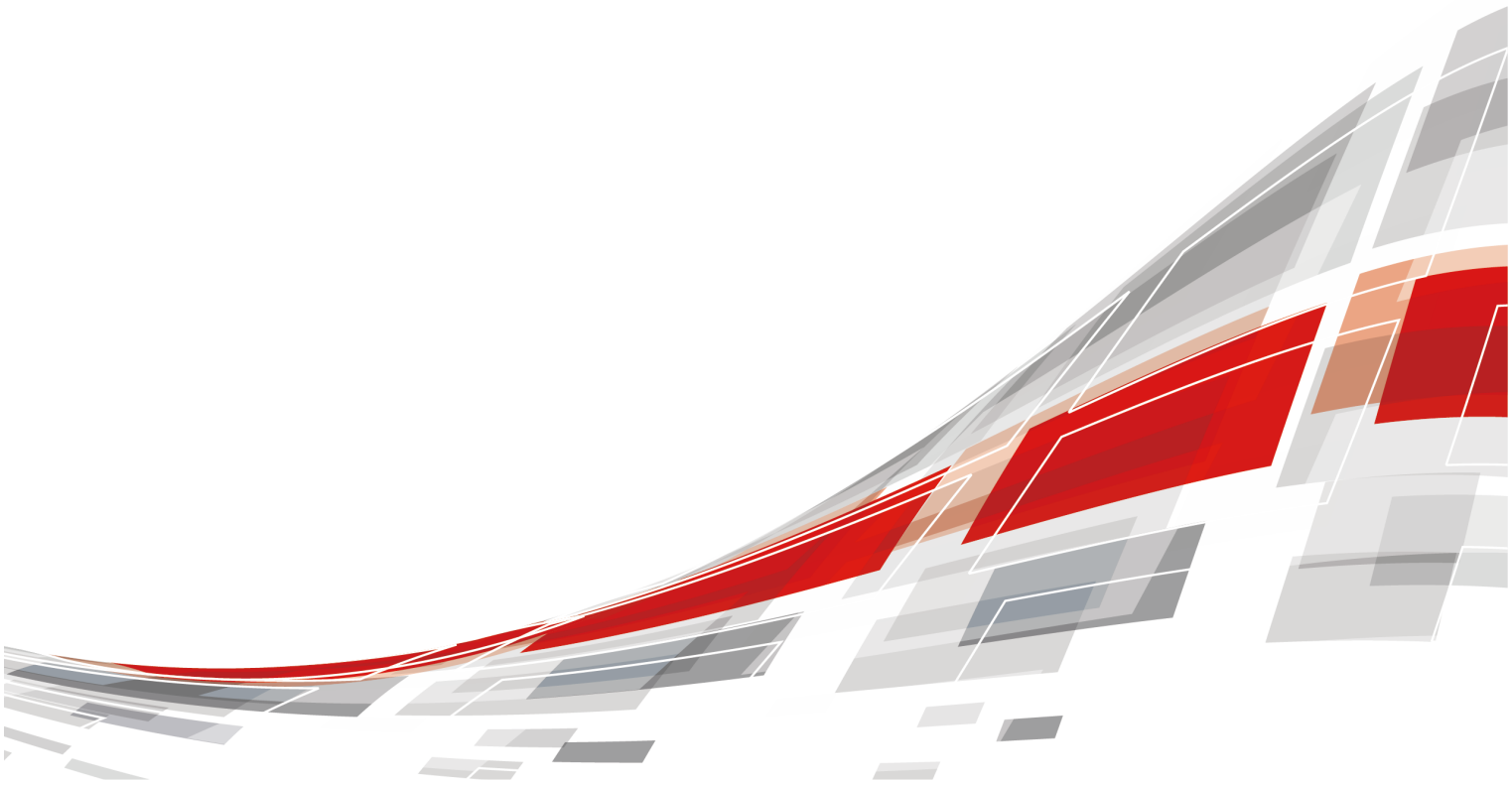
FusionServer G530 V5 Compute Node

White Paper

Issue 02

Date 2023-11-24



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About This Document

Purpose

This document describes the appearance, features, specification, and configuration of the general-purpose compute module G530 V5 and the heterogeneous compute modules GP316 and GP308 of the FusionServer G5500 server.

NOTE

In this document, the combination of a G530 V5 and a GP316 or GP308 is referred to as a compute node.

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.

Symbol	Description
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
02	2023-11-24	Added **7 Waste Product Recycling**
01	2021-10-22	This issue is the first official release.

Contents

1 About the G530 V5, GP316, and GP308

1.1 Overview

The G530 V5 is a half-width general-purpose compute module of the FusionServer G5500 server. It is powered by the new-generation Intel® Xeon® Scalable Skylake, and Cascade Lake processors. It delivers large memory capacity and powerful computing capabilities.

The GP316 and GP308 are heterogeneous compute modules used together with the G530 V5 to provide more powerful computing capabilities. The GP316 supports a maximum of 16 half-height half-length GPU cards. The GP308 supports eight full-height full-length single-slot or four full-height full-length dual-slot GPU cards and four 3.5-inch SAS/SATA drives.

A G530 V5 is used with a GP316 or GP308 to constitute a compute node in a FusionServer G5500 server. A G5500 chassis can house two compute nodes, which are managed by the management module.

1.2 Appearance

Appearances of the G530 V2 and GP316

Figure 1-1, **Figure 1-2**, and **Figure 1-3** show the appearances of the G530 V5, GP316, and GP308.

Figure 1-1 G530 V5 appearance

Figure 1-2 Appearance of the GP316

Figure 1-3 GP308 appearance

Installation Position

The G530 V5 is installed in the lower two slots in the front of the chassis, corresponding to G530 V5-1 and G530 V5-2. The GP316 or GP308 used with the G530 V5 is installed in the upper slot, the indicators correspond to GP316/GP308-1 and GP316/GP308-2, as shown in **Figure 1-4** and **Figure 1-5**.

Figure 1-4 Installation positions of the G530 V5 and GP316 modules

Figure 1-5 Installation positions of the G530 V5 and GP308 modules

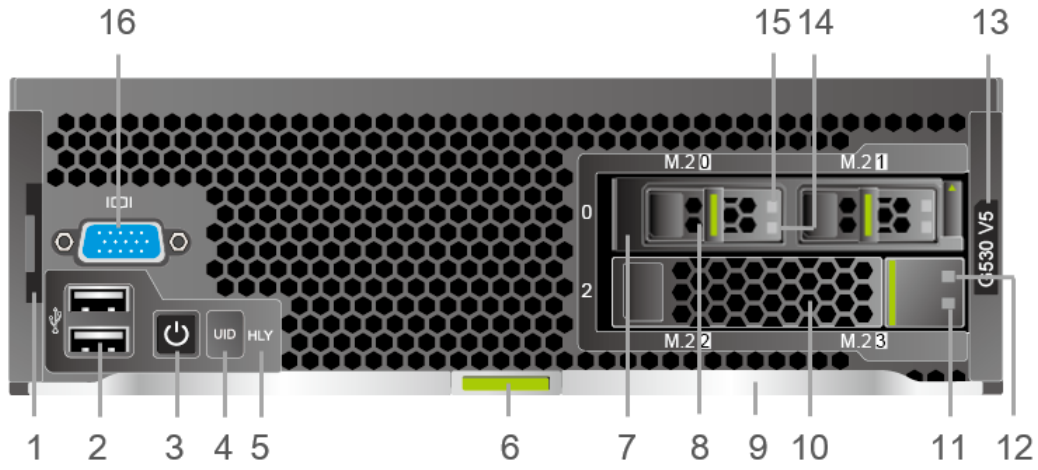
NOTE

- The G530 V5 and the GP316 or GP308 in the upper part of the chassis form a compute node. Each chassis can house a maximum of two compute nodes, which are independent of each other. If only one compute node is configured, install it in the left slot (G530 V5-1 or GP316/GP308-1) of the chassis.
- In each compute node, the G530 V5 and GP316/GP308 must be installed and removed in the following sequence: Install the GP316/GP308 and then the G530 V5. Remove the G530 V5 and then the GP316/GP308.
- Maintaining one compute node does not affect the proper operation of the other compute node.

Front Panel

Figure 1-6 shows the front panel of the G530 V5.

