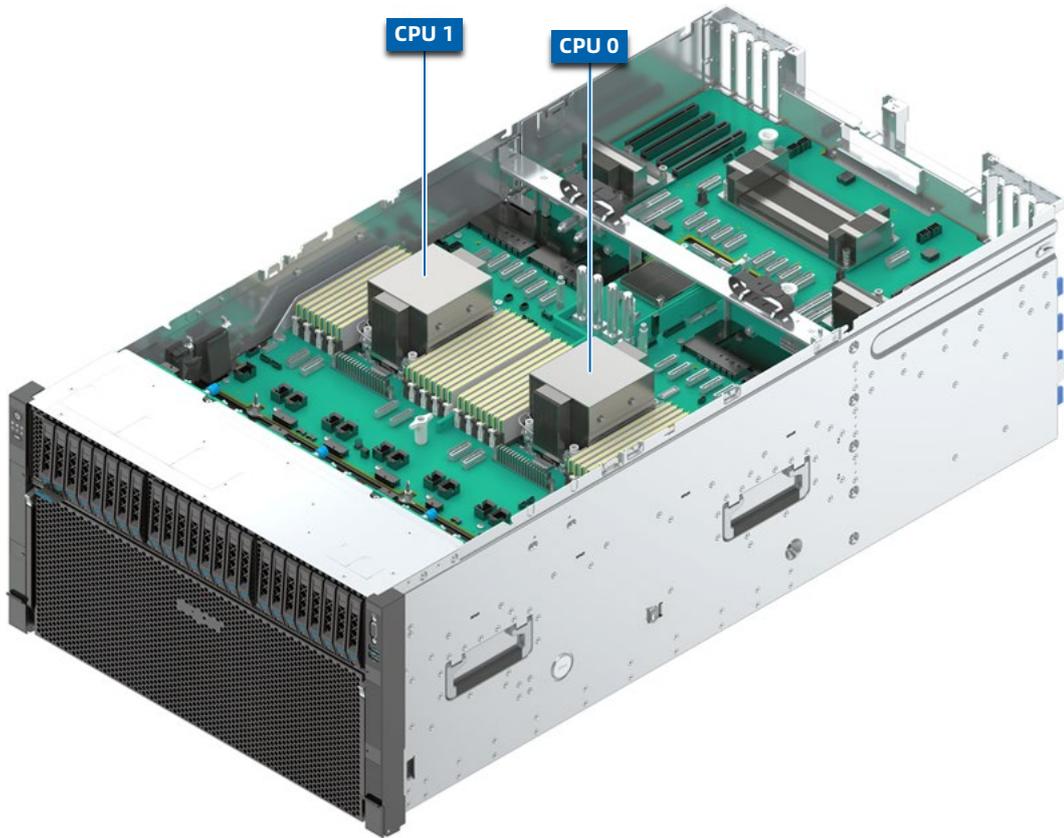
5.5 Processors

- Two 4th Gen Intel Xeon Scalable processors.
- The processors used in a server must bear the same model.

For specific system processor options, consult your local sales representative or refer to [7.2 Hardware Compatibility](#).

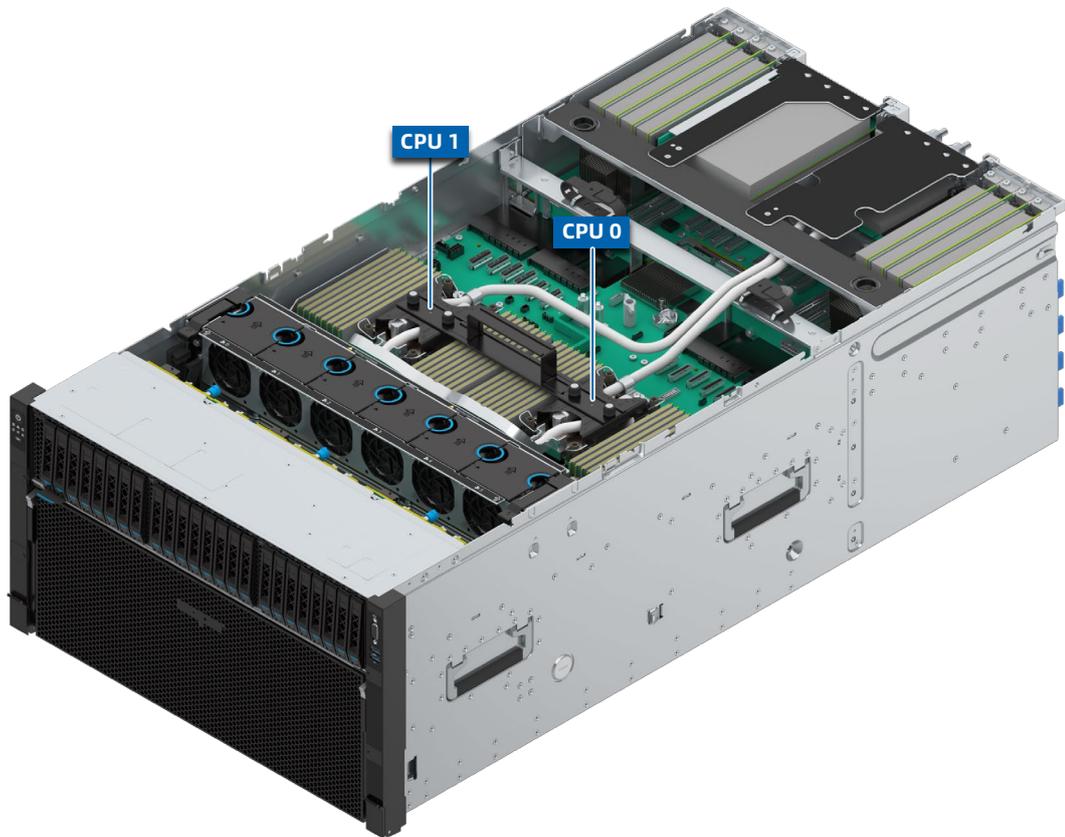
5.5.1 NF5688-M7-A0-R0-00

Figure 5-7 Processor Locations



5.5.2 NF5688-M7-C0-R0-00

Figure 5-8 Processor Locations

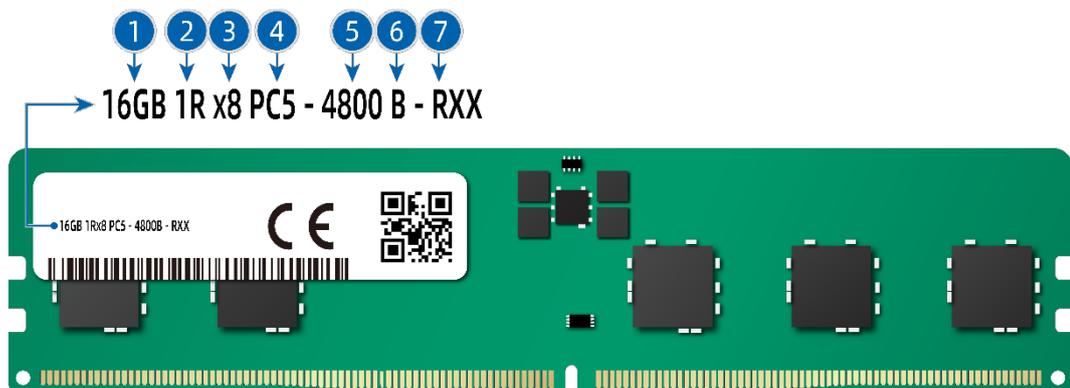


5.6 Memory

5.6.1 Identification

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

Figure 5-9 DIMM Identification



Item	Description	Example
1	Capacity	<ul style="list-style-type: none"> • 16 GB • 32 GB • 64 GB • 128 GB • 256 GB
2	Rank(s)	<ul style="list-style-type: none"> • 1R = Single rank • 2R = Dual rank • 2S2R = Two ranks of two high stacked 3DS DRAM • 2S4R = Four ranks of two high stacked 3DS DRAM • 4R = Quad rank
3	Data width of DRAM	<ul style="list-style-type: none"> • x4 = 4 bits • x8 = 8 bits
4	DIMM slot type	PC5 = DDR5
5	Maximum memory speed	<ul style="list-style-type: none"> • 4,800 MT/s • 5,600 MT/s
6	CAS latency	<ul style="list-style-type: none"> • SDP 4800B = 40-39-39 • 3DS 4800B = 46-39-39 • SDP 5600B = 46-45-45 • 3DS 5600B = 52-45-45
7	DIMM type	R = RDIMM

5.6.2 Memory Subsystem Architecture

The server supports 32 DIMM slots and 8 memory channels per CPU.

Within a channel, populate the DIMM slot with its silk screen ending with D0 first and second the DIMM slot with its silk screen ending with D1. For instance, within

CPU0 Channel 0, populate CPU0_C0D0 first and second CPU0_C0D1.

Table 5-3 DIMM Slot List

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

5.6.3 Compatibility

Refer to the following rules to configure the DDR5 DIMMs.

**IMPORTANT**

- A server must use DDR5 DIMMs with the same part number (P/N code). All DDR5 DIMMs operate at the same speed, which is the lowest of:
 - Memory speed supported by a specific CPU.
 - Maximum operating speed of a specific memory configuration.
- Mixing DDR5 DIMMs of different specifications (capacity, bit width, rank, height, etc.) is not supported.
- For specific system memory options, consult your local sales representative or refer to [7.2 Hardware Compatibility](#).

- DDR5 DIMMs can be used with the 4th Gen Intel Xeon Scalable processors (Sapphire Rapids). The maximum memory capacity supported is identical for different CPU models.
- The total memory capacity is the sum of the capacities of all DDR5 DIMMs.

**NOTE**

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

Table 5-4 DDR5 DIMM Specifications

Item		Value			
Capacity per DDR5 DIMM (GB)		16	32	64	128
Type		RDIMM	RDIMM	RDIMM	RDIMM
Rated speed (MT/s)		4,800	4,800	4,800	4,800
Operating voltage (V)		1.1	1.1	1.1	1.1
Maximum number of DDR5 DIMMs supported in a server ¹		32	32	32	32
Maximum capacity of DDR5 DIMMs supported in a server (GB) ²		512	1,024	2,048	4,096
Actual speed (MT/s)	1DPC ³	4,800	4,800	4,800	4,800
	2DPC	4,400	4,400	4,400	4,400

Item	Value
<p>Notes:</p> <ol style="list-style-type: none"> 1. The maximum number of DDR5 DIMMs supported is based on the dual-CPU configuration. 2. It indicates the maximum memory capacity supported when all the DIMM slots are populated with DDR5 DIMMs. 3. DPC (DIMM Per Channel) is the number of DIMMs per memory channel. <p>The information above is for reference only. Consult your local sales representative for details.</p>	

5.6.4 Population Rules

General population rules for DDR5 DIMMs:

- Install DIMMs only when the corresponding processor is installed.
- Install dummies in the empty DIMM slots.

Population rules for DDR5 DIMMs in specific modes:

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

5.6.5 DIMM Slot Layout

Up to 32 DDR5 DIMMs can be installed in a server, and a balanced DIMM configuration is recommended for optimal memory performance. DIMM configuration must be compliant with the DIMM population rules.

Figure 5-10 DIMM Slot Layout

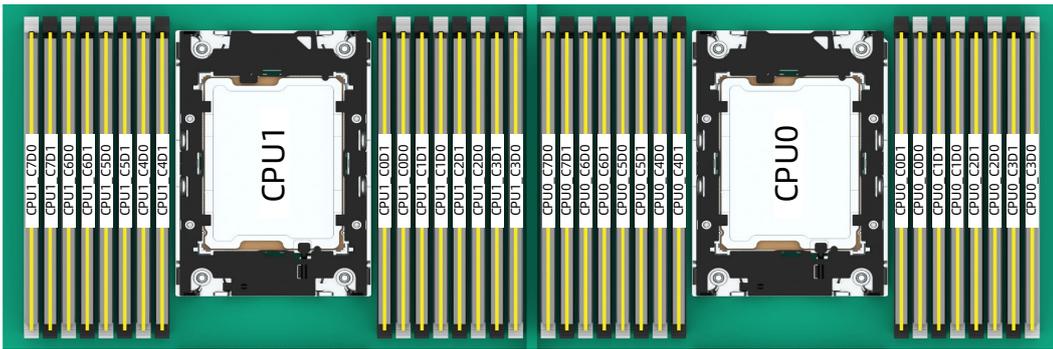


Table 5-5 DDR5 DIMM Population Rules (Dual-CPU Configuration)

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

5.7 Storage

5.7.1 Drive Configurations



NOTE

For the physical drive No. of each configuration, see [5.7.2 Drive Numbering](#).

