



White Paper for KAYTUS K22V2 Series Servers

Powered by AMD Processors

For K22-E2-A0-R0-00

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Applicable Model

Model	Node Model	Maintenance	Cooling
K22-E2-A0-R0-00	KM2160-E2-A0-R0-00	Rear access	Air cooling

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Abstract






This document describes the K22V2 AMD-based server's appearance, features, performance parameters, and software and hardware compatibility, providing in-depth information of K22V2.

Intended Audience

This white paper 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	2024/11/29	Initial release

Table of Contents

1	Product Overview	1
2	Features	2
2.1	Scalability and Performance	2
2.2	Availability and Serviceability	3
2.3	Manageability and Security	4
2.4	Energy Efficiency	5
3	System Parts Breakdown	7
4	Logical Diagram	8
5	Hardware Description	10
5.1	Front Panel	10
5.1.1	No-Drive Configuration	10
5.1.2	12 × 2.5-Inch SATA/NVMe SSD Configuration	11
5.2	Rear Panel	11
5.2.1	4 × PCIe Slot Configuration	11
5.2.2	8 × PCIe Slot Configuration	12
5.3	Buttons and LEDs	13
5.3.1	Front Panel Buttons and LEDs	13
5.3.2	Rear Panel Buttons and LEDs	14
5.3.3	Drive LEDs	15
5.3.4	PSU LED	17
5.4	Ports	17
5.5	Processors	18
5.6	Memory	19
5.6.1	DDR5 DIMMs	19
5.7	Storage	23

5.7.1	Drive Configurations	23
5.7.2	Drive Numbering	24
5.7.3	RAID Cards	24
5.8	Network	25
5.9	I/O Expansion	25
5.9.1	PCIe Expansion Cards	25
5.9.2	PCIe Slots	25
5.9.3	PCIe Riser Modules.....	26
5.9.4	PCIe Slot Description.....	30
5.10	PSUs	30
5.11	Fan Modules.....	31
5.12	Boards.....	32
5.12.1	Motherboard	33
5.12.2	Backplane.....	34
6	System Specifications	35
6.1	Technical Specifications	35
6.2	Environmental Specifications	38
6.3	Physical Specifications	39
7	Operating System and Hardware Compatibility	42
7.1	Supported Operating Systems	42
7.2	Hardware Compatibility	43
7.2.1	CPU Specifications	43
7.2.2	Memory Specifications.....	43
7.2.3	Drive Specifications	44
7.2.4	RAID Specifications	45
7.2.5	NIC Specifications	45
7.2.6	PSU Specifications	45

8	Regulatory Information	47
8.1	Safety	47
8.1.1	General	47
8.1.2	Personal Safety	47
8.1.3	Equipment Safety	49
8.1.4	Transportation Precautions	50
8.1.5	Manual Handling Weight Limits	50
9	Limited Warranty	51
9.1	Warranty Service	51
9.1.1	Remote Technical Support	51
9.1.2	RMA Service	52
9.1.3	ARMA Service	52
9.1.4	9 × 5 × NBD Onsite Service	52
9.1.5	24 × 7 × 4 Onsite Service	53
9.2	Our Service SLA	53
9.3	Warranty Exclusions	53
10	System Management	55
10.1	Intelligent Management System BMC	55
10.2	KSManage	58
10.3	KSManage Tools	60
11	Certifications	62
12	Appendix A	63
12.1	Operating Temperature Specification Limits	63
12.2	Model	63
12.3	RAS Features	63
12.4	Sensor List	64
13	Appendix B Acronyms and Abbreviations	69

13.1 A - E.....	69
13.2 F - J.....	70
13.3 K - O	72
13.4 P - T.....	73
13.5 U - Z	74

1 Product Overview

The K22V2 AMD-based system is a high-performance 2U 2-node rack server powered by AMD EPYC 9004 series processors. It brings superior performance, high reliability and intelligent power and fan control. It delivers flexible storage configurations while conserving rack space, energy consumption and deployment costs. It is designed for data center, virtualization, and other compute-intensive application scenarios.

Figure 1-1 Appearance of No-Drive Configuration

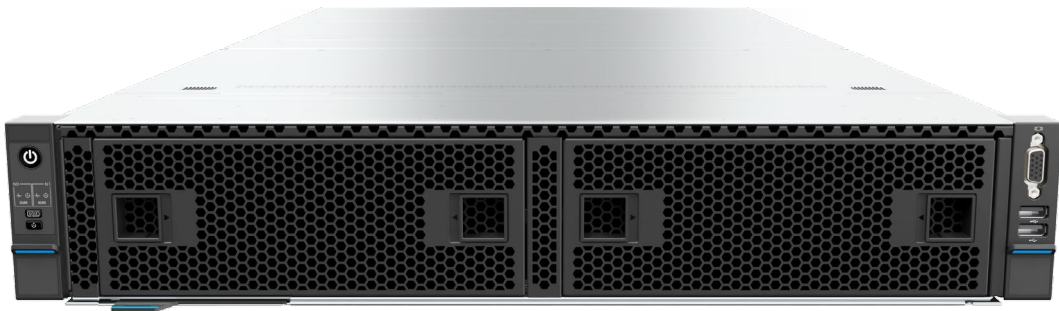
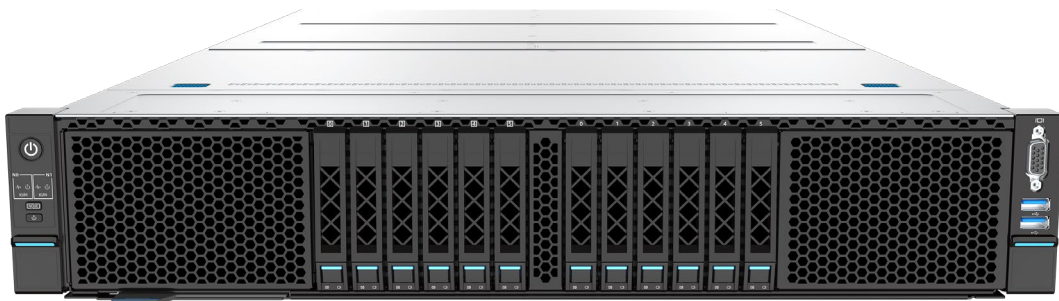


Figure 1-2 Appearance of 12 × 2.5-Inch SATA/NVMe SSD Configuration



2 Features

2.1 Scalability and Performance

Table 2-1 Scalability and Performance

Feature	Description
AMD EPYC 9004 Series CPU	<ul style="list-style-type: none"> Up to 96 cores, with a max base frequency of 4.1 GHz (the core number of the corresponding processor is 16), a max boost frequency of 4.4 GHz (the core number of the corresponding processor is 16), an L3 cache of up to 384 MB and a max TDP of 400 W. Support for 12 DDR5 memory channels per CPU, 128 PCIe 5.0 lanes per CPU and CXL 1.1+. 2 processors with up to 192 cores and 384 threads, maximizing concurrent execution of multi-threaded applications. AMD Turbo Core technology brings you an intelligent self-adaption system. It allows the CPU cores to exceed the processor TDP at peak workload and run at the max boost frequency. AMD Simultaneous Multi-Threading (SMT) technology allows every processor core to run multiple threads (up to 2 threads per core) concurrently, improving the performance of multi-threaded applications. AMD Virtualization (AMD-V) technology integrates hardware-level virtualization features, allowing the operating system to better leverage hardware to handle virtualized workloads.
DDR5 ECC DIMMs	<p>Up to 24 DDR5 ECC DIMMs (4,800 MT/s or 5,600 MT/s, RDIMMs, 12 DIMMs per node), delivering superior speed, high availability, and a memory capacity of up to 3 TB (up to 1.5 TB per node).</p> <p>Note: For DIMMs with a rated speed of 5,600 MT/s, the actual operating speed will be degraded to 4,800 MT/s due to memory speed limitation of AMD EPYC 9004 series processors.</p>
Flexible drive configurations	Provides elastic and scalable storage solutions to meet different capacity and upgrade requirements.

Feature	Description
All-SSD configuration	Brings higher I/O performance over all-HDD configuration or HDD-SSD mixing configuration.
AMD integrated I/O technology	With the AMD integrated I/O technology, the processors integrate the PCIe 5.0 controller to significantly reduce I/O latency and enhance overall system performance. The CXL 1.1 technology built on PCIe 5.0 enables resource sharing among different PCIe devices.
PCIe 5.0 expansion	<ul style="list-style-type: none"> When the single-slot riser is used, up to 2 PCIe 5.0 x16 HHHL expansion cards (up to 1 PCIe 5.0 x16 HHHL expansion card per node) are supported. When the two-slot riser is used, up to 4 PCIe 5.0 x16 HHHL expansion cards (up to 2 PCIe 5.0 x16 HHHL expansion cards per node) are supported. When the four-slot riser is used, up to 6 PCIe 5.0 LP expansion cards (two x16 and four x8 cards) and 2 PCIe 5.0 x16 FH³/₄L expansion cards (up to 3 PCIe 5.0 LP expansion cards and 1 PCIe 5.0 x16 FH³/₄L expansion card per node) are supported.
OCP IO	<p>Two dedicated PCIe 5.0 x16 OCP slots that can flexibly support two hot-plug 10/25/100/200 Gb OCP 3.0 cards (1 for each node.)</p> <p>Note:</p> <p>The hot-plug feature of the OCP 3.0 card has been validated on Red Hat Enterprise Linux 9.0. This feature is not guaranteed on other OSs.</p>

2.2 Availability and Serviceability

Table 2-2 Availability and Serviceability

Feature	Description
Hot-swappable SATA/NVMe SSDs	Supports hot-swappable SATA/NVMe SSDs and RAID card with RAID levels 0/1/10/5/50/6, RAID cache and data protection enabled by the super-capacitor in case of power failures.
Reliability	<ul style="list-style-type: none"> SSDs are much more reliable than traditional HDDs, increasing system uptime. The BMC monitors system parameters in real time and sends alerts in advance, enabling technicians to take

Feature	Description
	appropriate measures to ensure stable system operation and minimize system downtime.
Availability	<ul style="list-style-type: none"> Up to 2 hot-swap PSUs with 1+1 redundancy and 6 fans with N+1 redundancy, improving system availability. The UID and LEDs on the front panel and the BMC Web GUI indicate the status of key components and quickly lead technicians to failed (or failing) components, simplifying maintenance, speeding up troubleshooting, and enhancing system availability.
O&M efficiency	<ul style="list-style-type: none"> The BMC management network port on the rear panel enables local BMC O&M, improving O&M efficiency. Hot-swap system nodes, simplifying O&M Online memory diagnosis helps service technicians quickly locate the failed DIMMs, improving maintenance efficiency.

2.3 Manageability and Security

Table 2-3 Manageability and Security

Feature	Description
Remote management	The BMC monitors system operating status and enables remote management.
Network Controller Sideband Interface (NC-SI) feature	<p>The Network Controller Sideband Interface (NC-SI) feature allows a network port to serve as a management port and a service port. The NC-SI feature is disabled by default and can be enabled/disabled through the BIOS or BMC.</p> <p>Notes:</p> <p>The NC-SI port supports the following features:</p> <ul style="list-style-type: none"> 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 both IPv6 and IPv4 addresses. The subnet mask of IPv4 or prefix length of IPv6 subnet mask, IP addresses, and default gateways can be configured.
Unified Extensible Firmware Interface (UEFI)	The industry-standard UEFI improves the efficiency of setup, configuration and update, and simplifies the error handling process.