Figure 1-6 Front panel of the G530 V5

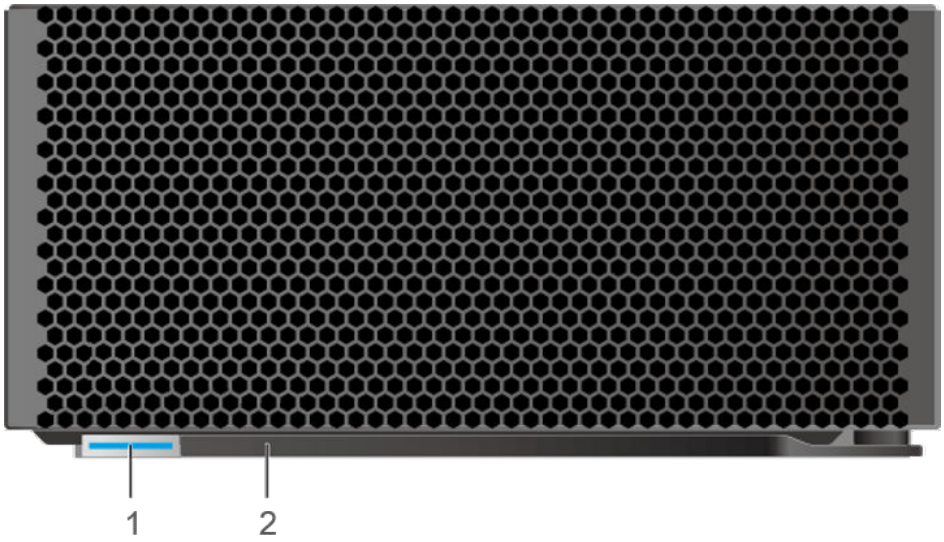


1	Customized label plate (including SN)	2	USB 3.0 ports
3	Power button/indicator	4	UID button/indicator

5	Health status indicator	6	Ejector release button
7	M.2 module adapter	8	M.2 module
9	Ejector lever	10	2.5-inch hard disk
11	Hard disk activity indicator	12	Hard disk fault indicator
13	Product model	14	M.2 module activity indicator
15	M.2 module fault indicator	16	VGA port

Figure 1-7 shows the front panel of the GP316.

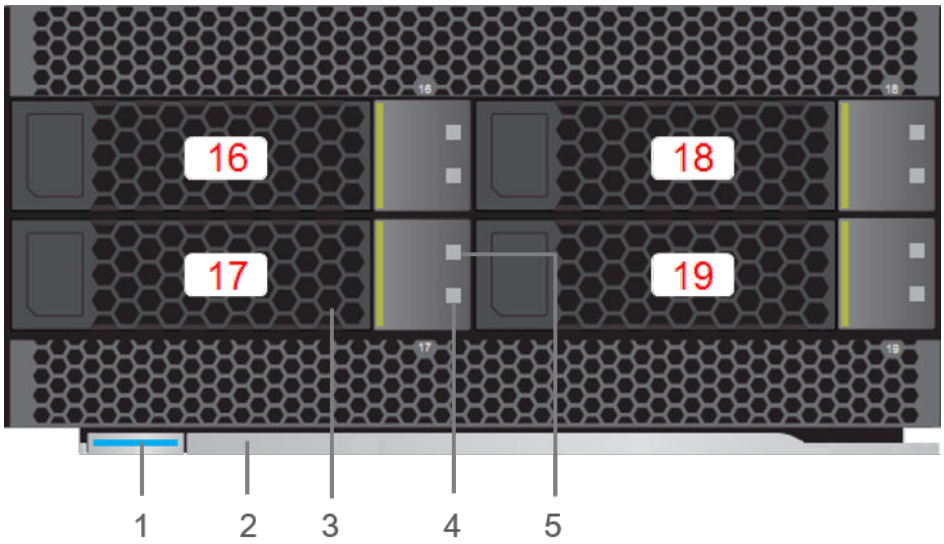
Figure 1-7 Front panel of the GP316



1	Ejector release button	2	Ejector lever

Figure 1-8 shows the front panel of the GP308.

Figure 1-8 GP308 panel



1	Ejector release button	2	Ejector lever
3	3.5" SAS/SATA drives	4	Drive active indicator
5	Drive fault indicator	-	-

NOTE

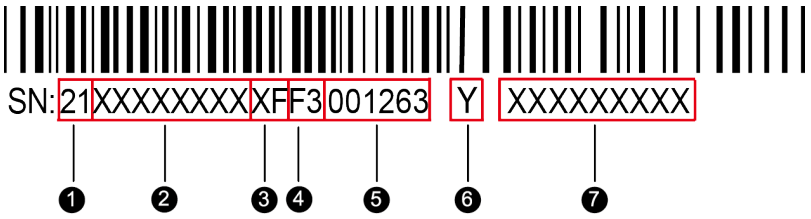
The ejector lever and ejector release button on the GP316/GP308 are visible after the G530 V5 is removed.

ESN

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

Figure 1-9 shows the SN format.

Figure 1-9 Example SN



No.	Description
1	Indicates the ESN ID (two digits). The value is fixed to **21**.

No.	Description
2	Indicates the item identification code (eight characters).
3	Vendor code (two characters), the code of the processing place.
4	Indicates the year and month (two characters). ● The first character indicates the year. The digits 1 to 9 indicate 2001 to 2009, the letters A to H indicate 2010 to 2017, the letters J to N indicate 2018 to 2022, and the letters P to Y indicate 2023 to 2032, respectively. **NOTE** The year from 2010 in the ESN is represented by uppercase letters. However, the letters **I**, **O**, and **Z** are not used because they are easily confused with 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, respectively.
5	Indicates the sequence number (six digits).
6	Indicates RoHS compliance (one character). **Y** indicates compliance.
7	Indicates the internal model of the board.

1.3 Ports

Table 1-1 G530 V5 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.

1.4 Indicators and Buttons

This section describes the indicators on the G530 V5 and GP308.

Table 1-2 G530 V5 indicators

Silk Screen	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 off the compute node. ● 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.

Silk Screen	Indicator/Button	Color	State Description
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 securely installed.
	Hard disk or M.2 module activity indicator	Green	• Off: The hard disk is faulty or not detected. • Blinking green: Data is being read from or written to the hard disk, or synchronized between hard disks. • Steady green: The hard disk is not being accessed.
	Hard disk or M.2 module fault indicator	Yellow	• Off: The hard disk is operating properly. • Blinking yellow: The hard disk is being located, or RAID is being rebuilt. • Steady yellow: The hard disk is faulty or not detected.
	NVMe SSD activity indicator	Green	• Off: The hard disk is faulty or not detected. • Blinking green: Data is being read from or written to the hard disk, or synchronized between hard disks. • Steady green: The hard disk is not being accessed.
	NVMe SSD fault indicator	Yellow	• Off: The hard disk 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 SSD is being located or hot-swapped. • Steady yellow: The SSD is faulty or not detected.

Table 1-3 Indicators on the GP308

Silkscreen	Indicator/Button	Color	Description
	Drive active indicator	Green	• Off: The hard disk is faulty or not detected. • Blinking green: Data is being read from or written to the hard disk, or synchronized between hard disks. • Steady green: The drive is inactive.
	Drive fault indicator	Yellow	• Off: The hard disk is operating properly. • Blinking yellow: The hard disk is being located, or RAID is being rebuilt. • Steady yellow: The drive is faulty or not detected.