Table 5-6 Drive Configurations

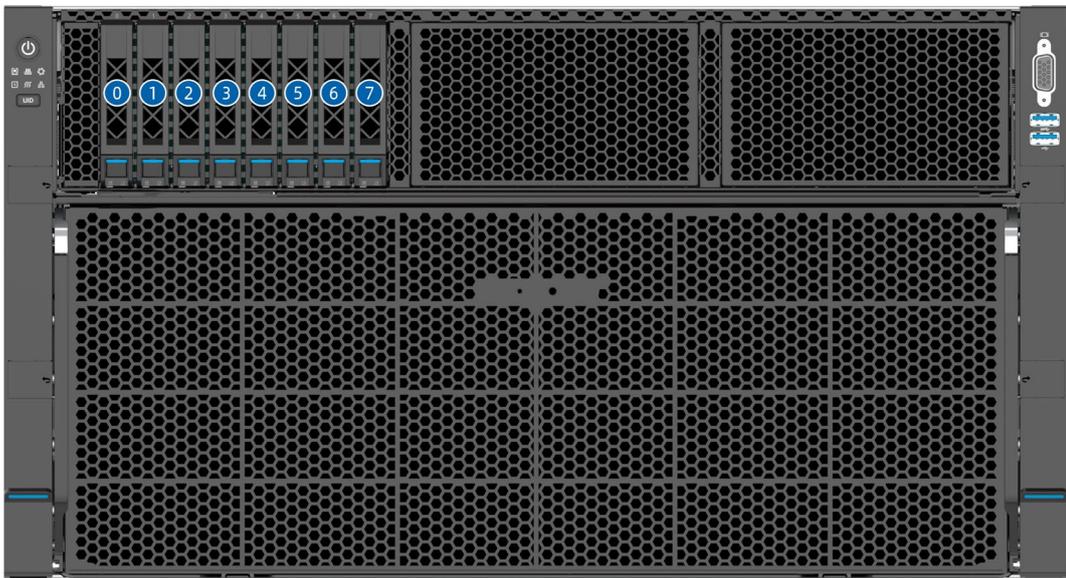
Configuration	Front Drives	Internal Drives	Drive Management Mode
24 × 2.5-Inch Drive Configuration (8 × NVMe + 16 × SAS/SATA)	<ul style="list-style-type: none"> Drive bays with physical drive No. 0 to 7 support NVMe drives only Drive bays with physical drive No. 8 to 23 support SAS/SATA drives only 	M.2 SSD on the M.2 adapter	<ul style="list-style-type: none"> NVMe drives: switch board SAS/SATA drives: 1 RAID card
16 × 2.5-Inch Drive Configuration (16 × SAS/SATA)	Drive bays with physical drive No. 0 to 15 support SAS/SATA drives only	M.2 SSD on the M.2 adapter	SAS/SATA drives: 1 or 2 RAID cards
16 × 2.5-Inch Drive Configuration (8 × NVMe + 8 × SAS/SATA)	<ul style="list-style-type: none"> Drive bays with physical drive No. 0 to 7 support NVMe drives only Drive bays with physical drive No. 8 to 15 support SAS/SATA drives only 	M.2 SSD on the M.2 adapter	<ul style="list-style-type: none"> NVMe drives: switch board SAS/SATA drives: PCH
8 × 2.5-Inch Drive Configuration (8 × NVMe)	Drive bays with physical drive No. 0 to 7 support NVMe drives only	M.2 SSD on the M.2 adapter	NVMe drives: switch board
			NVMe drives: 2 tri-mode RAID cards

Configuration	Front Drives	Internal Drives	Drive Management Mode
8 × 2.5-Inch Drive Configuration (8 × SAS/SATA)	Drive bays with physical drive No. 0 to 7 support SAS/SATA drives only	N/A	SAS/SATA drives: 1 RAID card

5.7.2 Drive Numbering

1. 8 × 2.5-Inch Drive Configuration (8 × SAS/SATA drive)

Figure 5-11 Drive Numbering



Physical Drive No.	Drive No. Identified by the iSBMC	Drive No. Identified by an 8i RAID Card
0	0	0
1	1	1
2	2	2
3	3	3
4	4	4
5	5	5
6	6	6
7	7	7

-

2. 8 × 2.5-Inch Drive Configuration (8 × NVMe drive)

- Connected to the switch board through a drive backplane.

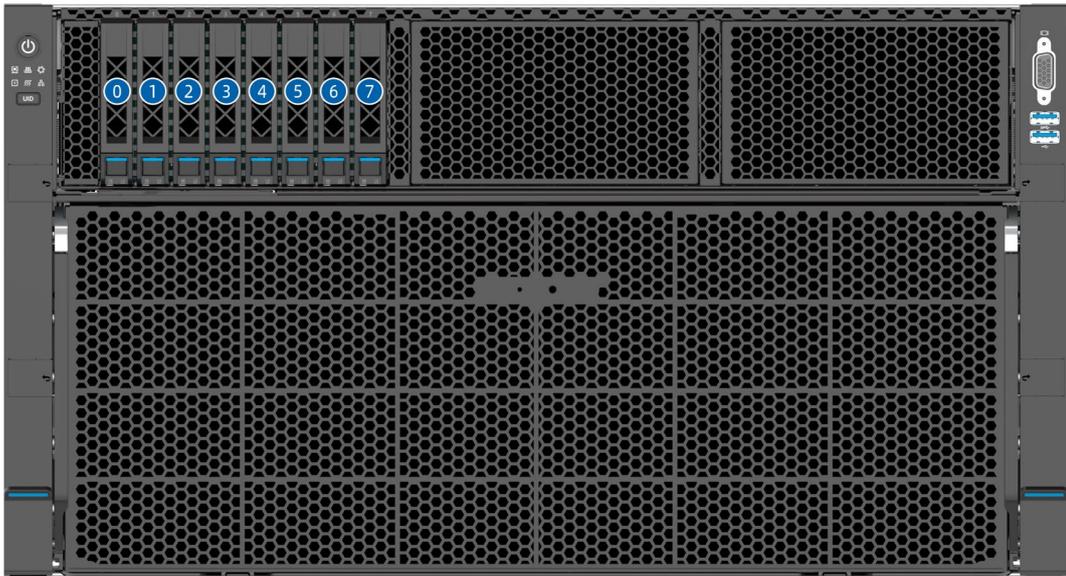
Figure 5-12 Drive Numbering



Physical Drive No.	Drive No. Identified by the ISBMC	Drive No. Identified by a RAID Card
0	0	-
1	1	-
2	2	-
3	3	-
4	4	-
5	5	-
6	6	-
7	7	-

- Connected to 2 tri-mode RAID cards through a drive backplane.

Figure 5-13 Drive Numbering

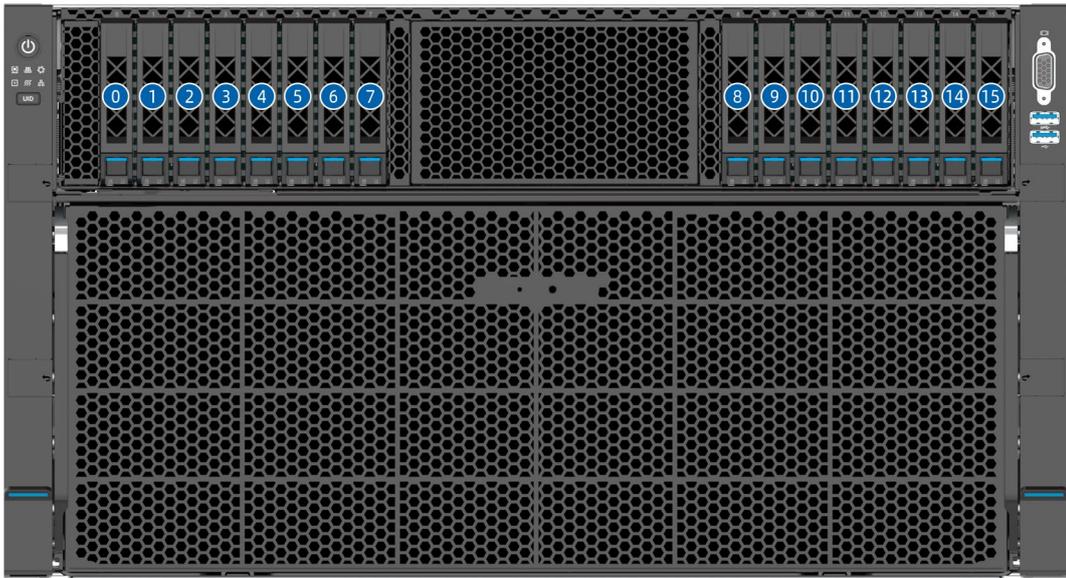


Physical Drive No.	Drive No. Identified by the ISBMC	Drive No. Identified by 2 Tri-Mode RAID Cards
0	0	0
1	1	1
2	2	2
3	3	3
4	4	0
5	5	1
6	6	2
7	7	3

3. 16 × 2.5-Inch Drive Configuration (16 × SAS/SATA drive)

- Connected to a 16i RAID card through 2 drive backplanes.

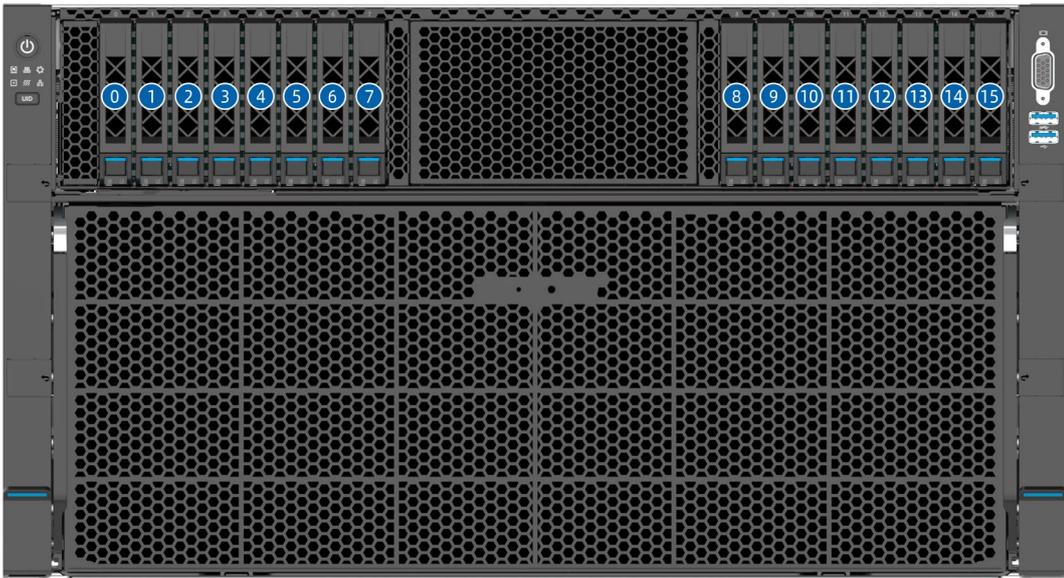
Figure 5-14 Drive Numbering



Physical Drive No.	Drive No. Identified by the ISBMC	Drive No. Identified by a 16i RAID Card
0	0	0
1	1	1
2	2	2
3	3	3
4	4	4
5	5	5
6	6	6
7	7	7
8	8	8
9	9	9
10	10	10
11	11	11
12	12	12
13	13	13
14	14	14
15	15	15

- Connected to two 8i RAID cards through 2 drive backplanes.

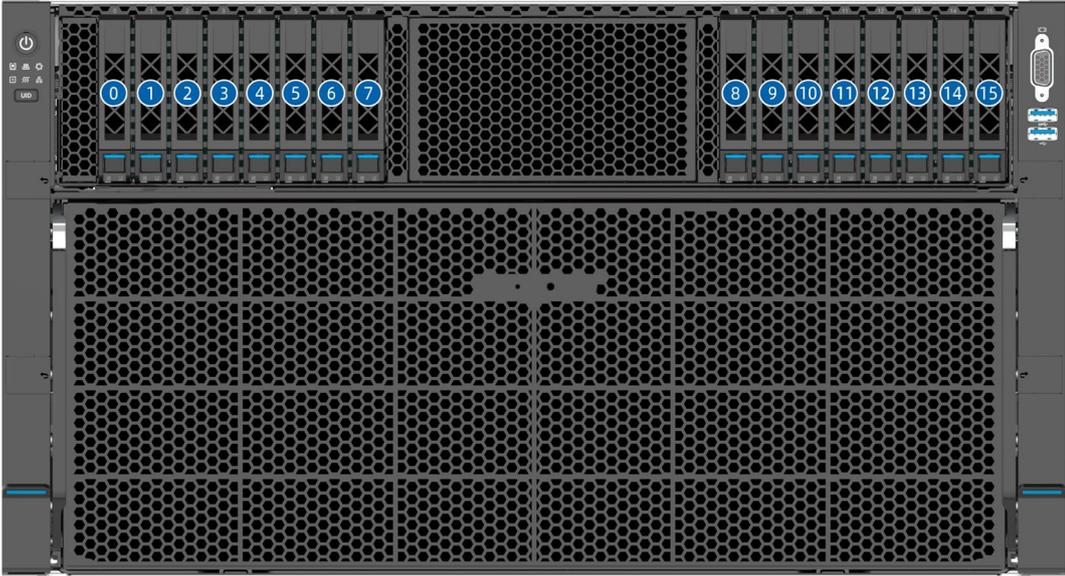
Figure 5-15 Drive Numbering



Physical Drive No.	Drive No. Identified by the ISBMC	Drive No. Identified by Two 8i RAID Cards
0	0	0
1	1	1
2	2	2
3	3	3
4	4	4
5	5	5
6	6	6
7	7	7
8	8	0
9	9	1
10	10	2
11	11	3
12	12	4
13	13	5
14	14	6
15	15	7

4. 16 × 2.5-Inch Drive Configuration (8 × NVMe drive + 8 × SAS/SATA drive)

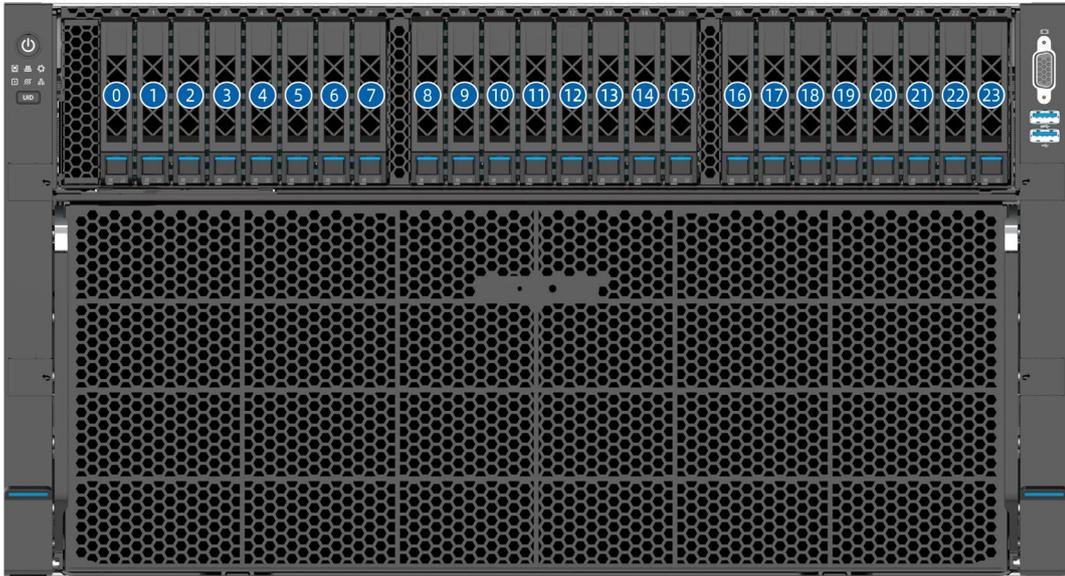
Figure 5-16 Drive Numbering



Physical Drive No.	Drive No. Identified by the ISBMC	Drive No. Identified by the RAID Card
0	0	-
1	1	-
2	2	-
3	3	-
4	4	-
5	5	-
6	6	-
7	7	-
8	8	-
9	9	-
10	10	-
11	11	-
12	12	-
13	13	-
14	14	-
15	15	-

