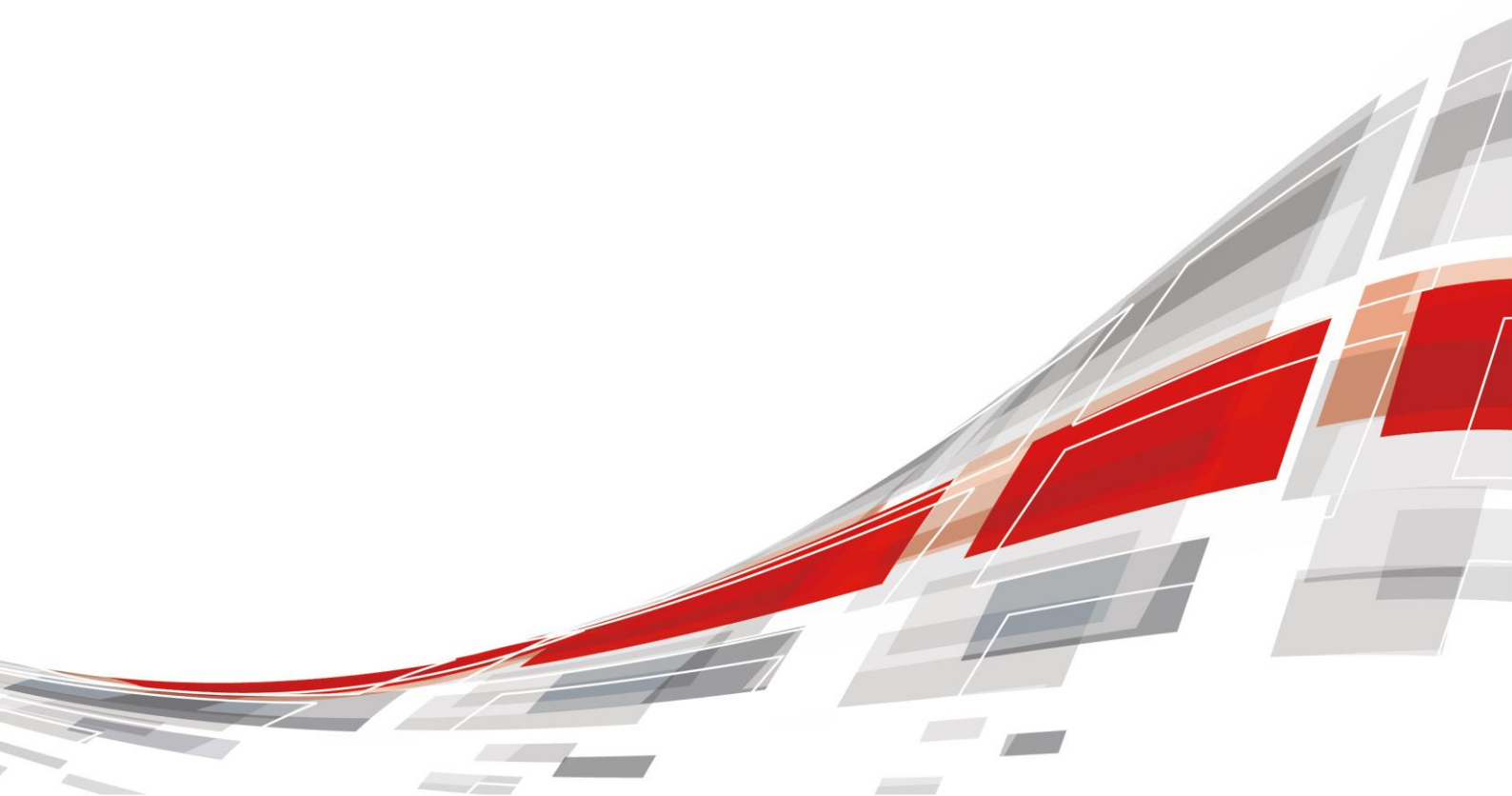
FusionServer G560 Compute Node

Technical White Paper

Issue	**02**
Date	**2022-11-11**



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Contents

1 About This Document

Purpose

This document describes the general-purpose compute module G560 and heterogeneous compute module GP608 of the FusionServer G5500 server in terms of appearances, features, performance parameters, and configurations.

NOTE

In this document, a compute node consists of one G560 and one GP608.

Intended Audience

This document is intended for pre-sales engineers.

Change History

Issue	Date	Description
02	2022-11-11	Updated GPGPU Card.
01	2021-10-22	This issue is the first official release.

2 About the G560 and GP608

2.1 Overview

This section describes the features, appearances, and installation positions of the G560 and GP608.

Introduction

The G560 is a full-width compute module of the G5500 that uses the Intel® new-generation Grantley CPU platform to deliver powerful computing capability and scalability.

- The G560 supports a maximum of six 2.5-inch NVMe SSDs and two 2.5-inch SAS or SATA drives. These drives support hot swap (orderly hot swap for NVMe SSDs).
- The I/O modules support a maximum of four half-height half-length single-slot PCIe 3.0 x16 cards.
- The management module provides one out-of-band management GE port.

The GP608 is used together with the G560 to expand the computing capabilities of the G5500.

The G560 and GP608 are installed in a G5500 chassis and centrally managed by the management module.

Appearance

Figure 2-1 shows the appearance of the G560.

Figure 2-1 Appearance of the G560

Figure 2-2 shows the appearance of the GP608.

Figure 2-2 Appearance of the GP608

Installation Position

Figure 2-3 shows the installation positions of the G560 and GP608 in a chassis.

NOTE

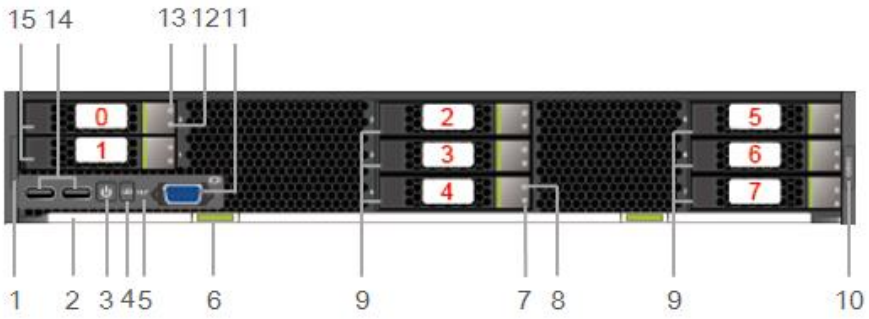
Install the GP608 first and then the G560. Remove the G560 first and then the GP608.

Figure 2-3 Installation positions of the G560 and GP608

2.2 Front Panel

Figure 2-4 and Figure 2-5 show the front panels of the G560 and GP608.

Figure 2-4 Front panel of the G560



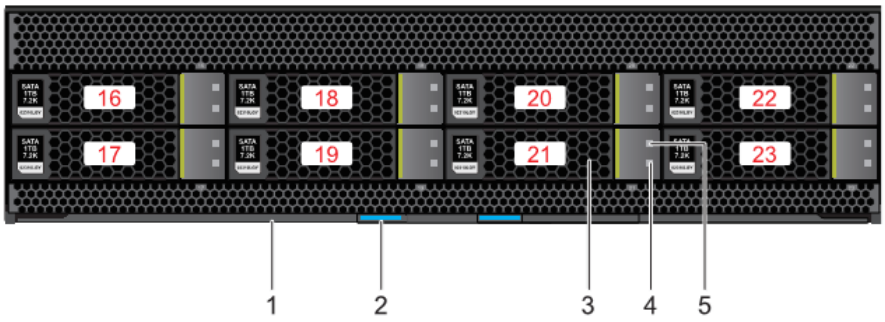
1	Label plate with an SN label	2	Ejector lever
3	Power button/indicator	4	UID button/indicator
5	HLY indicator	6	Ejector release button
7	NVMe SSD activity indicator	8	NVMe SSD fault indicator
9	2.5-inch NVMe SSDs	10	Product model
11	VGA port	12	Drive activity indicator

13	Drive fault indicator	14	USB ports
15	2.5-inch SAS or SATA drives	-	-

NOTE

The G560s of earlier versions do not have VGA and USB ports.

