FusionServer CH121 V5 Compute Node

Technical White Paper

Issue	**04**
Date	**2022-08-12**

xFusion Digital Technologies Co., Ltd.

Copyrights © xFusion Digital Technologies Co., Ltd. 2022. All rights reserved.

No part of this document may be reproduced or transmitted in any form or by any means without prior written consent of xFusion Digital Technologies Co., Ltd.

Trademarks and Permissions

xFUSION and other xFusion trademarks are trademarks of xFusion Digital Technologies Co., Ltd.

All other trademarks and trade names mentioned in this document are the property of their respective holders.

Notice

In this document, "xFusion" is used to refer to "xFusion Digital Technologies Co., Ltd." for concise description and easy understanding, which does not mean that "xFusion" may have any other meaning. Any "xFusion" mentioned or described hereof may not be understood as any meaning other than "xFusion Digital Technologies Co., Ltd.", and xFusion Digital Technology Co., Ltd. shall not bear any liability resulting from the use of "xFusion".

The purchased products, services and features are stipulated by the contract made between xFusion and the customer. All or part of the products, services and features described in this document may not be within the purchase scope or the usage scope. Unless otherwise specified in the contract, all statements, information, and recommendations in this document are provided "AS IS" without warranties, guarantees or representations of any kind, either express or implied.

The information in this document is subject to change without notice. Every effort has been made in the preparation of this document to ensure accuracy of the contents, but all statements, information, and recommendations in this document do not constitute a warranty of any kind, express or implied.

xFusion Digital Technologies Co., Ltd.

Address: 9th Floor, Building 1, Zensun Boya Square, Longzihu Wisdom Island
Zhengdong New District 450046
Zhengzhou, Henan Province
People's Republic of China

Website: https://www.xfusion.com

Contents

About This Document v
1 Product Introduction 7
2 Features 8
3 Physical Structure 10
4 Logical Structure 12
5 Hardware Description 13
5.1 Front Panel 13
5.1.1 Appearance 13
5.1.2 Indicators and Buttons 14
5.1.3 Ports 16
5.1.4 Installation Positions 16
5.2 Processor 17
5.3 Memory 18
5.3.1 DDR4 Memory 18
5.3.1.1 Memory Identifier 18
5.3.1.2 Memory Subsystem Architecture 19
5.3.1.3 Memory Compatibility 20
5.3.1.4 DIMM Installation Rules 22
5.3.1.5 Memory Installation Positions 23
5.3.1.6 Memory Protection Technologies 24
5.4 Storage 25
5.4.1 Drive Configurations 25
5.4.2 Drive Numbering 25
5.4.3 Drive Indicators 26
5.4.4 RAID Controller Card 28
5.5 Network 28
5.5.1 LOMs 28
5.6 I/O Expansion 30
5.6.1 PCIe Cards 30
5.6.2 PCIe Slot Description 30
5.7 Boards 31

5.7.1 Mainboard 31

6 Product Specifications 33

6.1 Technical Specifications 33

6.2 Environmental Specifications 35

6.3 Physical Specifications 37

7 Software and Hardware Compatibility 38

8 Safety Instructions 39

8.1 Security 39

8.2 Maintenance and Warranty 42

9 System Management 43

10 Certifications 45

A Appendix 47

B Glossary 51

C Acronyms and Abbreviations 54

About This Document

Overview

This document describes the appearance, features, specifications, and configurations of the new-generation CH121 V5 compute node of the E9000 blade 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	Indicates a hazard with a high level of risk which, if not avoided, will result in death or serious injury.
WARNING	Indicates a hazard with a medium level of risk which, if not avoided, could result in death or serious injury.
CAUTION	Indicates a hazard with a low level of risk which, if not avoided, could result in minor or moderate injury.
NOTICE	Indicates a potentially hazardous situation which, if not avoided, could result in equipment damage, data loss, performance deterioration, or unanticipated results. NOTICE is used to address practices not related to personal injury.
NOTE	Supplements the important information in the main text. NOTE is used to address information not related to personal injury, equipment damage, and environment deterioration.

Change History

Issue	Date	Description
04	2022-08-12	• Optimized 6.3 Physical Specifications . • Added A.1 Node Label.
03	2022-06-25	• Added a figure that shows how to measure dimensions. • Updated 6.1 Technical Specifications and claimed support for U.2 drives. • Upgrades the standards of CE and UKCA certifications in the chapter 10 Certifications.
02	2022-03-18	Added 10 Certifications.
01	2021-12-20	This issue is the first official release.

1 Product Introduction

The CH121 V5 is a half-width compute node powered by Intel® Xeon® Scalable processors. It delivers supreme computing power, large memory capacity, and outstanding scalability.

The CH121 V5 provides dense computing capability and an ultra-large memory. It is optimized for virtualization, cloud computing, high-performance computing, and compute-intensive enterprise applications.

The CH121 V5 compute nodes are installed in an E9000 chassis and are centrally managed by the management module.

Figure 1-1 CH121 V5

2 Features

Scalability and Performance

- Powered by two Intel® Xeon® Scalable Skylake or Cascade Lake processors, the server provides up to 28 cores, 3.8 GHz frequency, a 38.5 MB L3 cache, and two 10.4 GT/s UPI links between the processors, which deliver supreme processing performance.
  - It supports up to two processors with 56 cores and 112 threads to maximize the concurrent execution of multithreaded applications.
  - Intel Turbo Boost Technology 2.0 allows processor cores to run faster than the frequency specified in the Thermal Design Power (TDP) configuration if they are operating below power, current, and temperature specification limits.
  - Intel Hyper-Threading Technology enables each processor core to run up to two threads, improving parallel computation capability.
  - The hardware-assisted Intel® Virtualization Technology (Intel® VT) allows operating system (OS) vendors to better use hardware to address virtualization workloads.
  - Intel® Advanced Vector Extensions 512 (Intel AVX-512) significantly accelerates floating-point performance for computing-intensive applications.
  - The Cascade Lake processors support Intel® Deep Learning Boost vector neural network instructions (VNNI) to improve the performance of deep learning applications.
- A compute node fully configured with 24 LRDIMMs provides supreme speed, high availability, and a maximum memory capacity of 3 TB.
- The maximum theoretical memory bandwidth is 275 GB/s (64 bit/8 x 2933 MHz x 6 channels x 2), which is 83.3% higher than that of the previous-generation platform.
- The use of all solid-state drives (SSDs) is supported. An SSD supports up to 100 times more I/O operations per second (IOPS) than a typical hard disk drive (HDD). The use of all SSDs provides higher I/O performance than the use of all HDDs or a combination of HDDs and SSDs.
- The compute node supports 96-lane PCIe 3.0 (8 GT/s per lane) to provide 20% higher I/O bandwidth than the previous 80-lane PCIe.
- With Intel integrated I/O, the Intel® Xeon® Scalable processors integrate the PCIe 3.0 controller to shortens I/O latency and improve overall system performance.
- The compute node supports mezzanine cards with a variety of network ports to meet requirements for flexible networking.
- The compute node supports standard PCIe SSD cards.

- The compute node supports LOM that provides two 10GE ports.

Availability and Serviceability

- Memory mirroring and memory module backup prevent system shutdown caused by uncorrectable memory errors.
- Data is protected using hot-swappable drives and RAID properties.
- The server provides simplified O&M and efficient troubleshooting through the UID/HLY LED indicators on the front panel, fault diagnosis LED, and iBMC WebUI.
- The SSDs offer better reliability than HDDs, ensuring continued system performance.
- The iBMC monitors system parameters in real time, triggers alarms, and performs recovery actions in case of failures, minimizing system downtime.
- For more information about the warranty in the Chinese market, see Warranty.

Manageability and Security

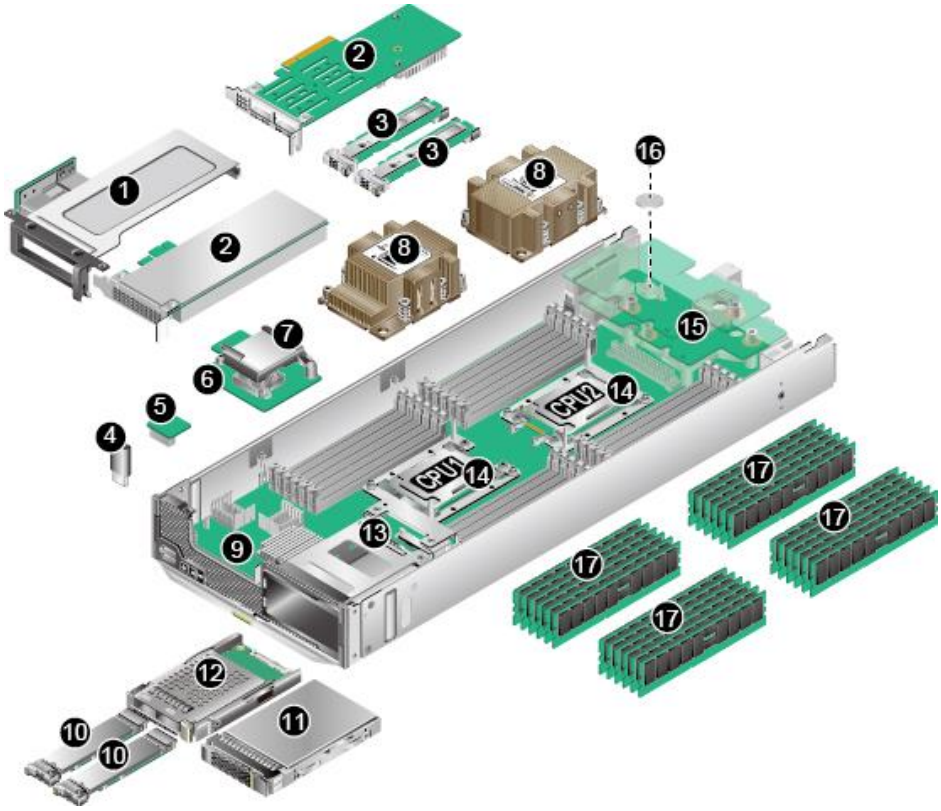
- The built-in iBMC monitors server operating status and provides remote management.
- The integrated Unified Extensible Firmware Interface (UEFI) improves setup, configuration, and update efficiency and simplifies fault handling.
- The Advanced Encryption Standard–New Instruction (AES NI) algorithm allows faster and stronger encryption.
- Intel Execute Disable Bit (EDB) function prevents certain types of malicious buffer overflow attacks when working with a supported OS.
- Intel Trusted Execution Technology enhances security using hardware-based defense against malicious software attacks, allowing applications to run independently.
- The trusted platform module (TPM) 2.0 provides advanced encryption functions, such as digital signatures and remote authentication.