5. 24 × 2.5-Inch Drive Configuration (8 × NVMe drive + 16 × SAS/SATA drive)

Figure 5-17 Drive Numbering



Physical Drive No.	Drive No. Identified by the ISBMC	Drive No. Identified by a 16i RAID Card
0	0	-
1	1	-
2	2	-
3	3	-
4	4	-
5	5	-
6	6	-
7	7	-
8	8	0
9	9	1
10	10	2
11	11	3
12	12	4
13	13	5
14	14	6
15	15	7
16	16	8

Physical Drive No.	Drive No. Identified by the ISBMC	Drive No. Identified by a 16i RAID Card
17	17	9
18	18	10
19	19	11
20	20	12
21	21	13
22	22	14
23	23	15

5.7.3 Drive LEDs

1. SAS/SATA Drive LEDs

Figure 5-18 SAS/SATA Drive LEDs



Table 5-7 SAS/SATA Drive LED Description

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

2. NVMe Drive LEDs

Figure 5-19 NVMe Drive LEDs



VMD is not supported by default.

When the NVMe drive is connected to the switch board via a drive backplane, RAID is not supported. Only the activity LED functions.

Table 5-8 NVMe Drive LED Description

Activity LED (①)	Description
Green	
Off	Drive absent
Solid on	Drive present but not in use
Blinking	Drive present and in use

When the NVMe drive is connected to a tri-mode RAID card via a drive backplane, RAID is supported. The drive LED descriptions are indicated in the following table.

Table 5-9 NVMe Drive LED Description

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

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

5.7.4 RAID Cards

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

5.8 Network

NICs provide network expansion capabilities.

- OCP 3.0 cards are supported. Users can select the OCP 3.0 cards as needed.
- The PCIe expansion slots support PCIe NICs. Users can select the PCIe NICs as needed.
- For specific NIC options, consult your local sales representative or refer to [7.2 Hardware Compatibility](#).

5.9 I/O Expansion

5.9.1 PCIe Expansion Cards

PCIe expansion cards provide system expansion capabilities.

- Supports up to 12 PCIe 5.0 expansion slots (NF5688-M7-A0-R0-00) or 11 PCIe 5.0 expansion slots (NF5688-M7-C0-R0-00), populated with up to 11 PCIe expansion cards.
- For specific PCIe expansion card options, consult your local sales representative or refer to [7.2 Hardware Compatibility](#).

5.9.2 PCIe Slot Locations

1. NF5688-M7-A0-R0-00

It supports up to 12 PCIe slots, as shown below.

Figure 5-20 PCIe Slot Locations - 12 PCIe Slots

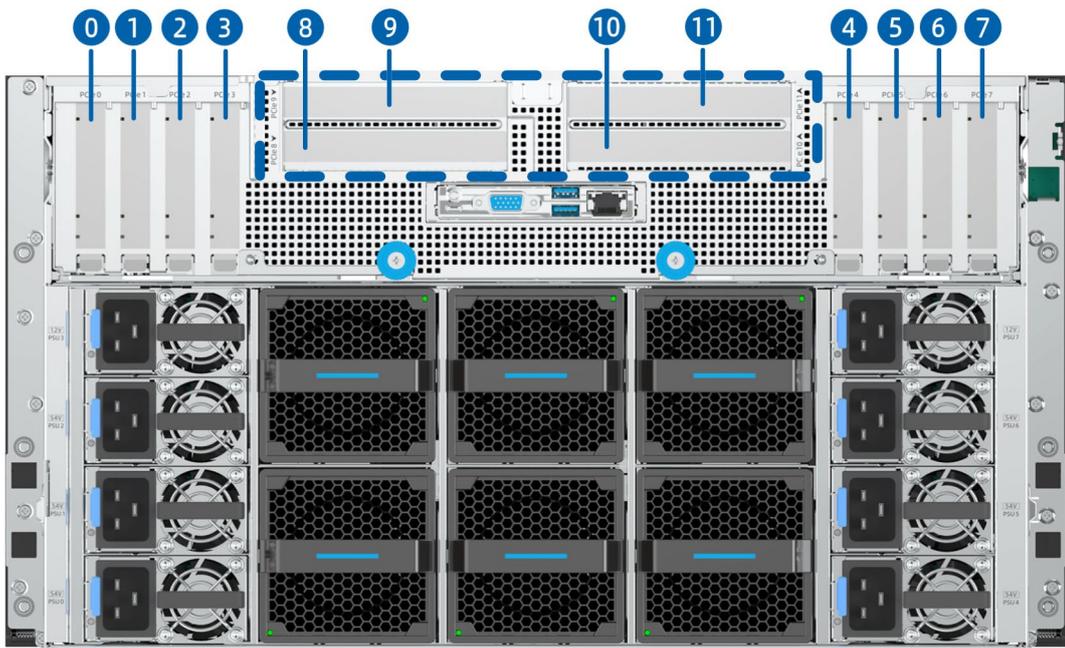
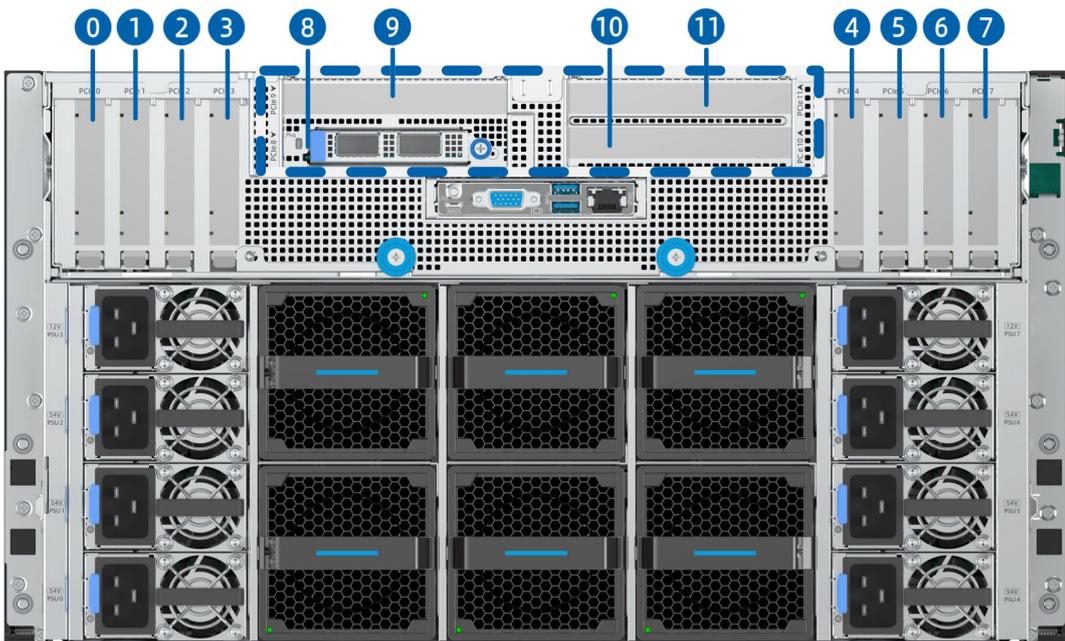


Figure 5-21 PCIe Slot Locations - Including a Dedicated Slot for the OCP 3.0 Card



- PCIe slot 8 to slot 11 can be populated with up to 3 single-width FHHL cards (PCIe slot 8, slot 10, and slot 11), or can be populated with 1 dual-width FHHL card (PCIe slot 8, occupying PCIe slot 8 and slot 9) and 2 single-width FHHL cards (PCIe slot 10 and slot 11).
- PCIe slot 8 can be populated with 1 optional OCP 3.0 card.

- PCIe slot 0 to slot 7 can be populated with up to 8 HHHL LP cards.

2. NF5688-M7-C0-R0-00

Figure 5-22 PCIe Slot Locations - 11 PCIe Slots

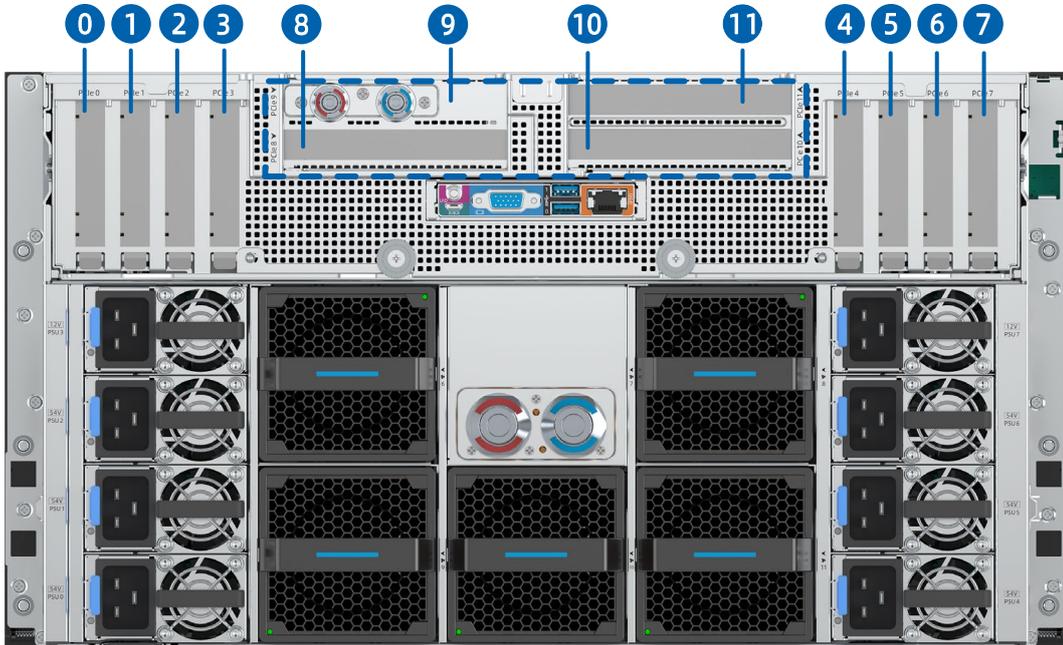
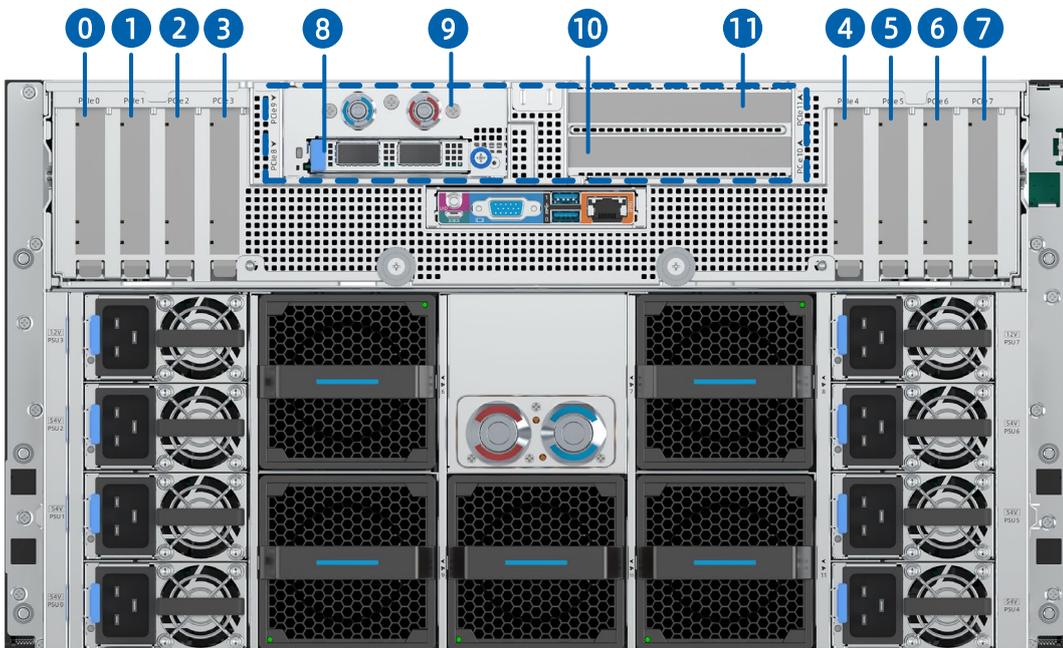


Figure 5-23 PCIe Slot Locations - Including a Dedicated Slot for the OCP 3.0 Card



- PCIe slot 8, slot 10, and slot 11 can be populated with up to 3 single-width FHHL cards (PCIe slot 8, slot 10, and slot 11), or can be populated with 1 dual-

width FHHL card (PCIe slot 10, occupying PCIe slot 10 and slot 11) and 1 single-width FHHL card (PCIe slot 8).