Figure 2-5 Front panel of the GP608



1	Ejector lever	2	Ejector release button
3	3.5-inch SAS or SATA drive	4	Drive activity indicator
5	Drive fault indicator	-	-

NOTE

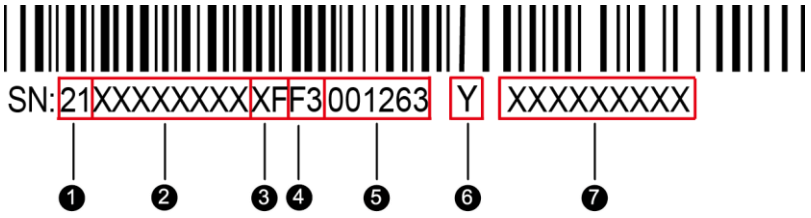
When a compute node is installed in a chassis, the ejector levers and ejector release buttons on the GP608 panel are invisible because they are blocked by the G560.

SN

A serial number (SN) is a string that uniquely identifies a server. The SN is required when you apply for technical support.

Figure 2-6 shows the SN format.

Figure 2-6 Example SN



No.	Description

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

2.3 Ports

Table 2-1 G560 ports

Port	Type	Quantity	Description
USB port	USB 3.0 Type A	2	The panel provides two USB 3.0 ports, which are compatible with USB 2.0.
VGA port	DB15	1	The panel provides a DB15 VGA port for local maintenance of the compute node.

2.4 Indicators and Buttons

You can determine the server status by observing the indicators. Table 2-2 and Table 2-3 describe the indicators and buttons of the G560 and GP608.

Table 2-2 G560 indicators and buttons

Silkscreen	Indicator/Button	Color	State Description
PWR 	Power button/indicator	Yellow and green	• Off: The compute node is not connected to a power source. • Blinking yellow: The power button is locked. The power button is locked when the iBMC is being started during the compute node startup. • Steady yellow: The compute node is ready to be powered on. • Steady green: The compute node is properly powered on. **NOTE** • When the compute node is powered on, you can press this button for less than 1 second to shut down the OS. • When the compute node is powered on, holding down this button for 6 seconds will forcibly power it off. • When the compute node is ready to be powered on, you can press this button for less than 1 second to start it.
UID	UID button/indicator	Blue	The UID indicator is used to locate the compute node in a chassis. You can remotely control the UID indicator status (off, on, or blinking) by using the management module. • Off: The compute node is powered off or not being located. • On: The compute node is located. • Blinking: The compute node is located and differentiated from other located compute nodes. **NOTE** • You can press this button for less than 1 second to turn on or off the UID indicator. • You can hold down the UID button for 4 to 6 seconds to reset the iBMC.
HLY	Health indicator	Red and green	• Off: The compute node is not powered on. • Steady green: The compute node hardware is operating properly. • Blinking red (at 1 Hz): A major alarm has been generated for the compute node. • Blinking red (at 5 Hz): A critical alarm has been generated for the compute node, or the compute node is not

Silkscreen	Indicator/Button	Color	State Description
			securely installed.
	NVMe SSD activity indicator	Green	• Off: The SSD is faulty or not detected. • Blinking green: Data is being read from or written to the SSD, or synchronized between SSDs. • Steady green: The SSD is not being accessed.
	NVMe SSD fault indicator	Yellow	• Off: The SSD is operating properly. • Blinking yellow (at 0.5 Hz): The SSD completes the hot swap process and is ready to be removed. • Blinking yellow (at 2 Hz): The drive is being located or ejected. • Steady yellow: The SSD is faulty or not detected.
	Drive activity indicator	Green	• Off: The drive is faulty or not detected. • Blinking green: Data is being read from or written to the drive, or synchronized between drives. • Steady green: The drive is not being accessed.
	Drive fault indicator	Yellow	• Off: The drive is operating properly. • Blinking yellow: The drive is being located, or RAID is being rebuilt. • Steady yellow: The drive is faulty or not detected.

Table 2-3 GP608 indicators

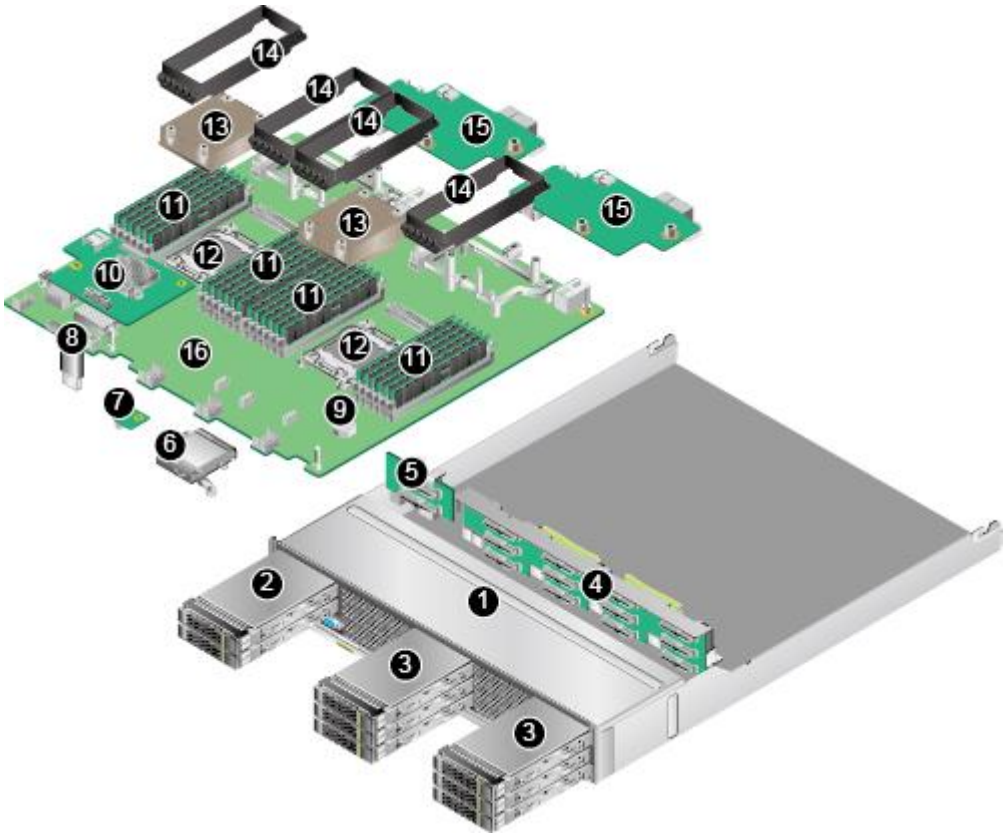
Silkscreen	Indicator	Color	State Description
	Drive activity indicator	Green	• Off: The drive is faulty or not detected. • Blinking green: Data is being read from or written to the drive, or synchronized between drives. • Steady green: The drive is not being accessed.
	Drive fault indicator	Yellow	• Off: The drive is operating properly. • Blinking yellow: The drive is being located, or RAID is being rebuilt. • Steady yellow: The drive is faulty or

Silkscreen	Indicator	Color	State Description
			not detected.

2.5 Physical Structure

Figure 2-7 and Figure 2-8 show the components of the G560 and GP608.