Feature	Description
TPM & TCM	Trusted Platform Module (TPM) 2.0 and Trusted Cryptography Module (TCM) provide advanced encryption.
Firmware update mechanism	The firmware update mechanism based on digital signatures prevents unauthorized firmware updates.
UEFI Secure Boot	Protects the system from malicious bootloaders.
Hierarchical BIOS password protection	Ensures system boot and management security.
BIOS Secure Flash and BIOS Lock Enable (BLE)	Reduce attacks from malicious software on the BIOS flash region.
BMC dual-image mechanism	Recovers firmware upon detection of corrupted BMC firmware.
BMC Secure Boot	Protects BMC from malicious tampering.
BMC Management Security	Flexible BMC access control policies and double-factor authentication improve BMC management security.
System Safe Erasing	Optional system safe erasing enables you to wipe off storage data with one click.
Intelligent Management Software KSMANage	Allows centralized management of the server and full lifecycle management covering part-level asset management, intelligent monitoring and alerting, automatic inspection, fault diagnosis and reporting, energy consumption management, and firmware update/configuration.
KSMANage Boot	Enables rapid server initialization and supports batch RAID configuration and OS deployment.
Intelligent Management System BMC	Provides various security features such as identification and authentication, authorization and access control, Web GUI security configuration, and log audit, offering industry-leading security reinforcement capabilities.

2.4 Energy Efficiency

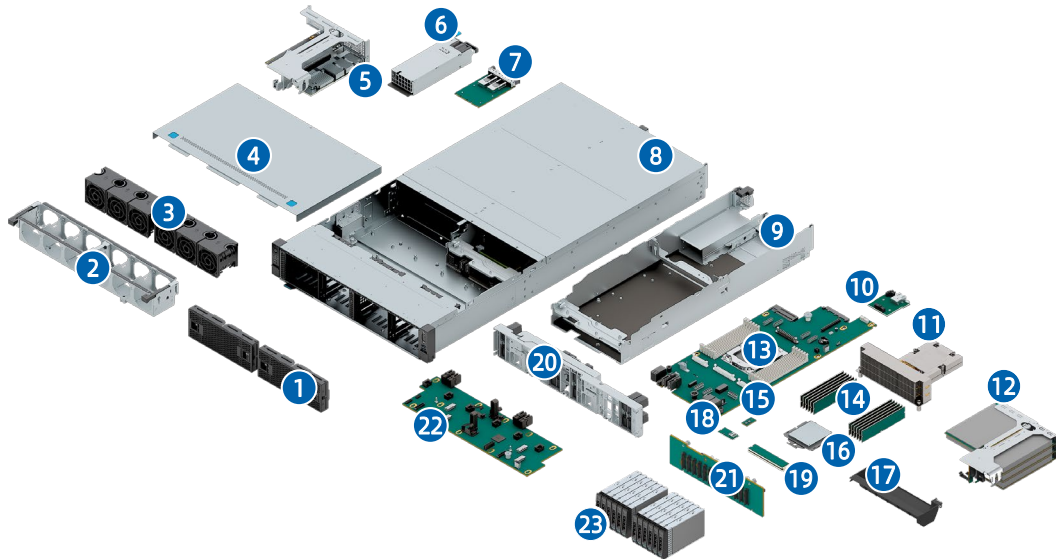
Table 2-4 Energy Efficiency

Feature	Description
80 Plus Platinum/Titanium power supply	Equipped with 80 Plus Platinum/Titanium power supplies of different power efficiency levels, with

Feature	Description
	power efficiency up to 94% (Platinum)/96% (Titanium) at a load of 50%.
1+1 redundant PSUs	1+1 redundant PSUs supporting AC/DC power input, improving power conversion efficiency.
VRD solution	Features the high-efficiency single-board voltage regulator down (VRD) solution, reducing DC-DC conversion loss.
Proportional-Integral-Derivative (PID) intelligent fan speed control and intelligent CPU frequency scaling	Supports Proportional-Integral-Derivative (PID) intelligent fan speed control and intelligent CPU frequency scaling, conserving energy.
System cooling design	Offers a fully-optimized system cooling design with energy-efficient cooling fans, lowering energy consumption from system cooling.
Power capping and power control	Provides power capping and power control measures.

3 System Parts Breakdown

Figure 3-1 Exploded View



Item	Feature	Item	Feature
1	Front Panel Cover	13	Motherboard
2	Fan Cage	14	DIMMs
3	Fan Modules	15	TPM/TCM Module
4	Top Cover	16	CPU
5	PCIe Butterfly Riser Module (for 1 or 2 PCIe cards)	17	Node Air Duct
6	PSU	18	System TF Card Module
7	OCP 3.0 Card	19	M.2 SSD Modules
8	System Chassis	20	Mid-Panel Mount Module
9	Node Chassis	21	Drive Backplane
10	IO Board	22	Midplane
11	Heatsink	23	Drive Modules
12	PCIe Butterfly Riser Module (for 4 PCIe cards)	-	-

card slot (for BMC TF card) and 1 TF card adapter connector (for the system TF card adapter), and other connectors.

5 Hardware Description



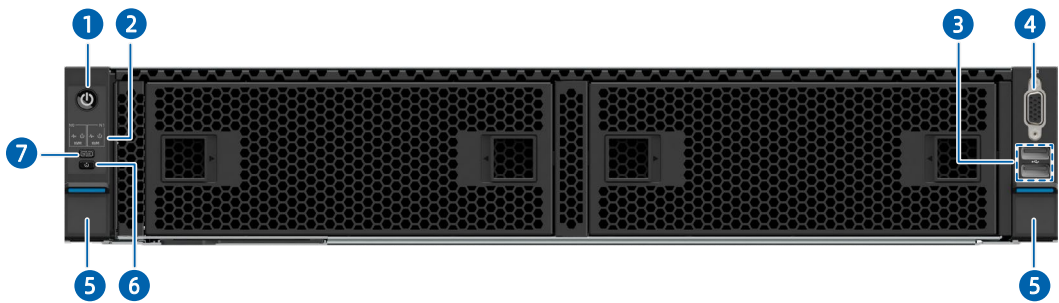
NOTE

The figure below may be different from the actual configuration.

5.1 Front Panel

5.1.1 No-Drive Configuration

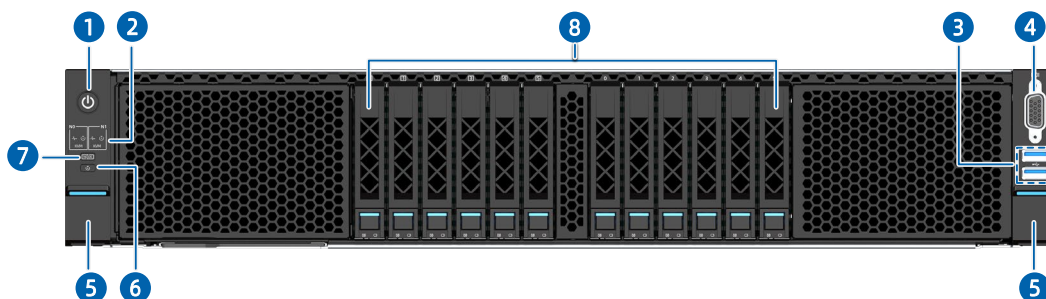
Figure 5-1 Front View



Item	Feature
1	Power Button and LED
2	Node LEDs
3	USB 2.0 Ports
4	VGA Port
5	Ear Latch
6	UID/BMC RST Button
7	Node Switch Button

5.1.2 12 × 2.5-Inch SATA/NVMe SSD Configuration

Figure 5-2 Front View

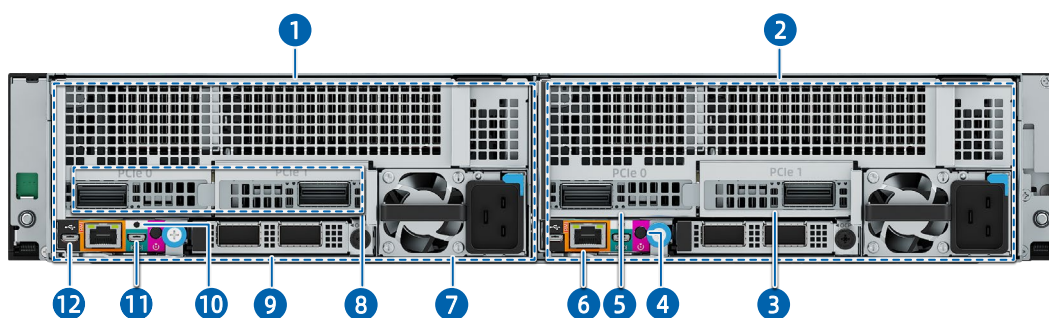


Item	Feature
1	Power Button and LED
2	Node LEDs
3	USB 2.0 Ports
4	VGA Port
5	Ear Latch
6	UID/BMC RST Button
7	Node Switch Button
8	2.5-Inch SSD Bay × 12

5.2 Rear Panel

5.2.1 4 × PCIe Slot Configuration

Figure 5-3 Rear View

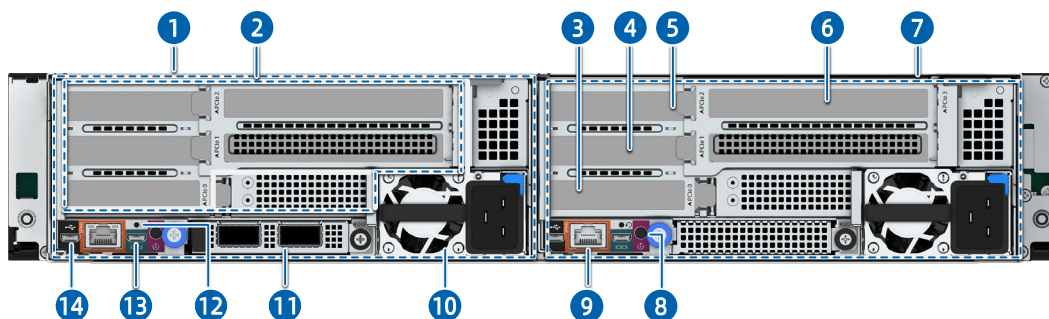


Item	Feature	Item	Feature
1	Node 1	7	PSU
2	Node 0	8	PCIe Riser Module

Item	Feature	Item	Feature
3	PCIe Slot 1 (empty when the single-slot riser is used)	9	OCP 3.0 Card
4	Node UID/BMC RST Button and LED	10	Node Reset Button
5	PCIe Slot 0	11	System/BMC Serial Port
6	BMC Management Network Port	12	Micro USB 2.0 Port

5.2.2 8 × PCIe Slot Configuration

Figure 5-4 Rear View


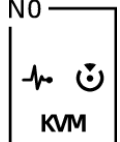
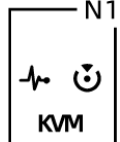






Item	Feature	Item	Feature
1	Node 1	8	Node UID/BMC RST Button and LED
2	PCIe Riser Module	9	BMC Management Network Port
3	PCIe Slot 0	10	PSU
4	PCIe Slot 1	11	OCP 3.0 Card (An OCP blank is shown in node 0)
5	PCIe Slot 2	12	Node Reset Button
6	PCIe Slot 3	13	System/BMC Serial Port
7	Node 0	14	Micro USB 2.0 Port

5.3 Buttons and LEDs

5.3.1 Front Panel Buttons and LEDs

Table 5-1 Button and LED Description

Icon	Feature	Description
	Power Button and LED	<ul style="list-style-type: none"> 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 4 seconds to force a shutdown from the power-on state. Power LED: <ul style="list-style-type: none"> Off = No power Solid green = Power-on state Solid amber = Standby state
	Node 0 LEDs	Include node 0 health LED, node 0 UID LED and node 0 selected LED
	Node 1 LEDs	Include node 1 health LED, node 1 UID LED and node 1 selected LED
	Node Switch Button	Enables you to switch the selected node. Upon switching to a specific node, the front USB and VGA ports will serve as the output ports for that node.
	UID/BMC RST Button	<ul style="list-style-type: none"> Press and release the button to turn on/off the UID LED Press and hold the button for 6 seconds to force the BMC to reset
	Node Health LED	<ul style="list-style-type: none"> Off = Normal Blinking red (1 Hz) = A warning error occurs Solid red = A critical error occurs
	Node UID LED	Solid blue = The UID LED is activated by the UID button or via the BMC