Energy Efficiency

- The Intel® Xeon® Scalable processors outperform the previous-generation processors while fitting into the same TDP.
- Intel® Intelligent Power Capability allows a processor to be powered on or off based on requirements.
- Low-voltage Intel® Xeon® Scalable processors consume less energy, ideally suited for data centers and telecommunications environments constrained by power and thermal limitations.
- The 1.2 V DDR4 RDIMMs consume 20% to 30% less power than 1.35 V DDR3 RDIMMs.
- SSDs consume 80% less power than HDDs.
- The hexagonal ventilation holes on the compute node provide higher ventilation density than round holes, increasing system cooling efficiency.
- Efficient voltage regulator-down (VRD) power supplies for boards minimize the energy loss from DC/DC power conversion.
- The server is protected with power capping and power control measures.

3 Physical Structure

Figure 3-1 CH121 V5 physical structure



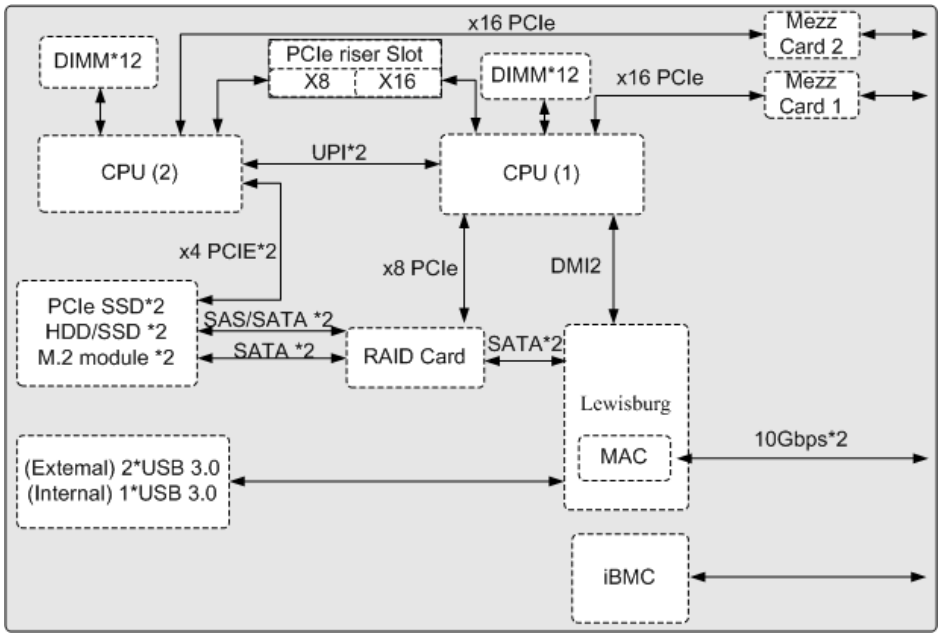
1	(Optional) HHHL PCIe riser module	2	(Optional) HHHL PCIe card
3	(Optional) M.2 SSD	4	(Optional) USB flash drive
5	(Optional) TPM	6	RAID controller card
7	(Optional) Supercapacitor	8	Heat sink
9	Mainboard	10	(Optional) M.2 FRUs[b]

11	Drive[a]	12	(Optional) M.2 adapter[b]
13	Drive cage	14	Processor
15	Mezzanine card	16	BIOS battery
17	Memory	-	-

- a: The drive slots support 2.5-inch SAS/SATA/NVMe drives and M.2 modules and mixed configuration of them.
- b: An M.2 module is a 2.5-inch drive module that consists of one M.2 adapter and two M.2 FRUs.

4 Logical Structure

Figure 4-1 CH121 V5 logical structure



- The server supports one or two Intel® Xeon® Scalable processors.
- The server supports up to 24 memory modules.
- The CPUs (processors) interconnect with each other through two UPI links at a speed of up to 10.4 GT/s.
- The mezzanine cards connect to the processors through PCIe buses to provide service ports.
- The Platform Controller Hub (PCH) has a built-in MAC chip and provides two 10 Gbit/s ports.
- The storage module, consisting of a RAID controller card and a drive backplane, connects to the CPUs through PCIe buses.
- The iBMC provides device management functions, such as compute node power control, slot number acquisition, PSU detection, and KVM over IP.

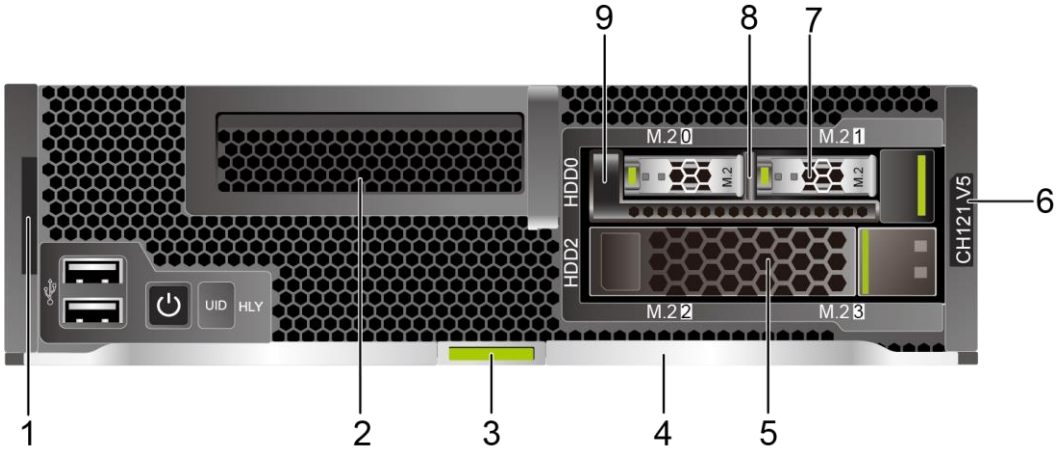
5 Hardware Description

5.1 Front Panel
5.2 Processor
5.3 Memory
5.4 Storage
5.5 Network
5.6 I/O Expansion
5.7 Boards

5.1 Front Panel

5.1.1 Appearance

Figure 5-1 Front view (with an M.2 module)



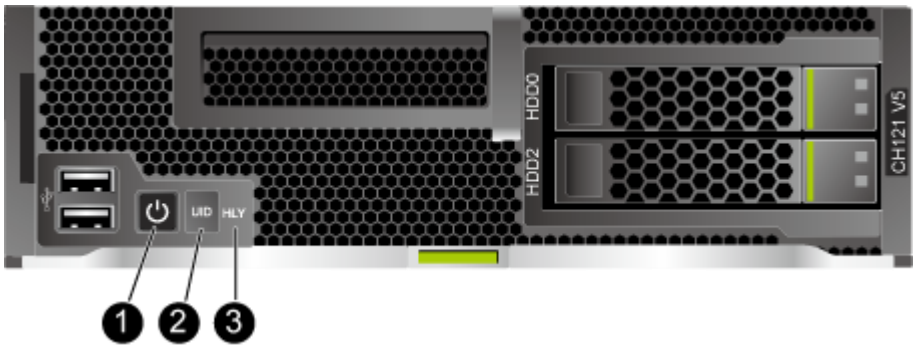
1	Slide-out label plate (with an SN label)	2	PCIe panel

3	Ejector release button	4	Ejector lever
5	2.5" drive[a]	6	Model
7	M.2 FRU	8	M.2 adapter
9	M.2 module[b]	-	-
• a: The drive slots support 2.5-inch SAS/SATA/NVMe drives and M.2 modules and mixed configuration of them. • b: An M.2 module is a 2.5-inch drive module that consists of one M.2 adapter and two M.2 FRUs.			

5.1.2 Indicators and Buttons

Indicator and Button Positions

Figure 5-2 Indicators and buttons on the front panel



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

Indicator and Button Descriptions

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

Sign	Indicator and Button	Description
	Power button/indicator	Power indicator: • Off: The device is not powered on. • Steady green: The device is powered on. • Blinking yellow: The iBMC is starting. The power button is locked and cannot be pressed. The iBMC is started in about 1 minute, and then the power

Sign	Indicator and Button	Description
		indicator is steady yellow. • Steady yellow: The device is standby. Power button: • When the device is powered on, you can press this button to gracefully shut down the OS. **NOTE** For different OSs, you may need to shut down the OS as prompted. • When the device is powered on, holding down this button for 6 seconds will forcibly power off the device. • When the power indicator is steady yellow, you can press this button to power on the device.
UID	UID button/indicator	The UID button/indicator helps identify and locate a device. UID indicator: • Off: The device is not being located. • Blinking or steady blue: The device is being located. UID button description: • You can control the UID indicator status by pressing the UID button or by using the iBMC or MM910. • You can press this button to turn on or off the UID indicator. • You can press and hold down this button for 4 to 6 seconds to reset the iBMC.
HLY	Health status indicator	• Off: The device is powered off or is faulty. • Blinking red at 1 Hz: A major alarm has been generated for the device. • Blinking red at 5 Hz: A critical alarm has been generated for the device, or the device is not securely installed. • Steady green: The device is operating properly.