- PCIe slot 8 can be populated with 1 optional OCP 3.0 card.
- PCIe slot 9 is occupied by the motherboard liquid-cooling tubes and not available for the PCIe expansion card.
- PCIe slot 0 to slot 7 can be populated with up to 8 HHHL LP cards.

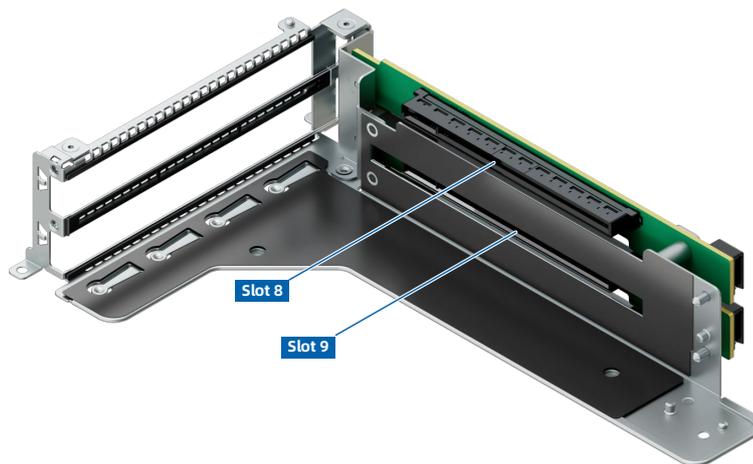
5.9.3 PCIe Riser Modules

1. NF5688-M7-A0-R0-00

- PCIe riser module (slot 8 and slot 9):

Supports two x16 single-width FHHL PCIe expansion cards, or one x16 dual-width FHHL PCIe expansion card (PCIe slot 8).

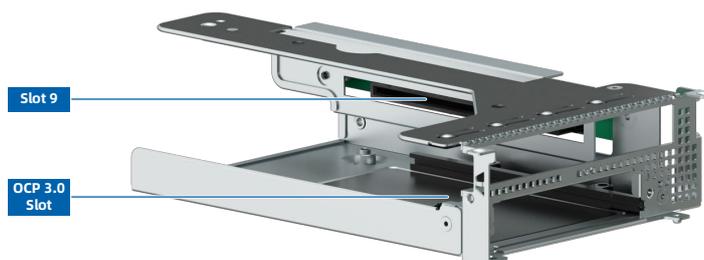
Figure 5-24 PCIe Riser Module (Slot 8 and Slot 9)



- PCIe riser module (slot 9 and OCP 3.0 slot):

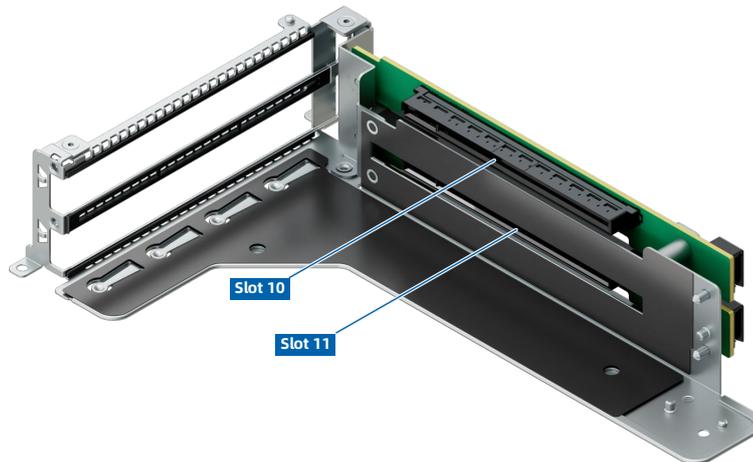
Supports one x16 single-width FHHL PCIe expansion card (PCIe slot 9) and 1 OCP 3.0 card (OCP 3.0 slot).

Figure 5-25 PCIe Riser Module (Slot 9 and OCP 3.0 Slot)



- PCIe riser module (slot 10 and slot 11):
Supports two x16 single-width FHHL PCIe expansion cards.

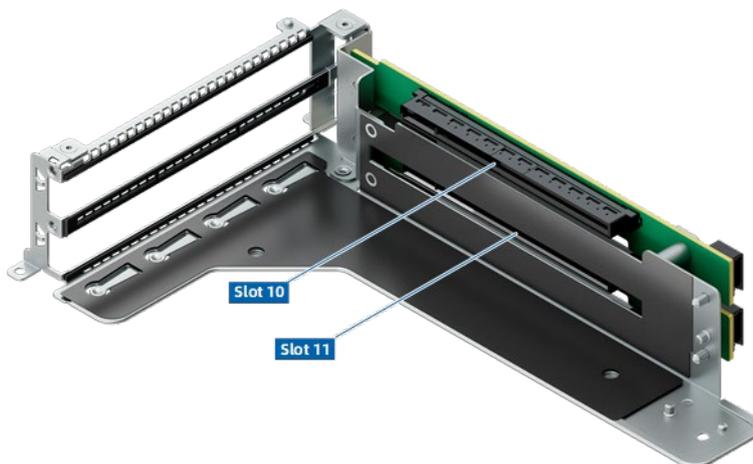
Figure 5-26 PCIe Riser Module (Slot 10 and Slot 11)



2. NF5688-M7-C0-R0-00

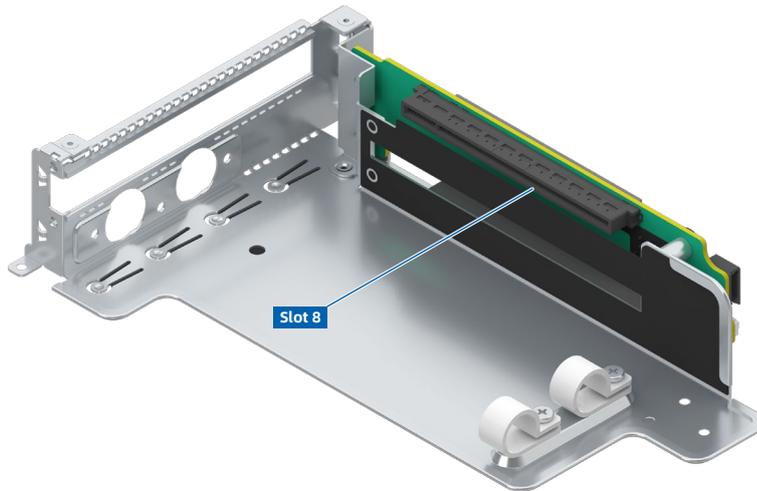
- PCIe riser module (slot 10 and slot 11):
Supports two x16 single-width FHHL PCIe expansion cards, or one x16 dual-width FHHL PCIe expansion card (PCIe slot 10, occupying slot 10 and slot 11).

Figure 5-27 PCIe Riser Module (Slot 10 and Slot 11)



- PCIe riser module (slot 8):
Supports one x16 single-width FHHL PCIe expansion card or 1 OCP 3.0 card.

Figure 5-28 PCIe Riser Module (Slot 8)



5.9.4 PCIe Slot Description

1. NF5688-M7-A0-R0-00

Table 5-10 PCIe Slot Description

PCIe Slot	Owner	PCIe Standard	Connector Width	Bus Width	Port No.	Form Factor
Slot 0	SWA	PCIe 5.0	x16	x16	S0	HHHL
Slot 1	SWA	PCIe 5.0	x16	x16	S5	HHHL
Slot 2	SWB	PCIe 5.0	x16	x16	S0	HHHL
Slot 3	SWB	PCIe 5.0	x16	x16	S5	HHHL
Slot 4	SWC	PCIe 5.0	x16	x16	S2	HHHL
Slot 5	SWC	PCIe 5.0	x16	x16	S1	HHHL
Slot 6	SWD	PCIe 5.0	x16	x16	S2	HHHL
Slot 7	SWD	PCIe 5.0	x16	x16	S1	HHHL
Slot 8	CPU0	PCIe 5.0	x16	x8/x16	PE1	FHHL
Slot 9	CPU0	PCIe 5.0	x16	x8	PE1	FHHL
Slot 10	CPU1	PCIe 5.0	x16	x8/x16	PE1	FHHL
Slot 11	CPU1	PCIe 5.0	x16	x8	PE1	FHHL
OCP 3.0 Slot (occupying slot 8)	CPU0	PCIe 5.0	x16	x16	PE1	SFF OCP 3.0
OCP 3.0 Slot (occupying slot 8)	CPU0 CPU1	PCIe 5.0	x16	x8 x8	CPU0- PE1 CPU1- PE1	SFF OCP 3.0

2. NF5688-M7-C0-R0-00

Table 5-11 PCIe Slot Description

PCIe Slot	Owner	PCIe Standard	Connector Width	Bus Width	Port No.	Form Factor
Slot 0	SWA	PCIe 5.0	x16	x16	S0	HHHL
Slot 1	SWA	PCIe 5.0	x16	x16	S5	HHHL
Slot 2	SWB	PCIe 5.0	x16	x16	S0	HHHL
Slot 3	SWB	PCIe 5.0	x16	x16	S5	HHHL
Slot 4	SWC	PCIe 5.0	x16	x16	S2	HHHL
Slot 5	SWC	PCIe 5.0	x16	x16	S1	HHHL
Slot 6	SWD	PCIe 5.0	x16	x16	S2	HHHL
Slot 7	SWD	PCIe 5.0	x16	x16	S1	HHHL
Slot 8	CPU0	PCIe 5.0	x16	x8/x16	PE1	FHHL
Slot 9	NA	NA	NA	NA	NA	NA
Slot 10	CPU1	PCIe 5.0	x16	x8/x16	PE1	FHHL
Slot 11	CPU1	PCIe 5.0	x16	x8	PE1	FHHL
OCP 3.0 Slot (occupying slot 8)	CPU0	PCIe 5.0	x16	X16	PE1	SFF OCP 3.0
OCP 3.0 Slot (occupying slot 8)	CPU0 CPU1	PCIe 5.0	x16	x8 x8	CPU0- PE1 CPU1- PE1	SFF OCP 3.0

5.10 PSUs

- Up to two 12 V PSUs and six 54 V PSUs.
- When the server is configured with two 12 V PSUs and six 54 V PSUs, the 12 V PSUs support 1+1 redundancy and the 54 V PSUs support 3+3 redundancy.
- Supports AC or DC power input.
- The PSUs are hot-swappable.
- The server must use 12 V PSUs with the same part number (P/N code) and 54 V PSUs with the same part number (P/N code).
- The PSUs feature short-circuit protection.

NOTE

- When the GPU module is installed, at least one 54 V PSU must be used to boot the server.
- When the GPU module is installed, at least three 54 V PSUs must be used to ensure proper system running and help avoid system crash.
- The PSU locations are the same for NF5688-M7-A0-R0-00 and NF5688-M7-C0-R0-00.

Figure 5-29 PSU Locations



5.11 Fan Modules

- The server supports six 6056 fan modules on the motherboard, and 6 rear 8086 fan modules (NF5688-M7-A0-R0-00) or 5 rear 8086 fan modules (NF5688-M7-C0-R0-00).
- The fan modules are hot-swappable.
- The motherboard fan modules and rear fan modules support N+1 redundancy, which means that the server can continue working when a single fan fails. The maximum ambient temperature supported is 30°C (86°F) with a single fan failure.
- Supports intelligent fan speed control.
- The server must use motherboard fan modules with the same part number (P/N code) and rear fan modules with the same part number (P/N code).

NOTE

Applicable model: NF5688-M7-A0-R0-00 and NF5688-M7-C0-R0-00.

Figure 5-30 Motherboard Fan Modules

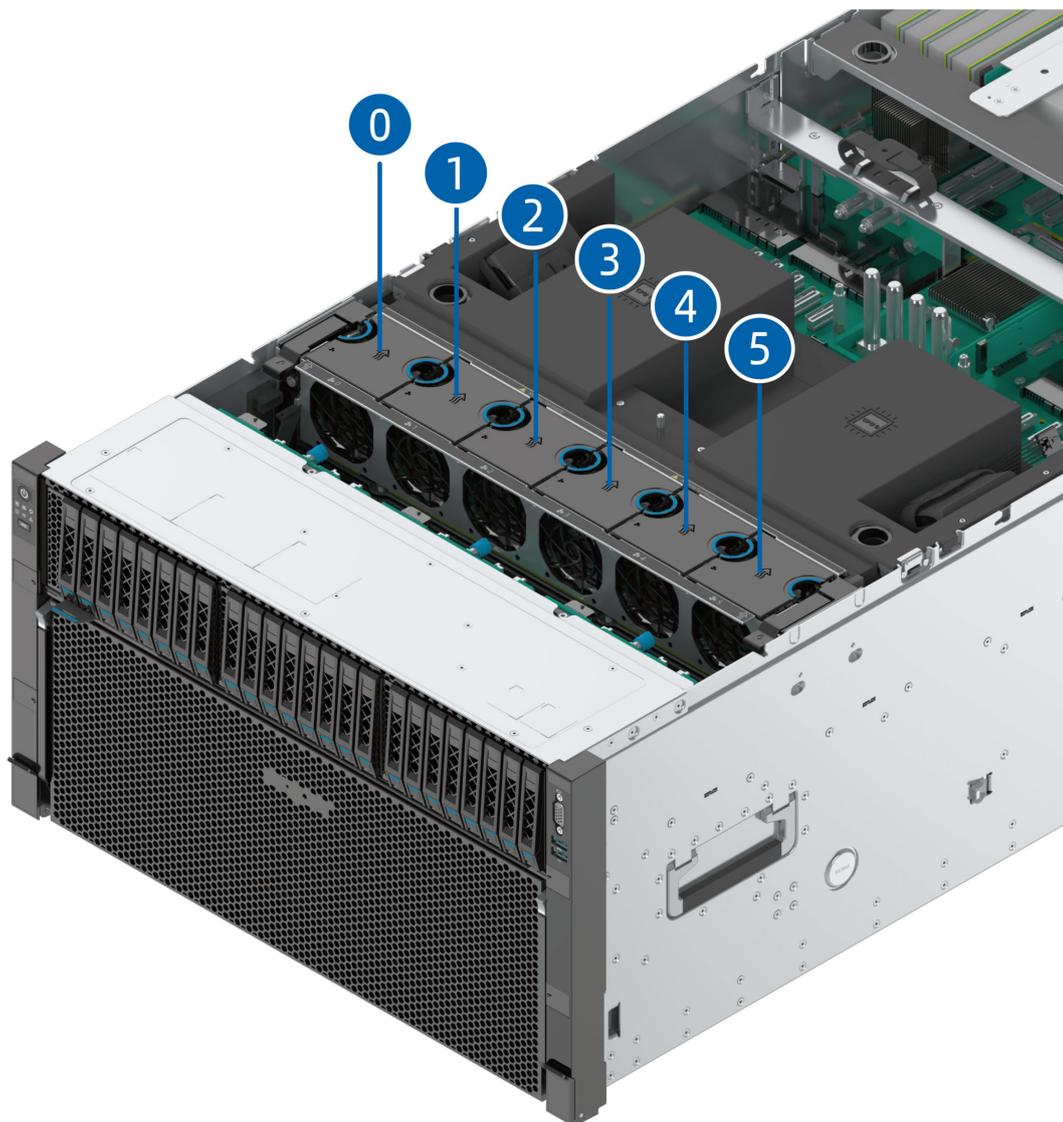


Figure 5-31 Rear Fan Modules (NF5688-M7-A0-R0-00)