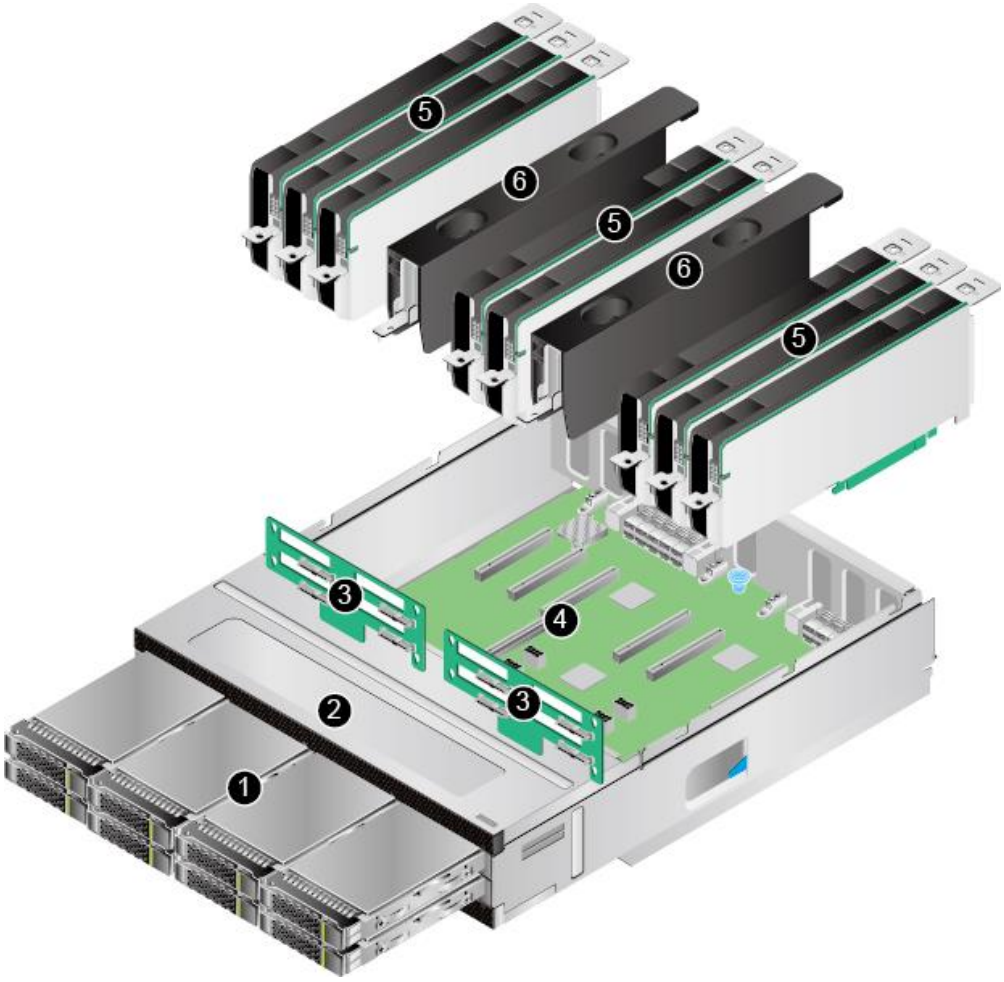
Figure 2-7 G560 components



1	G560 case	2	SATA or SAS drives
3	NVMe SSDs	4	NVMe SSD backplane
5	SAS or SATA drive backplane	6	Supercapacitor (optional)
7	TPM (optional)	8	USB flash drive (optional)
9	BIOS battery	10	RAID controller card
11	DIMMs	12	CPUs
13	Heat sinks	14	DIMM air ducts

15	Mezzanine cards	16	Mainboard

Figure 2-8 GP608 components



1	SATA or SAS drives	2	GP608 case
3	Drive backplane	4	PCIe board
5	Full-height full-length dual-slot GPGPU cards	6	Filler modules

2.6 Product Specifications

This section describes the specifications of G560 and GP608 components.

Table 2-4 and Table 2-5 describe the G560 and GP608 specifications.

Table 2-4 G560 specifications

No.	Item	Specifications
1	G560 case	Other components of the G560 are installed inside the case.
2	SATA or SAS drive	Up to two 2.5-inch SAS or SATA drives. The drive backplane provides two SAS or SATA ports for connecting to drives. The drives are hot-swappable and can be independently installed and removed.
3	NVMe SSD	Up to six 2.5-inch NVMe SSDs. The NVMe SSD backplane provides six PCIe 3.0 x4 slots for connecting to NVMe SSDs. The SSDs can be installed and removed independently and support orderly hot-swap. Surprise hot-swap is not supported.
4	NVMe SSD backplane	The backplane helps expand storage capacity and control NVMe SSDs in real time.
5	SAS or SATA drive backplane	The backplane helps expand storage capacity and control SAS or SATA drives in real time.
6	Supercapacitor (optional)	If the LSI SAS3108 RAID controller card is used, the supercapacitor provides power-off protection.
7	TPM (optional)	Supports TPM 1.2 and TPM 2.0. The TPM is a cost-effective security solution that complies with the Trusted Computing Group (TCG) standards. It enhances platform security by preventing viruses or unauthorized operations.
8	USB flash drive (optional)	The USB port on the mainboard connects to a USB 3.0 device. The device height, width, and thickness cannot exceed 31.75 mm x 12.00 mm x 4.50 mm (1.25 in. x 0.47 in. x 0.18 in.).
9	BIOS battery	When the G560 is not powered on, the BIOS battery supplies power to the real time clock (RTC).
10	RAID controller card	The RAID controller card expands the storage capacity of the compute node through drives and ensures data security. The G560 supports an LSI SAS3008 or LSI SAS3108 RAID controller card. The RAID controller card provides two SAS or SATA ports for connecting to two 2.5-inch SAS or SATA drives. RAID 0 and RAID 1 are supported. The LSI SAS3108 supports RAID 0, 1, 5, 6, 10, 50, and 60 through a maximum of eight 3.5-inch SAS or SATA drives in the GP608. A supercapacitor can be configured to provide power-off protection for the LSI SAS3108 RAID controller card.
11	Memory	The mainboard provides 24 slots for installing DDR4 DIMMs (12 DIMMs for each CPU). • Maximum memory speed: 2400 MT/s • Memory protection: ECC, memory mirroring, and memory sparing • DIMM types: RDIMMs and LRDIMMs. DIMMs in the same compute node must be of the same type (RDIMM or LRDIMM) and the same specifications (capacity, bit width,

No.	Item	Specifications
		rank, and height), and have the same BOM code. For details about the DIMM BOM numbers, see the Compatibility Checker. – RDIMMs: When twenty-four 32 GB RDIMMs and two CPUs are configured, the maximum memory capacity is 768 GB. – LRDIMMs: When twenty-four 64 GB LRDIMMs and two CPUs are configured, the maximum memory capacity is 1536 GB.
12	CPU	The mainboard supports two CPUs. • The following CPU models are supported: Intel® Xeon® E5-2600 v4 (Broadwell-EP) series CPUs, each supporting a maximum of 22 cores. For details about the CPU models, see the Compatibility Checker. • Each CPU integrates four memory controllers for supporting four DDR4 memory channels. Each channel supports three DDR4 DIMMs of 1600, 1866, 2133, or 2400 MT/s memory speed. • Each CPU integrates PCIe controllers for supporting PCIe 3.0 and provides 40 lanes. • The two CPUs are interconnected through two QPI links at 9.6 GT/s. • The maximum frequency is 3.5 GHz. **NOTE** The G560 does not support single-CPU configuration, and the two CPUs must be of the same model.
13	Heat sink	Cools CPUs. Each CPU is configured with one heat sink.
14	DIMM air duct	Provides ventilation channels for DIMMs.
15	Mezzanine card	The G560 supports two mezzanine cards. Each mezzanine card provides two PCIe 3.0 x16 channels and is connected to the mainboard through four connectors and to the GP608 through the chassis backplane. For details, see 2.9 Logical Structure. In addition, mezzanine card 1 also provides the SAS channel between the RAID controller card and the GP608.
16	Mainboard	As the most important component of the G560, the mainboard integrates basic components, such as the BIOS chip and PCH chip, and provides CPU sockets and DIMM slots.

Table 2-5 GP608 specifications

No.	Item	Specifications
1	SATA or SAS drive	Up to eight 3.5-inch SAS or SATA drives. The drives are hot-swappable and can be independently installed and removed.

No.	Item	Specifications
2	GP608 case	Other components of the GP608 are installed inside the case.
3	Drive backplane	The GP608 is configured with two drive backplanes. Each drive backplane supports four drives.
4	PCIe board	Up to nine PCIe slots. For details, see 2.7 PCIe Slots.
5	GPGPU card	Up to eight full-height full-length dual-slot GPGPU cards. **NOTE** Install filler modules in vacant GPGPU card slots.
6	Filler module	Provides ventilation channels. If all eight GPGPU cards are installed and PCIe slot 9 is not used, two filler modules are required. If all eight GPGPU cards are installed and PCIe slot 9 is used, one filler module is required.

2.7 PCIe Slots

Table 2-6 describes the mapping between G560 PCIe slots and CPUs, supported PCIe standards, and B/D/F information. Table 2-7 and Table 2-8 describe the mapping between GP608 PCIe slots and CPUs, supported PCIe standards, and B/D/F information.