Icon	Feature	Description
KVM	Node Selected LED	<ul style="list-style-type: none"> Off = The current node is not selected Solid white = The current node is selected

**NOTE**

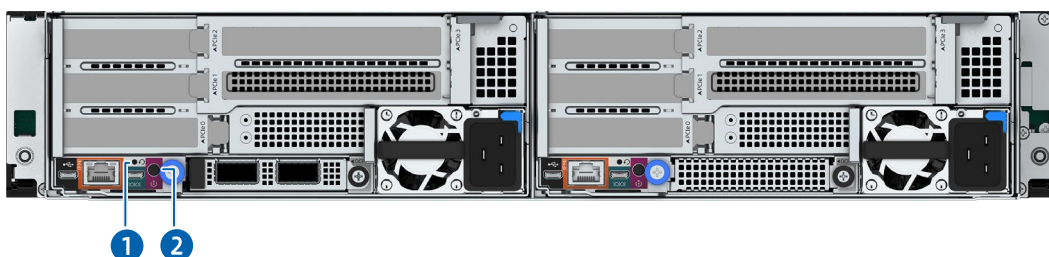
- Warning error: Errors that result in redundancy degradation or loss, and other errors that have a minor impact on system running and that require attention.
- Critical error: Errors that result in system crash or restart, part failure, and other errors that have a major impact on system running and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

5.3.2 Rear Panel Buttons and LEDs


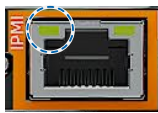
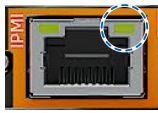
Figure 5-5 Rear Panel Buttons and LEDs of 4 × PCIe Slot Configuration



Figure 5-6 Rear Panel Buttons and LEDs of 8 × PCIe Slot Configuration



Icon	Feature	Description
	Node Reset Button	Press and release the button to reset the node OS

Icon	Feature	Description
	Node UID/BMC RST Button and LED	<ul style="list-style-type: none"> Node UID/BMC RST button: <ul style="list-style-type: none"> Press and release the button to turn on/off the UID LED Press and hold the button for 6 seconds to force the BMC to reset Node UID LED: <ul style="list-style-type: none"> Blinking blue = KVM is launched or firmware update in progress Solid blue = The node UID LED is activated by the UID button or via the BMC
	Management Network Port Link Speed LED	<ul style="list-style-type: none"> Off = No network connection Solid green = Network connected with link speed at 1,000 Mbps Solid orange = Network connected with link speed at 10/100 Mbps
	Management Network Port Link Activity LED	<ul style="list-style-type: none"> Off = No network connection Solid green = Network connected without data being transmitted Blinking green = Network connected with data being transmitted

5.3.3 Drive LEDs

1. SATA Drive LEDs

Figure 5-7 SATA Drive LEDs



Activity LED (①)	Locator/Error LED (②)			Description
Green	Blue	Red		
Off	Off	RAID created	RAID not created	Drive absent
		Solid on	Off	

Activity LED (①)	Locator/Error LED (②)		Description
Green	Blue	Red	
Solid on	Off	Off	Drive present but not in use
Blinking (4 Hz)	Off	Off	Drive present and in use
Blinking (4 Hz)	Solid pink		Copyback/Rebuild in progress
Solid on	Solid on	Off	Drive selected but not in use
Blinking (4 Hz)	Solid on	Off	Drive selected and in use
Off	Solid on	Off	Drive is selected but fails
Any status	Off	Solid on	Drive fails

2. NVMe Drive LEDs

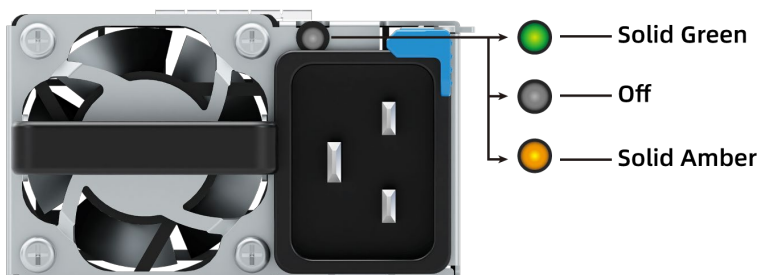
Figure 5-8 NVMe Drive LEDs



Activity LED (①)	Error LED (②)		Description
Green	Blue	Red	
Off	Off	Off	Drive absent
Solid on	Off	Off	Drive present but not in use
Blinking (4 Hz)	Off	Off	Drive present and in use
Blinking (4 Hz)	Solid pink		Copyback/Rebuild/Initializing/Verifying in progress
Solid on	Solid on	Off	Drive selected but not in use
Blinking (4 Hz)	Solid on	Off	Drive selected and in use
Off	Solid on	Off	Drive is selected but fails
Any status	Off	Solid on	Drive fails

5.3.4 PSU LED

Figure 5-9 PSU LEDs



NOTE

The PSU appearance and LED location may vary by different PSU model. The figure above is for illustration only.

Table 5-2 PSU LED

PSU LED	Description
Solid green	Normal input and output
Off	No AC/DC input to PSU
Solid amber	PSU critical event causing a shutdown (possible causes: PSU overtemperature protection, PSU overcurrent protection, PSU overvoltage protection, short circuit protection)
Blinking amber (1 Hz)	PSU warning event where the PSU continues to operate (possible causes: PSU overtemperature warning, PSU overcurrent warning, excessively low fan speed warning)
Blinking green (1 Hz)	PSU operating in standby state with normal input
Blinking green (off for 1 second and on for 2 seconds)	PSU in sleep state for cold redundancy
Blinking green (2 Hz)	PSU firmware updating

5.4 Ports

Table 5-3 Port Description

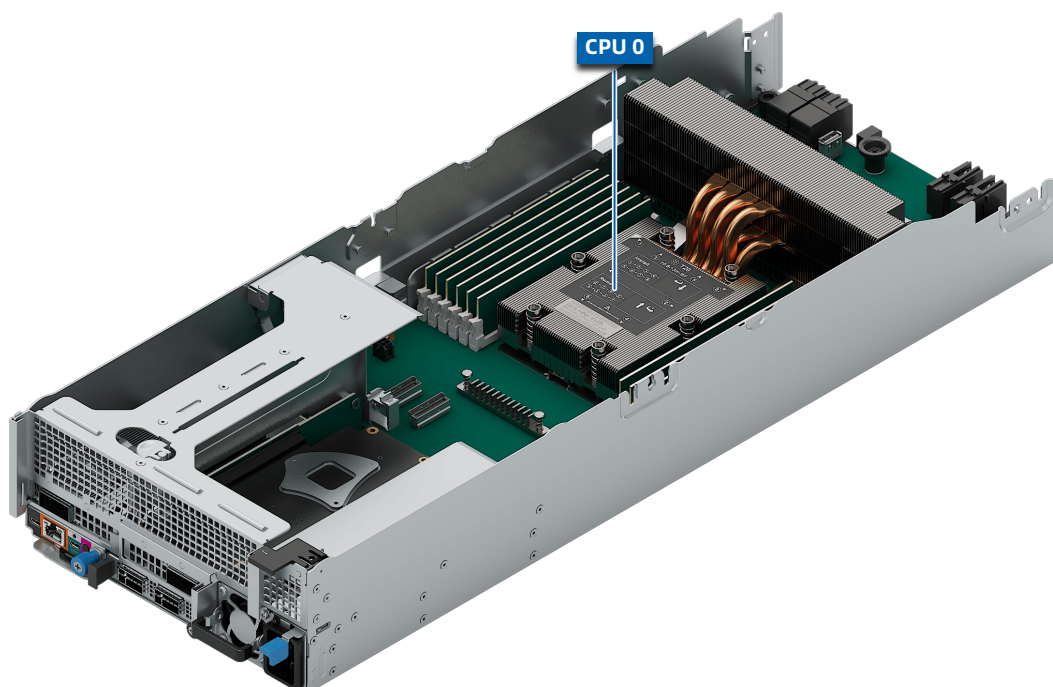
Feature	Description
VGA Port	Enables you to connect a display terminal to the system
USB 2.0 Port	Enables you to connect a USB 2.0 device to the system

Feature	Description
Micro USB 2.0 Port	Enables you to transfer data
System/BMC Serial Port	<ul style="list-style-type: none">Enables you to debug and monitor the systemEnables you to debug and monitor the BMC
BMC Management Network Port	Enables you to manage the server Note: It is a GbE port of 100/1,000 Mbps auto-negotiation
OCP 3.0 Network Port	Enables you to connect to a network
PCIe NIC Port	Enables you to connect to a network

5.5 Processors

- One AMD EPYC 9004 series processor per node.
- The processors used in a server must be of the same model.
- For specific system processor options, consult your local sales representative or refer to [7.2 Hardware Compatibility](#).

Figure 5-10 Processor Location



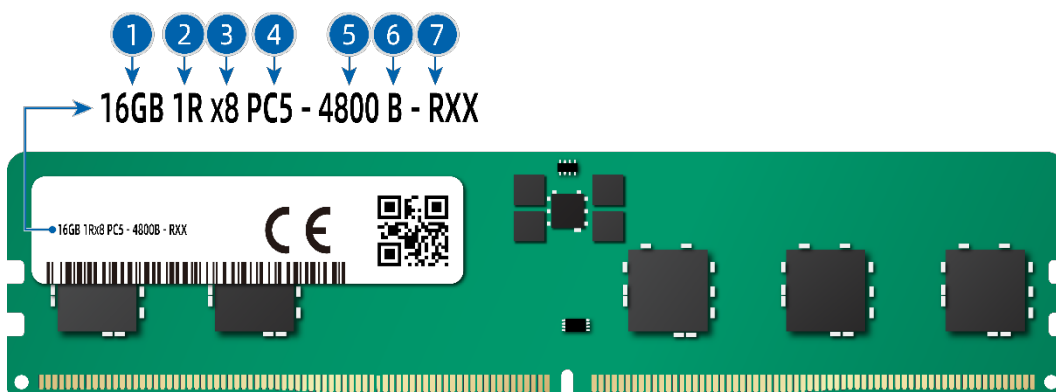
5.6 Memory

5.6.1 DDR5 DIMMs

1. Identification

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

Figure 5-11 DIMM Identification



Item	Description	Example
1	Capacity	<ul style="list-style-type: none"> • 16 GB • 24 GB • 32 GB • 64 GB • 96 GB • 128 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

Item	Description	Example
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

2. Memory Subsystem Architecture

Each node supports 12 DIMM slots and 12 memory channels per CPU.

Table 5-4 DIMM Slot List

CPU	Channel ID	Silk Screen
CPU0	Channel A	CPU0_CAD0
	Channel B	CPU0_CBD0
	Channel C	CPU0_CCD0
	Channel D	CPU0_CDD0
	Channel E	CPU0_CED0
	Channel F	CPU0_CFD0
	Channel G	CPU0_CGD0
	Channel H	CPU0_CHD0
	Channel I	CPU0_CID0
	Channel J	CPU0_CJD0
	Channel K	CPU0_CKD0
	Channel L	CPU0_CLD0

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 DIMM 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 AMD EPYC 9004 series processors. 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.
- The total memory capacity cannot exceed the maximum capacity supported by the CPU.
- The maximum number of DIMMs supported varies by CPU type, DIMM type and rank quantity.