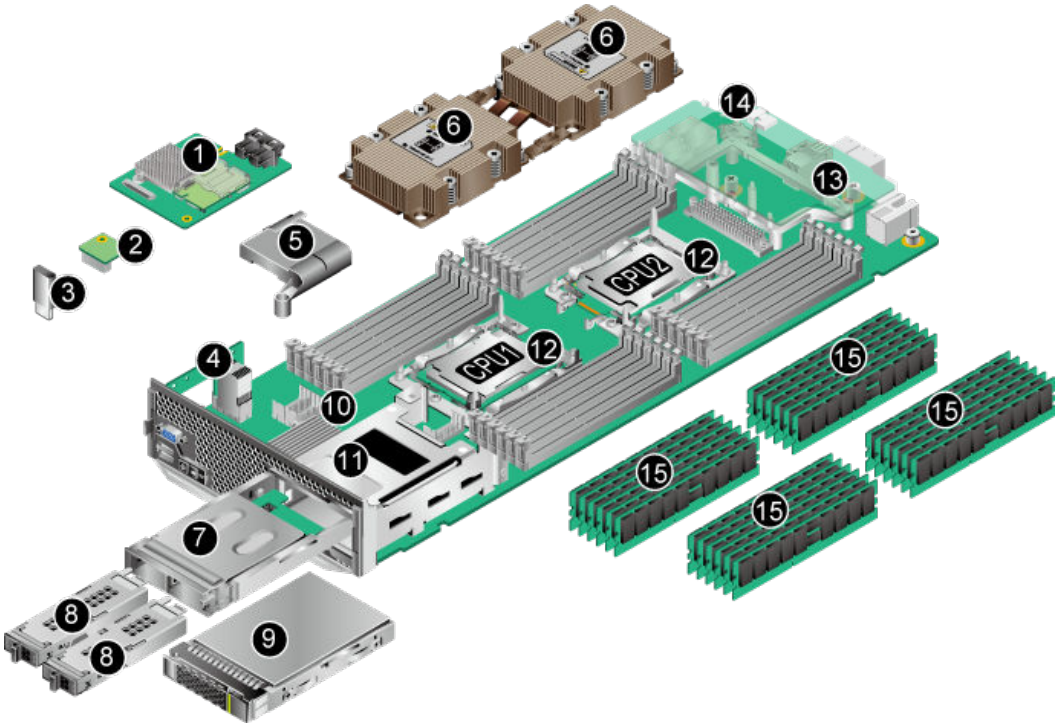
1.5 Physical Structure

This section describes:

- Components, PCIe devices, mainboard layout, and connectors of the G530 V5
- Components, PCIe devices, PCIe board layout, and connectors on the PCIe board of the GP316/G308

Components

Figure 1-10 G530 V5 components



1	RAID controller card	2	TPM (optional)
3	USB flash drive (optional)	4	VGA adapter
5	Supercapacitor (optional)	6	Heat sink
7	M.2 adapter (optional)	8	M.2 FRUs (optional)
9	Hard disk	10	Mainboard
11	Hard disk tray	12	CPUs
13	Mezzanine card	14	BIOS battery
15	DIMMs	-	-

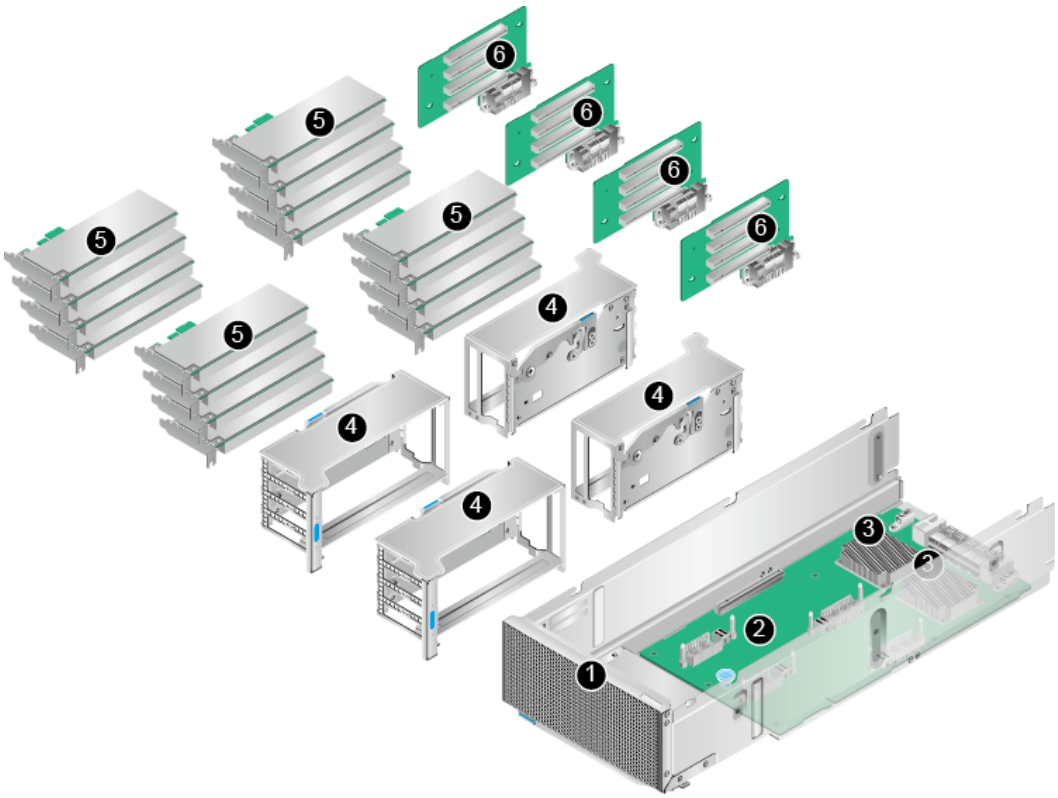
Table 1-4 G530 V5 components

No.	Item	Description
1	RAID controller card	The RAID controller card expands the storage capacity of the compute node through drives and ensures data security. LSI SAS3008 and LSI SAS3108 RAID controller cards are supported. The RAID controller cards of the two chip models provide two SAS/SATA ports to connect to 2.5" drives or four SATA ports to connect to M.2 FRUs. RAID 0 and RAID 1 are supported. The LSI SAS3108 supports RAID 0, 1, 5, 6, and 10, using a maximum of 4 x 3.5" SAS/SATA drives in the GP308. The LSI SAS3108 RAID controller card can be configured with a supercapacitor to prevent cache data loss and provide power failure protection when the compute node is unexpectedly powered off.
2	TPM (optional)	Supports Trusted Platform Module (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.
3	USB flash drive (optional)	The USB port on the mainboard connects to a USB 3.0 device. Dimensions (H x L x W): 33.9 mm (1.33 in.) x 14.5 mm (0.57 in.) x 7.12 mm (0.28 in.).
4	VGA adapter	The integrated video adapter on the mainboard uses this VGA adapter to provide a DB15 VGA port for the local maintenance of the compute node.
5	Supercapacitor (optional)	Provides power-off protection for the LSI SAS3108 RAID controller card.
6	Heat sink	Cools processors. The two processors of the G530 V5 use conjoined heat sinks. Currently, two types of heat sinks are available: ● A type of server that meets the heat dissipation requirements of CPUs with a maximum power consumption of 165 W and supports a maximum of 24 DIMMs. ● A wide conjoined heat sink and a memory air duct are required to support a maximum of 205 W CPU power. A board supports a maximum of 20 DIMMs. The heat sink with low fin density corresponds to CPU 1 and the heat sink with high fin density corresponds to CPU 2.

No.	Item	Description
7	M.2 adapter (optional)	The M.2 adapter can be installed in a 2.5-inch hard disk slot to provide two SATA 3.0 ports for installing two M.2 field replaceable units (FRUs). The M.2 adapter is a reserved function module and is not provided currently.
8	M.2 FRU (optional)	An M.2 SATA 3.0 SSD is a high-performance, compact, and high-stability storage component. The M.2 2280 form factor is supported. Each 2.5-inch hard disk slot can be configured with two M.2 FRUs, which require one M.2 adapter. A hard disk slot does not support mixed configuration of a hard disk and an M.2 module. The M.2 FRU is a reserved function module and is not provided currently.
9	Hard disk	A maximum of two 2.5-inch HDDs or SSDs (including SAS SSD/SATA SSD/NVMe SSD) can be configured. The hard disks are hot-swappable and can be independently installed and removed. **NOTE** In **Legacy** mode, the BIOS does not support 4Kn hard disks (which have 4K bytes sectors in both the physical layer and logical layer).
10	Mainboard	The mainboard holds the CPUs, DIMMs, hard disk interface modules, power control module, iBMC, logic module, chipset, and video adapter. The Intel® C620 chipset is used. The display adapter is integrated on the BMC management chip of the iBMC and provides 32 MB display memory. The maximum resolution is 1920 x1200 at 60 Hz with 16 M colors.
11	Hard disk tray	The hard disk tray holds hard disks.