Table 2-6 G560 PCIe slots

PCIe Device	CPU	PCIe Standard	Connector Width	Bus Width	Port Number	Root Port B/D/F	Device B/D/F	Slot Size
RAID controller card	CPU 1	PCIe 2.0	x4	x4	-	00/1c/4	0d/00/0	Non-standard device
Mezzanine card 1	CPU 1	PCIe 3.0	Two x16	Two x16	Port 3A (through PCIe switch)	-	-	Non-standard device
Mezzanine card 2	CPU 2	PCIe 3.0	Two x16	Two x16	Port 3A (through PCIe switch)	-	-	Non-standard device
NVMe	CPU 1	PCIe	x4	x4	Port	00/02/2	19/00/0	2.5-inch

PCIe Device	CPU	PCIe Standard	Connector Width	Bus Width	Port Number	Root Port B/D/F	Device B/D/F	Slot Size
SSD 2		3.0			2C			drive
NVMe SSD 3	CPU 1	PCIe 3.0	x4	x4	Port 2A	00/02/0	11/00/0	2.5-inch drive
NVMe SSD 4	CPU 1	PCIe 3.0	x4	x4	Port 2B	00/02/1	15/00/0	2.5-inch drive
NVMe SSD 5	CPU 2	PCIe 3.0	x4	x4	Port 2A	80/02/0	8d/00/0	2.5-inch drive
NVMe SSD 6	CPU 2	PCIe 3.0	x4	x4	Port 2D	80/02/3	99/00/0	2.5-inch drive
NVMe SSD 7	CPU 2	PCIe 3.0	x4	x4	Port 2C	80/02/2	95/00/0	2.5-inch drive

NOTE

- NVMe SSDs 2 to 4 are connected to CPU 1, and NVMe SSDs 5 to 7 are connected to CPU 2. It is recommended that NVMe SSDs are evenly installed to ensure bandwidth balance.
- The preceding B/D/F information is the default system configuration.

Table 2-7 GP608 PCIe slots in topology 1

PCIe Device	CPU	PCIe Standard	Connector Width	Bus Width	Port Number	Root Port B/D/F	Device B/D/F	Slot Size
PCIe slot 1	CPU 1	PCIe 3.0	x16	x16	Port 3A	00/03/0-22/14/0-28/08/0	45/00/0	Full-height full-length dual-slot
PCIe slot 2	CPU 1	PCIe 3.0	x16	x16	Port 3A	00/03/0-22/14/0-28/14/0	51/00/0	Full-height full-length dual-slot
PCIe slot 3	CPU 1	PCIe 3.0	x16	x16	Port 3A	00/03/0-22/14/0-28/10/0	4d/00/0	Full-height full-length dual-slot
PCIe slot 4	CPU 1	PCIe 3.0	x16	x16	Port 3A	00/03/0-22/14/0-28/0c/0	49/00/0	Full-height full-length dual-slot
PCIe	CPU 1	PCIe	x16	x16	Port	00/03/0-	2f/00/0	Full-heigh

PCIe Device	CPU	PCIe Standard	Connector Width	Bus Width	Port Number	Root Port B/D/F	Device B/D/F	Slot Size
slot 5		3.0			3A	22/14/0-28/04/0-2a/08/0		t full-length dual-slot
PCIe slot 6	CPU 1	PCIe 3.0	x16	x16	Port 3A	00/03/0-22/14/0-28/04/0-2a/14/0	3b/00/0	Full-height full-length dual-slot
PCIe slot 7	CPU 1	PCIe 3.0	x16	x16	Port 3A	00/03/0-22/14/0-28/04/0-2a/10/0	37/00/0	Full-height full-length dual-slot
PCIe slot 8	CPU 1	PCIe 3.0	x16	x16	Port 3A	00/03/0-22/14/0-28/04/0-2a/0c/0	33/00/0	Full-height full-length dual-slot
PCIe slot 9	CPU 1	PCIe 3.0	x16	x8	Port 3A	00/03/0-22/0c/0	23/00/0	Full-height full-length single-slot
I/O slot 1	CPU 1	PCIe 3.0	x16	x16	Port 3A	00/03/0-22/0c/0	23/00/0 23/00/1	Half-height half-length single-slot
I/O slot 2	-	PCIe 3.0	x16	x16	-	-	-	Half-height half-length single-slot
I/O slot 3	CPU 2	PCIe 3.0	x16	x16	Port 3A	80/03/0-9e/08/0	9f/00/0 9f/00/1	Half-height half-length single-slot
I/O slot 4	CPU 1	PCIe 3.0	x16	x16	Port 3A	00/03/0-22/14/0-28/04/0-2a/04/0	2b/00/0 2b/00/1	Half-height half-length single-slot

Table 2-8 GP608 PCIe slots in topology 2

PCIe Device	CPU	PCIe Standard	Connector Width	Bus Width	Port Number	Root Port B/D/F	Device B/D/F	Slot Size
PCIe slot 1	CPU 1	PCIe 3.0	x16	x16	Port 3A	00/03/0-22/14/0-28/08/0	2d/00/0	Full-height full-length dual-slot
PCIe slot 2	CPU 1	PCIe 3.0	x16	x16	Port 3A	00/03/0-22/14/0-28/14/0	39/00/0	Full-height full-length dual-slot
PCIe slot 3	CPU 1	PCIe 3.0	x16	x16	Port 3A	00/03/0-22/14/0-28/10/0	35/00/0	Full-height full-length dual-slot
PCIe slot 4	CPU 1	PCIe 3.0	x16	x16	Port 3A	00/03/0-22/14/0-28/0c/0	31/00/0	Full-height full-length dual-slot
PCIe slot 5	CPU 2	PCIe 3.0	x16	x16	Port 3A	80/03/0-9e/10/0-a4/08/0	a9/00/0	Full-height full-length dual-slot
PCIe slot 6	CPU 2	PCIe 3.0	x16	x16	Port 3A	80/03/0-9e/10/0-a4/14/0	b5/00/0	Full-height full-length dual-slot
PCIe slot 7	CPU 2	PCIe 3.0	x16	x16	Port 3A	80/03/0-9e/10/0-a4/10/0	b1/00/0	Full-height full-length dual-slot
PCIe slot 8	CPU 2	PCIe 3.0	x16	x16	Port 3A	80/03/0-9e/10/0-a4/0c/0	ad/00/0	Full-height full-length dual-slot
PCIe slot 9	CPU 1	PCIe 3.0	x16	x8	Port 3A	00/03/0-22/0c/0	23/00/0	Full-height full-length single-slot
I/O slot 1	CPU 1	PCIe 3.0	x16	x16	Port 3A	00/03/0-22/0c/0	23/00/0 23/00/1	Half-height half-length single-slot

PCIe Device	CPU	PCIe Standard	Connector Width	Bus Width	Port Number	Root Port B/D/F	Device B/D/F	Slot Size
I/O slot 2	CPU 1	PCIe 3.0	x16	x16	Port 3A	00/03/0-22/14/0-28/04/0	29/00/0 29/00/1	Half-height half-length single-slot
I/O slot 3	CPU 2	PCIe 3.0	x16	x16	Port 3A	80/03/0-9e/08/0	9f/00/0 9f/00/1	Half-height half-length single-slot
I/O slot 4	CPU 2	PCIe 3.0	x16	x16	Port 3A	80/03/0-9e/10/0-a4/04/0	a5/00/0 a5/00/1	Half-height half-length single-slot