**NOTE**

Maximum number of DIMMs supported per channel \leq Maximum number of ranks supported per channel \div Number of ranks per DIMM

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

Item		Value				
Capacity per DDR5 DIMM (GB)		16	32	64	96	128
Type		RDIMM	RDIMM	RDIMM	RDIMM	RDIMM
Rated speed (MT/s)		4,800	4,800	4,800	4,800	4,800
Operating voltage (V)		1.1	1.1	1.1	1.1	1.1
Maximum number of DDR5 DIMMs supported in a server ¹		24	24	24	24	24
Maximum capacity of DDR5 DIMMs supported in a server (GB) ²		384	768	1,536	2,304	3,072
Actual speed	1DPC ³	4,800	4,800	4,800	4,800	4,800

Item	Value
Notes:	
1.	The maximum number of DDR5 DIMMs supported is based on the dual-node 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.
The information above is for reference only. Consult your local sales representative for details.	

Table 5-6 DDR5 DIMM (5,600 MT/s) Specifications

Item		Value				
Capacity per DDR5 DIMM (GB)		16	32	64	96	128
Type		RDIMM	RDIMM	RDIMM	RDIMM	RDIMM
Rated speed (MT/s)		5,600	5,600	5,600	5,600	5,600
Operating voltage (V)		1.1	1.1	1.1	1.1	1.1
Maximum number of DDR5 DIMMs supported in a server ¹		24	24	24	24	24
Maximum capacity of DDR5 DIMMs supported in a server (GB) ²		384	768	1,536	2,304	3,072
Actual speed	1DPC ³	4,800	4,800	4,800	4,800	4,800
Notes:						
1. The maximum number of DDR5 DIMMs supported is based on the dual-node 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.						
The information above is for reference only. Consult your local sales representative for details.						

4. Population Rules

General population rules for DDR5 DIMMs:

- Install DIMMs only when the corresponding processor is installed.

5. DIMM Slot Layout

Up to 24 DDR5 DIMMs can be installed in a server. DIMM configuration must be compliant with the DIMM population rules.

Figure 5-12 DIMM Slot Layout

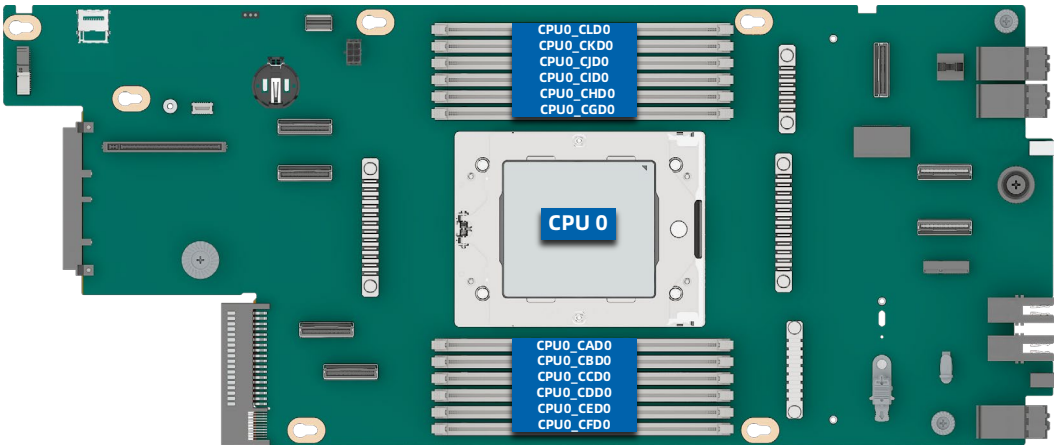


Table 5-7 DDR5 DIMM Population Rules

DDR	CPU0											
QTY	CAD0	CBD0	CCD0	CDD0	CED0	CFD0	CGD0	CHD0	CID0	CJD0	CKD0	CLD0
1	●											
2	●						●					
4	●		●				●		●			
6	●	●	●				●	●	●			
8	●	●	●		●		●	●	●		●	
10	●	●	●	●	●		●	●	●	●	●	
12	●	●	●	●	●	●	●	●	●	●	●	●

5.7 Storage



CAUTION

Mixing of storage controllers may result in drive letter drift and is not allowed.

5.7.1 Drive Configurations



NOTE

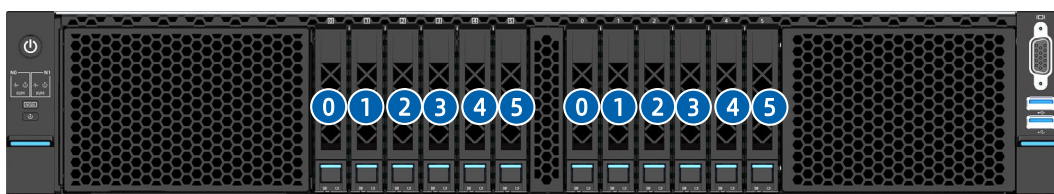
For the physical drive No. of each configuration, refer to [5.7.2 Drive Numbering](#).

Table 5-8 Drive Configurations

Config.	Front Drives	Internal Drives	Drive Management Mode
12 × 2.5-inch SATA/NVMe SSD	12 × 2.5-inch drive (Drive bays with physical drive No. 0 to 5 and physical drive No. 0 to 5 support SATA/NVMe SSDs)	2 × SATA/PCIe M.2 SSD	<ul style="list-style-type: none"> SATA SSD: PCIe RAID card and CPU NVMe SSD: CPU M.2 SSD: CPU

5.7.2 Drive Numbering

Figure 5-13 Drive Numbering of 12 × 2.5-inch SATA/NVMe SSD Configuration



Config.	Physical Drive No.	Drive No. Identified by the BMC	Front/Rear	Drive Number Identified by an 8i RAID Card
12 × SATA/NVMe SSD	0 to 5	0 to 5	Front	0 to 5
12 × SATA/NVMe SSD	0 to 5	0 to 5	Front	0 to 5

5.7.3 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.

- The system supports the OCP 3.0 card in the OCP slot. Users can select the OCP cards as needed.
- The system 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

- The PCIe cards provide system expansion capabilities.
 - When the single-slot riser is used, up to 2 PCIe 5.0 x16 HHHL expansion cards (up to 1 PCIe 5.0 x16 HHHL expansion card per node) are supported.
 - When the two-slot riser is used, up to 4 PCIe 5.0 x16 HHHL expansion cards (up to 2 PCIe 5.0 x16 HHHL expansion cards per node) are supported.
 - When the four-slot riser is used, up to 6 PCIe 5.0 LP expansion cards (2 x16 and 4 x8 LP expansion cards) and 2 PCIe 5.0 x16 FH $\frac{3}{4}$ L expansion cards (up to 3 PCIe 5.0 LP expansion cards and 1 PCIe 5.0 x16 FH $\frac{3}{4}$ L expansion card per node) are supported.
- For specific PCIe card options, consult your local sales representative or refer to [7.2 Hardware Compatibility](#).

5.9.2 PCIe Slots

Figure 5-14 PCIe Slot Locations of 4 × PCIe Slot Configuration



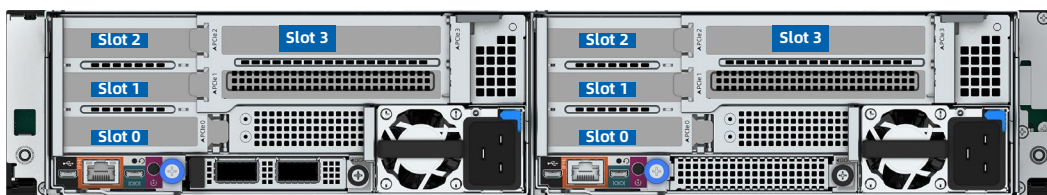
- Slot 0 and slot 1 reside in the PCIe riser module.



NOTE

When the single-slot riser is used, slot 1 is empty.

Figure 5-15 PCIe Slot Locations of 8 × PCIe Slot Configuration



- Slot 0, slot 1, slot 2 and slot 3 reside in the PCIe riser module.

5.9.3 PCIe Riser Modules



NOTE

There are three kinds of risers: single-slot, two-slot or four-slot risers. There are two kinds of PCIe riser cage. The single-slot riser and two-slot riser use the same PCIe riser cage, whereas the four-slot riser locates in the other PCIe riser cage. The figures of the PCIe riser modules below are shown upside down in order to show the PCIe slots clearly.

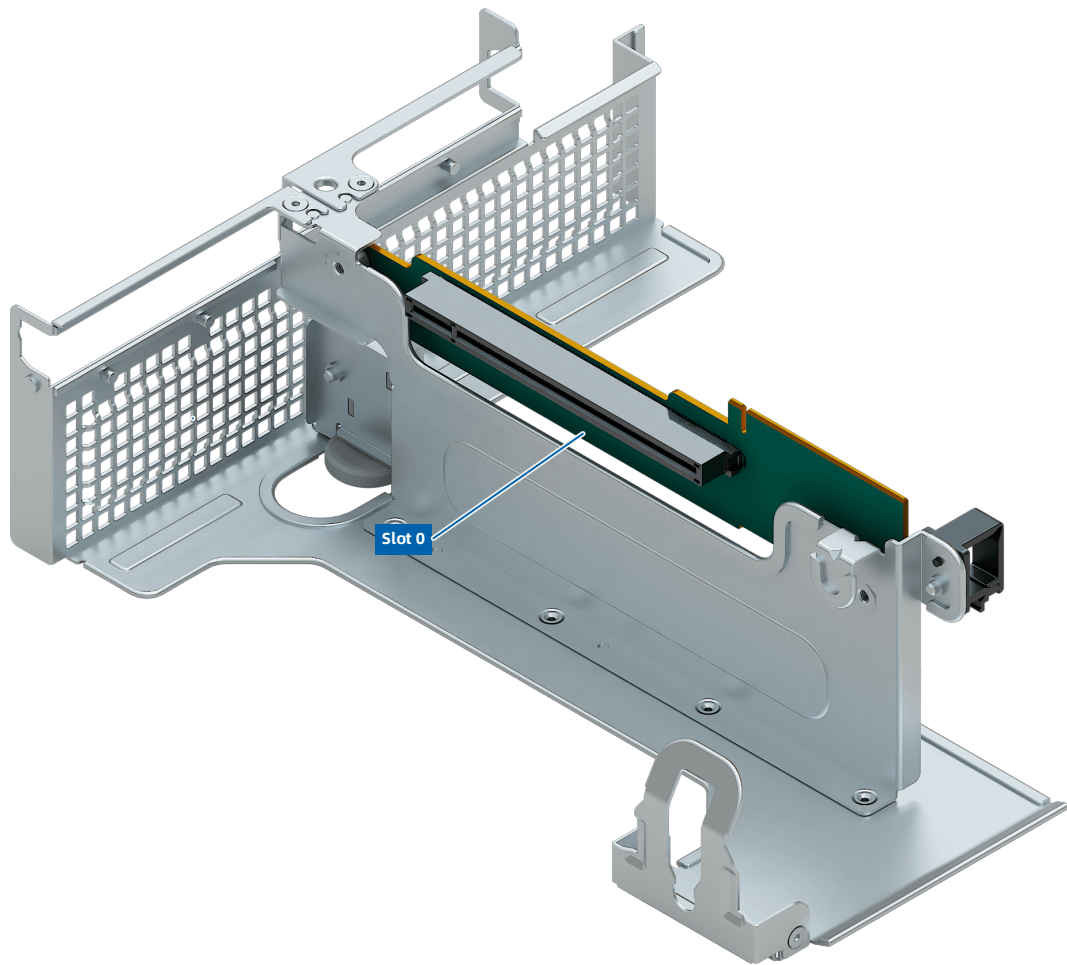
- The single-slot PCIe riser module supports one x16 single-width HHL PCIe expansion card.
 - Slot 0 resides in this PCIe riser module.