No.	Item	Description
12	CPU	Supports two CPUs. ● Intel® Xeon® Scalable Skylake and Cascade Lake processors are supported. For details about the supported models, see the **Compatibility Checker**. ● Each processor integrates four memory controllers for supporting six DDR4 memory channels. Each channel supports two DDR4 DIMMs of 2400, 2666, or 2933 MHz. ● Each processor integrates PCIe controllers for supporting PCIe 3.0 and providing 48 lanes. ● Links between processors: two UPI links, each of which provides 10.4 GT/s transmission speed. ● Maximum frequency: 3.8 GHz **NOTE** The G530 V5 does not support single-processor configuration, and the two processors must be of the same model.
13	Mezzanine card	The G530 V5 supports one mezzanine card. The mezzanine card provides two PCIe 3.0 x16 channels and is connected to the mainboard through four connectors and to the GP316/GP308 through the chassis backplane. For details, see **1.6 Logical Structure**.
14	BIOS battery	When the G530 V5 is not powered on, the BIOS battery supplies power to the real time clock (RTC).
15	DIMM	The mainboard provides 24 slots for installing DDR4 DIMMs (12 DIMMs for each processor). ● Maximum memory speed: 2666 MT/s ● Memory protection technology for reliability, availability, serviceability (RAS): error checking and correcting (ECC), memory mirroring, and memory sparing ● Registered DIMMs (RDIMMs) and load-reduced DIMMs (LRDIMMs) are supported.

Figure 1-11 GP316 components



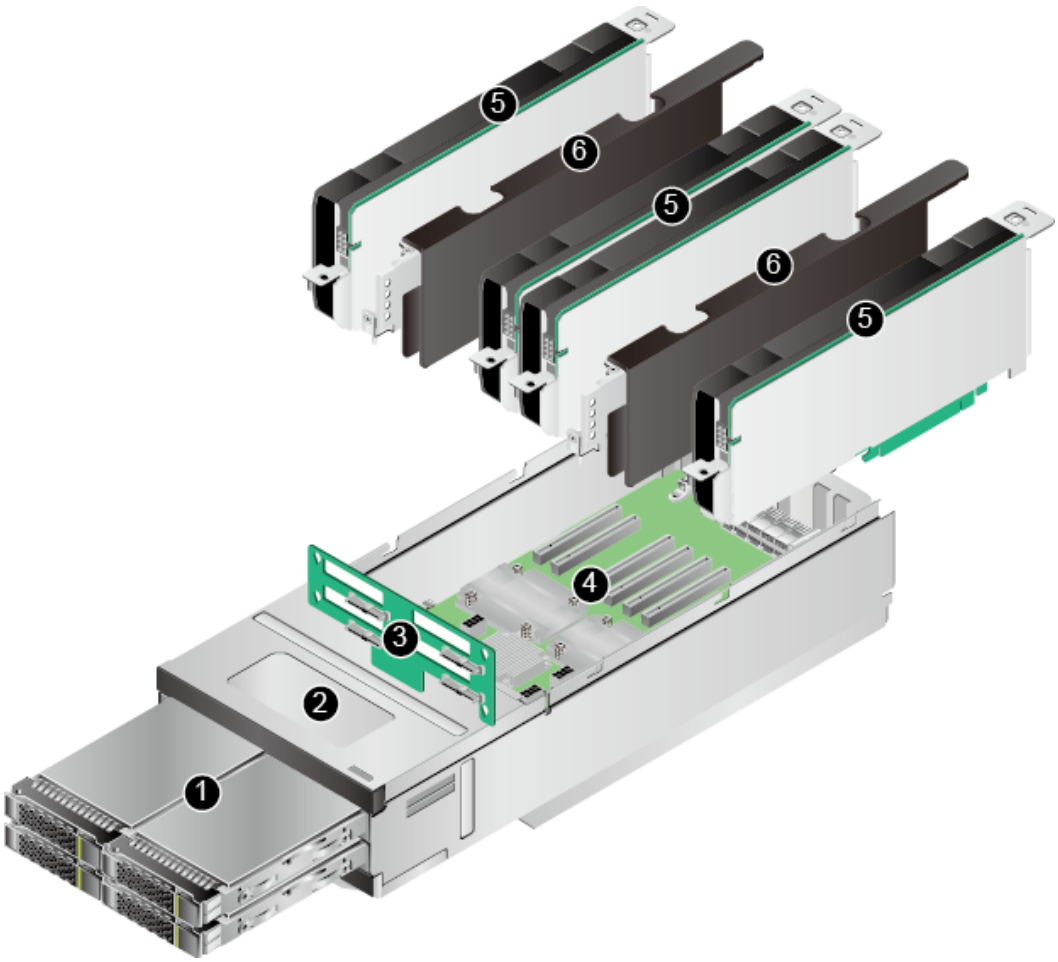
1	GP316 case	2	PCIe board
3	PCIe switches	4	Riser modules
5	HHHL single-slot PCIe card	6	Riser cards

Table 1-5 GP316 component description

No.	Item	Description
1	GP316 case	Holds GP316 components.
2	PCIe board	Integrated with two PCIe Switches and provides four riser cards and one full-height full-length (FHFL) PCIe card to connect to the G530 V5 and I/O modules through the backplane of the chassis.
3	PCIe switch	Provide 16 PCIe 3.0 x8 slots to the four riser cards through two PCIe Switches.
4	Riser modules	Each riser card tray houses one riser card and a maximum of four half-height half-length single-slot PCIe cards. The GP316 has four riser card trays.

No.	Item	Description
5	Half-height half-length single-slot card	Installed in a riser card tray. Each riser card tray supports up to four half-height half-length single-slot PCIe cards. **NOTE** Install filler modules in vacant PCIe card slots.
6	Riser card	Provides four PCIe 3.0 x16 connectors for PCIe HHHL single-slot cards. Each connector provides x8 bandwidth.

Figure 1-12 GP308 components



1	SAS/SATA drive	2	GP308 case
3	Drive backplane	4	PCIe board
5	GPU card	6	Filler module

Table 1-6 GP308 components

No.	Item	Description
1	SAS/SATA drive	Supports 4 x 3.5" SAS/SATA drives. The hard disks are hot-swappable and can be independently installed and removed.
2	GP308 case	Holds GP308 components.
3	Drive backplane	Provides four ports to connect to the drives.
4	PCIe board	Supports up to eight PCIe slots. For details, see **Table 1-9**.
5	GPU cards	Supports eight or four FHFL GPU cards. **NOTE** Install filler modules in vacant PCIe card slots.
6	Filler module	Provides ventilation channels.

PCIe Slots

Table 1-7, **Table 1-8**, and **Table 1-9** describe the relationships between the PCIe slots and the CPUs of the G530 V5 and GP316/GP308, PCIe standards, and Bus/Device/Function Number (B/D/F) information.

Table 1-7 G530 V5 PCIe device description

PCIe Device	CPU	PCIe Standard	Connector Bandwidth	Bus Bandwidth	Port Number	Root Port B/D/F	Device B/D/F	Slot Size	Display on BMC
RAID controller card	CPU 1	PCIe 3.0	x8	x8	Port 1A	17/00/0	18/00/0	Non-standard device	\
Mezzanine card channel 1	CPU 1	PCIe 3.0	x16	x16	Port 2A	-	-	Non-standard device	\
Mezzanine card channel 2	CPU 2	PCIe 3.0	x16	x16	Port 2A	-	-	Non-standard device	\

PCIe Device	CPU	PCIe Standard	Connector Bandwidth	Bus Bandwidth	Port Number	Root Port B/D/F	Device B/D/F	Slot Size	Display on BMC
NVMe SSD 0	CPU 2	PCIe 3.0	x4	x4	Port 1C	85/02/0	86/00/0	2.5-inch disk	disk0
NVMe SSD 1	CPU 2	PCIe 3.0	x4	x4	Port 1D	85/03/0	87/00/0	2.5-inch disk	disk1

NOTE

The preceding B/D/F information is the default system configuration.