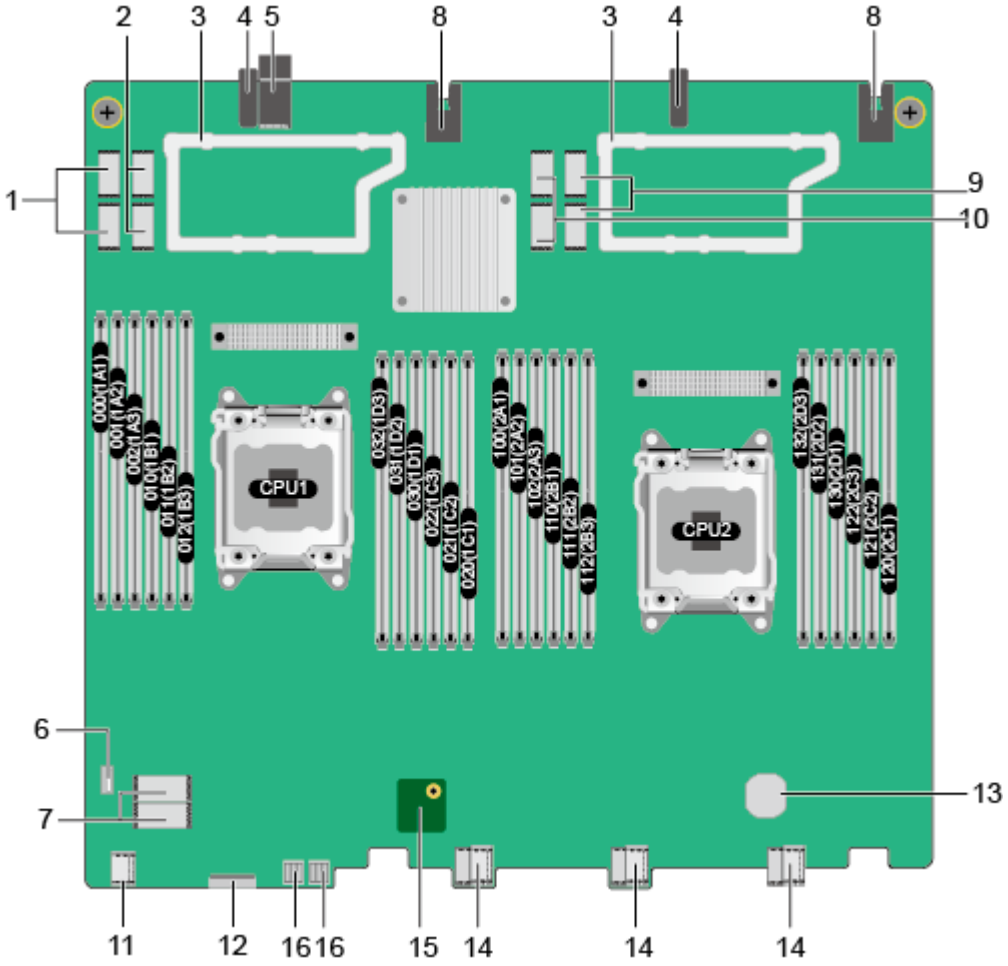
NOTE

- The CPUs to which PCIe slots 5 to 8 and I/O slot 4 are connected vary depending on the logical topology. For details, see 2.9 Logical Structure.
- PCIe slot 9 and I/O slot 1 are mutually exclusive and cannot be used at the same time. By default, I/O slot 1 is used.
- I/O slot 2 is available only in logical topology 2.
- A customized panel is required for installing PCIe cards in the PCIe Slot 1 - 9.
- The preceding B/D/F information is the system default configuration. If PCIe cards with the PCI bridge function are configured, the B/D/F allocation result will change.
- The B/D/F allocation result of an I/O card with two ports is used as an example. Each port corresponds to one B/D/F allocation result.

2.8 Mainboard Layout

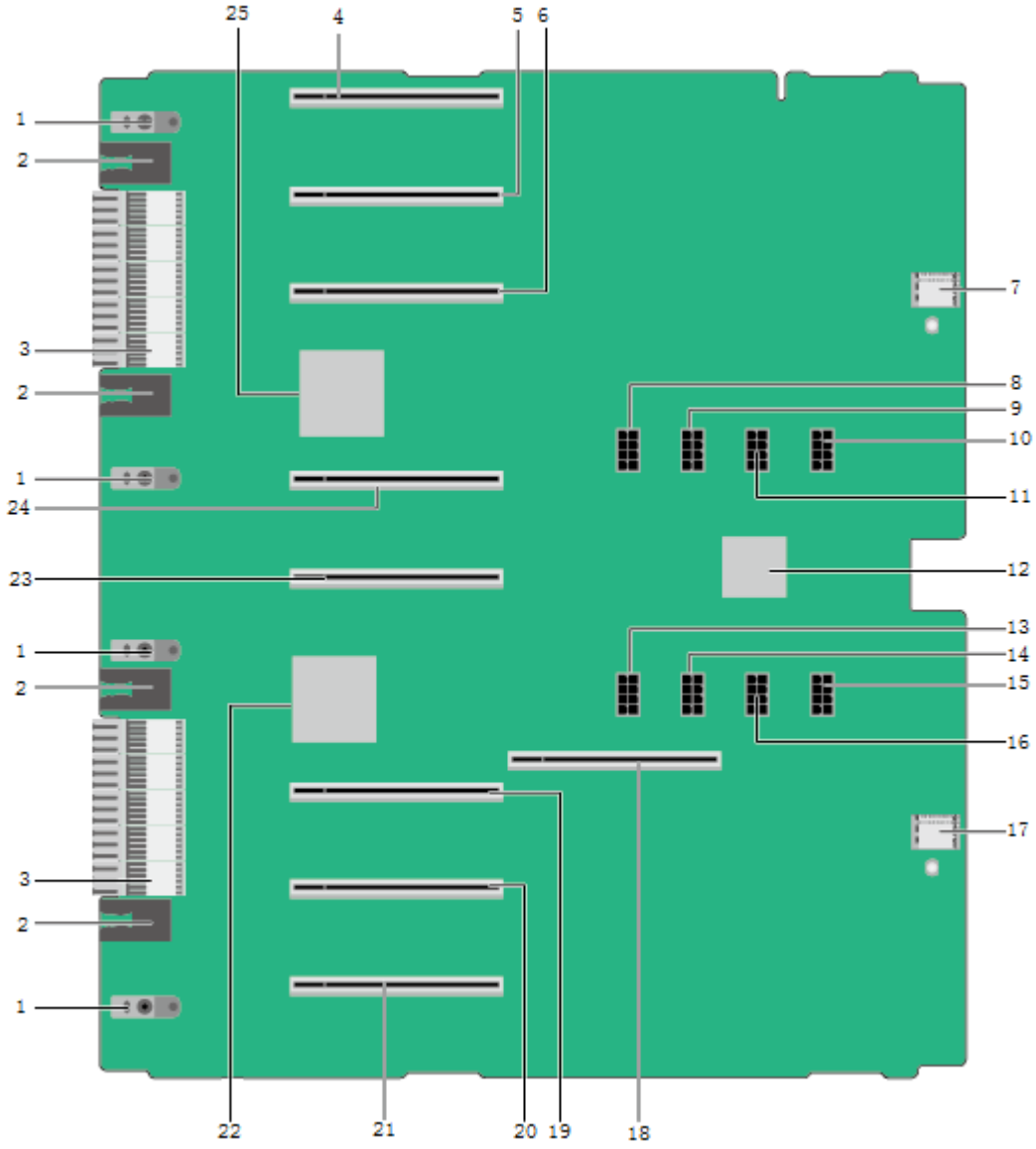
Figure 2-9 and Figure 2-10 show the connectors and key components on the mainboard of the G560 and the PCIe board of the GP608.

Figure 2-9 G560 connectors and components



1	Channel 1 connectors of mezzanine card 1	2	Channel 2 connectors of mezzanine card 1
3	Mezzanine card trays	4	Backplane guide sleeves
5	Backplane signal connector	6	USB port
7	RAID controller card connectors	8	Backplane power connectors
9	Channel 2 connectors of mezzanine card 2	10	Channel 1 connectors of mezzanine card 2
11	SAS or SATA drive backplane connector	12	Interface board connector
13	BIOS battery	14	NVMe SSD backplane signal connectors
15	TPM connector	16	NVMe SSD backplane power connectors

Figure 2-10 GP608 connectors and components



1	Backplane guide sleeves	2	Backplane power connectors
3	Backplane signal connectors	4	PCIe slot 8
5	PCIe slot 7	6	PCIe slot 6
7	Drive backplane 2 connector	8	PCIe slot 5 auxiliary power connector
9	PCIe slot 6 auxiliary power connector	10	PCIe slot 8 auxiliary power connector
11	PCIe slot 7 auxiliary power connector	12	SAS expander
13	PCIe slot 4 auxiliary power	14	PCIe slot 3 auxiliary power

	connector		connector
15	PCIe slot 1 auxiliary power connector	16	PCIe slot 2 auxiliary power connector
17	Drive backplane 1 connector	18	PCIe slot 9 (reserved)
19	PCIe slot 3	20	PCIe slot 2
21	PCIe slot 1	22	PCIe switch 1
23	PCIe slot 4	24	PCIe slot 5
25	PCIe switch 2	-	-

NOTE

The auxiliary power supplies of the PCIe cards installed in PCIe slots 1 to 8 must be connected to their respective auxiliary power connectors on the GP608 PCIe board.