NOTE

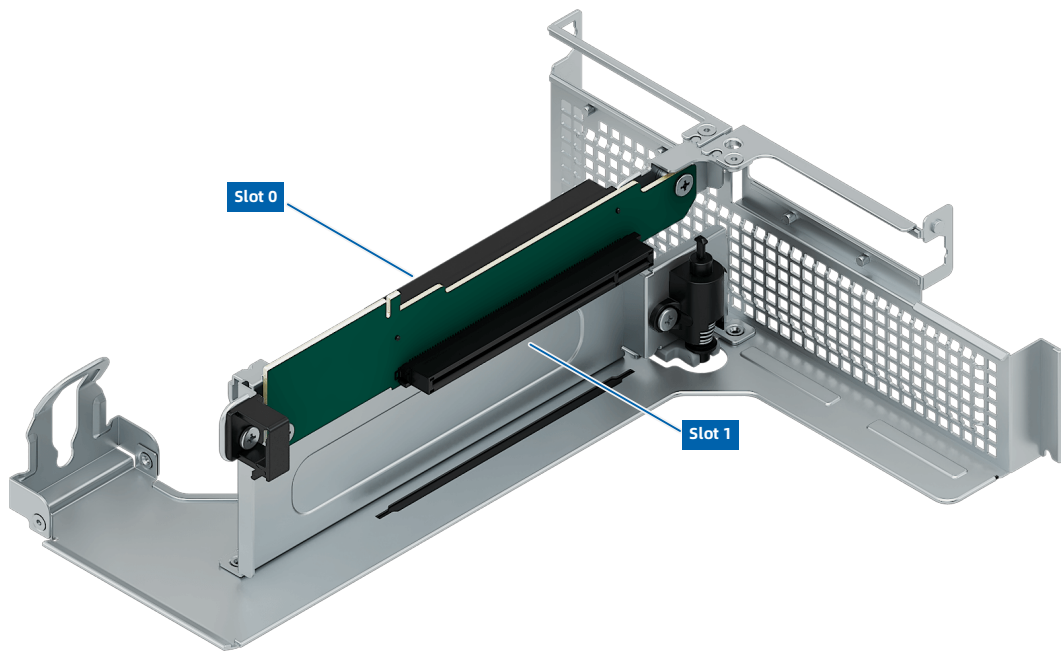
Install a blank in slot 1 to aid in proper system cooling.

Figure 5-16 Single-Slot PCIe Riser Module



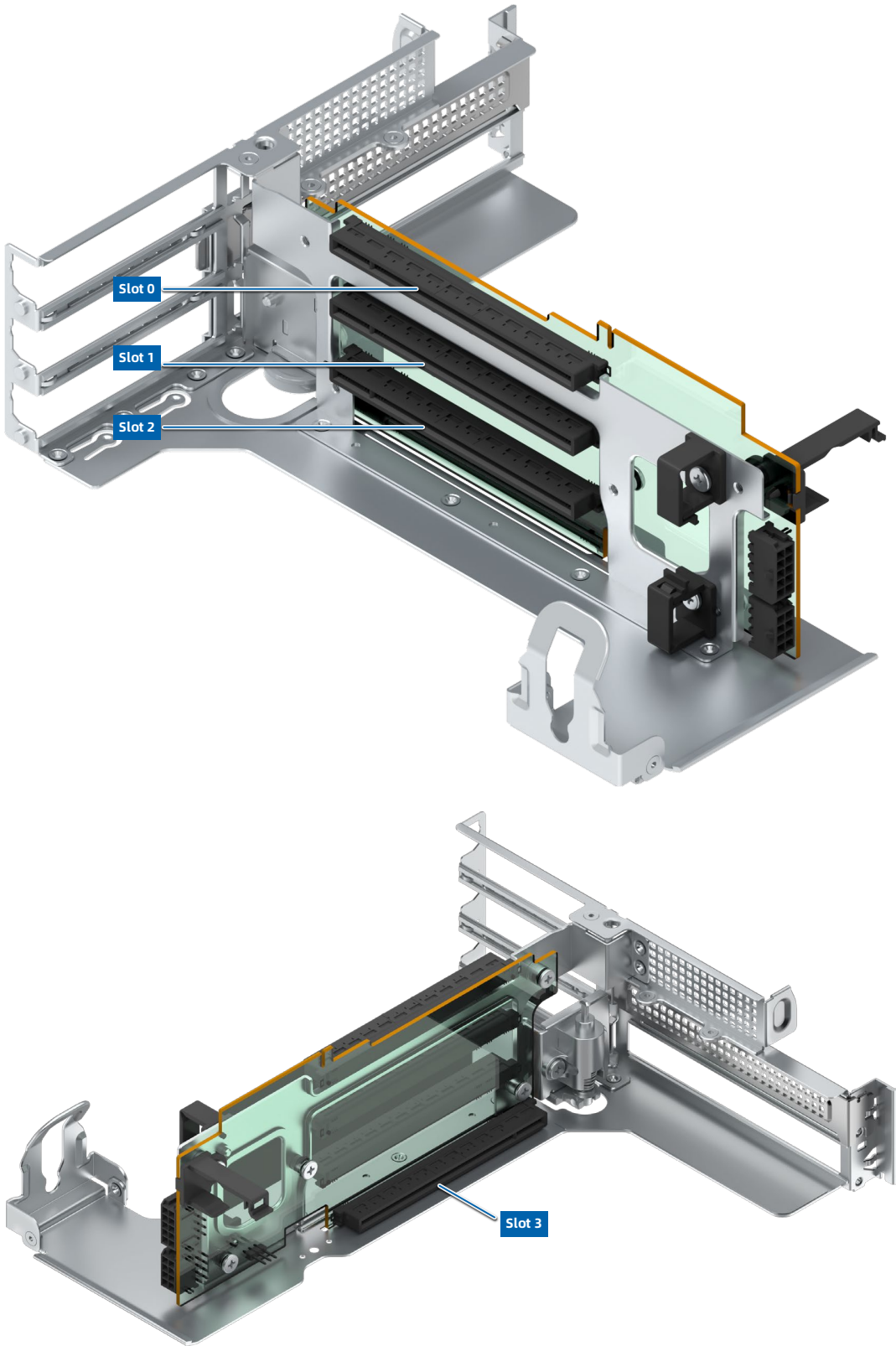
- The two-slot PCIe riser module supports two x16 single-width HHHL PCIe expansion cards.
 - Slot 0 and slot 1 reside in this PCIe riser module.

Figure 5-17 Two-Slot PCIe Riser Module



- The four-slot PCIe riser module supports 3 LP cards (2 x8 and 1 x16 LP cards) and 1 FH $\frac{3}{4}$ L card.
 - Slot 0, slot 1, slot 2 and slot 3 reside in this PCIe riser module.

Figure 5-18 Four-Slot PCIe Riser Module



5.9.4 PCIe Slot Description

Table 5-9 PCIe Slot Description – Single-Slot PCIe Riser Module

PCIe Slot	Owner	PCIe Standard	Connector Width	Bus Width	Port No.	Form Factor
Slot 0	CPU0	PCIe 5.0	x16	x16	P2	HHHL
OCP 3.0 Slot	CPU0	PCIe 5.0	x16	x16	P1	SFF OCP 3.0

Table 5-10 PCIe Slot Description – Two-Slot PCIe Riser Module

PCIe Slot	Owner	PCIe Standard	Connector Width	Bus Width	Port No.	Form Factor
Slot 0	CPU0	PCIe 5.0	x16	x16	P0	HHHL
Slot 1	CPU0	PCIe 5.0	x16	x16	P2	HHHL
OCP 3.0 Slot	CPU0	PCIe 5.0	x16	x16	P1	SFF OCP 3.0

Table 5-11 PCIe Slot Description – Four-Slot PCIe Riser Module

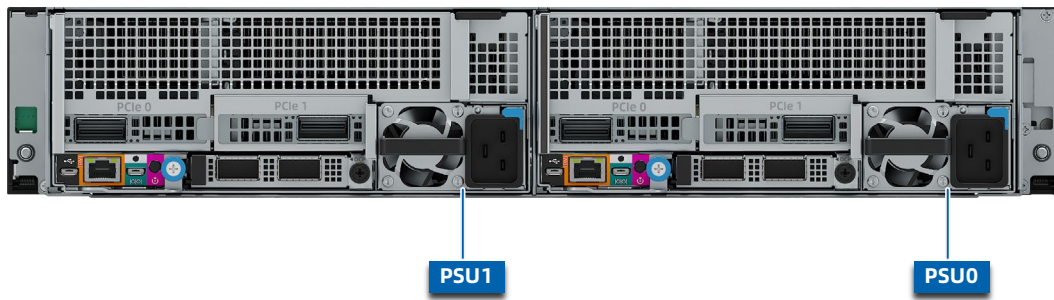
PCIe Slot	Owner	PCIe Standard	Connector Width	Bus Width	Port No.	Form Factor
Slot 0	CPU0	PCIe 5.0	x16	x16	P2	Low-Profile
Slot 1	CPU0	PCIe 5.0	x16	x8	P3 (15~8)	Low-Profile
Slot 2	CPU0	PCIe 5.0	x16	x8	P3 (7~0)	Low-Profile
Slot 3	CPU0	PCIe 5.0	x16	x16	P0	FH¾L
OCP 3.0 Slot	CPU0	PCIe 5.0	x16	x16	P1	SFF OCP 3.0

5.10 PSUs

- Supports 2 PSUs, each node is configured with 1 PSU.
- Supports AC or DC power input.

- The PSUs are hot-swappable.
- The PSUs are 1+1 redundant.
- The 2 PSUs configured in the server must have the same part number (P/N code).
- The PSUs feature short-circuit protection.

Figure 5-19 PSU Locations



5.11 Fan Modules

- The server supports six 6056 fan modules.
- The fan modules are not hot-swappable.
- The fan modules support N+1 redundancy, which means that the server can continue working when a fan fails.
- Supports intelligent fan speed control.
- The server must use fan modules with the same part number (P/N code).

Figure 5-20 Fan Module Locations



5.12 Boards

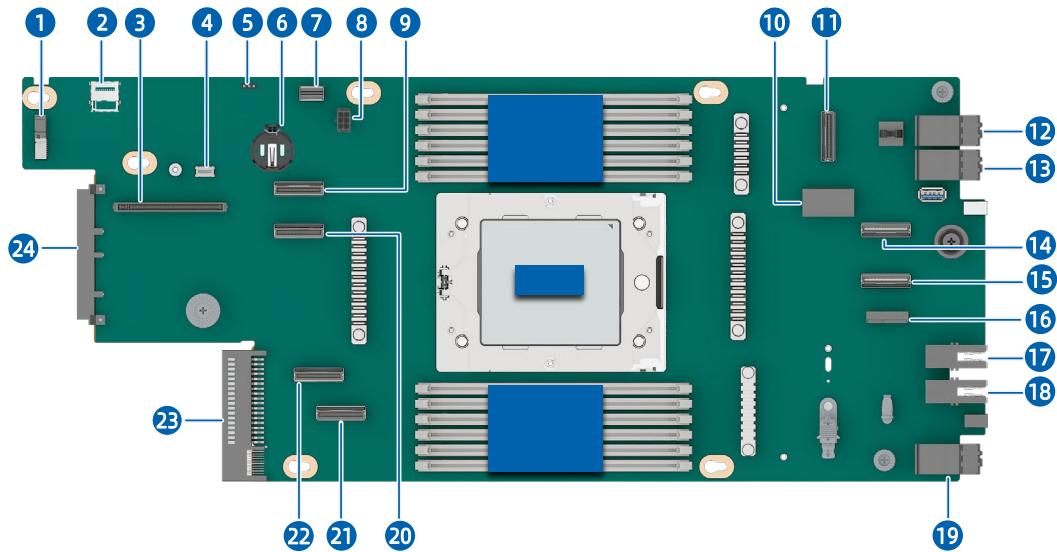


NOTE

The figure below may be different from the actual configuration.