Table 1-8 GP316 PCIe device description

PCIe Device	Display on BMC	CPU	PCIe Standard	Connector Bandwidth	Bus Bandwidth	Port Number	Root Port B/D/F	Device B/D/F	Slot Size
Riser 1 slot 1	GPU1	CPU 2	PCIe 3.0	x16	x8	Port 2A	ae/00/0-b0/01/0	b5/00/0	Half-height half-length single-slot
Riser 1 slot 2	GPU2	CPU 2	PCIe 3.0	x16	x8	Port 2A	ae/00/0-b0/00/0	b1/00/0	Half-height half-length single-slot
Riser 1 slot 3	GPU3	CPU 2	PCIe 3.0	x16	x8	Port 2A	ae/00/0-b0/05/0	bd/00/0	Half-height half-length single-slot

PCIe Device	Display on BMC	CPU	PCIe Standard	Connector Bandwidth	Bus Bandwidth	Port Number	Root Port B/D/F	Device B/D/F	Slot Size
Riser 1 slot 4	GPU4	CPU 2	PCIe 3.0	x16	x8	Port 2A	ae/00/0-b0/04/0	b9/00/0	Half-height half-length single-slot
Riser 2 slot 1	GPU5	CPU 2	PCIe 3.0	x16	x8	Port 2A	ae/00/0-b0/14/0	cd/00/0	Half-height half-length single-slot
Riser 2 slot 2	GPU6	CPU 2	PCIe 3.0	x16	x8	Port 2A	ae/00/0-b0/15/0	d1/00/0	Half-height half-length single-slot
Riser 2 slot 3	GPU7	CPU 2	PCIe 3.0	x16	x8	Port 2A	ae/00/0-b0/0c/0	c5/00/0	Half-height half-length single-slot
Riser 2 slot 4	GPU8	CPU 2	PCIe 3.0	x16	x8	Port 2A	ae/00/0-b0/0d/0	c9/00/0	Half-height half-length single-slot
Riser 3 slot 1	GPU9	CPU 1	PCIe 3.0	x16	x8	Port 2A	3a/00/0-3c/01/0	41/00/0	Half-height half-length single-slot
Riser 3 slot 2	GPU10	CPU 1	PCIe 3.0	x16	x8	Port 2A	3a/00/0-3c/00/0	3d/00/0	Half-height half-length single-slot

PCIe Device	Display on BMC	CPU	PCIe Standard	Connector Bandwidth	Bus Bandwidth	Port Number	Root Port B/D/F	Device B/D/F	Slot Size
Riser 3 slot 3	GPU11	CPU 1	PCIe 3.0	x16	x8	Port 2A	3a/00/0-3c/05/0	49/00/0	Half-height half-length single-slot
Riser 3 slot 4	GPU12	CPU 1	PCIe 3.0	x16	x8	Port 2A	3a/00/0-3c/04/0	45/00/0	Half-height half-length single-slot
Riser 4 slot 1	GPU13	CPU 1	PCIe 3.0	x16	x8	Port 2A	3a/00/0-3c/14/0	59/00/0	Half-height half-length single-slot
Riser 4 slot 2	GPU14	CPU 1	PCIe 3.0	x16	x8	Port 2A	3a/00/0-3c/15/0	5d/00/0	Half-height half-length single-slot
Riser 4 slot 3	GPU15	CPU 1	PCIe 3.0	x16	x8	Port 2A	3a/00/0-3c/0c/0	51/00/0	Half-height half-length single-slot
Riser 4 slot 4	GPU16	CPU 1	PCIe 3.0	x16	x8	Port 2A	3a/00/0-3c/0d/0	55/00/0	Half-height half-length single-slot
Expansion slot	PCIecard19	CPU 1	PCIe 3.0	x16	x8	Port 2A	3a/00/0-3c/01/0	41/00/0	Full-height full-length single-slot

PCIe Device	Display on BMC	CPU	PCIe Standard	Connector Bandwidth	Bus Bandwidth	Port Number	Root Port B/D/F	Device B/D/F	Slot Size
I/O slots 1 and 3	PCIe card18	CPU 1	PCIe 3.0	x16	x16	Port 2A	3a/00/0-3c/08/0	4d/00/0 4d/00/1	Half-height half-length single-slot
I/O slots 2 and 4	PCIe card17	CPU 2	PCIe 3.0	x16	x16	Port 2A	ae/00/0-b0/08/0	c1/00/0 c1/00/1	Half-height half-length single-slot

NOTE

- The expansion slot and riser 3 slot 1 cannot be enabled at the same time. Only one of the two slots can be enabled by software programming. By default, the expansion slot is disabled.
- 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.

Table 1-9 GP308 PCIe device description

PCIe Slots	Display on BMC	CPU	PCIe Standard	Connector Bandwidth	Bus Bandwidth	Port Number	Root Port B/D/F	Device B/D/F	Slot Size
PCIe Slot 1	GPU1	CPU 1	PCIe 3.0	x16	x16	Port 2A	3a/00/0-3c/10/0	49/00/0	Full-height full-length single-slot
PCIe Slot 2	GPU2	CPU 1	PCIe 3.0	x16	x16	Port 2A	3a/00/0-3c/08/0	41/00/0	FHFL, single-slot/dual-slot compatible

PCIe Slots	Display on BMC	CPU	PCIe Standard	Connector Bandwidth	Bus Bandwidth	Port Number	Root Port B/D/F	Device B/D/F	Slot Size
PCIe Slot 3	GPU3	CPU 1	PCIe 3.0	x16	x16	Port 2A	3a/00/0-3c/14/0	4d/00/0	Full-height full-length single-slot
PCIe Slot 4	GPU4	CPU 1	PCIe 3.0	x16	x16	Port 2A	3a/00/0-3c/0c/0	45/00/0	FHFL, single-slot/ dual-slot compatible
PCIe Slot 5	GPU5	CPU 2	PCIe 3.0	x16	x16	Port 2A	ae/00/0-b0/10/0	bd/00/0	Full-height full-length single-slot
PCIe Slot 6	GPU6	CPU 2	PCIe 3.0	x16	x16	Port 2A	ae/00/0-b0/08/0	b5/00/0	FHFL, single-slot/ dual-slot compatible
PCIe Slot 7	GPU7	CPU 2	PCIe 3.0	x16	x16	Port 2A	ae/00/0-b0/14/0	c1/00/0	Full-height full-length single-slot
PCIe Slot 8	GPU8	CPU 2	PCIe 3.0	x16	x16	Port 2A	ae/00/0-b0/0c/0	b9/00/0	FHFL, single-slot/ dual-slot compatible

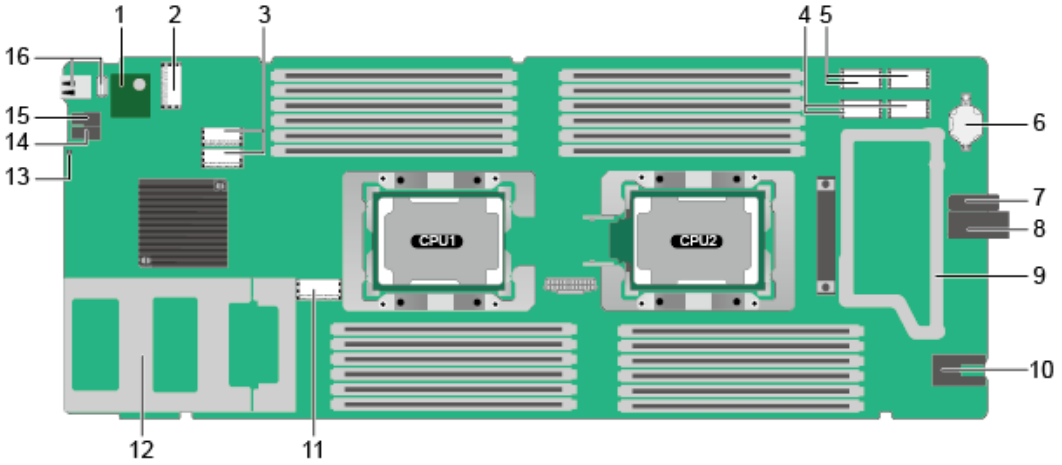
PCIe Slots	Display on BMC	CPU	PCIe Standard	Connector Bandwidth	Bus Bandwidth	Port Number	Root Port B/D/F	Device B/D/F	Slot Size
I/O slots 1 and 3	PCIe card9	CPU 1	PCIe 3.0	x16	x16	Port 2A	3a/00/0-3c/04/0	3d/00/0 3d/00/1	Half-height half-length single-slot
I/O slots 2 and 4	PCIe card10	CPU 2	PCIe 3.0	x16	x16	Port 2A	ae/00/0-b0/04/0	b1/00/0 b1/00/1	Half-height half-length single-slot

NOTE

- When dual-slot PCIe cards are installed in slots 2, 4, 6 and 8, the single-slot PCIe cards in slots 1, 3, 5 and 7 are occupied. As a result, the single-slot PCIe cards in slots 1, 3, 5 and 7 are unavailable.
- A customized panel is required for installing PCIe cards in the PCIe Slot 1 - 8.
- 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.