2.9 Logical Structure

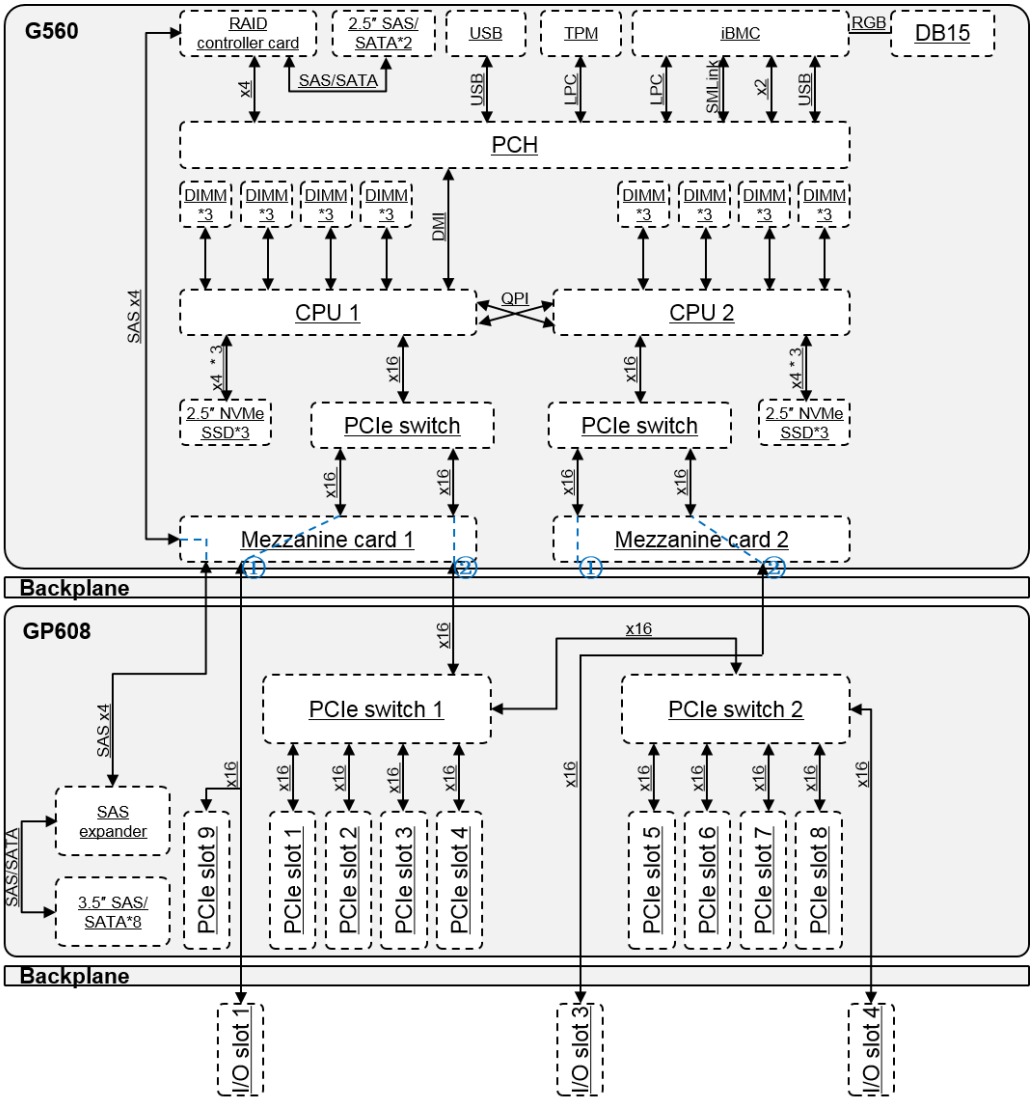
This section describes the logical topologies of the G560 and GP608.

The PCIe x16 port of each G560 CPU is expanded to two PCIe x16 ports through the PCIe switch. These ports are connected to PCIe switches 1 and 2 and I/O slots 1 and 3 in the GP608 through the mezzanine cards and chassis backplane. The RAID controller card in the G560 is connected to a mezzanine card and then to the SAS expander in the GP608 through SAS x4 cables. The RAID controller card is connected to the eight 3.5-inch SAS or SATA drives in the GP608, and the two 2.5-inch SAS or SATA drives.

The two PCIe switches on the GP608 PCIe board are connected to eight PCIe x16 PCIe slots and two PCIe x16 I/O slot (I/O slots 2 and 4). The PCIe slots and I/O slots are used for installing GPGPU cards and NICs respectively. By means of programming control of the GP608, two logical topologies are available to meet requirements of different service models.

Figure 2-11 and Figure 2-12 show the logical topologies of the G560 and GP608.

Figure 2-11 G560 and GP608 logical topology 1

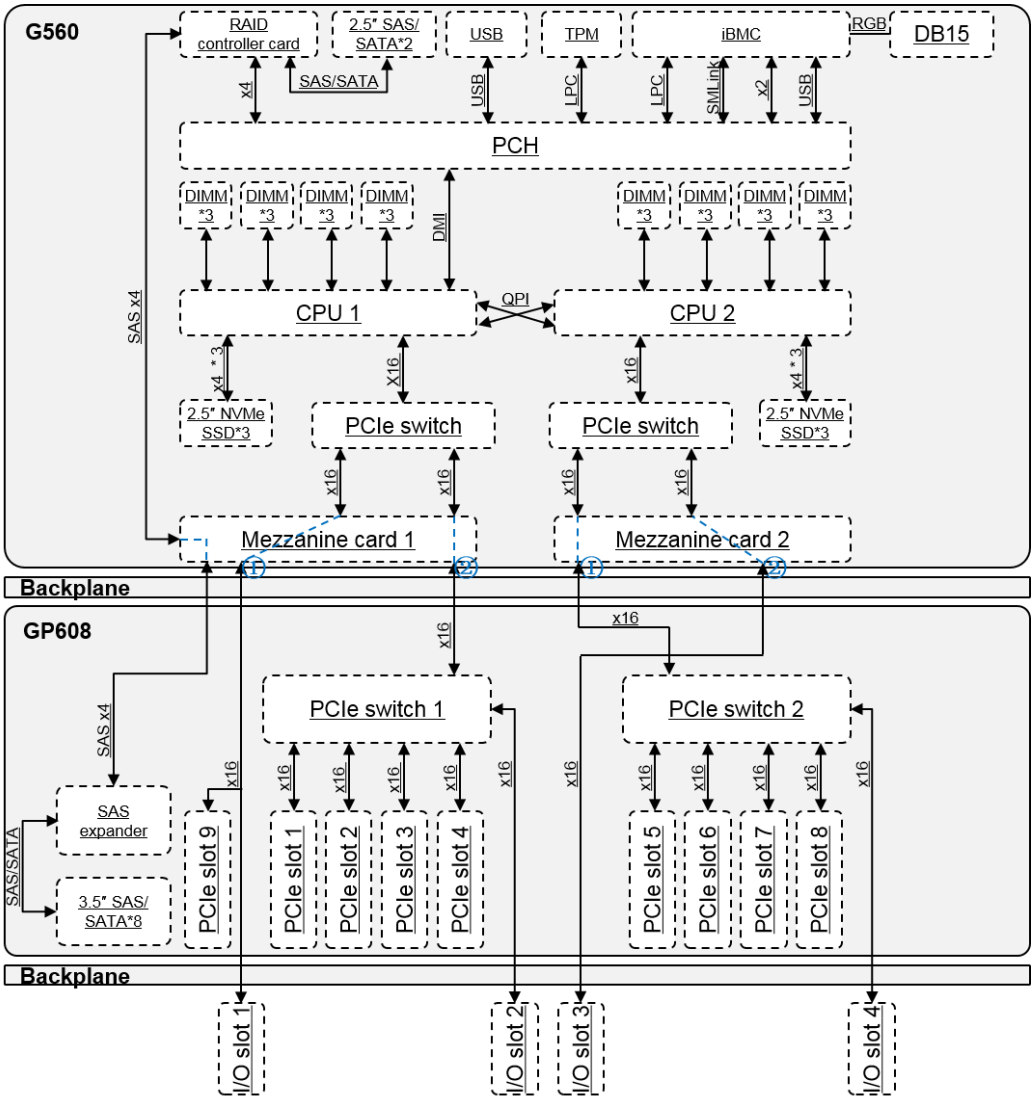


In this logical topology, the two PCIe switches in the GP608 are cascaded, and PCIe slots 1 to 8 belong to the same root port of the CPUs, supporting direct data transmission between a maximum of eight GPGPU cards with an optimal delay. This topology is ideal for machine learning. In this logical topology, I/O slot 2 is unavailable.