5.1.3 Ports

Port Positions

Figure 5-3 Ports on the front panel

1	USB 3.0 ports	2	-

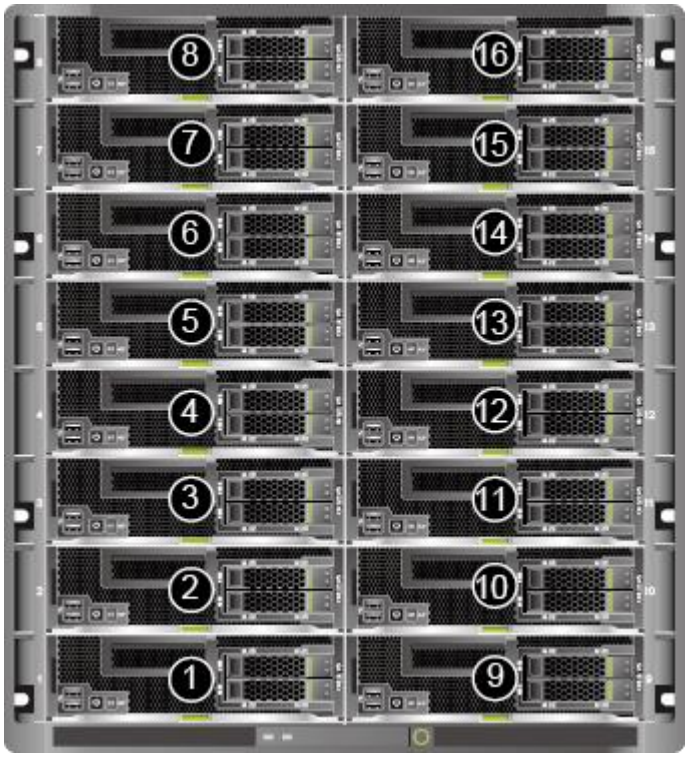
Port Description

Port	Type	Quantity	Description
USB port	USB 3.0	2	Used to connect to a USB device. **NOTICE** Before connecting an external USB device, check that the USB device functions properly. The server may operate abnormally if an abnormal USB device is connected.

5.1.4 Installation Positions

The CH121 V5 is installed in a half-width slot in the front of the E9000 chassis. An E9000 chassis can house a maximum of 16 CH121 V5 compute nodes.

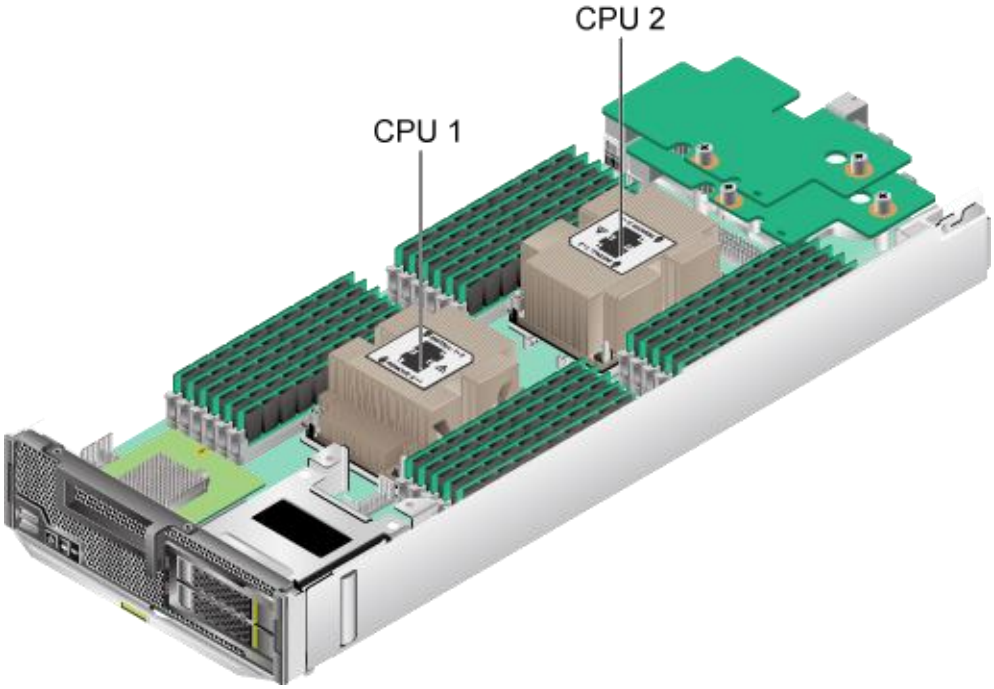
Figure 5-4 Installation positions



5.2 Processor

- The server supports one or two processors.
- If only one processor is required, install it in socket **CPU1**.
- The same model of processors must be used in a server.
- Contact your local sales representative or use the Compatibility Checker to determine the components to be used.

Figure 5-5 Processor positions



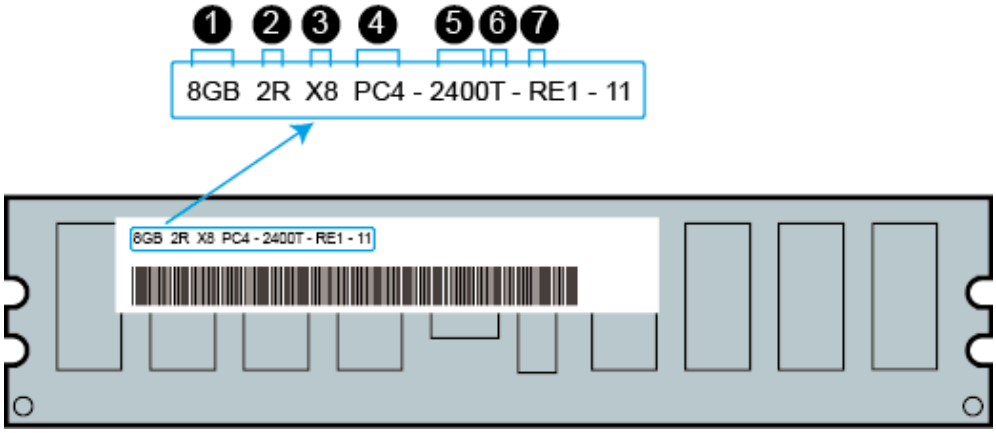
5.3 Memory

5.3.1 DDR4 Memory

5.3.1.1 Memory Identifier

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

Figure 5-6 Memory identifier



Callout	Description	Definition
1	Capacity of the memory module	• 8 GB • 16 GB • 32 GB • 64 GB • 128 GB
2	Number of ranks of the memory module	• 1R: single-rank • 2R: dual-rank • 4R: quad-rank • 8R: octal-rank
3	Data width on the DRAM	• X4: 4-bit • X8: 8-bit
4	Type of the memory interface	• PC3: DDR3 • PC4: DDR4
5	Maximum memory speed	• 2133 MT/S • 2400 MT/S • 2666 MT/S • 2933 MT/S
6	Column Access Strobe (CAS) latency	• P: 15 • T: 17
7	DIMM type	• R: RDIMM • L: LRDIMM

5.3.1.2 Memory Subsystem Architecture

The CH121 V5 provides 24 memory slots. Each processor integrates six memory channels.

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

Table 5-2 Memory channels

CPU	Memory Channel	Memory Slot
CPU 1	1A (primary)	DIMM000(1A1)
	1A	DIMM001(1A2)
	1B (primary)	DIMM010(1B1)
	1B	DIMM011(1B2)
	1C (primary)	DIMM020(1C1)
	1C	DIMM021(1C2)

CPU	Memory Channel	Memory Slot
	1D (primary)	DIMM030(1D1)
	1D	DIMM031(1D2)
	1E (primary)	DIMM040(1E1)
	1E	DIMM041(1E2)
	1F (primary)	DIMM050(1F1)
	1F	DIMM051(1F2)
CPU 2	2A (primary)	DIMM100(2A1)
	2A	DIMM101(2A2)
	2B (primary)	DIMM110(2B1)
	2B	DIMM111(2B2)
	2C (primary)	DIMM120(2C1)
	2C	DIMM121(2C2)
	2D (primary)	DIMM130(2D1)
	2D	DIMM131(2D2)
	2E (primary)	DIMM140(2E1)
	2E	DIMM141(2E2)
	2F (primary)	DIMM150(2F1)
	2F	DIMM151(2F2)

5.3.1.3 Memory Compatibility

Observe the following rules when configuring DDR4 DIMMs:

NOTICE

- A server must use the same model of DDR4 DIMMs, and all the DIMMs operate at the same speed, which is the smallest value of:
- Memory speed supported by a processor
- Maximum operating speed of a memory module
- The DDR4 memory modules of different types (RDIMM and LRDIMM) cannot be used together.
- Contact your local sales representative or use the Compatibility Checker to determine the components to be used.

- The memory can be used with Intel® Xeon® Scalable Skylake and Cascade Lake processors. The maximum memory capacity supported varies depending on the processor model.
  - Skylake processors
    - M processors: 1.5 TB/socket
    - Other processors: 768 GB/socket
  - Cascade Lake processors
    - L processors: 4.5 TB/socket
    - M processors: 2 TB/socket
    - Other processors: 1 TB/socket
- The total memory capacity is the sum of the capacity of all DDR4 DIMMs.