5.12.1 Motherboard

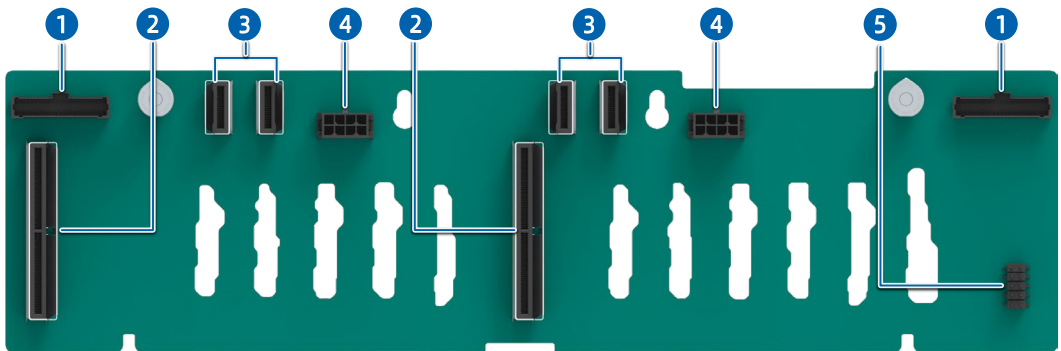
Figure 5-21 Motherboard Layout



Item	Feature	Item	Feature
1	I/O Board Connector	13	High-Speed High-Density Connector
2	BMC TF Card Slot	14	MCIO x8 Connector
3	PCIe Riser Connector	15	MCIO x8 Connector
4	TCM/TPM Connector	16	System TF Card Adapter Connector
5	CMOS Jumper	17	Bus Bar - GND
6	Button Cell Battery Socket	18	Bus Bar - +12V
7	Slimline VGA Connector	19	High-Speed High-Density Connector
8	PCIe Riser Power Connector	20	MCIO x8 Connector
9	MCIO x8 Connector	21	MCIO x8 Connector
10	M.2 SSD Connectors	22	MCIO x8 Connector
11	Slim SATA Connector	23	PSU Connector
12	Low-Speed High-Density Connector	24	OCP 3.0 Card Connector

5.12.2 Backplane

Figure 5-22 12 × 2.5-Inch SATA/NVMe SSD Backplane



Item	Feature	Item	Feature
1	Low-Speed Signal Connector	4	Power Connector
2	MCIO x16 Connector	5	CPLD JTAG Header (Depopulated)
3	MCIO x4 Connector	-	-

6 System Specifications

6.1 Technical Specifications

Table 6-1 System Technical Specifications

Item	Description
Form Factor	2U 2-node rack server
Processor	<p>Two AMD EPYC 9004 Series processors (one processor per node):</p> <ul style="list-style-type: none"> Up to 96 cores per CPU (base frequency of the corresponding processor is 2.4 GHz) Integrated memory controllers and 12 memory channels per processor Integrated PCIe 5.0 controllers and 128 PCIe lanes per processor Base frequency up to 4.1 GHz (the core number of the corresponding processor is 16) Max boost frequency up to 4.4 GHz (the core number of the corresponding processor is 16) TDP up to 400 W L3 cache up to 384 MB per processor <p>Note: The information above is for reference only. For details, see 7.2 Hardware Compatibility.</p>
Memory	<p>24 DIMM slots (12 DIMM slots per node)</p> <ul style="list-style-type: none"> Up to twenty-four 4,800 MT/s or 5,600 MT/s DDR5 DIMMs (up to 12 DDR5 DIMMs per node) RDIMMs supported 1 DIMM per channel Up to 4,800 MT/s at 1 DPC Error-correcting code (ECC) supported Mixing DDR5 DIMM specifications (capacity, bit width, rank, height, etc.) is not supported. A server must use DDR5 DIMMs with the same part number (P/N code). <p>Note:</p>

Item	Description
	<ul style="list-style-type: none"> For DIMMs with a rated speed of 5,600 MT/s, the actual operating speed will be degraded to 4,800 MT/s due to memory speed limitation of AMD EPYC 9004 series processors. The information above is for reference only. For details, see 7.2 Hardware Compatibility.
Storage	<ul style="list-style-type: none"> Front: <ul style="list-style-type: none"> No drives or Up to 12 × 2.5-Inch SATA/NVMe SSD (hot-swap) Internal: <ul style="list-style-type: none"> Up to 4 SATA or PCIe M.2 SSDs (2280 or 22110, up to 2 internal M.2 SSDs per node) Up to 4 TF cards (up to 2 TF cards per node, one for BIOS and one for BMC)
Network	<ul style="list-style-type: none"> Up to two 10/25/100/200 Gb OCP 3.0 cards (hot-pluggable, up to 1 OCP card per node) Standard 1/10/25/100 Gb PCIe NIC cards Two BMC management network ports of 100/1,000 Mbps self-negotiation (1 per node) <p>Note: The hot-plug feature of the OCP 3.0 card has been validated on Red Hat Enterprise Linux 9.0. This feature is not guaranteed on other OSs.</p>
I/O Expansion	<ul style="list-style-type: none"> PCIe expansion cards: <ul style="list-style-type: none"> When the single-slot riser is used, up to 2 PCIe 5.0 x16 HHHL expansion cards (up to 1 PCIe 5.0 x16 HHHL expansion card per node) are supported. When the two-slot riser is used, up to 4 PCIe 5.0 x16 HHHL expansion cards (up to 2 PCIe 5.0 x16 HHHL expansion cards per node) are supported. When the four-slot riser is used, up to 6 PCIe 5.0 LP expansion cards (2 x16 and 4 x8 LP expansion cards) and 2 PCIe 5.0 x16 FH$\frac{3}{4}$L expansion cards (up to 3 PCIe 5.0 LP expansion cards and 1 PCIe 5.0 x16 FH$\frac{3}{4}$L expansion card per node) are supported. Up to 2 dedicated slots for two OCP 3.0 cards (up to 1 OCP 3.0 card per node) <p>For details, see 5.9.2 PCIe Slots and 5.9.4 PCIe Slot Description.</p>
Port	<ul style="list-style-type: none"> Front: <ul style="list-style-type: none"> 1 × VGA port

Item	Description
	<ul style="list-style-type: none"> - 2 × USB 2.0 port • Rear: <ul style="list-style-type: none"> - 2 × micro USB 2.0 port (1 per node) - 2 × BMC management network port (1 per node) - 2 × system/BMC serial port (1 per node) <p>Note: OS installation on the USB storage media is not recommended.</p>
Display	<p>Integrated VGA on the motherboard with a video memory of 64 MB and a maximum 16M color resolution of 1,920 × 1,200 at 60 Hz</p> <p>Note: 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.</p>
Fan	Six non-hot-swappable 6056 fans with N+1 redundancy (supported temperature range: 10°C to 30°C [50°F to 86°F] if a fan fails)
Power Supply	<ul style="list-style-type: none"> • 1+1 redundant 2,000 W/2,200 W power supplies with a rated input voltage of 115 Vac and 230 Vac: <ul style="list-style-type: none"> - 2,000 W Platinum/Titanium power supply: 1,000 W (115 Vac), 2,000 W (230 Vac) - 2,200 W Platinum/Titanium power supply: 1,000 W (115 Vac), 2,200 W (230 Vac) • Input voltage range: <ul style="list-style-type: none"> - 115 Vac: 90 to 132 Vac - 230 Vac: 180 to 264 Vac
System Management	<ul style="list-style-type: none"> • UEFI/Legacy • BMC • NC-SI • KSMange • KSMange Tools
Security	<ul style="list-style-type: none"> • Trusted Platform Module (TPM) 2.0 and Trusted Cryptography Module (TCM) • Firmware update mechanism based on digital signatures • UEFI Secure Boot • Hierarchical BIOS password protection • BIOS Secure Flash and BIOS Lock Enable (BLE)

Item	Description
	<ul style="list-style-type: none"> BMC dual-image mechanism

6.2 Environmental Specifications

Table 6-2 Environmental Specifications

Item	Description
Temperature ^{1, 2}	<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 +70°C (-40°F to +158°F)
Relative Humidity (RH, non-condensing)	<ul style="list-style-type: none"> Operating: 10% to 90% RH Storage (packed): 5% to 95% RH Storage (unpacked): 5% to 95% RH
Altitude	<ul style="list-style-type: none"> Operating: 0 to 3,050 m (0 to 10,007 ft) Shipping (Storage): 0 to 12,000 m (0 to 39,370 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 ^{3, 4, 5}	<p>Noise emissions are measured in accordance with ISO 7779 (ECMA 74) and declared in accordance with ISO 9296 (ECMA 109). Listed are the declared A-weighted sound power levels (LWAd) and the declared average bystander position A-weighted sound pressure levels (LpAm) at a server operating temperature of 23°C (73.4°F):</p> <ul style="list-style-type: none"> Idle: <ul style="list-style-type: none"> LWAd: 6.8 Bels LpAm: 54.1 dBA Operating: <ul style="list-style-type: none"> LWAd: 7.4 Bels

Item	Description
	- LpAm: 60.1 dBA

1. Standard operating temperature:
 - 10°C to 35°C (50°F to 95°F) is the standard operating temperature range at sea level. Derate the maximum allowable temperature by 1°C per 305 m (1°F per 556 ft) above sea level. 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 by different system configuration.
 - Operations above 30°C (86°F) with any fan failure may lead to system performance degradation.
2. Expanded operating temperature:
 - For certain configurations, the supported system inlet ambient temperature can be expanded to 5°C to 10°C (41°F to 50°F) and 35°C to 40°C (95°F to 104°F) at sea level. At an altitude of 0 to 950 m (0 to 3,117 ft), derate the maximum allowable temperature by 1°C per 305 m (1°F per 556 ft). At an altitude of 950 to 3,050 m (3,117 to 10,007 ft), derate the maximum allowable temperature by 1°C per 175 m (1°F per 319 ft).
 - For certain configurations, the supported system inlet ambient temperature can be expanded to 40°C to 45°C (104°F to 113°F) at sea level. At an altitude of 0 to 950 m (0 to 3,117 ft), derate the maximum allowable temperature by 1°C per 305 m (1°F per 319 ft). At an altitude of 950 to 3,050 m (3,117 to 10,007 ft), derate the maximum allowable temperature by 1°C per 125 m (1°F per 228 ft).
 - Any fan failure or operations under the expanded operating temperature may lead to system performance degradation.
3. This document lists the LWAd of the product at a 23°C (73.4°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.
4. The sound levels shown here were measured based on the specific configurations of a server. Sound levels vary by server configuration, load and ambient temperature. These values are for reference only and subject to change without notice.
5. 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.