NOTE

If an InfiniBand NIC is used to support a GPGPU cluster, I/O slot 4 is recommended.

Figure 2-12 G560 and GP608 logical topology 2



In this logical topology, the two PCIe switches of the GP608 are connected to the two CPUs respectively and provide higher uplink bandwidth for PCIe slots 1 to 8. This topology is ideal for HPC and public cloud scenarios. This topology supports direct data transmission between a maximum of four GPGPU cards.

NOTE

If InfiniBand NICs are used to support GPGPU clusters, I/O slots 2 and 4 are recommended.

2.10 Technical Specifications

Table 2-9 provides the technical specifications of the G560 and GP608.

Table 2-9 Technical specifications

Category	Item	Specifications
Physical specifications	Dimensions (H x W x D)	• G560: 60.46 mm x 423 mm x 537.2 mm (2.38 in. x 16.65 in. x 21.15 in.) • GP608: 122.85 mm × 437.4 mm × 540 mm (4.84 in. x 17.22 in. x 21.26 in.)
	Color	• Front panel: black • Casing: silver
	Weight	• G560 – Net weight (with eight drives): 16 kg (35.28 lb) – Packing materials: 3.42 kg (7.54 lb) • GP608 – Net weight (with eight drives and eight GPGPU cards): 22 kg (48.51 lb) – Packaging materials: 4.5 kg (9.92 lb)
Environmental specifications	Temperature	• Operating temperature: 5°C to 35°C (41°F to 95°F) • Storage temperature: -40°C to +65°C (-104°F to +149°F) • Maximum change rate: 20°C/h (36°F/h)
	Humidity	• Operating humidity: 8% to 90% RH (non-condensing) • Storage humidity: 5% to 95% RH (non-condensing) • Maximum change rate: 20% RH/h
	Altitude	• Maximum altitude: 3048 m (9999.88 ft). For altitudes above 900 m (2952.72 ft), the operating temperature decreases by 1°C (1.8°F) for every increase of 300 m (984.24 ft) in altitude. • HDDs are not supported when the altitude is higher than 3000 m (9842.4 ft).
	Corrosive gaseous contaminant	• Copper corrosion rate test requirements: The corrosion product thickness growth rate is lower than 300 Å/month (meeting level G1 requirements of the ANSI/ISA-71.04-2013 standard on gaseous corrosion). • Corrosion rate of the silver test piece: < 200 Å/month
	Particle contaminant	• The equipment room environment meets the requirements of ISO 14664-1 Class 8. You are advised to hire a professional organization to monitor particle contaminants in the equipment room. • The equipment room is free from explosive, conductive, magnetic conductive, and corrosive dust.
Input power specifications	Rated input voltage	12 V DC
Power	-	The power consumption parameters vary with server

Category	Item	Specifications
consumption		configurations, including the configurations complying with EU's energy-related products (ErP) requirements. For details, see the Power Calculator.

3 Product Features

- Two Intel® Xeon® E5-2600 v4 series CPUs, each supporting 12 DDR4 DIMMs
- Multiple drive configuration schemes, enabling elastic and scalable storage capacity expansion
  - The G560 supports a maximum of six NVMe SSDs to provide high-performance storage and meet various requirements for storage capacities and capacity expansion. It also provides two 2.5-inch SAS or SATA drives for local OS installation.
  - The GP608 provides eight 3.5-inch SAS or SATA drives to expand the storage capability of the compute node.
  - The LSI SAS3008 and LSI SAS3108 RAID controller cards are supported.
- Eight full-height full-length dual-slot PCIe 3.0 x16 slots for installing GPGPU cards of 300 W.
- Flexible PCIe topology programming, meeting requirements of different service models
- The GP608 PCIe slots, SAS expander, SAS/SATA drives, PCIe switches and system I/O modules can be powered on only when the G560 is powered on, minimizing power consumption when the G560 is not powered on or installed.

4 Components

This section describes the software and hardware that are supported by the G560 and GP608.

For details about the software and hardware models supported by G560 and GP608, see the Compatibility Checker.

CPU

The G560 supports two CPUs.

- The G560 supports Intel® Xeon® E5-2600 v4 (Broadwell-EP) series CPUs, each with a maximum of 22 cores. For details about the specific models, see the Compatibility Checker.
- Each CPU integrates four memory controllers for supporting four DDR4 memory channels. Each channel supports three DDR4 DIMMs of 1600, 1866, 2133, or 2400 MT/s.
- Each CPU integrates PCIe controllers for supporting PCIe 3.0 and providing 40 lanes.
- The two CPUs are interconnected through two QPI links at 9.6 GT/s.
- The maximum frequency is 3.5 GHz.

Memory

The G560 provides 24 slots for installing DIMMs (12 DIMMs for each CPU). At least one DIMM must be configured.

Memory Configuration Rules

Observe the following rules when configuring DIMMs:

1. The G560 supports DIMMs of 8 GB, 16 GB, 32 GB, and 64 GB. A server fully configured with DIMMs has up to 1536 GB of memory.
2. The maximum number of DIMMs supported by a compute node varies depending on the CPU type, DIMM type, and number of ranks. For details, see **Maximum number of DIMMs** in Table 4-1.

NOTE

Restriction of the number of ranks supported by each channel on the maximum number of DIMMs 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

3. DIMMs in the same compute node must be of the same type (RDIMM or LRDIMM) and the same specifications (capacity, bit width, rank, and height), and have the same BOM number. For details about the DIMM BOM numbers, see the Compatibility Checker.
4. All DIMMs operate at the same speed, which is the smaller value of:
   - Memory speed supported by a CPU
   - The smallest value among the maximum operating speeds of specific DIMMs. See the **Maximum Operating Speed** in Table 4-1.

Table 4-1 DIMM configuration rules for Broadwell-EP CPUs

Item		Specifications	
Rank		Dual-rank	Quad-rank
Rated speed (MT/s)		2400	2400
Rated voltage (V)		1.2	1.2
Operating voltage (V)		1.2	1.2
Maximum number of DIMMs		24	24
Maximum capacity per DIMM (GB)		32	64
Maximum memory capacity (GB)		768	1536
Maximum memory capacity at maximum operating speed (GB)		512	1024
Maximum operating speed (MT/s)	One DIMM per channel	2400	2400
	Two DIMMs per channel	2400	2400
	Three DIMMs per channel	1600	1866
This table is for reference only. For details about the components that can be purchased, see the Compatibility Checker.			

DIMM Slot Configuration Rules

Table 4-2 shows the DIMM installation rules. See Figure 2-9 for DIMM slot numbers.

Table 4-2 DIMM installation sequence

CPU	DIMM Installation Sequence
CPU 1 and CPU 2	1A1, 2A1, 1B1, 2B1, 1C1, 2C1, 1D1, 2D1, 1A2, 2A2, 1B2, 2B2, 1C2, 2C2, 1D2, 2D2, 1A3, 2A3, 1B3, 2B3, 1C3, 2C3, 1D3, 2D3

The G560 provides 24 DDR4 DIMM slots. Each CPU integrates four memory channels. The four memory channels for CPU 1 are 1A, 1B, 1C, and 1D, and those for CPU 2 are 2A, 2B, 2C, and 2D. Table 4-3 lists channels for each CPU.

Slots 1A1, 1B1, 1C1, 1D1, 2A1, 2B1, 2C1, and 2D1 are the primary slots of channels 1A, 1B, 1C, 1D, 2A, 2B, 2C, and 2D, respectively. When installing DIMMs, install primary DIMMs first.