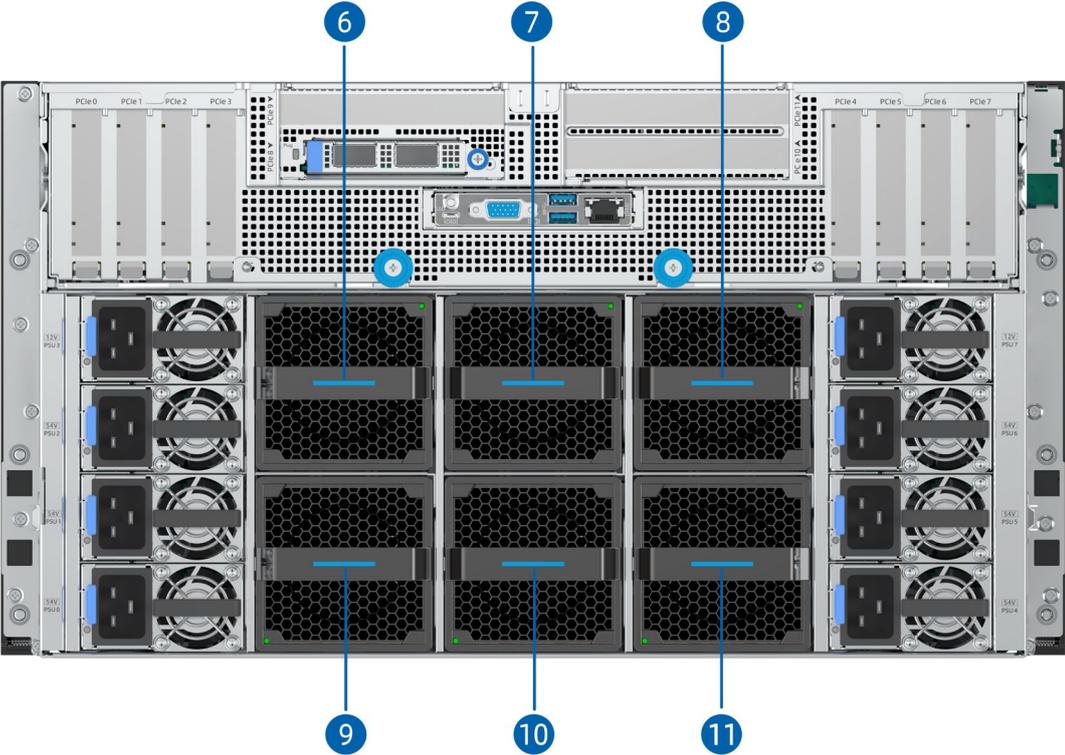
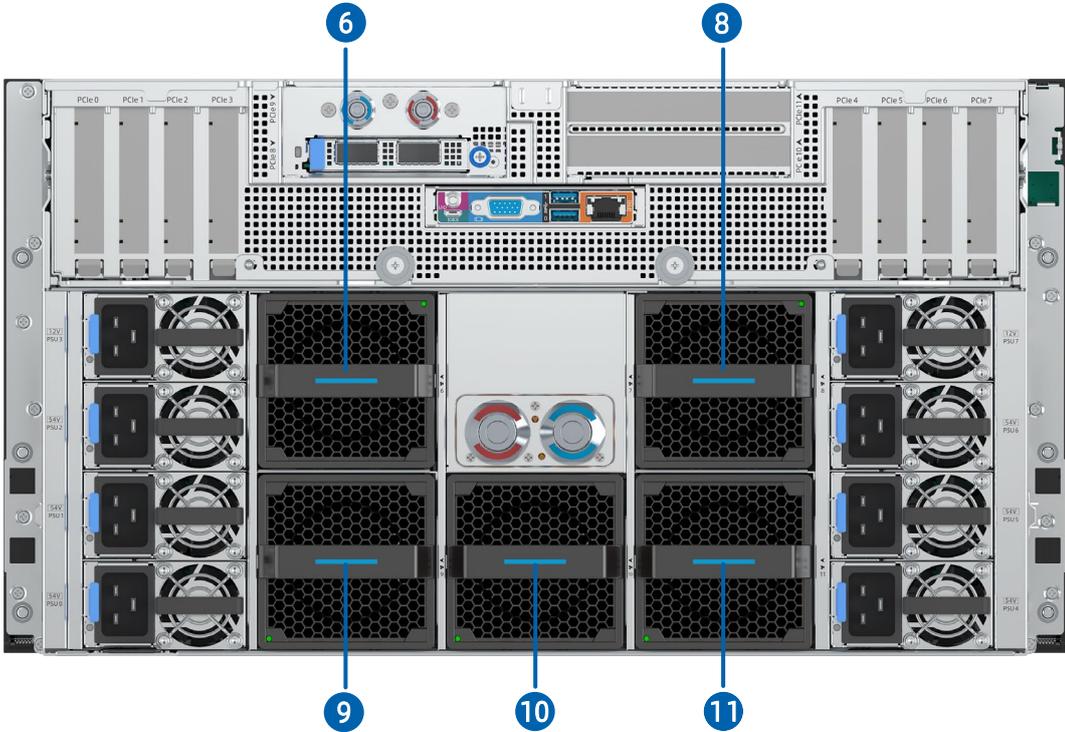


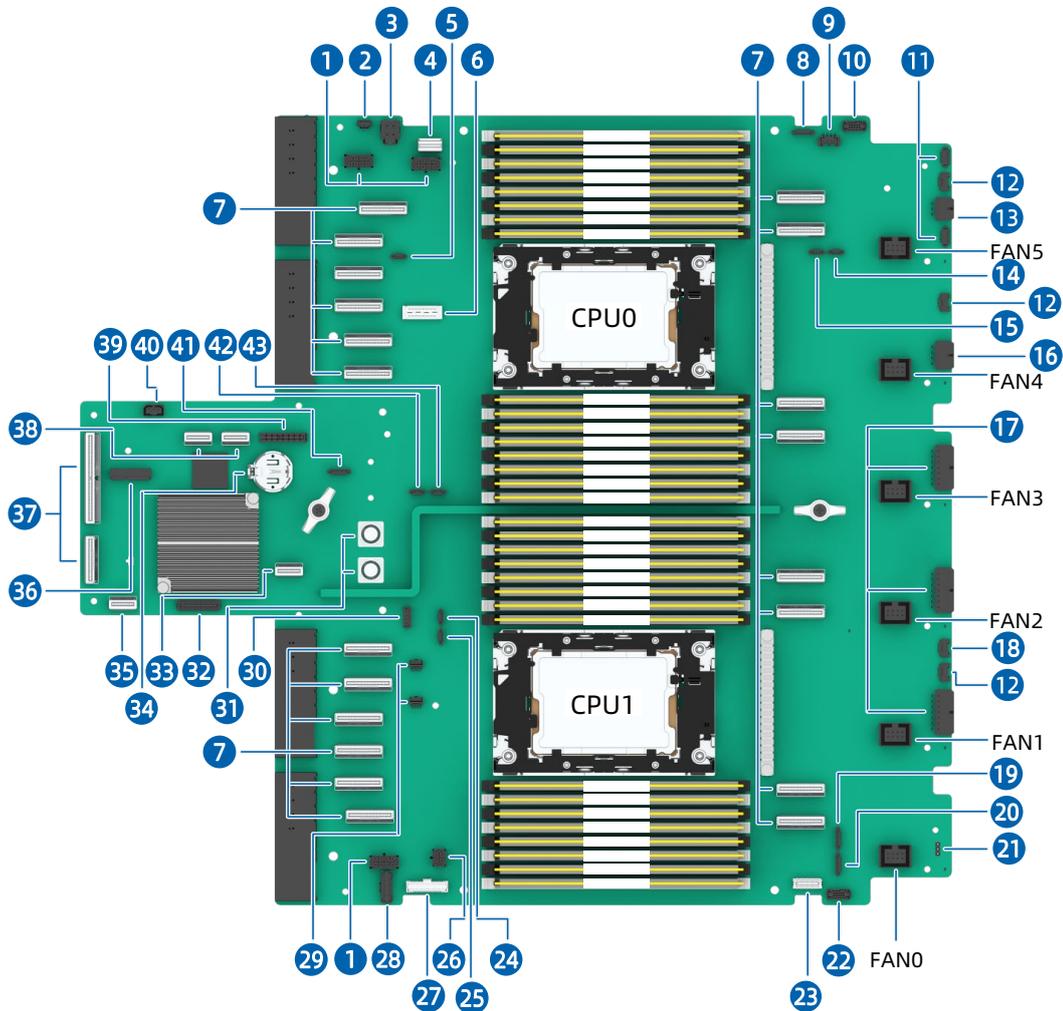
Figure 5-32 Rear Fan Modules (NF5688-M7-C0-R0-00)



5.12 Boards

5.12.1 Motherboard

Figure 5-33 Motherboard

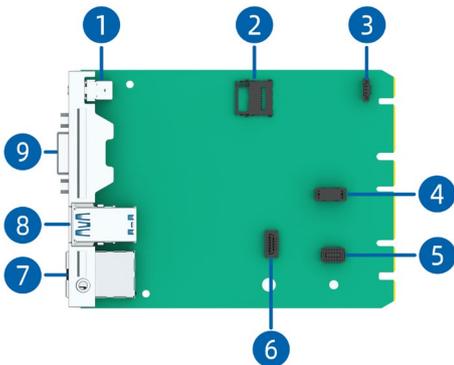


Item	Feature	Item	Feature
1	GPU Module Power Connector × 3	23	Left Control Panel Connector
2	OCP Hot-Plug Button Connector	24	MCU COM2 Connector
3	OCP Power Connector	25	MCU COM3 Connector
4	Right Control Panel Connector	26	Smart NIC Power Connector
5	Smart NIC Connector	27	PDB Sideband Connector
6	XDP Connector	28	Smart NIC Sideband Connector
7	MCI0 x8 Connector × 20	29	Leak Detection Connector × 2

Item	Feature	Item	Feature
8	SGPIO2 Connector	30	RAID Key Connector
9	Inlet Temperature Sensor Connector	31	Motherboard Power Connector × 2
10	CPU VPP0 Connector	32	OCP Sideband Connector
11	Riser Card I ² C Connector × 2	33	SATA Connector
12	BP I ² C Connector × 3	34	CMOS Battery Socket
13	Riser Card (dedicated for RAID card) Power Connector	35	NVLink Connector
14	MCU COM5 Connector	36	SYS_TF Connector
15	MCU COM4 Connector	37	DC-SCM Connector
16	PCIe Riser Card Power Connector	38	M.2 Riser Card SATA Connector × 2
17	BP Power Connector × 3	39	M.2 Riser Card Power Connector
18	TSOM I ² C Connector	40	Intrusion Switch Connector
19	SGPIO1 Connector	41	PDB SGPIO Connector
20	SGPIO0 Connector	42	MCU COM1 Connector
21	CMOS Jumper	43	MCU COM0 Connector
22	CPU VPP1 Connector	-	-

5.12.2 DC-SCM Board

Figure 5-34 DC-SCM Board



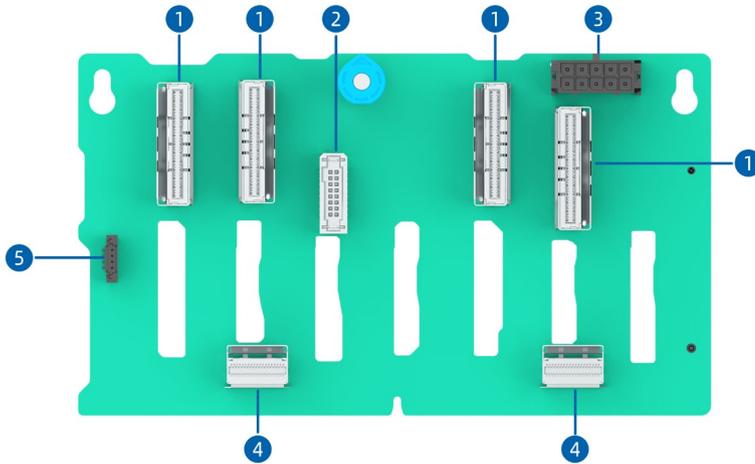
Item	Feature	Item	Feature
1	UID/BMC RST Button and LED	6	TCM/TPM Connector
2	TF Card Slot	7	BMC Management Network Port