Mainboard Layout

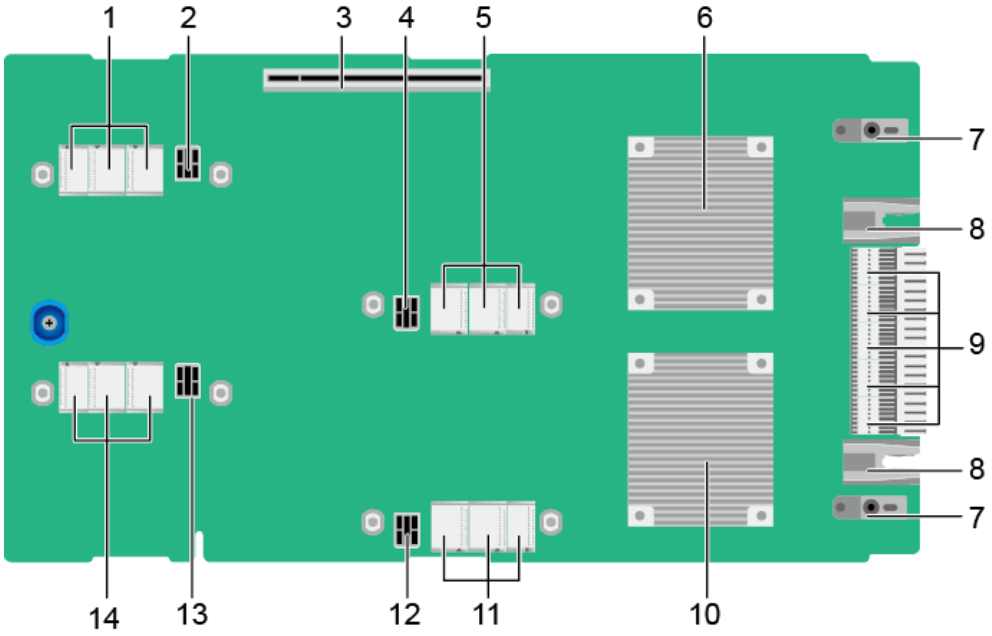
Figure 1-13 G530 V5 connectors and components



1	TPM connector	2	VGA adapter connector

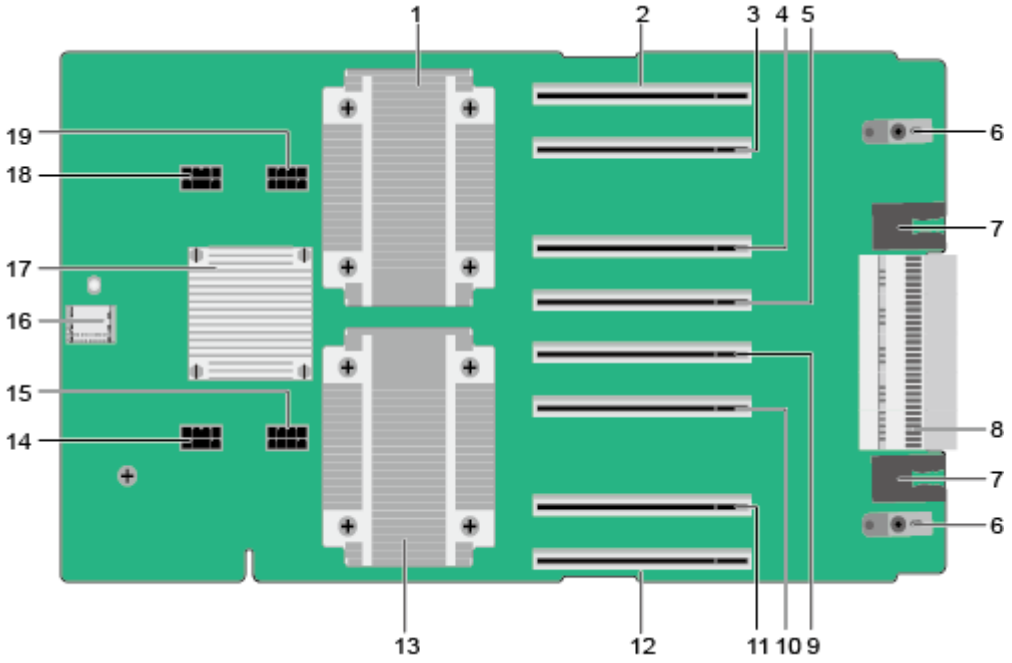
3	RAID controller card connectors	4	Channel 2 mezzanine card connectors
5	Channel 1 mezzanine card connectors	6	BIOS battery
7	Backplane guide sleeve	8	Backplane signal connector
9	Mezzanine card tray	10	Backplane power connector
11	Drive backplane connector	12	Hard disk tray
13	HLY indicator	14	UID button/indicator
15	Power button/indicator	16	USB 3.0 port

Figure 1-14 GP316 connectors and components



1	Signal connectors of riser 4	2	Power connector of riser 4
3	Expansion slot	4	Power connector of riser 3
5	Signal connectors of riser 3	6	PCIe switch 2
7	Backplane guide sleeves	8	Backplane power connectors
9	Backplane signal connectors	10	PCIe switch 1
11	Signal connectors of riser 1	12	Power connector of riser 1
13	Power connector of riser 2	14	Signal connectors of riser 2

Figure 1-15 Positions of the GP308 connectors and components



1	PCIe switch 1	2	PCIe Slot 1
3	PCIe Slot 2	4	PCIe Slot 3
5	PCIe Slot 4	6	Backplane guide sleeve
7	Backplane power connector	8	Backplane signal connector
9	PCIe Slot 5	10	PCIe Slot 6
11	PCIe Slot 7	12	PCIe Slot 8
13	PCIe switch 2	14	PCIe slot 5/6 auxiliary power connector
15	PCIe slot 7/8 auxiliary power connector	16	Drive backplane connector
17	SAS Expander	18	PCIe slot 3/4 auxiliary power connector
19	PCIe slot 1/2 auxiliary power connector	-	-

NOTE

The auxiliary power supplies of the PCIe cards in PCIe slots 1 to 8 must be connected to the auxiliary power sockets of PCIe slots 1/2, 3/4, 5/6, and 7/8 on the GP308 PCIe board. A dual-slot card uses a 1-to-1 power cable, and a single-slot card uses a 1-to-2 power cable.

1.6 Logical Structure

Figure 1-16 shows the logical structure of the G530 V5 and GP316. **Figure 1-17** shows the logical structure of the G530 V5 and GP308.

The PCIe x16 ports of the two CPUs in the G530 V5 connect to the two PCIe switches in the GP316 or GP308 through the mezzanine card. In GP316, each PCIe switch provides two riser card and one x16 I/O slot, and each riser card supports four x8 (x16 slot and x8 bus) half-height half-length single-slot PCIe cards. In GP308, each PCIe switch provides four x16 PCIe slots and one x16 I/O slot. The RAID controller card in the G530 V5 is connected to a mezzanine card and then to the SAS expander in the GP308 through SAS x4 cables. The RAID controller card is connected to the four 3.5-inch SAS or SATA drives in the GP308, and the two 2.5-inch SAS or SATA drives in the G530 V5.