NOTICE

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

- Use the Compatibility Checker to determine the capacity type of a single memory module.
- The maximum number of DIMMs supported by a server varies depending on the CPU type, memory type, rank quantity, and operating voltage.

NOTE

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

Number of DIMMs supported by each channel ≤ Number of ranks supported by each memory channel/Number of ranks supported by each DIMM

- A memory channel supports more than eight ranks for LRDIMMs.

NOTE

A quad-rank LRDIMM generates the same electrical load as a single-rank RDIMM on a memory bus.

- DDR4 DIMMs of different specifications (capacity, bit width, rank, and height) can be used together for capacity expansion purposes. However, the memory Reliability, Availability, and Serviceability (RAS) features may be affected.

  Observe the following rules when you need to use different types of DIMMs in a compute node:
  - RDIMMs and LRDIMMs cannot be used together.

- Do not use 128 GB DIMMs together with DIMMs of other capacities.
- If DIMMs with different rank quantities need to be installed in the same channel, install the DIMMs with more ranks in slots farther away from the CPU.

  For example, install the dual-rank DIMM in slot 1A1 and the single-rank DIMM in slot 1A2.
- Memory modules of different speeds can be mixed in any way. However, the memory speed is the lowest speed of the DIMMs configured.
- RAS features, such as memory mirroring, single device data correction (SDDC), SDDC+1, and double device data correction (DDDC), are not supported if x4 and x8 DIMMs are used together.

Table 5-3 DDR4 memory specifications

Parameter		DIMM			
Maximum capacity per DDR4 DIMM (GB)		16	32	64	128
Rated speed (MT/s)		2933	2933	2666	2666
Rank		Single rank	Dual rank	Quad rank	Octal rank
Operating voltage (V)		1.2	1.2	1.2	1.2
Maximum number of DDR4 DIMMs in a node[a]		24	24	24	24
Maximum DDR4 memory capacity of the node (GB)[b]		384	768	1536	3072
Maximum operating speed (MT/s)	1DPC[c]	2933[d]	2933[d]	2666	2666
	2DPC	2666	2666	2666	2666

- a: The maximum number of DDR4 memory modules is based on dual-processor configuration. The value is halved for a server with only one processor.
- b: The maximum DDR4 memory capacity varies depending on the processor type. The value listed in this table is based on the assumption that DIMMs are fully configured.
- c: DPC (DIMM per channel) indicates the number of DIMMs per channel.
- d: If the Cascade Lake processor is used, the maximum operating speed of a DIMM can reach 2933 MT/s. If the Skylake processor is used, the maximum operating speed of a DIMM can reach 2666 MT/s only. Different CPUs possess different specifications, For details about the CPU parameters, see the Intel official website.
- The information listed in this table is for reference only. For details, consult the local sales representative.

5.3.1.4 DIMM Installation Rules

- Observe the following when configuring DDR4 memory modules:
  - Install memory modules only when corresponding processors are installed.
  - Do not install LRDIMMs and RDIMMs in the same server.

  - Install filler memory modules in vacant slots.
- Observe the following when configuring DDR4 memory modules in specific operating mode:
  - Memory sparing mode
    - Comply with the general installation guidelines.
    - Each memory channel must have a valid online spare configuration.
    - The channels can have different online spare configurations.
    - Each populated channel must have a spare rank.
  - Memory mirroring mode
    - Comply with the general installation guidelines.
    - Each processor supports two integrated memory controllers (IMCs). At least two channels of each IMC are used for installing memory modules (channels 1 and 2, or channels 1, 2, and 3). The installed memory modules must be identical in size and organization.
    - For a multi-processor configuration, each processor must have a valid memory mirroring configuration.
  - Memory scrubbing mode
    - Comply with the general installation guidelines.

5.3.1.5 Memory Installation Positions

A CH121 V5 supports a maximum of 24 DDR4 DIMMs. To maximize the performance, balance the total memory capacity between the installed processors and load the channels similarly whenever possible.

Figure 5-7 Memory slots

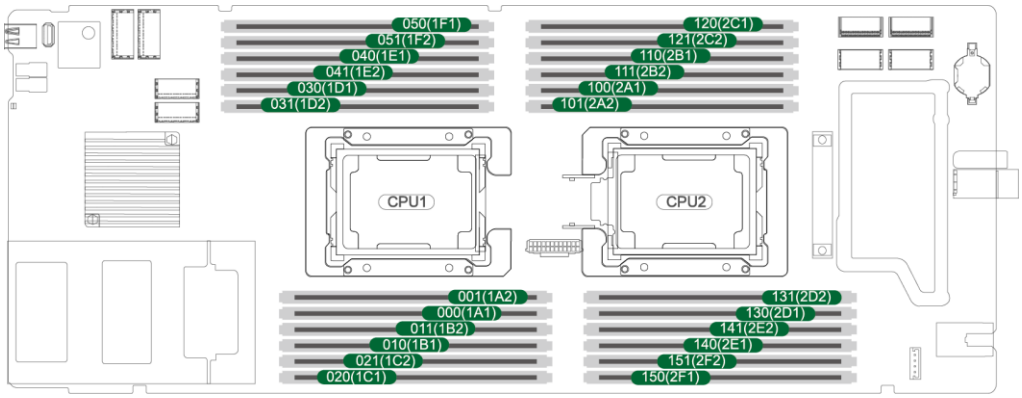


Figure 5-8 DDR4 memory installation guidelines (1 processor)

CPU	Channel	DIMM Slot	Number of DIMMs (✓: recommended ○: not recommended)											
			✓	✓	✓	✓	○	✓	○	✓	○	○	○	✓
			1	2	3	4	5	6	7	8	9	10	11	12
CPU1	A	DIMM000(1A1)	•	•	•	•	•	•	•	•	•	•	•	•
		DIMM001(1A2)							•	•	•	•	•	•
	B	DIMM010(1B1)		•	•	•	•	•	•	•	•	•	•	•
		DIMM011(1B2)								•	•	•	•	•
	C	DIMM020(1C1)			•		•	•	•		•	•	•	•
		DIMM021(1C2)									•		•	•
	D	DIMM030(1D1)				•	•	•	•	•	•	•	•	•
		DIMM031(1D2)								•		•	•	•
	E	DIMM040(1E1)				•	•	•	•	•	•	•	•	•
		DIMM041(1E2)								•		•	•	•
	F	DIMM050(1F1)						•	•		•	•	•	•
		DIMM051(1F2)												•

Figure 5-9 DDR4 memory installation guidelines (2 processors)

DIMM Installation Rules for 2-Socket Compute Nodes																										
CPU	Channel	DIMM Slot	Number of DIMMs (✓: recommended ○: not recommended)																							
			○	✓	○	✓	○	✓	○	✓	○	○	○	✓	○	○	○	✓	○	○	○	○	○	○	○	✓
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
CPU1	A	DIMM000(1A1)	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
		DIMM001(1A2)													•	•	•	•	•	•	•	•	•	•	•	•
	B	DIMM010(1B1)			•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
		DIMM011(1B2)															•	•	•	•	•	•	•	•	•	•
	C	DIMM020(1C1)					•	•			•	•	•	•	•	•			•	•	•	•	•	•	•	•
		DIMM021(1C2)																	•	•			•	•	•	•
	D	DIMM030(1D1)							•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
		DIMM031(1D2)															•	•			•	•	•	•	•	•
	E	DIMM040(1E1)							•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
		DIMM041(1E2)															•	•			•	•	•	•	•	•
	F	DIMM050(1F1)											•	•	•	•			•	•	•	•	•	•	•	•
		DIMM051(1F2)																							•	•
CPU2	A	DIMM100(2A1)		•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
		DIMM101(2A2)														•	•	•	•	•	•	•	•	•	•	•
	B	DIMM110(2B1)				•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
		DIMM111(2B2)																•	•	•	•	•	•	•	•	•
	C	DIMM120(2C1)						•	•			•	•	•	•	•	•			•	•	•	•	•	•	•
		DIMM121(2C2)																		•	•			•	•	•
	D	DIMM130(2D1)								•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
		DIMM131(2D2)																•	•			•	•	•	•	•
	E	DIMM140(2E1)								•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
		DIMM141(2E2)																•	•			•	•	•	•	•
	F	DIMM150(2F1)												•	•	•	•			•	•	•	•	•	•	•
		DIMM151(2F2)																								•

5.3.1.6 Memory Protection Technologies

The following memory protection technologies are supported:

- ECC
- Full mirroring
- Address range mirroring
- SDDC
- SDDC+1
- Rank sparing mode
- Static virtual lockstep

- Faulty DIMM isolation
- Memory thermal throttling
- Memory address parity protection
- Memory demand/patrol scrubbing
- Device tagging
- Data scrambling
- Adaptive double device data correction (ADDDC)
- ADDDC+1

5.4 Storage

5.4.1 Drive Configurations

Table 5-4 Drive Configuration

Configuration	Maximum Drive Number	Drive Management Mode
Front drives[a]	2[b] • Slots 0 and 2 support SAS/SATA/NVMe drives. • M.2 FRUs can be installed only in slots 0 to 3.	1 x RAID controller card Screw-in RAID controller card: installed in the RAID controller card connector on the mainboard.
• a: Only 2.5-inch drives fit into the front slots. • b: Mixed configuration of M.2 modules and SAS/SATA/NVMe drives is supported. • Contact your local sales representative or use the Compatibility Checker to determine the components to be used.		