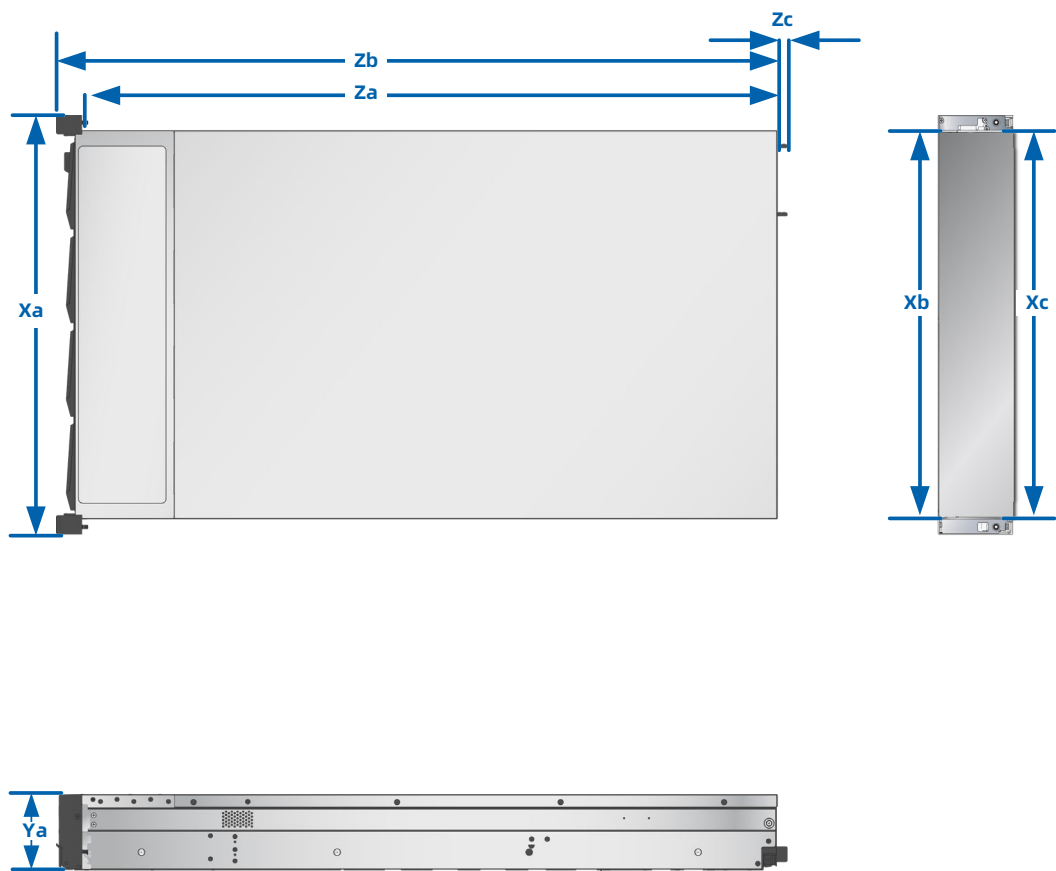
6.3 Physical Specifications

Table 6-3 Physical Specifications

Item	Description
Outer Packaging Dimensions	<ul style="list-style-type: none"> • Node outer packaging: <ul style="list-style-type: none"> - Length: 981 mm (38.62 in.) - Width: 391 mm (15.40 in.) - Height: 287 mm (11.30 in.) • Server outer packaging: <ul style="list-style-type: none"> - Length: 1,168 mm (45.98 in.) - Width: 722 mm (28.43 in.) - Height: 287 mm (11.30 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 650 to 910 mm (25.59 to 35.83 in.)
Weight	<ul style="list-style-type: none"> • No-drive configuration <ul style="list-style-type: none"> - Net weight: 26.7 kg (58.86 lbs) - Gross weight: 34 kg (74.96 lbs) (including server, packaging box, rails and accessory box) • 12 × 2.5-inch SATA/NVMe SSD configuration <ul style="list-style-type: none"> - Net weight: 29.6 kg (65.26 lbs) - Gross weight: 40.6 kg (89.51 lbs) (including server, packaging box, rails and accessory box) <p>Note: The system weight varies by configuration.</p>
Power Consumption	Power consumption varies by configuration. Consult us for details.

Figure 6-1 System Dimensions (Unit: mm/inch)



Model	Xa	Xb	Xc	Ya	Za	Zb	Zc
K22-E2-A0-R0-00	482/18.98	447/17.60	447/17.60	87/3.43	855/33.66	880/34.65	24.95/0.98

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 by the model. Contact your sales representative for 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.



NOTE

The compatibility validation of OS and hardware is still ongoing. The content of this chapter will continue to be updated from time to time.

7.1 Supported Operating Systems

Table 7-1 Supported Operating Systems

OS Version
Windows Server 2022
Red Hat Enterprise Linux 9.0

Debian 11.6.0
Ubuntu 22.04.1
Ubuntu 20.04.5

**NOTE**

After installing Linux OS, add **iommu=pt** in the OS. See the OS installation guide on our website for details.

7.2 Hardware Compatibility

7.2.1 CPU Specifications

Up to two AMD EPYC 9004 series processors (one per node).

Table 7-2 CPU Specifications

Model	Cores	Threads	Base Frequency (GHz)	Max Boost Frequency (GHz)	L3 Cache (MB)	TDP (W)
9654	96	192	2.40	3.70	384	360
9554	64	128	3.10	3.75	256	360
9354P	32	64	3.25	3.80	256	280
9654P	96	192	2.40	3.70	384	360
9554P	64	128	3.10	3.75	256	360
9634	84	168	2.25	3.70	384	290
9454p	48	64	2.75	3.80	256	290
9334	32	56	2.70	3.90	128	210
9754	128	256	2.25	3.10	256	360
9734	112	224	2.20	3.00	256	340
9354	32	64	3.25	3.80	256	280
9454	48	64	2.75	3.80	256	290

7.2.2 Memory Specifications

Up to 24 DDR5 DIMMs (up to 12 per node) with 12 memory channels per processor. RDIMMs are supported.

Table 7-3 Memory Specifications

Type	Capacity (GB)	Speed (MT/s)	Data Width	Organization
RDIMM	16	4,800	x80	1R x8
RDIMM	32	4,800	x80	2R x8
RDIMM	64	4,800	x80	2R x4
RDIMM	96	4,800	x80	2R x4
RDIMM	96	5,600 ^{Note 1}	x80	2R x4

Note 1: The actual speed of the memory is 4,800 MT/s due to memory speed limitation of AMD EPYC 9004 series processors.

7.2.3 Drive Specifications

Table 7-4 SATA SSD Specifications

Type	Capacity	Max Qty
SATA SSD	480 GB	12
SATA SSD	960 GB	12
SATA SSD	1.92 TB	12
SATA SSD	3.84 TB	12

Table 7-5 NVMe SSD Specifications

Type	Capacity	Max Qty
NVMe SSD	480GB	12
NVMe SSD	960GB	12
NVMe SSD	1.92TB	12

Table 7-6 M.2 SSD Specifications

Type	Capacity (GB)	Max Qty
PCIe M.2 SSD	960	4
SATA M.2 SSD	240	4
SATA M.2 SSD	480	4

7.2.4 RAID Specifications

Table 7-7 RAID Card Specifications

Type	Description
RAID Card	RAID_BRCM_8R0_9560-8i_4G_SMSAS3_PCIE4_7

7.2.5 NIC Specifications

Table 7-8 OCP Card Specifications

Type	Description	Speed (Gbps)	Port Qty
OCP 3.0 Card	NIC_I_25G_E810XXVDA2_LC_OCP3x8_2_XR	25	2
	NIC_I_100G_E810CQDA2_LC_OCP3x16_2_XR	100	2
	NIC_M_100G_MCX623436AN_LC_OCP3x16_2_XR	100	2
	NIC_BROADCM_100G_57508_LC_OCP3x16_2_XR	100	2
	NIC_BROADCM_100G_57504_LC_OCP3x16_XR	100	1

Table 7-9 PCIe Card Specifications

Type	Description	Speed (Gbps)	Port Qty
PCIe NIC	NIC_I_25G_E810XXVDA2_LC_PCIEx8_2_XR	25	2
	NIC_M_25G_MCX631102AN_LC_PCIEx8_2_XR	25	2
	NIC_BROADCM_25G_57414_LC_PCIEx8_2_XR_42C	25	2
	NIC_I_100G_E810CQDA2_LC_PCIEx16_2_XR	100	2
	NIC_M_100G_MCX623106AN_LC_PCIEx16_2_XR	100	2

7.2.6 PSU Specifications

The server supports up to 2 CR68 PSUs in 1+1 redundancy. 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 CR68 PSUs are 80 Plus Platinum or Titanium rated with various output powers, allowing customers to choose as needed.

- The following 1+1 redundant 2,000 W/2,200 W power supplies with a rated input voltage of 115 Vac and 230 Vac are supported:
 - 2,000 W Platinum PSU: 1,000 W (115 Vac), 2,000 W (230 Vac)
 - 2,000 W Titanium PSU: 1,000 W (115 Vac), 2,000 W (230 Vac)
 - 2,200 W Platinum PSU: 1,000 W (115 Vac), 2,200 W (230 Vac)
 - 2,200 W Titanium PSU: 1,000 W (115 Vac), 2,200 W (230 Vac)



NOTE

At a rated input voltage of 115 Vac, the output power of a 2,000/2,200 W PSU will be derated to 1,000 W.

- Input voltage range:
 - 115 Vac: 90 to 132 Vac
 - 230 Vac: 180 to 264 Vac

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.

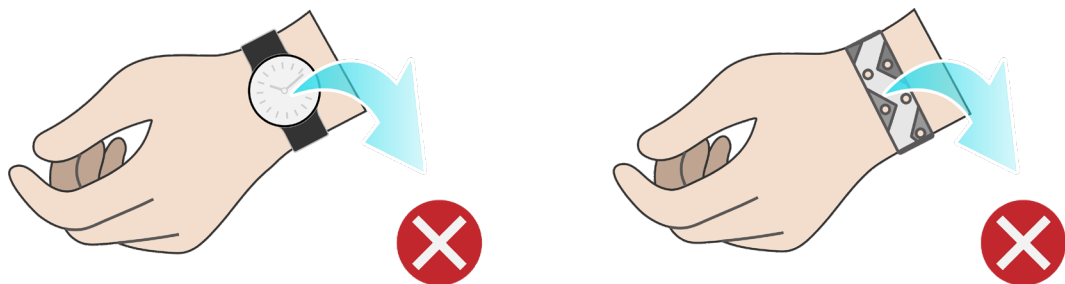
Installation personnel must wear clean work clothes, work gloves, safety helmets and safety shoes, as shown in [Figure 8-1](#).

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.

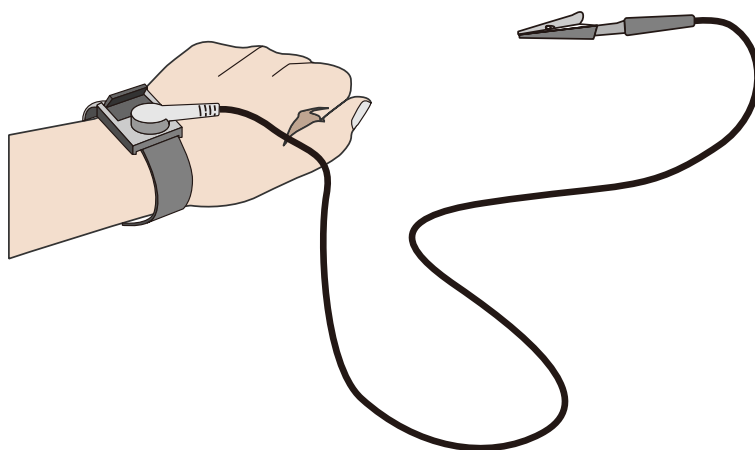
Figure 8-2 Removing Conductive Objects



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

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

Figure 8-3 Wearing an ESD Wrist Strap



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

8.1.3 Equipment Safety

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

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

8.1.4 Transportation Precautions

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

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

8.1.5 Manual Handling Weight Limits



CAUTION

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

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

Table 8-1 Manual Handling Weight Limits per Person

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

9 Limited Warranty

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

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

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

9.1 Warranty Service

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

9.1.1 Remote Technical Support

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

Information needed when requesting support:

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

9.1.2 RMA Service

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



NOTE

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

9.1.3 ARMA Service

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



NOTE

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

9.1.4 9 × 5 × NBD Onsite Service

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

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

**NOTE**

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

9.1.5 24 × 7 × 4 Onsite Service

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

**NOTE**

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

9.2 Our Service SLA

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

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

9.3 Warranty Exclusions

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

The Limited Warranty does not apply to

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

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

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

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

10 System Management

10.1 Intelligent Management System BMC

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

BMC supports:

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

Table 10-1 BMC Features

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

Feature	Description
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 local images, USB devices and folders 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	<ul style="list-style-type: none"> • Supports automatic crash screenshot and crash video recording (video needs to be enabled manually) to capture the last screen and video before crash; • Provides manual screenshot, which can quickly capture the screen for easy inspection at scheduled time.
Dual Flash and Dual Image	Supports dual flash and dual image, enabling automatic flash failover in case of software or flash corruption, improving operational reliability.
Power Capping	Supports power capping, increasing deployment density and reducing energy consumption.
IPv4/IPv6	Supports both IPv4 and IPv6, enhancing network deployment flexibility.
Auto-Switching of Management Network Port	Supports auto-switching between the dedicated management network port and shared management network port, providing customers with flexible network deployment solutions for different management network deployment scenarios.
BMC Self-Diagnosis and Self-Recovery System	<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 ensure that the fan operates at safe speeds to avoid system overheating.