The G530 V5 supports the following storage capability options:

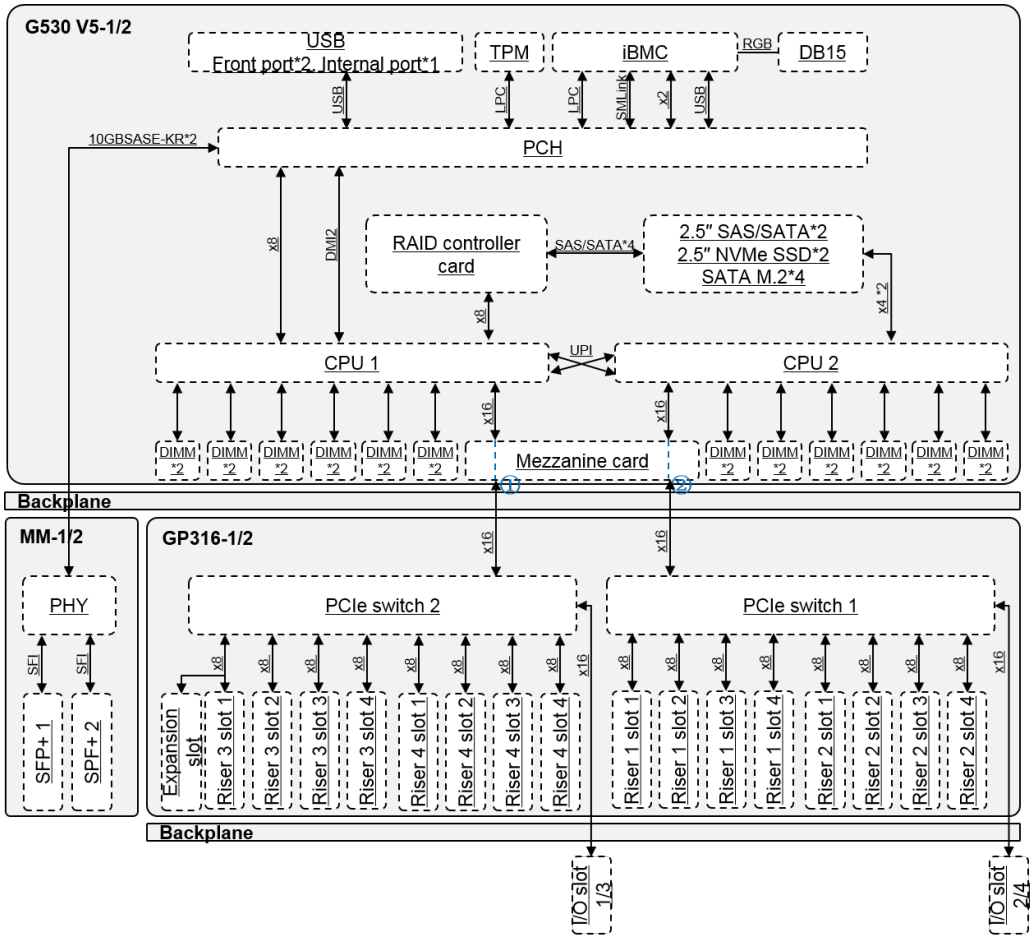
- The G530 V5 without a RAID controller card supports two 2.5-inch NVMe SSDs. The width of each SSD is PCIe 3.0 x4. Intel VROC is supported.
- The G530 V5 equipped with an LSI SAS3008 RAID controller card supports two 2.5-inch SAS/SATA HDDs and supports RAID 0 and 1.
- The G530 V5 equipped with an LSI SAS3108 RAID controller card supports two 2.5-inch SAS/SATA HDDs and four external 3.5-inch SAS or SATA drives, and supports RAID 0, 1, 5, 6, 10.

The G530 V5 supports the following external ports:

- Two USB 3.0 ports are provided on the panel and one USB 3.0 port is provided on the mainboard.
- Two SFP+ 1/10GE ports are provided by the Intel X722 NIC that is integrated into the PCH and connected to the management module through the chassis backplane.
- One DB15 VGA port is provided on the panel by the iBMC built-in video card. This port is used for the local maintenance of the compute node.

One x8 port of PCIe switch 2 is shared by the expansion slot and riser 3 slot 1 in the GP316. Only one of the two slots can be enabled by software programming. By default, the expansion slot is disabled.

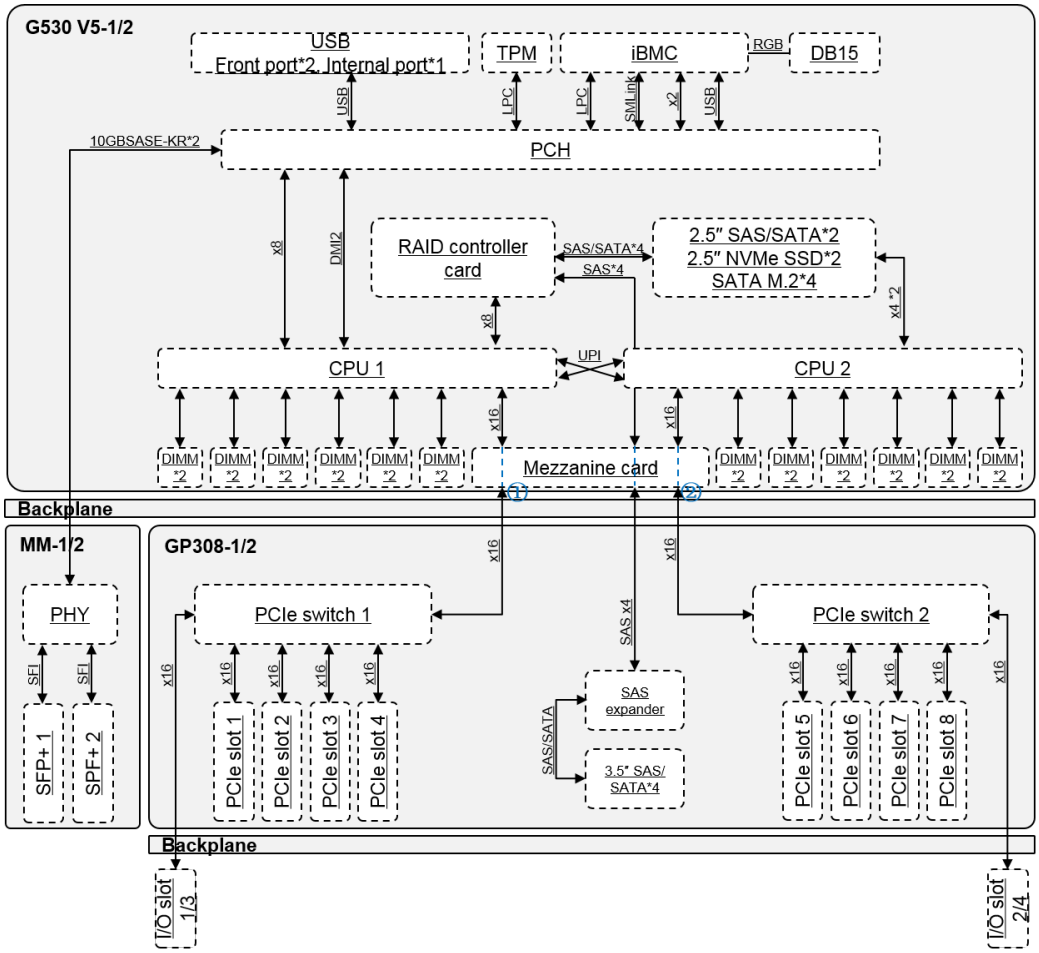
Figure 1-16 Logical structure of the G530 V5 and GP316



NOTE

G530 V5-1, GP316-1, MM-1, I/O slot 1, and I/O slot 2 are the configuration combination on the left of the chassis. G530 V5-2, GP316-2, MM-2, I/O slot 3, and I/O slot 4 are the configuration combination on the right of the chassis. The logical structures of the two configuration combinations are the same.

Figure 1-17 Logical structure of the G530 V5 and GP308



NOTE

G530 V5-1, GP308-1, MM-1, I/O slot 1, and I/O slot 2 are the configuration combination on the left of the chassis. G530 V5-2, GP308-2, MM-2, I/O slot 3, and I/O slot 4 are the configuration combination on the right of the chassis. The logical structures of the two configuration combinations are the same.

1.7 Technical Specifications

Table 1-10 Technical specifications

Category	Item	Specifications
Physical specifications	Dimensions (H x W x D)	• G530 V5: 60.46 mm × 210 mm × 537.2 mm (2.38 in. x 8.27 in. x 21.15 in.) • GP316: 122.85 mm × 217.2 mm × 540 mm (4.84 in. x 8.55 in. x 21.26 in.) • GP308: 122.85 mm × 217.2 mm × 540 mm (4.84 in. x 8.55 in. x 21.26 in.)