5.4.2 Drive Numbering

- SAS/SATA/NVMe drives

Figure 5-10 Drive numbering

- M.2 FRU

Figure 5-11 Drive numbering

5.4.3 Drive Indicators

SAS/SATA Drive Indicators

Figure 5-12 SAS/SATA drive indicators

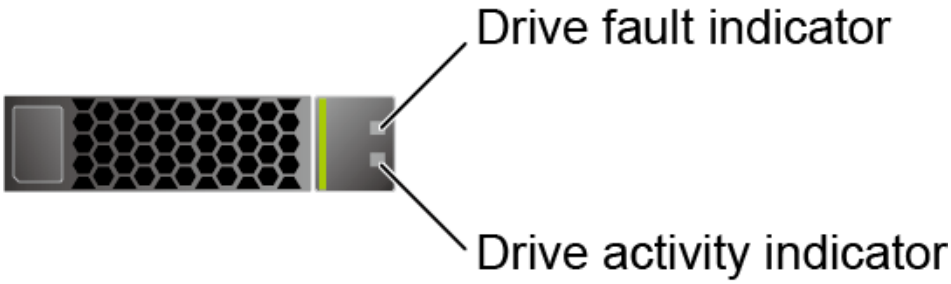


Table 5-5 Description of SAS/SATA drive indicators

Activity Indicator (Green)	Fault Indicator (Yellow)	Description
Off	Off	The drive is not in position.
Steady on	Off	The drive is detected.
Blinking at 4 Hz	Off	Data is being read or written normally, or data on the primary drive is being rebuilt.
Steady on	Blinking at 1 Hz	The drive is being located.
Blinking at 1 Hz	Blinking at 1 Hz	Data on the secondary drive is being rebuilt.
Off	Steady on	A member drive in the RAID array is removed.
Steady on	Steady on	The drive is faulty.

M.2 FRU Indicators

Figure 5-13 M.2 FRU indicators

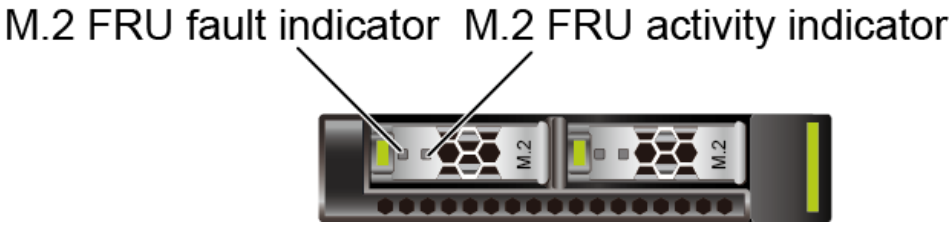
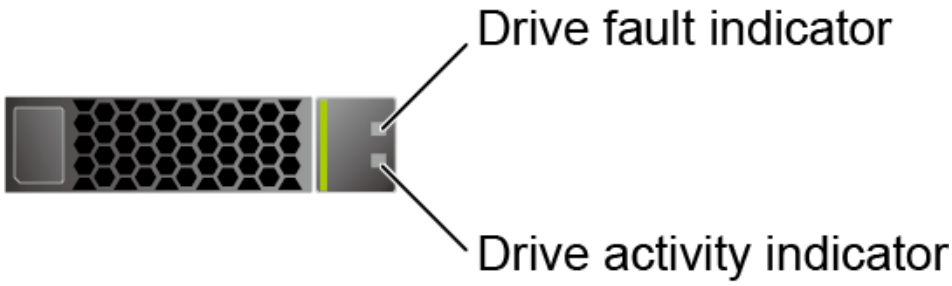


Table 5-6 M.2 FRU indicator description

Indicator	Description
M.2 FRU fault indicator	• Off: The M.2 FRU is running properly. • Blinking yellow: The M.2 FRU is being located, or RAID is being rebuilt. • Steady yellow: The M.2 FRU is faulty or not detected.
M.2 FRU activity indicator	• Off: The M.2 FRU is not in position or is faulty. • Blinking green: Data is being read, written, or synchronized. • Steady green: The M.2 FRU is inactive.

NVMe Drive Indicators

Figure 5-14 NVMe drive indicators



- If the VMD function is enabled and the latest VMD driver is installed, the NVMe drives support surprise hot swap.

Table 5-7 NVMe drive indicators (VMD enabled)

Activity Indicator (Green)	Fault Indicator (Yellow)	Description
Off	Off	The NVMe drive cannot be detected.

Activity Indicator (Green)	Fault Indicator (Yellow)	Description
Steady on	Off	The NVMe drive is working properly.
Blinking at 2 Hz	Off	Data is being read from or written to the NVMe SSD.
Off	Blinking at 2 Hz	The NVMe drive is being located.
Steady on/Off	Steady on	The NVMe drive is faulty.

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

Table 5-8 NVMe drive indicators (VMD disabled)

Activity Indicator (Green)	Fault Indicator (Yellow)	Description
Off	Off	The NVMe drive cannot be detected.
Steady on	Off	The NVMe drive is working properly.
Blinking at 2 Hz	Off	Data is being read from or written to the NVMe drive.
Off	Blinking at 2 Hz	The NVMe drive is being located or hot-swapped.
Off	Blinking at 0.5 Hz	The hot removal process is complete, and the NVMe drive is removable.
Steady on/Off	Steady on	The NVMe drive is faulty.

5.4.4 RAID Controller Card

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

- Contact your local sales representative or use the Compatibility Checker to determine the components to be used.
- For details about the RAID controller card, see *V5 Server RAID Controller Card User Guide*.

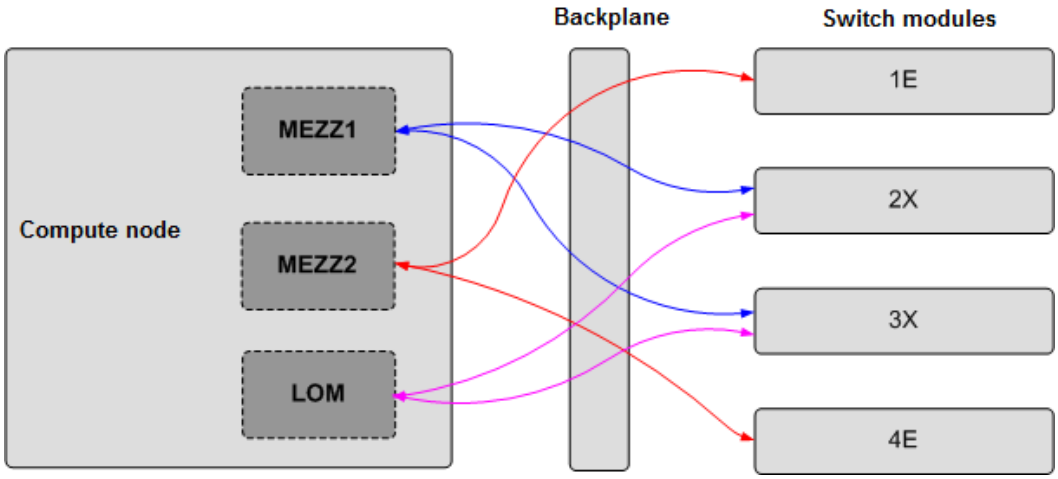
5.5 Network

5.5.1 LOMs

The LOM is a network interface module (X722) integrated in the PCH. It can be connected to an I/O module (switch module). The LOM provides two 10GE network ports for connecting

to the Base network ports of the switch modules in slots 2X and 3X. The LOM supports Wake on LAN (WOL) and PXE functions.

Figure 5-15 Connections between the LOM and I/O modules



NOTE

- In addition to the LOM, the compute node connects to the Fabric ports of the switch modules through the network ports on mezzanine cards.
- Powering off the compute node forcibly will make the WOL function of the LOM ports invalid.
- If flow control is enabled for a LOM port, the switch module connected to the LOM port must also have flow control enabled.

Table 5-9 I/O modules supported by the LOM

I/O Module	I/O Module Slot	LOM	Remarks
CX916	2X/3X	√	-
	1E/4E	×	The LOM cannot communicate with the I/O modules in slots 1E and 4E.
CX916L	2X/3X	√	-
	1E/4E	×	The LOM cannot communicate with the I/O modules in slots 1E and 4E.
CX920	2X/3X	√	-
	1E/4E	×	The LOM cannot communicate with the I/O modules in slots 1E and 4E.

5.6 I/O Expansion

5.6.1 PCIe Cards

PCIe cards provide ease of expandability and connection.

- Contact your local sales representative or use the Compatibility Checker to determine the components to be used.

5.6.2 PCIe Slot Description

NOTE

The PCIe slots mapping to a vacant CPU socket are unavailable.