Item	Feature	Item	Feature
3	BMC_RTC_BAT Connector (Reserved)	8	USB 3.0 Port × 2
4	Board to Board PHY Connector (Reserved)	9	VGA Port
5	Front Panel USB Type-C Port Connector (Reserved)	-	-

5.12.3 Drive Backplanes

- SAS/SATA/NVMe Drive Backplane

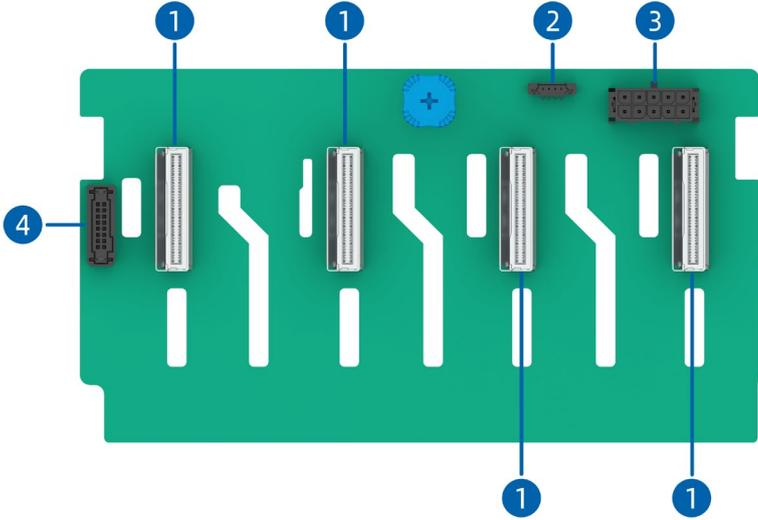
Figure 5-35 SAS/SATA/NVMe Drive Backplane



Item	Feature	Item	Feature
1	MCI0 x8 Connector × 4	4	Slimline x4 Connector × 2
2	VPP Connector	5	BMC_I2C Connector
3	Backplane Power Connector	-	-

- E3.S Drive Backplane

Figure 5-36 E3.S Drive Backplane



Item	Feature	Item	Feature
1	MPIO x8 Connector × 4	3	Backplane Power Connector
2	BMC_I ² C Connector	4	VPP Connector

6 System Specifications

6.1 Technical Specifications

Table 6-1 Technical Specifications

Item	Description
Form Factor	6U rack server
Chipset	Intel Emmitsburg C740 Series
Processor	<p>Two 4th Gen Intel Xeon Scalable processors (Sapphire Rapids):</p> <ul style="list-style-type: none">• Up to 56 cores per CPU• Max. base frequency of 2.6 GHz and max. Turbo frequency of 3.8 GHz <p>Note: NVIDIA Hopper HGX 8-GPU baseboard needs to be used with CPUs with base frequency higher than 2.0 GHz and core counts more than 48.</p> <ul style="list-style-type: none">• Up to 3 UPI links per CPU at up to 16 GT/s per link• TDP up to 350 W
Memory	<ul style="list-style-type: none">• Up to 32 DIMMs• 8 memory channels per processor• Up to 2 DIMMs per channel• Up to 4,800 MT/s• Supports RDIMMs• Supports error-correcting code (ECC)
Storage	<p>Front:</p> <ul style="list-style-type: none">• 24 × 2.5-inch drive (16 × 2.5-inch SAS/SATA drive + 8 × 2.5-inch NVMe drive) or• 16 × 2.5-inch SAS/SATA drive or• 16 × 2.5-inch drive (8 × NVMe drive + 8 × SAS/SATA drive) or• 16 × E3.S SSD or• 8 × 2.5-inch SAS/SATA/NVMe drive

Item	Description
	Internal: <ul style="list-style-type: none"> • Up to 2 M.2 SSDs • Up to 2 TF cards
Network	<ul style="list-style-type: none"> • 1 optional 10/25/100 Gb OCP 3.0 card • Standard 1/10/25/40/100/200 Gb PCIe NICs • 100/200/400 Gb HCA cards
I/O Expansion	<ol style="list-style-type: none"> 1. NF5688-M7-A0-R0-00 <ul style="list-style-type: none"> • Up to 12 PCIe expansion slots: up to 11 PCIe expansion cards, including 1 optional OCP 3.0 card (occupying PCIe slot 8). • PCIe slots 0 to 7: up to 8 HHHL PCIe expansion cards • PCIe slots 8 to 11: up to 3 single-width FHHL cards (PCIe slot 8, slot 10 and slot 11), or 2 single-width FHHL cards (PCIe slot 10 and slot 11) and 1 dual-width FHHL card (PCIe slot 8, occupying slot 8 and slot 9) 2. NF5688-M7-C0-R0-00 <ul style="list-style-type: none"> • Up to 11 PCIe expansion slots: up to 11 PCIe expansion cards, including 1 optional OCP 3.0 card (occupying PCIe slot 8). • PCIe slots 0 to 7: up to 8 HHHL PCIe expansion cards • PCIe slots 8/10/11: up to 3 single-width FHHL cards (PCIe slot 8, slot 10 and slot 11), or 1 single-width FHHL card (PCIe slot 8) and 1 dual-width FHHL card (PCIe slot 10, occupying slot 10 and slot 11) <p>For details, see 5.9 I/O Expansion.</p>
Port	Front: <ul style="list-style-type: none"> • 1 × VGA port • 1 × USB 3.0 port • 1 × USB 2.0 port Rear: <ul style="list-style-type: none"> • 2 × USB 3.0 port

Item	Description
	<ul style="list-style-type: none"> • 1 × BMC management network port • 1 × system/BMC serial port • 1 × VGA port <p>Note: OS installation on the USB storage media is not recommended.</p>
Display	<p>Integrated VGA on the DC-SCM board with a video memory of 64 MB and a maximum 16M color resolution of 1,920 × 1,200 at 60 Hz</p> <p>Notes:</p> <ul style="list-style-type: none"> • The integrated VGA can support a maximum resolution of 1,920 × 1,200 only when the video driver matching the OS version is installed; otherwise, only the default resolution of the OS is supported. • When the front and rear VGA ports are both connected to monitors, only the monitor connected to the front VGA port works.
System Management	<ul style="list-style-type: none"> • UEFI • ISBMC • NC-SI • InManage
Security	<ul style="list-style-type: none"> • Intel Platform Firmware Resilience (PFR) • Trusted Platform Module (TPM) 2.0 and Trusted Cryptography Module (TCM) • Intel Trusted Execution Technology • Firmware update mechanism based on digital signatures • UEFI Secure Boot • Hierarchical BIOS password protection • BIOS Secure Flash and BIOS Lock Enable (BLE) • BMC and BIOS dual-image mechanism • Chassis intrusion detection

6.2 Environmental Specifications

Table 6-2 Environmental Specifications

Item	Description
Temperature	<ul style="list-style-type: none"> • Operating: 10°C to 35°C (50°F to 95°F) • Storage (packed): -40°C to +70°C (-40°F to +158°F) • Storage (unpacked): -40°C to +55°C (-40°F to +131°F) • Cold plate inlet temperature: ≤45°C(113°F)
Relative Humidity (RH, non-condensing)	<ul style="list-style-type: none"> • Operating: 10% to 90% RH • Storage (packed): 10% to 93% RH • Storage (unpacked): 10% to 93% RH
Operating Altitude	<p>≤3,050 m (10,007 ft)</p> <ul style="list-style-type: none"> • 0 to 900 m (0 to 2,953 ft): Operating temperature ranges from 10°C to 35°C (50°F to 95°F) • 900 to 3,050 m (2,953 to 10,007 ft): Derate the maximum allowable temperature by 1°C per 300 m (1°F per 546.81 ft)
Corrosive Gaseous Contaminants	<p>Maximum growth rate of corrosion film thickness:</p> <ul style="list-style-type: none"> • Copper coupon: 300 Å/month (compliant with the gaseous corrosivity level of G1 defined in ANSI/ISA-71.04-2013) • Silver coupon: 200 Å/month (compliant with the gaseous corrosivity level of G1 defined in ANSI/ISA-71.04-2013)
Acoustic Noise	<p>Noise levels are within the limits defined by OSHA and occupational health and safety regulations in China. Listed is noise measured at a server operating temperature of 25°C (77°F):</p> <ul style="list-style-type: none"> • Idle: 8.7 Bels • Operating: 9.6 Bels



NOTE

- Standard operating temperature:
 - 10°C to 35°C (50°F to 95°F) is the standard operating temperature range at an altitude of 0 to 900 m (0 to 2953 ft). Derate the maximum allowable temperature by 1°C per 300 m (1°F per 546.81 ft) at an altitude of 900 to 3,050 m (2,953 to 10,007 ft). No direct sustained sunlight is permitted. The maximum operating altitude is 3,050 m (10,007 ft) and the maximum temperature gradient is 20°C/h (36°F/h), both varying with different system configurations.
 - Any fan failure or operations above 30°C (86°F) may lead to system performance degradation.
- This document lists the LWAd of the product at a 25°C (77°F) ambient environment. All measurements are conducted in conformance with ISO 7779 (ECMA 74) and declared in conformance with ISO 9296 (ECMA 109). The listed sound levels apply to the standard configuration. Additional options may result in increased sound levels. Contact your sales representative for more information.
- The sound levels shown here were measured based on the specific configurations of a server. Sound levels vary with server configuration. These values are for reference only and subject to change without notice.
- Product conformance to cited normative standards is based on sample testing, evaluation, or assessment. This product or family of products is eligible to bear the appropriate compliance logos and statements.

6.3 Physical Specifications

Table 6-3 Physical Specifications

Item	Description
Dimensions (W × H × D)	<ul style="list-style-type: none">• With mounting ears: 482 × 263 × 890 mm (18.98 × 10.35 × 35.04 in.)• Without mounting ears: 447 × 263 × 860 mm (17.60 × 10.35 × 33.86 in.)• Outer packaging: 450 × 721 × 1,167 mm (17.72 × 28.39 × 45.94 in.)

Item	Description
Installation Dimension Requirements	<ul style="list-style-type: none"> • Installation requirements for the cabinet are as follows: <ul style="list-style-type: none"> - General cabinet compliant with the International Electrotechnical Commission 297 (IEC 297) standard - Width: 482.6 mm (19 in.) - Depth: Above 1,000 mm (39.37 in.) • Installation requirements for the server rails are as follows: <ul style="list-style-type: none"> - Static rail kit: Distance between the front and rear mounting flanges ranges from 609 to 914 mm (23.98 to 35.98 in.)
Weight	<ul style="list-style-type: none"> • 24 × 2.5-inch drive configuration <ul style="list-style-type: none"> - Net weight: 92 kg (202.83 lbs) - Gross weight: 107 kg (235.89 lbs) (including server, packaging box, rails and accessory box) <p>Note: The server weight varies by configuration.</p>

7 Operating System and Hardware Compatibility

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



IMPORTANT

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

7.1 Supported Operating Systems

Table 7-1 Supported Operating Systems

OS Version
Red Hat Enterprise Linux 8.8
Ubuntu 20.04
Ubuntu 22.04

7.2 Hardware Compatibility

7.2.1 CPU Specifications

The server supports two 4th Gen Intel Xeon Scalable processors. The 84XX series supports up to 4,800 MHz.

Table 7-2 CPU Specifications

Model	Cores	Threads	Base Frequency (GHz)	Max. Turbo Frequency (GHz)	Cache (MB)	TDP (W)
8480+	56	112	2.0	3.8	105	350
8470	52	104	2.0	3.8	105	350
8468	48	96	2.1	3.8	105	350
8468V	52	104	2.1	3.8	105	350

7.2.2 DIMM Specifications

The server supports up to 32 DDR5 DIMMs. Each processor supports 8 memory channels with up to 2 DIMMs per channel. RDIMMs are supported.

Table 7-3 DIMM Specifications

Type	Capacity (GB)	Frequency (MHz)	Data Width	Organization
RDIMM	32	4,800	x64	2R x8
RDIMM	64	4,800	x64	2R x4
RDIMM	96	4,800	x64	2R x4

7.2.3 Drive Specifications

Table 7-4 SATA SSD Specifications

Type	Capacity	Max. Qty.
SATA SSD	240 GB	16
SATA SSD	480 GB	16
SATA SSD	960 GB	16
SATA SSD	1.9 TB	16
SATA SSD	3.8 TB	16

Table 7-5 U.2 NVMe SSD Specifications

Type	Capacity	Max. Qty.
U.2 NVMe SSD	960 GB	8
U.2 NVMe SSD	1.68 TB	8
U.2 NVMe SSD	1.92 TB	8
U.2 NVMe SSD	3.2 TB	8
U.2 NVMe SSD	3.84 TB	8
U.2 NVMe SSD	7.68 TB	8
U.2 NVMe SSD	6.4 TB	8

Table 7-6 M.2 SSD Specifications

Type	Capacity	Max. Qty.
M.2 SATA SSD	240 GB	2
M.2 SATA SSD	480 GB	2
M.2 PCIe SSD	960 GB	2
M.2 PCIe SSD	1.92 TB	2
M.2 PCIe SSD	3.84 TB	2

7.2.4 RAID Card Specifications

Table 7-7 RAID Card Specifications

Type	Description
RAID Card	RAID_PM8204_RA_8_2GB_SAS3_PCIE 3.0
	RAID_PM8204_RA_8_4GB_SAS3_PCIE 3.0
	RAID_L_8R0_9560-8i_4G_HDM12G_PCIE4
	RAID_L_16R0_9560-16i_8GB_SMSAS3_PCIE4

7.2.5 NIC Specifications

Table 7-8 OCP Card Specifications

Type	Description	Speed (Gbps)	Port Qty.
OCP 3.0 Card	NIC_I_10G_X710T2L_RJ_OCP3x8_2_XR_M7	10	2
	NIC_BRCM_10G_57416_RJ_OCP3x8_2_XR	10	2
	NIC_M_25G_MCX631432AN_LC_OCP3x8_2_XR	25	2
	NIC_M_100G_MCX623436AN_LC_OCP3x16_2_XR	100	2

Table 7-9 PCIe NIC Specifications

Type	Description	Speed (Gbps)	Port Qty.
PCIe NIC	NIC_Vostok_I350_1G_RJ_PCIEx4_4	1	4
	NIC_Vostok_X710_10G_LC_PCIEx8_2_M7	10	2
	NIC_M_25G_MCX631102AN_LC_PCIEx8_2_XR	25	2
	NIC_M_100G_MCX623106AN_LC_PCIEx16_2_XR	100	2
	NIC_M_200G_MCX623105AN_LC_PCIEx16_XR	200	1
	NIC_M_200G_755106AS_LC_PCIEx16_2_XR	200	2

7.2.6 HCA Card Specifications

Table 7-10 HCA Card Specifications

Type	Description	Speed (Gbps)	Port Qty.
HCA Card	HCA_M_1-HDR200_MCX653105A-HDAT_PCIE_NV	200	1
	HCA_M_2-HDR200_MCX653106A-HDAT_PCIE	200	2
	HCA_NV_1-NDR200_MCX75310AAS-HEAT_PCIE	200	1
	HCA_NV_1-NDR_MCX75310AAS-NEAT_PCIE	400	1

7.2.7 GPU Specifications

Table 7-11 GPU Specifications

Type	Description	Max. Qty.
GPU Module	GPUM_NV_640G_HGX-H100-8GPU-AC_5120b_MP	1
	GPUM_NV_640G_HGX-H800-8GPU-AC_5120b_MP	1

7.2.8 PSU Specifications

The server supports up to two 12 V PSUs with 1+1 redundancy and six 54 V PSUs with 3+3 redundancy that follow the Intel Common Redundant Power Supply (CRPS) specification. The PSUs share a common electrical and structural design that allows for hot-swap and tool-less installation into the server with the PSUs locking automatically after being inserted into the power bay. The CRPS PSUs are 80 Plus Titanium rated with various output powers, allowing customers to choose as needed.