Feature	Description
	<ul style="list-style-type: none"> Supports self-diagnosis of processors, memory modules, and storage devices of BMC, and automatically cleans the workload to restore to normal when the device usage rate is too high.
Power Control	Supports virtual power buttons for power on/off, power cycle and reset.
UID LED	Supports remote lighting of the UID LED for locating the server in the server room
Secure Firmware Update	<ul style="list-style-type: none"> 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, provides more user roles to allow administrators to grant different privileges to O&M personnel.
Security Features	Adopts the industry-leading server security baseline standard V3.0. SSH, HTTPS, SNMP and IPMI use secure and reliable algorithms. BMC offers capabilities including secure update and boot and security reinforcement mechanisms such as anti-replay, anti-injection, and anti-brute force.
Double Factor Authentication	Supports double factor authentication for local BMC users. Users need to log in to the BMC with both password and certificate, thus to prevent attacks caused by password leakage.
Configuration Exporting and Importing	To import and export the existing system configurations.
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

Feature	Description
	mode and preset the speed for each fan module in the Manual Fan Control mode.
Power Policy	To set how the server operating system reacts under the BMC's control when AC power is reconnected to the server.
One-Key Erasing	To perform non-recoverable erasing on all storage devices of the server, preventing data leakage when the server is to be retired.
System Lockdown	After this feature is enabled, some parameters of the server cannot be set and some operations cannot be performed on the server.

10.2 KSManage

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

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

- lightweight deployment in multiple scenarios and full lifecycle management of devices
- high reliability and on-demand scalability enabled by 1 to N data collectors
- intelligent asset management and real-time tracking of asset changes
- comprehensive monitoring for overall business control
- intelligent fault diagnosis for reduced maintenance time
- second-level performance monitoring for real-time status of devices
- batch configuration, deployment and update, shortening the time needed to bring the production environment online
- improved firmware version management efficiency
- standardized northbound interfaces for easy integration and interfacing

Table 10-2 KSManage Features

Feature	Description
Home	Display of basic information (data centers, server rooms, cabinets, assets and alerts), quick addition of devices and custom home page
Assets	<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 • 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

Feature	Description
	<ul style="list-style-type: none"> • 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 • 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
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 KSManage parameters
Security	Security control of KSManage via a set of security policies such as user management, role management, authentication management (local authentication and LDAP authentication) and certificate management.

10.3 KSManage Tools

Table 10-3 Features of KSManage Tools

Feature	Description
KSManage Kits	A lightweight automatic batch O&M tool for servers, mainly used for server deployment, routine maintenance, firmware update, fault handling, etc.

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

11 Certifications

Table 11-1 Certifications

Country/Region	Certification	Mandatory/Voluntary
International	CB	Voluntary
EU	CE	Mandatory
U.S.	FCC	Mandatory
	UL	Voluntary
	Energy Star	Voluntary
Canada	IC	Mandatory
	cUL	Voluntary
Korea	KC	Mandatory

12 Appendix A

12.1 Operating Temperature Specification Limits

Table 12-1 Operating Temperature Specification Limits

Configuration	Max. Operating Temp. 30°C (86°F)	Max. Operating Temp. 35°C (95°F)
No-Drive Configuration	All options supported	All options supported
12 × 2.5-Inch SATA/NVMe SSD Configuration	All options supported	All options supported



NOTE

- The maximum operating temperature will drop by 5°C (9°F) if a fan fails.
- Single fan failure may affect system performance

12.2 Model

Table 12-2 Model

Certified Model	Description
K22-E2-A0-R0-00	Global

12.3 RAS Features

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

availability, and serviceability.

12.4 Sensor List

Table 12-3 Sensor List

Sensor	Description	Sensor Location	Notes
Inlet_Temp	Air inlet temperature	Left mounting ear	-
MB_Outletx_Temp	MB outlet temperature	Motherboard	x indicates the MB outlet number with a value of 0 - 1
MB_Inlet_Temp	MB inlet temperature	Motherboard	-
CPU0_Temp	CPU0 core temperature	CPU0	-
CPU0_VR_Temp	CPU0 VR chip temperature	CPU0 VR chip	-
CPU0_DIMM_T	The maximum temperature among DDR5 DIMMs of CPU0	CPU0	-
PSUx_Inlet_Temp	PSU inlet temperature	PSUx	x indicates the PSU number with a value of 0 - 1
M.2_Temp	M.2 SSD temperature	M.2 SSD	-
OCP_NIC_Temp	OCP 3.0 card temperature	OCP 3.0 card	-
OCP_NIC_SFP_Temp	OCP 3.0 card SFP module temperature	OCP 3.0 card SFP module	-
PCIe_NIC_Temp	Maximum temperature among all PCIe NICs	PCIe NIC	-
PCIe_NIC_SFP_T	PCIe NIC SFP module temperature	PCIe NIC SFP module	-
PCIe_HCA_Temp	Maximum temperature among all PCIe HCA cards	PCIe HCA card	-
PCIe_HCA_SFP_T	PCIe HCA card SFP module temperature	PCIe HCA card SFP module	-
IOBoard_Temp	IO Board temperature	IO Board	-

Sensor	Description	Sensor Location	Notes
Riser0_Temp	Riser 0 temperature	Riser card	-
P1V05_STBY_USB	Motherboard 1.05 V standby voltage	Motherboard	-
P1V2_STBY_SENSOR	Motherboard 1.2 V standby voltage	Motherboard	-
P1V8_S5_P0	Motherboard 1.8 V standby voltage	Motherboard	-
P1V_BMC_STBY_SEN	Motherboard 1 V standby voltage	Motherboard	-
P1V8_STBY_SENSOR	Motherboard 1.8 V standby voltage	Motherboard	-
P2V5_BMC_STBY	Motherboard 2.5 V standby voltage	Motherboard	-
P3V3_BMC_RGM_STB	Motherboard 3.3 V standby voltage	Motherboard	Detection of voltage supplied to the BMC
P3V3_STBY_SCALED	Motherboard 3.3 V standby voltage	Motherboard	Detection of voltage supplied to the system
STBY_5V	Motherboard 5 V standby voltage	Motherboard	-
SYS_12V	Motherboard 12 V standby voltage	Motherboard	-
SYS_3V3	System 3.3 V voltage	Motherboard	-
PVDDCR_0	CPU VR voltage	VR chip	-
PVDDCR_1	CPU VR voltage	VR chip	-
PVDDIO_P0	CPU VR voltage	VR chip	-
PVDDCR_SOC_P0	CPU VR voltage	VR chip	-
PVDD11_S3_P0	CPU VR voltage	VR chip	-
PSUx_VIN	PSU input voltage	Motherboard	x indicates the PSU number with a value of 0 - 1
PSUx_VOUT	PSU output voltage	Motherboard	x indicates the PSU number with a

Sensor	Description	Sensor Location	Notes
			value of 0 - 1
RTC_Battery	RTC battery voltage	Motherboard RTC battery	-
FANx_Speed	Fan speed	Fanx	x indicates the fan number with a value of 0 - 5
FANx_F_Speed			x indicates the fan number with a value of 0 - 5
FANx_R_Speed			x indicates the fan number with a value of 0 - 5
Total_Power	Total PSU power consumption	2 PSUs, one sensor on every PSU	-
PSUx_PIN	PSU input power	PSUx	x indicates the PSU number with a value of 0 - 1
PSUx_POUT	PSU output power	PSUx	x indicates the PSU number with a value of 0 - 1
FAN_Power	Total fan power	Midplane CPLD	-
CPU0_Power	Total CPU power	Motherboard	-
Memory_Power	Total memory power	Motherboard	-
Node_Power	Total node power	PSU	-
CPU0_Status	CPU status detection	CPU0	-

Sensor	Description	Sensor Location	Notes
CPU_Config	Mixed use of CPUs	CPU	-
CPU0_CXDY	CPU0 memory configuration information	CPU0 DIMM	X indicates the channel number of CPU with a value of A - L Y indicates the memory number with a value of 0.
FANx_Status	Fan status	Fanx	x indicates the fan number with a value of 0 - 5
FAN_Redundant	Fan redundancy lost	Fan	-
PCle_Status	PCle expansion card status	PCle expansion card	-
Power_Button	Power button pressed	Motherboard and power button	-
Watchdog2	Watchdog	Motherboard	-
Sys_Health	System health status	-	-
UID_Button	UID button status	Motherboard	-
PWR_CAP_Fail	Power capping status	Motherboard	-
PSU_Redundant	PSU redundancy lost after being plugged out	-	-
PSU_Mismatch	PSU model mismatch	-	-
PSUx_Status	PSU status	-	-
ACPI_PWR	ACPI status	-	-
SysRestart	Reason for system restart	-	-
BIOS_Boot_Up	BIOS boot complete	-	-
System_Error	System emergent error	-	-
POST_Status	POST status	-	-
BMC_Boot_Up	Records BMC boot event	-	-

Sensor	Description	Sensor Location	Notes
SEL_Status	Records SEL is almost full or has been cleared.	-	-
BMC_Status	BMC status	-	-
PWR_On_TMOUT	Power-on timer	-	-

13 Appendix B Acronyms and Abbreviations

13.1 A - E

A

AC	Alternating Current
ACPI	Advanced Configuration and Power Interface
AI	Artificial Intelligence
AMD	Advanced Micro Devices
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

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	Conformité Européenne
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
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

E

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

13.2 F - J

F

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

G

GB	Gigabyte
GND	Ground
GUI	Graphical User Interface

H

HBA	Host Bus Adapter
HCA	Host Channel Adapter
HDD	Hard Disk Drive
HDT	Hardware Debug Tool
HHHL	Half-Height Half-Length
HSE	Health and Safety Executive
HTTPS	Hypertext Transfer Protocol Secure

I

IB	InfiniBand
IC	Industry Canada
ID	Identification
IEC	International Electrotechnical Commission
IO	Input/Output
IP	Internet Protocol
IPMI	Intelligent Platform Management Interface
ISO	International Organization for Standardization

J

JTAG	Joint Test Action Group
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13.3 K - O

K

KC	Korea Certification
KVM	Keyboard Video Monitor

L

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

M

MB	Motherboard
MCIO	Mini Cool Edge IO

N

NBD	Next Business Day
NC-SI	Network Controller Sideband Interface
NIC	Network Interface Card
NIOSH	National Institute for Occupational Safety and Health
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**

PCIe	Peripheral Component Interconnect Express
PDB	Power Distribution Board
PHY	Physical
PID	Proportional-Integral-Derivative
POST	Power-On Self-Test
PSU	Power Supply Unit
PXE	Pre-boot Execution Environment

R

RAID	Redundant Arrays of Independent Disks
RAS	Reliability, Availability, Serviceability
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
SCSI	Small Computer System Interface
SEL	System Event Log
SFF	Small Form Factor
SFP	Small Form-Factor Pluggable
SLA	Service Level Agreement
SMASH CLP	Systems Management Architecture for Server Hardware Command Line Protocol
SNMP	Simple Network Management Protocol
SSD	Solid State Drive
SSH	Secure Shell

T

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

13.5 U - Z**U**

UART	Universal Asynchronous Receiver-Transmitter
UEFI	Unified Extensible Firmware Interface
UID	Unit Identification

UL	Underwriters Laboratories
USB	Universal Serial Bus

V

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