Table 5-10 PCIe slot description

PCIe Slot	Name on iBMC	CPU	PCIe Standards	Connector Width	Bus Width	Port No.	Root Port (B/D/F)	Device (B/D/F)	Slot Size
RAID controller card	\	CPU 1	PCIe 3.0	x8	x8	Port1A	17:00.00	18:00.00	-
LOM	\	CPU 1	PCIe 3.0	x8	x8	Port1C	17:02.00	1c:00.00	-
Mezz 1	\	CPU 1	PCIe 3.0	x16 or two x8	x16 or two x8	Port2A or (Port2A+Port2C)	3a:00.0 3a:02.0	3b:00.0 3c:00.0	-
Mezz 2	\	CPU 2	PCIe 3.0	x16 or two x8	x16 or two x8	Port2A or (Port2A+Port2C)	ae:00.0 ae:02.0	af:00.0 b0:00.0	-
PCIe riser 1	PCIe riser card 1	CPU 1	PCIe 3.0	x16	x16	Port3A	5d:00.0	5e:00.0	HHHL
NVMe SSD0	disk 0	CPU 2	PCIe 3.0	x4	x4	Port1C	85:02.00	86:00.0	2.5" drive

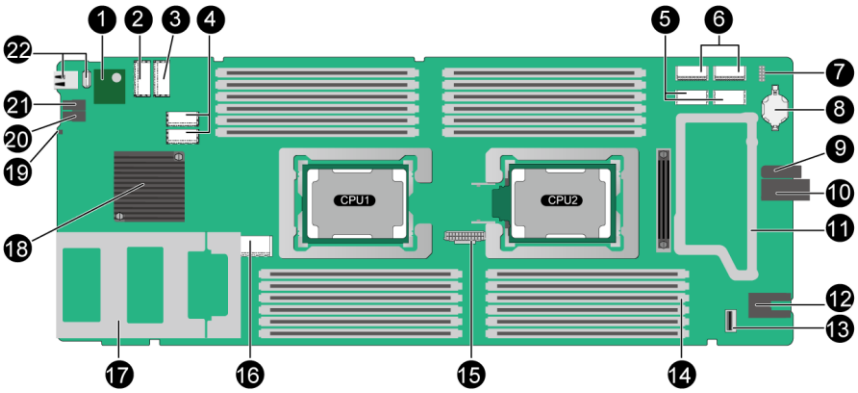
PCIe Slot	Name on iBMC	CPU	PCIe Standards	Connector Width	Bus Width	Port No.	Root Port (B/D/F)	Device (B/D/F)	Slot Size
NVMe SSD 2	disk 2	CPU 2	PCIe 3.0	x4	x4	Port1D	85:03.00	87:00.0	2.5" drive

- The B/D/F (Bus/Device/Function Number) values are the default values when the server is fully configured with PCIe devices. The values may vary if the server is not fully configured with PCIe devices or if a PCIe card with a PCI bridge is configured.
- Root Port (B/D/F) indicates the B/D/F of an internal PCIe root port of the processor.
- Device (B/D/F) indicates the B/D/F (displayed on the OS) of an onboard or extended PCIe device.

5.7 Boards

5.7.1 Mainboard

Figure 5-16 CH121 V5 mainboard



1	TPM connector	2	PCIe riser module connector (PCIe 3.0 x16)
3	PCIe riser module connector (x8)	4	RAID controller card connectors
5	Mezzanine card 2 connector	6	Mezzanine card 1 connector
7	Jumper (J76)[b]	8	RTC battery
9	Positioning sleeve	10	Backplane signal connector

11	Mezzanine card brackets	12	Power connector
13	SoftRAID key connector[a]	14	DIMM slot
15	CPU2 OPA sideband signal port	16	Drive backplane connector
17	Drive cage	18	PCH (Platform Controller Hub)
19	HLY indicator	20	UID button/indicator
21	Power button/indicator	22	USB 3.0 port
a: The port is reserved. b: The CLR_BMC_PW pin is used to restore the iBMC to default configuration.			

6 Product Specifications

6.1 Technical Specifications
6.2 Environmental Specifications
6.3 Physical Specifications

6.1 Technical Specifications

Table 6-1 Technical Specifications

Component	Specifications
Form factor	Half-width compute node
Chipset	Intel® C622
Processor	Supports one or two processors. • Intel® Xeon® Scalable (Skylake and Cascade Lake) processors • Built-in memory controller and six memory channels • Built-in PCIe controller, supporting PCIe 3.0 and 48 lanes per processor • Two UPI buses between processors, providing up to 10.4GT/s transmission per channel • Up to 28 cores per processor • Max. 3.8 GHz • Min. 1.375 MB L3 cache per core • Max. 205 W TDP **NOTE** The preceding information is for reference only. Use the Compatibility Checker to obtain specific information.
DIMM	Supports 24 memory modules of the following types: • Up to 24 DDR4 memory modules • Max. 2933 MT/s memory speed

Component	Specifications
	• RDIMM and LRDIMM support • The DDR4 memory modules of different types (RDIMM and LRDIMM) cannot be used together. **NOTE** The preceding information is for reference only. Use the Compatibility Checker to obtain specific information.
Storage	Supports a variety of drive configurations. For details, see 5.4.1 Drive Configurations. • Supports hot swap of SAS/SATA/NVMe U.2 drives. **NOTE** The NVMe drives support: • Surprise hot swap if the VMD function is enabled and the latest Intel VMD driver is installed. • Orderly hot swap if the VMD function is disabled. • Supports a variety of RAID controller cards. Use the Compatibility Checker to obtain information about the specific RAID controller cards supported. – The RAID controller card supports RAID configuration, RAID level migration, and drive roaming. – The RAID controller card does not occupy a standard PCIe slot. For details about the RAID controller card, see *V5 Server RAID Controller Card User Guide*. **NOTE** If the BIOS is in legacy mode, 4Kn drives (4 KB sectors in physical and logical layers) are not supported.
Network	Supports LOM. • Supports two 10GE Ethernet ports to connect to the Base network ports on the switch modules in slots 2X and 3X. • The LOM ports support WOL and PXE. **NOTE** • Powering off the compute node forcibly will make the WOL function of the LOM ports invalid. • If flow control is enabled for a LOM port, the switch module connected to the LOM port must also have flow control enabled.
I/O expansion	6 PCIe 3.0 slots: • One slot dedicated for a screw-in RAID controller card, two for mezzanine cards, one for a standard PCIe card, and two for NVMe drives. For details, see 5.6.2 PCIe Slot Description. • The two mezzanine cards connect the compute node to switch or pass-through modules through the midplane. – Upper card (Mezz1): directs one PCIe 3.0 x16 from CPU 1 to the I/O modules in slots 2X and 3X in the rear of the E9000 chassis. – Lower card (Mezz2): directs one PCIe 3.0 x16 from

Component	Specifications
	CPU 2 to the I/O modules in slots 1E and 4E in the rear of the E9000 chassis. • Support PCIe SSD cards to bolster I/O performance for applications such as searching, caching, and download services. **NOTE** The preceding information is for reference only. Use the Compatibility Checker to obtain specific information.
Port	Supports a variety of ports. • Ports on the front panel: – Two USB 3.0 ports • Built-in port: – One USB 3.0 port **NOTE** The maximum dimensions (H x W x D) of the built-in USB device are 33.9 mm x 14.5 mm x 7.12 mm (1.33 in. x 0.57 in. x 0.28 in.).
Video card	An SM750 video chip with 32 MB display memory is integrated on the mainboard. The maximum display resolution is 1600 x 1200 at 60 Hz with 16 M colors.
System management	• Supports UEFI. • Supports iBMC. • Supports integration with third-party management systems.
Security feature	• Power-on password • Administrator password • TPM • Secure boot

6.2 Environmental Specifications

Table 6-2 Environmental specifications

Category	Specifications
Temperature	• Operating temperature: 5°C to 40°C (41°F to 104°F) (ASHRAE Classes A1 to A3 compliant) • Storage temperature (within three months): –30°C to +60°C (–22°F to +140°F) • Storage temperature (within six months): –15°C to +45°C (5°F to 113°F) • Storage temperature (within one year): –10°C to +35°C (14°F to 95°F)

Category	Specifications
	• Maximum rate of temperature change: 20°C (36°F) per hour, 5°C (9°F) per 15 minutes **NOTE** If Intel® Xeon® Scalable processors (Platinum 8180, 8180M, 8168 or Gold 6144, 6146, 6154) are used, the maximum operating temperature supported is 35°C (95°F).
Relative humidity (RH, non-condensing)	• Operating humidity: 5% to 85% • Storage humidity (within three months): 8% to 85% • Storage humidity (within six months): 8% to 80% • Storage humidity (within one year): 20% to 75% • Maximum change rate: 20%/h
Operating altitude	≤3050m • When the server configuration complies with ASHRAE Classes A1 and A2 and the altitude is above 900 m (2952.76 ft), the highest operating temperature decreases by 1°C (1.8°F) for every increase of 300 m (984.25 ft). • When the configuration complies with ASHRAE Class A3 standards and the altitude is above 900 m (2952.76 ft.), the highest operating temperature decreases by 1°C (1.8°F) for every increase of 175 m (574.14 ft.). • HDDs cannot be used at an altitude of over 3050 m (10006.44 ft).
Corrosive gaseous contaminant	Maximum corrosion product thickness growth rate: • Copper corrosion rate test: 300 Å/month (meeting level G1 requirements of the ANSI/ISA-71.04-2013 standard on gaseous corrosion) • Silver corrosion rate test: 200 Å/month
Particle contaminant	• The equipment room environment meets the requirements of ISO 14664-1 Class 8. • There is no explosive, conductive, magnetic, or corrosive dust in the equipment room. **NOTE** It is recommended that the particulate pollution in the equipment room be monitored by a professional agency.

NOTE

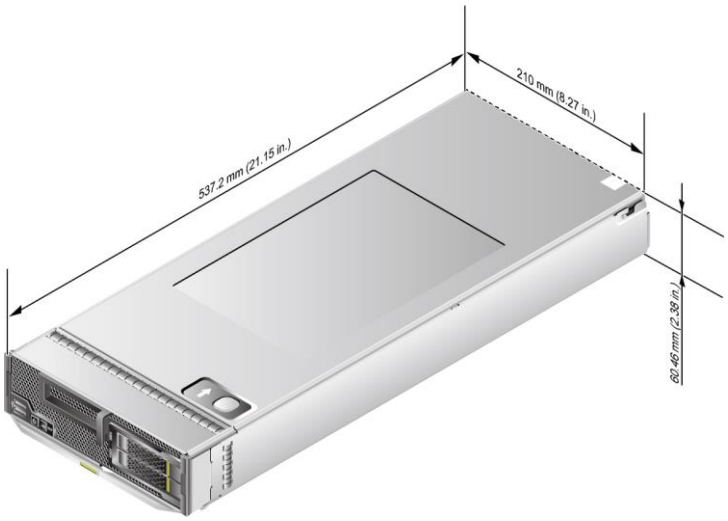
SSDs and HDDs (including NL-SAS, SAS, and SATA) cannot be preserved for a long time in the power-off state. Data may be lost or faults may occur if the preservation duration exceeds the specified maximum duration. When drives are preserved under the storage temperature and humidity specified in the preceding table, the following preservation time is recommended:

- Maximum preservation duration of SSDs:
- 12 months in power-off state without data stored
- 3 months in power-off state with data stored
- Maximum preservation duration of HDDs:

- 6 months in unpacked/packed and powered-off state
- The maximum preservation duration is determined according to the preservation specifications provided by drive vendors. For details, see the manuals provided by drive vendors.