The following rated 110 Vac, 230 Vac and 240 Vdc PSUs are supported:

12 V PSU:

- 3,200 W Titanium PSU: 1,400 W (110 Vac), 3,200 W (230 Vac), 3,200 W (240 Vdc for China)

54 V PSU:

- 2,700 W Titanium PSU: 1,200 W (110 Vac), 2,700 W (230 Vac), 2,700 W (240 Vdc for China)
- 3,200 W Titanium PSU: 1,400 W (110 Vac), 3,200 W (230 Vac), 3,200 W (240 Vdc for China)

Operating voltage range:

- 110 Vac: 90 Vac to 132 Vac
- 230 Vac: 180 Vac to 264 Vac
- 240 Vdc: 180 Vdc to 320 Vdc

8 Regulatory Information

8.1 Safety

8.1.1 General

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

8.1.2 Personal Safety

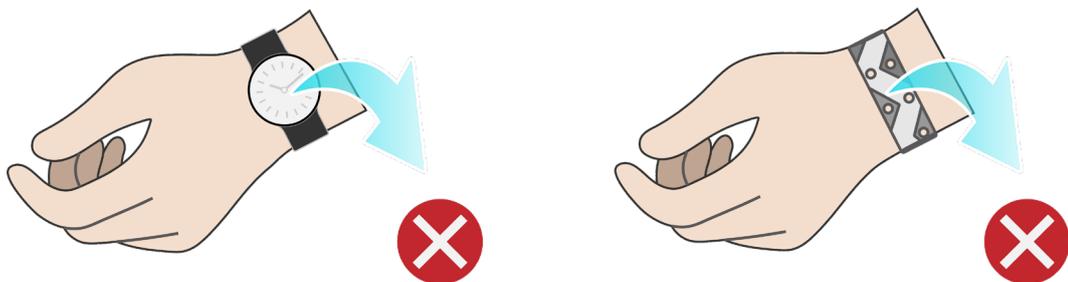
- Only personnel certified or authorized by us are allowed to perform the installation procedures.
- Stop any operation that could cause personal injury or equipment damage. Report to the project manager and take effective protective measures.
- Working during thunderstorms, including but not limited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

Figure 8-1 Protective Clothing



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

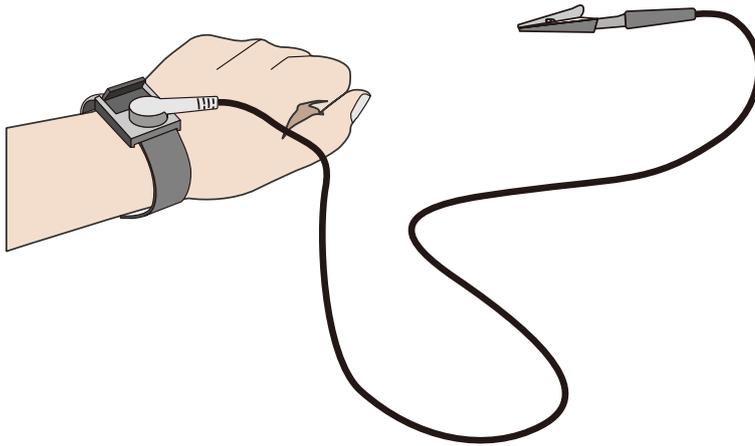
Figure 8-2 Removing Conductive Objects



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

3. Put your hand through an ESD wrist strap.
4. Tighten the strap buckle to ensure a snug fit.
5. Plug the alligator clip of the ESD wrist strap into the corresponding jack on the grounded cabinet or grounded chassis.

Figure 8-3 Wearing an ESD Wrist Strap



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

8.1.3 Equipment Safety

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

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

8.1.4 Transportation Precautions

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

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

8.1.5 Manual Handling Weight Limits



CAUTION

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

[Table 8-1](#) lists the manual handling weight limits per person specified by some organizations.

Table 8-1 Manual Handling Weight Limits per Person

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

9 Limited Warranty

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

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

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

9.1 Warranty Service

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

9.1.1 Remote Technical Support

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

Information needed when requesting support:

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

9.1.2 RMA Service

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



NOTE

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

9.1.3 ARMA Service

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



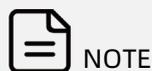
NOTE

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

9.1.4 9 × 5 × NBD Onsite Service

When we ultimately determine that an onsite service call is required to repair or replace a defect, the call will be scheduled in accordance with the Response Time

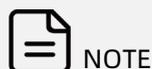
Commitment. The response time is measured from the time when the remote troubleshooting is completed and logged to the arrival of a service engineer and parts to Customer location for repair.



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

9.1.5 24 × 7 × 4 Onsite Service

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



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

9.2 Our Service SLA

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

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

9.3 Warranty Exclusions

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

The Limited Warranty does not apply to

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

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

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

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

10 System Management

10.1 Intelligent Management System ISBMC

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

ISBMC supports:

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

Table 10-1 ISBMC Features

Feature	Description
Management Interface	Supports extensive remote management interfaces for various server O&M scenarios. The supported interfaces include: <ul style="list-style-type: none">• IPMI• SSH CLI• SNMP• HTTPS• Web GUI• Redfish• RESTful• Syslog

Feature	Description
Accurate and Intelligent Fault Location	IDL, a fault diagnosis system, offers accurate and comprehensive hardware fault location capabilities, and outputs detailed fault causes and handling suggestions.
Alert Management	Supports rich automatic remote alert capabilities, including proactive alerting mechanisms such as SNMP Trap (v1/v2c/v3), email alerts and syslog remote alerts to ensure 24 × 7 reliability.
Remote Console KVM	Supports HTML5- and Java-based remote console to remotely control and operate the monitor/mouse/keyboard of the server, providing highly available remote management capabilities without on-site operation.
Virtual Network Console (VNC)	Supports mainstream third-party VNC clients without relying on Java, improving management flexibility.
Remote Virtual Media	Supports virtualizing images, USB devices, folders and local media devices as media devices of remote servers, simplifying OS installation, file sharing, and other O&M tasks.
Web GUI	Supports the visual management interface developed by us, displaying abundant information of the server and components, and offers easy-to-use Web GUIs.
Crash Screenshot and Crash Video Recording	Supports automatic crash screenshot and crash video recording (video needs to be enabled manually) to capture the last screen and video before crash; provides manual screenshot, which can quickly capture the screen for easy inspection at scheduled time
Dual Flash and Dual Image	Supports dual flash and dual image, enabling automatic flash failover in case of software or flash corruption, improving operational reliability.
Power Capping	Supports power capping, increasing deployment density and reducing energy consumption.
IPv4/IPv6	Supports both IPv4 and IPv6, enhancing network deployment flexibility.
Auto-Switching of Management Network Port	Supports auto-switching between the dedicated management network port and shared management network port, providing customers with flexible network deployment solutions for different management network deployment scenarios.
ISBMC Self-Diagnosis and Self-Recovery System	<ul style="list-style-type: none"> • Supports the reliable dual watchdog mechanism for hardware and software, enabling automatic restoration of BMC in case of BMC abnormality. • Provides a thermal protection mechanism, which is automatically triggered when the BMC is abnormal to

Feature	Description
	<p>ensure that the fan operates at safe speeds to avoid system overheating.</p> <ul style="list-style-type: none"> Supports self-diagnosis of processors, memory modules, and storage devices of ISBMC, and automatically cleans the workload to restore to normal when the device usage rate is too high.
Power Control	Supports virtual power buttons for power on/off, power cycle and reset.
UID LED	Supports remote lighting of the UID LED for locating the server in the server room.
Secure Firmware Update	Supports firmware update based on secure digital signatures, and mismatch prevention mechanism for firmware from different manufacturers and firmware for different models; supports firmware update of BMC/BIOS/CPLD/PSU.
Serial Port Redirection	Supports remote redirection of the system serial port, BMC serial port and other serial ports, and directs the server-side serial port output to the local administrator via the network for server debugging.
Storage Information Display	Displays RAID logical array information and drive information, and supports remote RAID creation for improved deployment efficiency.
User Role Management	Supports user detail management based on user roles and flexible creation of user roles with different privileges, and provides more user roles to allow administrators to grant different privileges to O&M personnel.
Security Features	Adopts the industry-leading server security baseline standard V3.0. SSH, HTTPS, SNMP and IPMI use secure and reliable algorithms. ISBMC offers capabilities including secure update and boot and security reinforcement mechanisms such as anti-replay, anti-injection, and anti-brute force.
Double Factor Authentication	Supports double factor authentication for local BMC users. Users need to log in to the BMC with both password and certificate, thus to prevent attacks caused by password leakage.
Configuration Exporting and Importing	To import and export the existing system configurations.

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

10.2 InManage

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

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

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

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

Table 10-2 InManage Features

Feature	Description
Home	<ul style="list-style-type: none"> • Display of basic information (data centers, server rooms, cabinets, assets and alerts), quick addition of devices and custom home page
Assets	<ul style="list-style-type: none"> • Batch asset import, automatic asset discovery, and full lifecycle management of assets • Management of the full range of our server family, including general-purpose rack servers, AI servers, multi-node servers, edge servers and all-in-one servers • Management of our general-purpose disk arrays and distributed storage devices • Management of network devices (switches, routers, etc.), security devices (firewalls, load balancers, etc.), cabinets and clouds • Management of data centers • Asset warranty information management, asset inventory reports for server acceptance, asset attribute expansion, etc.
Monitor	<ul style="list-style-type: none"> • Display of real-time alerts, history alerts, blocked alerts and events • Fault prediction of drives and memories • Custom inspection plan and inspection result management • Notification record viewing • Intelligent fault diagnosis and analysis, automatic fault reporting and repair ticket viewing • Trap management and Redfish management

Feature	Description
	<ul style="list-style-type: none"> • Management of monitoring rules, such as alert rules, notification rules, blocking rules, alert noise reduction rules, compression rules and fault reporting rules, and redefinition of the above rules.
Control	<ul style="list-style-type: none"> • Quick start of firmware update, OS installation, power management, drive data erasing and stress test • Batch firmware update (BMC/BIOS/RAID Card/NIC/Drive/HBA Card/MB CPLD/BP CPLD/PSU) • Batch firmware configuration (BMC/BIOS) • Batch RAID configuration and OS deployment for servers • Secure and quick drive data erasing • CPU and memory stress test • Automatic firmware baseline management • BMC and BIOS snapshot management • Repositories for update files
Energy Efficiency	<ul style="list-style-type: none"> • Overview of data center power consumption trend chart and carbon emission trend chart • Setting of server dynamic power consumption policies and minimum power consumption policies • Server temperature optimization, utilization optimization, power consumption characteristics analysis, power consumption prediction, load distribution, etc. • Carbon asset and carbon emission management
Log	<ul style="list-style-type: none"> • Fault log record management • Diagnosis record and diagnosis rule management
Topologies	<ul style="list-style-type: none"> • Centralized management of multiple data centers and panoramic 3D views, including dynamic display of power consumption, temperature, alerts and cabinet capacity of the data center • Network topologies

Feature	Description
Reports	<ul style="list-style-type: none"> • Management of warranty information reports, alert reports, asset reports, hardware reports and performance reports • Export of reports in .xlsx format
System	<ul style="list-style-type: none"> • Password management, alert forwarding and data dump • Customized InManage parameters
Security	Security control of InManage via a set of security policies such as user management, role management, authentication management (local authentication and LDAP authentication) and certificate management.