Table 4-3 Channels

CPU	Channel	DIMM
CPU 1	1A	DIMM000(1A1)
		DIMM001(1A2)
		DIMM002(1A3)
	1B	DIMM010(1B1)
		DIMM011(1B2)
		DIMM012(1B3)
	1C	DIMM020(1C1)
		DIMM021(1C2)
		DIMM022(1C3)
	1D	DIMM030(1D1)
		DIMM031(1D2)
		DIMM032(1D3)
CPU 2	2A	DIMM100(2A1)
		DIMM101(2A2)
		DIMM102(2A3)
	2B	DIMM110(2B1)
		DIMM111(2B2)
		DIMM112(2B3)
	2C	DIMM120(2C1)
		DIMM121(2C2)
		DIMM122(2C3)
	2D	DIMM130(2D1)
		DIMM131(2D2)
		DIMM132(2D3)

GPGPU Card

Table 4-4 shows the GPGPU cards supported by the GP608. The GP608 does not support mixed use of GPGPU cards of different models.

Table 4-4 Card models

Model	Vendor	Specifications	Auxiliary Power Connector Type	Installation Position
P40	NVIDIA	PCIe 3.0 x16/24 GB/250 W	CPU 8-pin	PCIe slots 1 to 8
P100-12G	NVIDIA	PCIe 3.0 x16/12 GB/250 W	CPU 8-pin	PCIe slots 1 to 8
P100-16G	NVIDIA	PCIe 3.0 x16/16 GB/250 W	CPU 8-pin	PCIe slots 1 to 8
V100-16G	NVIDIA	PCIe 3.0 x16/16 GB/250 W	CPU 8-pin	PCIe slots 1 to 8
A800	NVIDIA	PCIe 4.0[a] x16/80GB/300W	CPU 8-pin	PCIe Slot 1-8
A30	NVIDIA	PCIe 4.0[a] x16/24GB/165W	CPU 8-pin	PCIe Slot 1-8
a:The GPU card works in the PCIe 3.0 state.				

NOTE

The PCIe card models (including GPGPU card models) supported by the GP608 is subject to change. See the Compatibility Checker to obtain the latest list of supported models.

Drive

The G560 supports a maximum of six 2.5-inch NVMe SSDs and two 2.5-inch SAS or SATA drives. These drives can be independently installed and removed, and support hot swap (orderly hot swap for NVMe SSDs).

The G560 supports LSI SAS3008 and LSI SAS3108 RAID controller cards. The RAID controller card provides two SAS or SATA ports for connecting to two 2.5-inch SAS or SATA drives. RAID 0 and RAID 1 are supported.

The LSI SAS3108 supports RAID 0, 1, 5, 6, 10, 50, and 60 using a maximum of eight 3.5-inch SAS or SATA drives in the GP608.

Table 4-5 lists the performance of different RAID levels, the minimum number of drives required, and drive usage.

Table 4-5 RAID level comparison

RAID Level	Reliability	Read Performance	Write Performance	Minimum Number of Drives	Drive Usage

RAID Level	Reliability	Read Performance	Write Performance	Minimum Number of Drives	Drive Usage
RAID 0	Low	High	High	2	100%
RAID 1	High	Low	Low	2	50%
RAID 5	Relatively high	High	Medium	3	(N – 1)/N
RAID 6	Relatively high	High	Medium	4	(N – 2)/N
RAID 10	High	Medium	Medium	4	50%
RAID 50	High	High	Relatively high	6	(N – M)/N
RAID 60	High	High	Relatively high	8	(N – M x 2)/N
Note: N indicates the number of member drives in a RAID group, and M indicates the number of spans in a RAID group.					

I/O Expansion

The G560 supports two mezzanine cards, which are connected to the GP608 through the chassis backplane to support hardware capability expansion.

The I/O modules support a maximum of four half-height half-length single-slot PCIe 3.0 x16 cards.

Power Supply

The G560 and GP608 are powered by PSUs in the chassis and do not require independent power supply.

OS and Software

See the Compatibility Checker to check OSs and virtualization software supported by the G560.

5 Management

The compute node integrates the new-generation iBMC intelligent management system to provide highly reliable hardware monitoring and management functions. It seamlessly communicates with management module in a chassis and manages the compute nodes in the chassis through the management module.

The iBMC supports the following features and protocols:

- KVM and text console redirection
- Remote virtual media
- IPMI V2.0
- Common information model (CIM)
- Login using a web browser

Table 5-1 describes the features of the iBMC.

Table 5-1 iBMC features

Feature	Description
Management interface	Integrates with any standard management system through the following interfaces: • IPMI V2.0 • CLI • HTTPS
Fault detection	Detects faults and accurately locates hardware faults.
System watchdog	Supports BIOS power on self-test (POST), OS watchdog, and automatic system reset for timeout. You can enable or disable these functions on the iBMC.
Boot device configuration	Supports out-of-band configuration for boot devices.
Alarm management	Supports alarm management and reports alarms in various ways, such as SMTP and syslog service, to ensure uninterrupted system operating.
Integrated KVM	Provides remote maintenance measures, such as KVM and KVM over IP, for troubleshooting, and supports a

Feature	Description
	maximum resolution of 1920 x 1200.
Integrated virtual media	Virtualizes local media devices or images to the media devices for remote compute nodes, 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. The iBMC WebUI supports the following browsers: • Internet Explorer 9/10/11 • Mozilla Firefox 26/34 • Google Chrome 21/43 • Safari 5.1
Fault reproduction	Reproduces faults to facilitate fault diagnosis.
Screen snapshots and screen videos	Allows you to view screenshots and videos without login, which facilitates routine preventive maintenance inspection (PMI)
DNS/LDAP	Supports the DNS and AD, significantly simplifying network and configuration management.
Dual-image backup	Starts software from a backup image if the software fails.
Asset management	Supports intelligent asset management.
Intelligent power management	Uses the power capping technology to increase deployment density, and uses dynamic energy saving to lower operating expenses.

6 Maintenance and Warranty

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

For details about the warranty policy, visit Warranty.

7 Certifications and Protocols

7.1 Certifications

Region	Country	Certification Name	Certification Mark
China	China	CCC	
		RoHS	
Europe	EU Czech	RoHS+REACH+WEEE (included in CE)	
		CE-SDOC	
	Denmark Finland Sweden Norway	NEMKO DEMKO FIMKO SEMKO	
	Germany	GS	
	Hungary	MEEI	
		S-mark	N/A
North America	United States Canada	NRTL-UL/MET	

Region	Country	Certification Name	Certification Mark
	United States	FCC-SDOC	Warning
	Canada	IC	Warning
Asia Pacific	Australia New Zealand	C-Tick or RCM	
	Japan	VCCI	Warning
	South Korea	KCC	
South America	Argentina	IRAM-S Mark	
	Mexico	NOM	
		NRTL-COC	
Middle East and Africa	Turkey	CE-SDOC	
	Saudi Arabia	SASO	N/A
	Nigeria	SONCAP+Liences	N/A
	Kenya	PVOC	N/A
	Member countries of Multi-country certification	Multi-country certification	N/A
Global	IECEE member countries	CB	N/A

7.2 Protocols

Category	Standard/Protocol	Specifications
Standards	IEEE 802.1P	QoS
	IEEE 802.1Q	VLAN
	IEEE 802.1D	Bridge/Spanning Tree
	IEEE 802.3	Ethernet

Category	Standard/Protocol	Specifications
	IEEE 802.3u	FE
	IEEE 802.3x	Flow control
	IEEE 802.3z	GE
	IEEE 1149.1-2001	IEEE Standard Test Access Port and Boundary-Scan Architecture
	IEC 812	Procedure for Failure Mode and Effects Analysis (FMEA)
	IEC 863	Presentation of Reliability, Maintainability, and Availability Predictions
	IEC60297	Chassis compliance
	IEC60950	Safety
	IEC60825-1/2/6	Safety
	IEC60215	Safety
	IEC61000	EMC standard
	UL60950	Safety (North America)
	EN60950	Safety (Europe)
	ECMA TR/70	Environment protection
	GR-929	Reliability
	Telcordia SR-332	Reliability
	ETS	European telecommunications standards
Protocols	IP	Internet Protocol
	ARP	Address Resolution Protocol
	ICMP	Internet Control Message Protocol
	IGMP	Internet Group Management Protocol
	SNMP	Simple Network Management Protocol
	TELNET	Remote terminal protocol
	HTTP	Hypertext Transfer Protocol
	TFTP	Trivial File Transfer Protocol
	FTP	File Transfer Protocol
	IPMI	Intelligent Platform Management Interface