6.3 Physical Specifications

Table 6-3 Physical specifications

Item	Description
Dimensions (H x W x D)	60.46 mm x 210 mm x 537.2 mm (2.38 in. x 8.27 in. x 21.15 in.) **Figure 6-1** Physical dimensions  **NOTE** See Figure 6-1 for methods in measuring physical dimensions of the server node.
Fully equipped weight	• Net weight: 6.5 kg (14.33 lb) • Packing materials: 2.3 kg (5.07 lb)
Energy consumption	The power consumption parameters vary with server configurations, including the configurations complying with energy-related products (ErP) requirements. Use the Power Calculator to obtain specific information.

7 Software and Hardware Compatibility

Use the Compatibility Checker to obtain information about the operating systems and hardware supported.

NOTICE

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

8 Safety Instructions

8.1 Security

8.2 Maintenance and Warranty

8.1 Security

General Statement

- Comply with local laws and regulations when installing devices. These Safety Instructions are only a supplement.
- The "DANGER", "WARNING", and "CAUTION" information in this document does not represent all the safety instructions, but supplements to the safety instructions.
- Observe all safety instructions provided on the device labels when installing hardware. Follow them in conjunction with these Safety Instructions.
- Only qualified personnel are allowed to perform special tasks, such as performing high-voltage operations and driving a forklift.

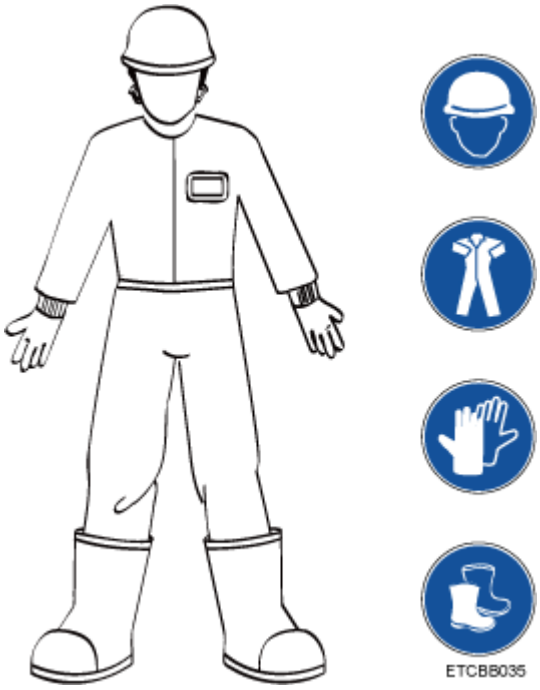
WARNING

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

Human Safety

- Only certified or authorized personnel are allowed to install the device.
- Discontinue any dangerous operations and take protective measures. Report anything that could cause personal injury or device damage to a project supervisor.
- Do not move devices or install racks and power cables in hazardous weather conditions.
- Do not carry the weight that is over the maximum load per person allowed by local laws or regulations. Before moving or installing equipment, check the maximum equipment weight and arrange required personnel.
- Wear clean protective gloves, ESD clothing, a protective hat, and protective shoes, as shown in Figure 8-1.

Figure 8-1 Safety work wear



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

Figure 8-2 Removing conductive objects

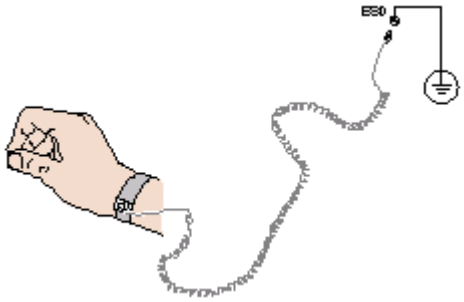
Figure 8-3 shows how to wear an ESD wrist strap.

a. Put your hands into the ESD wrist strap.

b. Tighten the strap buckle and ensure that the ESD wrist strap is in contact with your skin.

c. Insert the ground terminal attached to the ESD wrist strap into the jack on the grounded rack or chassis.

Figure 8-3 Wearing an ESD wrist strap



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

Equipment Safety

- Use the recommended power cables at all times.
- Use power cables only for dedicated servers. Do not use them for other devices.
- Before operating equipment, wear ESD clothes and gloves to prevent electrostatic-sensitive devices from being damaged by ESD.
- When moving a device, hold the bottom of the device. Do not hold the handles of the installed modules, such as the PSUs, fan modules, drives, and the mainboard. Handle the equipment with care.
- Exercise caution when using tools that could cause personal injury.
- If the device is configured with active and standby PSUs, connect power cables of active and standby PSUs to different power distribution units (PDUs) to ensure reliable system operating.
- Ground the equipment before powering it on.

Transportation Precautions

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

Transportation precautions include but are not limited to:

- The logistics company engaged to transport the device must be reliable and comply with international standards for transporting electronics. Ensure that the equipment being

transported is always kept upright. Take necessary precautions to prevent collisions, corrosion, package damage, damp conditions and pollution.

- Transport the equipment in its original packaging.
- If the original packaging is unavailable, package heavy, bulky parts (such as chassis and blades) and fragile parts (such as PCIe GPUs and SSDs) separately.

NOTE

Use Compatibility Checker to obtain information abut the components supported by a node or server.

- Power off all devices before transportation.

Maximum Weight Carried by a Person

CAUTION

To reduce the risk of personal injury, comply with local regulations with regard to the maximum weight one person is permitted to carry.

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

Table 8-1 Maximum weight carried per person

Organization	Weight (kg/lb)
European Committee for Standardization (CEN)	25/55.13
International Organization for Standardization (ISO)	25/55.13
National Institute for Occupational Safety and Health (NIOSH)	23/50.72
Health and Safety Executive (HSE)	25/55.13

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

8.2 Maintenance and Warranty

For details about the maintenance policy, visit Customer Support Service.

For details about the warranty policy, visit Warranty.

9 System Management

The server uses the next-generation Intelligent Baseboard Management Controller (iBMC) to implement remote server management. The iBMC complies with IPMI 2.0 and provides highly reliable hardware monitoring and management.

Features

The iBMC supports the following features and protocols:

- KVM and text console redirection
- Remote virtual media
- IPMI
- SNMP
- Common information model (CIM)
- Redfish
- Browser-based login

Specifications

Table 9-1 iBMC specifications

Specifications	Description
Management interface	Integrates with any standard management system through the following interfaces: • IPMI • CLI • HTTPS • SNMP • Redfish
Fault Detection	Detects and accurately locates faults in a field replaceable unit (FRU).
System watchdog	Supports BIOS POST, OS watchdog, and automatic system reset after fault timeout. Users can enable or disable these features individually.

Specifications	Description
Setting of boot device	Supports out-of-band configuration for the boot device.
Alarm management	Supports alarm management and reports alarms using the SNMP trap, SMTP, and syslog service to ensure 24/7 operating.
Integrated virtual KVM	Provides remote maintenance measures and VNC service for troubleshooting.
Integrated virtual media	Virtualizes local media devices, images, USB keys, and folders into media devices on a remote server, simplifying OS installation. (The virtual DVD-ROM drive supports a maximum transmission rate of 8 MB/s.)
WebUI	Provides a user-friendly graphical user interface (GUI), which simplifies users' configuration and query operations.
Fault reproduction	Reproduces faults to facilitate fault diagnosis.
Screen snapshots and videos	Allows users to view screenshots and videos without login, facilitating routine preventive maintenance inspection (PMI).
Black Box	Allows users to enable or disable the black box function and download black box data.
DNS/LDAP	Supports domain management and directory services, which significantly simplify network and configuration management.
Dual-image backup	Allows a boot from the backup image when the active software crashes.
Device asset management	Provides intelligent asset management, supporting unified management and stocktaking of assets in use.
Intelligent power management	Uses the power capping technology to increase deployment density, and uses dynamic energy saving to lower operating expenses.
IPv6	Supports IPv6 to help build an all-IPv6 environment.
Network Controller Sideband Interface (NC-SI)	Supports NC-SI, allowing access to the iBMC through the service network port.