10.3 InManage Tools

Table 10-3 Features of InManage Tools

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

11 Certifications

11.1 NF5688-M7-A0-R0-00

Table 11-1 Certifications

Country/Region	Certification	Mandatory/Voluntary
China	CQC	Voluntary
	China Environmental Labelling	Voluntary
International	CB	Voluntary
Korea	KC	Mandatory

11.2 NF5688-M7-C0-R0-00

Table 11-2 Certifications

Country/Region	Certification	Mandatory/Voluntary
China	China Environmental Labelling	Voluntary
International	CB	Voluntary
Korea	KC	Mandatory

12 Appendix A

12.1 Operating Temperature Specification Limits

Table 12-1 Operating Temperature Specification Limits

Configuration	Max. Operating Temp. 35°C (95°F)
24 × 2.5-Inch Drive Configuration	<ul style="list-style-type: none">• 8 NVMe drives and 16 SATA drives• RDIMMs ≤32• CPU ≤350 W• 10 PCIe cards• NVIDIA Hopper HGX 8-GPU baseboard
16 × 2.5-Inch Drive Configuration	<ul style="list-style-type: none">• 16 SATA drives• RDIMMs ≤32• CPU ≤350 W• 10 PCIe cards• NVIDIA Hopper HGX 8-GPU baseboard
	<ul style="list-style-type: none">• 8 NVMe drives and 8 SATA drives• RDIMMs ≤32• CPU ≤350 W• 10 PCIe cards• NVIDIA Hopper HGX 8-GPU baseboard
8 × 2.5-Inch Drive Configuration	<ul style="list-style-type: none">• 8 SATA drives or 8 NVMe drives• RDIMMs ≤32• CPU ≤350 W• 10 PCIe cards• NVIDIA Hopper HGX 8-GPU baseboard



NOTE

- The maximum operating temperature will drop by 5°C (9°F) if a single fan fails.
- Single fan failure may affect system performance.
- The maximum operating temperature for the air-cooled configuration is 28°C (82.4°F) when the server is configured with 400 Gb NICs or HCA cards.

12.2 Model

Certified Model	Description
NF5688-M7-A0-R0-00	Global
NF5688-M7-C0-R0-00	Global

12.3 RAS Features

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

12.4 Sensor List

Sensor	Description	Sensor Location
Inlet_Temp	Air inlet temperature	-
Outlet_Temp	Air outlet temperature	-
CPUx_VR_Temp	CPUx VR temperature	CPUx x indicates the CPU number with a value of 0 - 1
CPUx_Temp	CPUx core temperature	CPUx x indicates the CPU number with a value of 0 - 1
CPUx_DTS	CPU_DTS temperature CPU margin temperature before it reaches the throttling frequency	CPUx x indicates the CPU number with a value of 0 - 1
CPUx_DIMM_T	The maximum temperature among DDR5 DIMMs of CPUx	CPUx x indicates the CPU number with a value of 0 - 1
PCH_Temp	PCH temperature	Motherboard
PSU_Inlet_Temp	PSU temperature	PSU
PVNN_MAIN_CPUx	CPU voltage	CPUx x indicates the CPU number with a value of 0 - 1
nV_PSUx_VIN	PSUx input voltage	<ul style="list-style-type: none"> nV n indicates the PSU voltage, which is 12 V for PSU3 and PSU7 (n is 12), and 54 V for PSU 0/1/2/4/5/6 (n is 54).

Sensor	Description	Sensor Location
		<ul style="list-style-type: none"> PSUx x indicates the PSU number with a value of 0 - 7
nV_PSUx_VOUT	PSUx output voltage	<ul style="list-style-type: none"> nV n indicates the PSU voltage, which is 12 V for PSU3 and PSU7 (n is 12), and 54 V for PSU 0/1/2/4/5/6 (n is 54). PSUx x indicates the PSU number with a value of 0 - 7
SYS_12V	System 12 V voltage (output by HSC)	Motherboard
SYS_5V	System 5 V voltage	Motherboard
SYS_3V3	System 3.3 V voltage	Motherboard
PVNN_PCH_STBY	PCH core voltage	Motherboard
P1V05_PCH_STBY	PCH logic voltage	Motherboard
RTC_Battery	Motherboard RTC battery voltage	Motherboard
Total_Power	Total power	/
nV_PSUx_PIN	PSUx input power	<ul style="list-style-type: none"> nV n indicates the PSU voltage, which is 12 V for PSU3 and PSU7 (n is 12), and 54 V for PSU 0/1/2/4/5/6 (n is 54). PSUx x indicates the PSU number with a value of 0 - 7
nV_PSUx_POUT	PSUx output power	<ul style="list-style-type: none"> nV n indicates the PSU voltage, which is 12 V for PSU3 and PSU7 (n is 12), and 54 V for PSU 0/1/2/4/5/6 (n is 54). PSUx x indicates the PSU number with a value of 0 - 7
CPU_Power	Total CPU power (obtained through ME)	/
Memory_Power	Total memory power (obtained through ME)	/

Sensor	Description	Sensor Location
FANx_F_Speed, FANx_R_Speed	FANx speed in rpm	FANx x indicates the fan number with a value of 0 - 11
RAID_Temp	PCIe RAID card temperature (Max. temp. will be taken in case of multiple RAID cards, including SAS card, RAID card, and HBA card)	RAID card
HDD_MAX_Temp	Maximum temperature among all drives	-
OCP_RAID_Temp	RAID mezz card temperature	-
NVME_Temp	Maximum temperature among all NVMe drives	-
OCP_NIC_SFP_Temp	OCP 3.0 card SFP module temperature	OCP 3.0 card SFP module
PCIe_NIC_SFP_T	PCIe NIC SFP module temperature	PCIe NIC SFP module
OCP_NIC_Temp	OCP 3.0 card temperature (Max temp. will be taken in case of multiple OCP 3.0 cards)	OCP 3.0 card
PCIE_NIC_Temp	PCIe NIC temperature (Max temp. will be taken in case of multiple PCIe NICs)	PCIe NIC
FAN_Power	Total fan power	-
P12V_CPUx_DIMM	CPUx DIMM voltage	CPUx x indicates the CPU number with a value of 0 - 1
PVCCIN_CPUx	CPUx core voltage	CPUx x indicates the CPU number with a value of 0 - 1
PVCCFA_FIVR_CPUx	UPI IIO voltage	CPUx x indicates the CPU number with a value of 0 - 1
PVC_CIN_FAON_CPUx	CPUx boot voltage	CPUx x indicates the CPU number with a value of 0 - 1
PVCCFA_EHV_CPUx	Controller voltage	CPUx x indicates the CPU number with a value of 0 - 1

Sensor	Description	Sensor Location
PVCCD_HV_CPUx	Memory controller voltage	CPUx x indicates the CPU number with a value of 0 - 1
CPUx_Status	CPUx status	CPUx x indicates the CPU number with a value of 0 - 1
PSU_Redundant	PSU redundancy status	-
FanX_Status	FanX status	FanX X indicates the fan number with a value of 0 - 11
CPUx1_Cx2Dx3	DIMM silkscreen	Motherboard x1 indicates the CPU number with a value of 0 - 1 x2 indicates the channel number with a value of 0 - 7 x3 indicates the DIMM slot number with a value of 0 - 1
PSU_Mismatch	Monitored PSU model mismatch	-
POST_Status	System firmware and POST status	-
CPU_Config	CPU configuration status (mixing of CPUs, or primary CPU not installed)	-
SEL_Status	SEL status	-
PCle_Status	The status of PCIe device (including PCIe bus, slots and cards)	-
PWR_CAP_Fail	Power capping failure	-
PSUx_Status	PSUx status	PSUx x indicates the PSU number with a value of 0 - 7
K_HDDx	HDD	HDDx K denotes front, internal and rear, with a value of F/I/R respectively x indicates the drive number
BMC_Boot_Up	BMC boot up complete	-

Sensor	Description	Sensor Location
BIOS_Boot_Up	BIOS boot up complete	-
FAN_Redundant	Fan redundancy status	-
Sys_Health	System health status	-
ACPI_PWR	ACPI status	-
Intrusion	Chassis-opening activity	-
LeakageStatus	Leak detection	Top cover
ME_FW_Status	ME health status	-
TPM_Verify	TPM verification status	-
System_Error	System error	-
CPUx_PMEM_DIMM_T	The maximum temperature among all PMems of CPUx	CPUx x indicates the CPU number with a value of 0 - 1
GPUx_Temp	GPUx core temperature	GPUx x indicates the GPU number with a value of 0 - 7
MEM_ResourceRate	Memory utilization rate	-
CPU_ResourceRate	CPU utilization rate	-
DELTA_FPGA_Temp	FPGA temperature on Delta-Next board	-
DELTA_NVSWx_Temp	NVSW temperature on Delta-Next board	-
GPUx_Mem_Temp	GPUx memory temperature	GPUx x indicates the GPU number with a value of 0 - 7
DELTA_PCSW_Temp	PCIe switch temperature on Delta-Next board	-
DELTA_RTxx_Temp	Retimer temperature on Delta-Next board	-
SWB_Inlet_Temp	Maximum inlet temperature of switch board	-
SWB_PCIEIN_Temp	Maximum inlet temperature of PCIe slots on switch board	-
MBP_GPUOUT_Temp	Average outlet temperature of GPU board on the midplane	-
MBP_PSUIN_Temp	Average inlet temperature of PSUs on the midplane	-

Sensor	Description	Sensor Location
PDB_FANIN_Temp	Average inlet temperature of rear 8086 fans on PDB	-
PDB_PSUIN_Temp	Average inlet temperature of PSUs on PDB	-
UID_Button	Long press the UID button to reset the BMC	-
PCIE_HCA_Temp	HCA card temperature (The maximum temp. will be taken in case of multiple HCA cards)	-
PCIE_HCA_SFP_T	HCA card SFP module temperature	-
FPGA_Card_Temp	FPGA card temperature	-
HBA_Temp	HBA card temperature	-
UBB54PB_Temp	UBB 54 V power chip temperature	
GPUx_Tlimit_Temp	GPUx Tlimit temperature, GPU margin temperature before it reaches the throttling frequency	GPUx x indicates the GPU number with a value of 0 - 7
nV_PSUx_IOUT	PSU output current	<ul style="list-style-type: none"> nV n indicates the PSU voltage, which is 12 V for PSU3 and PSU7 (n is 12), and 54 V for PSU 0/1/2/4/5/6 (n is 54). PSUx x indicates the PSU number with a value of 0 - 7
SNIC_SFP_Temp	Smart NIC SFP module temperature	Smart NIC
SNIC_NIC_Temp	Smart NIC temperature	Smart NIC
PWR_Drop	Abnormal power failure	-

13 Appendix B Acronyms and Abbreviations

13.1 A - E

A

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

B

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

C

CAS	Column Address Strobe
-----	-----------------------

CB	Certification Body
CE	Conformite Europeenne
CEN	European Committee for Standardization
CLI	Command-Line Interface
CMOS	Complementary Metal-Oxide-Semiconductor
CPLD	Complex Programmable Logic Device
CPU	Central Processing Unit
CRPS	Common Redundant Power Supply
CSP	Cloud Service Provider
CV	Computer Vision
CXL	Compute Express Link

D

DC	Direct Current
DDR5	Double Data Rate 5
DIMM	Dual In-line Memory Module
DOA	Dead on Arrival
DPC	DIMM Per Channel
DRAM	Dynamic Random Access Memory
DTS	Digital Thermal Sensor

E

EAC	Eurasian Conformity
EBG	Emmitsburg
ECC	Error-Correcting Code
ECMA	European Computer Manufacturers Association

ESD	Electrostatic Discharge
-----	-------------------------

13.2 F - J

F

FCC	Federal Communications Commission
FHHL	Full-Height Half-Length
FPGA	Field Programmable Gate Array

G

GPU	Graphics Processing Unit
GUI	Graphical User Interface

H

HBA	Host Bus Adapter
HCA	Host Channel Adapter
HDD	Hard Disk Drive
HHHL	Half-Height Half-Length
HSE	Health and Safety Executive
HSC	Hot Swap Controller
HTML	HyperText Markup Language
HTTPS	HyperText Transfer Protocol Secure

I

IB	InfiniBand
IC	Industry Canada

ID	Identification
IEC	International Electrotechnical Commission
IIPC	Intel Intelligent Power Capability
iMC	Integrated Memory Controller
IP	Internet Protocol
IPMI	Intelligent Platform Management Interface
ISA	International Society of Automation
ISO	International Organization for Standardization
IVA	Intelligent Virtual Assistant

13.3 K - O

K

KC	Korea Certification
KVM	Keyboard, Video, Mouse

L

LDAP	Lightweight Directory Access Protocol
LED	Light Emitting Diode
LP	Low Profile

M

MB	Motherboard
ME	Management Engine

N

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

O

OCP	Open Compute Project
OS	Operating System
OSHA	Occupational Safety and Health Administration

13.4 P - T

P

PCH	Platform Controller Hub
PCIe	Peripheral Component Interconnect Express
PDB	Power Distribution Board
PDU	Power Distribution Unit
PFR	Platform Firmware Resilience
PHY	Physical
PID	Proportional-Integral-Derivative
POST	Power-On Self-Test
PSU	Power Supply Unit

PUE	Power Usage Effectiveness
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R

RAID	Redundant Arrays of Independent Disks
RAS	Reliability, Availability, Serviceability
RCM	Regulatory Compliance Mark
RDIMM	Registered Dual In-line Memory Module
RH	Relative Humidity
RMA	Return Material Authorization
RST	Reset
RTC	Real Time Clock

S

SAS	Serial Attached SCSI
SATA	Serial Advanced Technology Attachment
SCM	Secure Control Module
SCSI	Small Computer System Interface
SEL	System Event Log
SFF	Small Form Factor
SFP	Small Form-Factor Pluggable
SGPIO	Serial General Purpose Input/Output
SLA	Service Level Agreement
SNMP	Simple Network Management Protocol
SSD	Solid State Drive
SSH	Secure Shell
Syslog	System Log

T

TCM	Trusted Cryptography Module
TDP	Thermal Design Power
TF	TransFlash
TPM	Trusted Platform Module
TSOM	Transport, Storage, Operation Monitor

13.5 U - Z

U

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

V

VGA	Video Graphics Array
VLAN	Virtual Local Area Network
VMD	Volume Management Device
VNC	Virtual Network Console
VPP	Virtual Pin Port
VRD	Voltage Regulator-Down

x

XDP	eXtend Debug Port
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