10 Certifications

Country/Region	Certification	Standards
Europe	WEEE	2012/19/EU
Europe	REACH	EC NO. 1907/2006
Europe	CE	Safety: EN 62368-1:2014+A11:2017 EMC: EN 55032:2015+A11:2020 CISPR 32:2015+A1:2019 EN IEC 61000-3-2:2019+A1:2021 EN 61000-3-3:2013+A1:2019 EN 55035:2017+A11:2020 CISPR 35:2016 EN 55024:2010+A1:2015 CISPR 24:2010+A1:2015 ETSI EN 300 386 V1.6.1:2012 ETSI EN 300 386 V2.1.1:2016 RoHS: EN IEC 63000:2018 ErP: Commission Regulation(EU) 424/2019
UK	UKCA	Safety: EN 62368-1:2014+A11:2017 EMC: EN 55032:2015+A11:2020 CISPR 32:2015+A1:2019 EN IEC 61000-3-2:2019+A1:2021 EN 61000-3-3:2013+A1:2019 EN 55035:2017+A11:2020

Country/Region	Certification	Standards
		CISPR 35:2016 EN 55024:2010+A1:2015 CISPR 24:2010+A1:2015 ETSI EN 300 386 V1.6.1:2012 ETSI EN 300 386 V2.1.1:2016 RoHS: BS EN IEC 63000:2018 ErP: Commission Regulation(EU) 424/2019
US	FCC	FCC PART 15
Canada	IC	ICES-003
China	RoHS	SJ/T-11364 GB/T 26572
Japan	VCCI	VCCI 32-1
Global	CB	IEC 62368-1:2014

A Appendix

A.1 Node Label

Figure A-1 Position of the CH121 V5 label

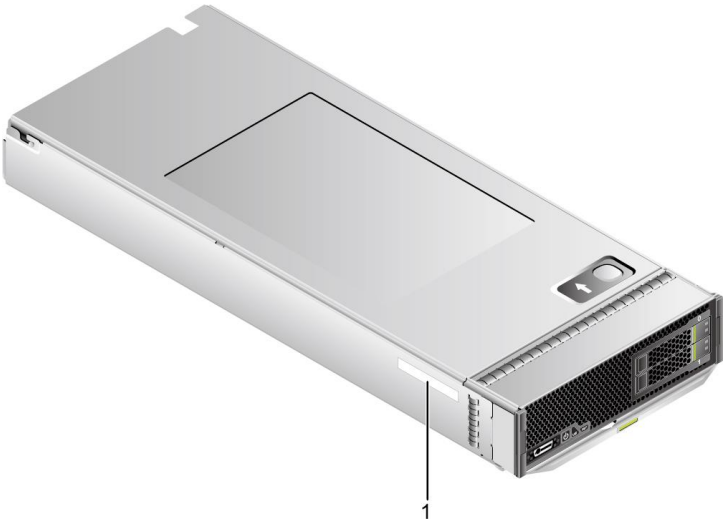


Table A-1 CH121 V5 Label description

No.	Description
1	Serial number of the server node. For details, see A.2 Product SN.

A.2 Product SN

The serial number (SN) on the slide-out label plate uniquely identifies a device. The SN is required when you contact technical support.

Figure A-2 Example SN

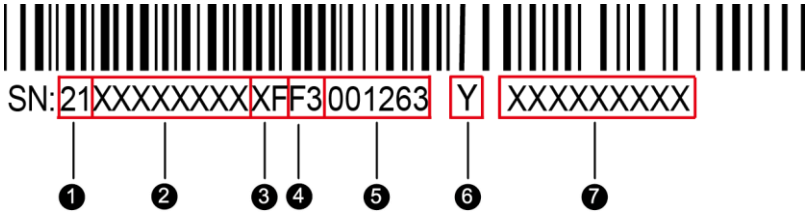


Table A-2 SN description

No.	Description
1	ESN ID (two characters), which can only be **21**.
2	Material ID (eight characters), that is, the processing code.
3	Vendor code (two characters), that is, the code of the processing place.
4	Year and month (two characters). • The first character indicates the year. – Digits 1 to 9 indicate years 2001 to 2009, respectively. – Letters A to H indicate years 2010 to 2017, respectively. – Letters J to N indicate years 2018 to 2022, respectively. – Letters P to Y indicate years 2023 to 2032, respectively. **NOTE** The years from 2010 are represented by upper-case letters excluding I, O, and Z because the three letters are similar to the digits 1, 0, and 2. • The second character indicates the month. – Digits 1 to 9 indicate January to September, respectively. – Letters A to C indicate October to December, respectively.
5	Serial number (six digits).
6	RoHS compliance (one character). **Y** indicates RoHS compliant.
7	Internal model (product name) of the board.

A.3 RAS Features

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

For details about how to configure these features, see the *Server Purley Platform BIOS Parameter Reference*.

Table A-3 Supported RAS features

Module	Feature	Description

Module	Feature	Description
CPU	Corrected Machine Check Interrupt (CMCI)	Corrects error-triggered interrupts.
Memory	Failed DIMM Isolation	Identifies faulty DIMMs to facilitate isolation and replacement of the faulty DIMMs.
	Memory Thermal Throttling	Automatically adjusts the memory temperature to prevent the memory from being damaged due to overheat.
	Rank Sparing	Uses some memory ranks for backup to prevent the system from breaking down due to uncorrectable errors.
	Memory Address Parity Protection	Detects memory command and address errors.
	Memory Demand and Patrol Scrubbing	Corrects correctable errors upon detection. If these errors are not corrected in a timely manner, uncorrectable errors may occur.
	Memory Mirroring	Provides high reliability for the system via mirroring.
	Single Device Data Correction (SDDC)	Corrects single-chip multi-bit errors to improve memory reliability.
	Device Tagging	Degrades and rectifies memory faults to improve memory availability.
	Data Scrambling	Optimizes data flow distribution to reduce the error probability and improve memory data flow reliability and address error detection.
PCIe	PCIe Advanced Error Reporting	Provides a PCIe advanced error reporting mechanism to improve server serviceability.
UPI	Intel UPI Link Level Retry	Provides a retry mechanism to improve the reliability of UPI links.
	Intel UPI Protocol Protection via CRC	Provides cyclic redundancy check (CRC) protection for UPI data packets to improve system reliability.
System	Core Disable For FRB (Fault Resilient Boot)	Isolates a faulty CPU core during startup to improve system reliability and availability.
	Corrupt Data Containment Mode	Marks the memory storage unit when a data error occurs to limit the impact on the running program and improve system reliability.
	Socket disable for FRB (Fault Resilient Boot)	Isolates a faulty socket during the BIOS startup process to improve system reliability.

Module	Feature	Description
	Architected Error Records	With the features such as eMCA, the BIOS collects error information recorded in hardware registers in compliance with UEFI specifications, notifies the OS through the APEI interface of the ACPI, and locates the error unit, improving system availability.
	Error Injection Support	Implements fault injection to verify RAS features.
	Machine Check Architecture (MCA)	Provides a software repair function to rectify uncorrectable errors to improve system availability.
	Enhanced Machine Check Architecture (eMCA): Gen2	Improves system availability.
	OOB access to MCA registers	The out-of-band system can access MCA registers through the PECI. When a fatal error occurs in the system, the out-of-band system can collect onsite data to facilitate subsequent fault analysis and locating and improve system serviceability.
	BIOS Abstraction Layer for Error Handling	The BIOS processes errors and reports error information to the OS based on specifications, improving system serviceability.
	BIOS-based Predictive Failure Analysis (PFA)	The OS takes the lead. The BIOS provides information about physical memory error units. The OS tracks, predicts, and handles the errors.

B Glossary

B.1 A-E

E

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

B.2 F-J

G

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

H

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

B.3 K-O

K

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

B.4 P-T

P

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

R

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

S

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

B.5 U-Z

U

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

C Acronyms and Abbreviations

C.1 A-E

A

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

B

BBU	backup battery unit
BIOS	Basic Input/Output System

C

CD	calendar day
CE	Conformite Europeenne
CIM	Common Information Model
CLI	command-line interface

D

DC	direct current
DCPMM	DC persistent memory module

DDR3	Double Data Rate 3
DDR4	Double Data Rate 4
DDDC	double device data correction
DEMT	Dynamic Energy Management Technology
DIMM	dual in-line memory module
DRAM	dynamic random-access memory
DVD	digital video disc

E

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

C.2 F-J

F

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

G

GE	Gigabit Ethernet
GPIO	General Purpose Input/Output
GPU	graphics processing unit

H

HA	high availability
HDD	hard disk drive
HPC	high-performance computing
HTTP	Hypertext Transfer Protocol
HTTPS	Hypertext Transfer Protocol Secure

I

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

C.3 K-O

K

KVM	keyboard, video, and mouse

L

LC	Lucent connector
LRDIMM	load-reduced dual in-line memory module
LED	light emitting diode

LOM	LAN on motherboard

M

MAC	media access control
MMC	module management controller

N

NBD	next business day
NC-SI	Network Controller Sideband Interface

C.4 P-T

P

PCIe	Peripheral Component Interconnect Express
PDU	power distribution unit
PHY	physical layer
PMBUS	power management bus
POK	power OK
PWM	pulse-width modulation
PXE	Preboot Execution Environment

Q

QPI	Quick Path Interconnect

R

RAID	redundant array of independent disks
RAS	reliability, availability and serviceability
RDIMM	registered dual in-line memory module

REACH	Registration Evaluation and Authorization of Chemicals
RJ45	registered jack 45
RoHS	Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment

S

SAS	Serial Attached Small Computer System Interface
SATA	Serial Advanced Technology Attachment
SCM	supply chain management
SDDC	single device data correction
SERDES	serializer/deserializer
SGMII	serial gigabit media independent interface
SMI	serial management interface
SMTP	Simple Mail Transfer Protocol
SNMP	Simple Network Management Protocol
SOL	serial over LAN
SONCAP	Standards Organization of Nigeria-Conformity Assessment Program
SSD	solid-state drive
SSE	Streaming SIMD Extensions

T

TACH	tachometer signal
TBT	Turbo Boost Technology
TCG	Trusted Computing Group
TCM	trusted cryptography module
TCO	total cost of ownership
TDP	thermal design power
TELNET	Telecommunication Network Protocol
TET	Trusted Execution Technology
TFM	TransFlash module

TFTP	Trivial File Transfer Protocol
TOE	TCP offload engine
TPM	trusted platform module

C.5 U-Z

U

UDIMM	unbuffered dual in-line memory module
UEFI	Unified Extensible Firmware Interface
UID	unit identification light
UL	Underwriter Laboratories Inc.
USB	Universal Serial Bus

V

VCCI	Voluntary Control Council for Interference by Information Technology Equipment
VGA	Video Graphics Array
VLAN	virtual local area network
VRD	voltage regulator-down

W

WEEE	waste electrical and electronic equipment
WSMAN	Web Service Management