Category	Item	Specifications
	Color	● Front panel: black ● Casing: silver
	Weight	● G530 V5: – Net weight (with two hard disks): 6 kg (13.23 lb) – Packaging materials: 1.7 kg (3.75 lb) ● GP316 – Net weight (fully configured with 16 NVIDIA P4 cards): 12 kg (26.46 lb) – Packaging materials: 2.7 kg (5.95 lb) ● GP308: – Net weight (fully configured with four drives and four GPUs): 12.4 kg (27.33 lb) – Packaging materials: 2.7 kg (5.95 lb)
Environmental specifications	Temperature	● Operating temperature: 5°C to 35°C (41°F to 95°F) ● Storage temperature: -40°C to +65°C (-40°F to +149°F) ● Temperature 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) ● Humidity change rate: < 20% RH/h
	Altitude	● ≤ 3048 m (9999.88 ft). For altitudes above 900 m (2952.72 ft), the operating temperature decreases by 1°C (1.8°F) every 300 m (984.24 ft). ● 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). ● Silver corrosion rate test requirements: The corrosion product thickness growth rate is lower than 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.

Category	Item	Specifications
Input power specifications	Rated input voltage	12 V DC
Power consumption	-	The power consumption parameters vary with server configurations, including the configurations complying with EU's energy-related products (ErP) requirements. For details, see the **Power Calculator**.

2 Product Features

- The FusionServer G5500 chassis supports two compute nodes, providing higher integration.
- The G530 V5 supports two Intel® Xeon® Scalable processors (Bronze 3100, Silver 4100, Gold 5100/6100, or Platinum 8100), each with up to 165 W TDP and a maximum of 28 cores. The maximum frequency is 3.6 GHz. The two processors provide a large capacity of L3 cache and are interconnected through two UPI links at 10.4 GT/s. With the two processors, the G530 V5 delivers higher processing performance.
- The GP316 supports 16 NVIDIA P4 cards, increasing the computing capabilities for the G530 V5.
- The GP308 supports eight FHFL single-slot GPU cards or four FHFL dual-slot GPU cards.
- The G530 V5 provides multiple flexible drive configuration solutions.
  - Two 2.5-inch NVMe SSDs
  - Two 2.5-inch SAS/SATA drives, supporting RAID 0 or 1
  - Four 3.5-inch SAS/SATA drives in one GP308, supporting RAID 0, 1, 5, 6, and 10
- The PCIe slots and PCIe Switch in the GP316 module and the I/O modules in the FusionServer G5500 chassis are powered on synchronously with the G530 V5, minimizing power consumption when the G530 V5 is not powered on or installed.
- The PCIe slots, SAS expander, SAS/SATA drives, and PCIe Switch in the GP308 and I/O modules in the FusionServer G5500 chassis are powered on synchronously with the G530 V5, minimizing power consumption when the G530 V5 is not powered on or installed.
- The following requirements in NIST SP 800-147B are met:
  - The BIOS firmware digital signature update mechanism is supported. During the upgrade, the digital signature is verified to prevent unauthorized BIOS firmware upgrade.
  - The flash security protection mechanism is supported to prevent unauthorized modification of the flash memory in the OS.

3 Components

This section describes the software and hardware that are supported by the G530 V5 and GP316/GP308.

For details about the software and hardware models supported by the G530 V5 and GP316/GP308, see the **Compatibility Checker**.

CPU

The mainboard supports two processors.

- Uses the new-generation Intel® Xeon® Scalable (Skylake and Cascade Lake) processors to deliver large memory capacity and supreme computing power. The two processors of the G530 V5 use a conjoined heat sink, meeting cooling requirements for processors with up to 165 W of thermal design power (TDP). If the processor power is 200 W or 205 W, a wide conjoined heat sink and memory air duct are required to ensure heat dissipation of the compute modules. For details about the processor model, see the **Compatibility Checker**.
- Each processor integrates a memory controller for supporting six DDR4 memory channels. Each channel supports two DDR4 DIMMs at 2400, 2666, or 2933 MHz, DDR4 DIMMs (RDIMMs and LRDIMMs), and DCPMMs.
- Each processor integrates PCIe controllers for supporting PCIe 3.0 and providing 48 lanes.
- Links between processors: two UPI links, each of which provides 10.4 GT/s transmission speed.
- Maximum frequency: 3.8 GHz

Memory

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

Memory Configuration Rules

Observe the following rules when configuring DIMMs:

1. The G530 V5 supports DIMMs of 8 GB, 16 GB, 32 GB, and 64 GB per module. 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 3-1**.

   NOTE

   - The DIMM slots of CPU 1 must be configured with DIMMs. If DIMMs are configured only in the DIMM slots of CPU 2, the compute node cannot be powered on. **Figure 1-13** shows the positions of CPUs 1 and 2.
   - 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. A compute node cannot be configured with DIMMs (RDIMMs or LRDIMMs) of different types.
4. All DIMMs operate at the same speed, which is the smaller value of:
   – Memory speed supported by a CPU
   – The smallest values among the maximum operating speed of specific DIMMs. See the **Maximum Operating Speed** in **Table 3-1**.

Table 3-1 DIMM configuration rules

Item		Specifications	
Rank		Dual-rank	Quad-rank
Rated speed (MT/s)		2666	2666
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)		768	1536
Maximum operating speed (MT/s)	One DIMM per channel	2666	2666
	Two DIMMs per channel	2666	2666
This table is for reference only. For details about the components that can be purchased, see the **Compatibility Checker**.			

DIMM Slot Configuration Rules

The G530 V5 provides 24 DDR4 DIMM slots. Each CPU integrates six memory channels. The memory channels for CPU 1 are 1A, 1B, 1C, 1D, 1E,

and 1F, and those for CPU 2 are 2A, 2B, 2C, 2D, 2E, and 2F. **Table 3-2** lists channels for each CPU.

Slots 1A1, 1B1, 1C1, 1D1, 1E1, 1F1, 2A1, 2B1, 2C1, 2D1, 2E1, and 2F1 are the primary slots of channels 1A, 1B, 1C, 1D, 1E, 1F, 2A, 2B, 2C, 2D, 2E, and 2F, respectively. When installing DIMMs, install the primary DIMMs first.

Table 3-2 Channels

CPU	Channel	DIMM
CPU 1	1A	DIMM000(1A1)
		DIMM001(1A2)
	1B	DIMM010(1B1)
		DIMM011(1B2)
	1C	DIMM020(1C1)
		DIMM021(1C2)
	1D	DIMM030(1D1)
		DIMM031(1D2)
	1E	DIMM040(1E1)
		DIMM041(1E2)
	1F	DIMM050(1F1)
		DIMM051(1F2)
CPU 2	2A	DIMM100(2A1)
		DIMM101(2A2)
	2B	DIMM110(2B1)
		DIMM111(2B2)
	2C	DIMM120(2C1)
		DIMM121(2C2)
	2D	DIMM130(2D1)
		DIMM131(2D2)
	2E	DIMM140(2E1)
		DIMM141(2E2)
	2F	DIMM150(2F1)
		DIMM151(2F2)

Table 3-3 shows the DIMM installation rules. See Figure 1-13 for DIMM slot numbers.

Table 3-3 DIMM configuration rules

DIMM Quantity	Memory Configuration	DIMM Slots of CPU 1	DIMM Slots of CPU 2
1	Unbalanced	1A1	-
2	Balanced	1A1	2A1
3	Unbalanced	1A1, 1B1	2A1
4	Balanced	1A1, 1B1	2A1, 2B1
5	Unbalanced	1A1, 1B1, 1C1	2A1, 2B1
6	Balanced	1A1, 1B1, 1C1	2A1, 2B1, 2C1
7	Unbalanced	1A1, 1B1, 1D1, 1E1	2A1, 2B1, 2C1
8	Balanced	1A1, 1B1, 1D1, 1E1	2A1, 2B1, 2D1, 2E1
9	Unbalanced	1A1, 1B1, 1C1, 1D1, 1E1	2A1, 2B1, 2D1, 2E1
10	Unbalanced	1A1, 1B1, 1C1, 1D1, 1E1	2A1, 2B1, 2C1, 2D1, 2E1
11	Unbalanced	1A1, 1B1, 1C1, 1D1, 1E1, 1F1	2A1, 2B1, 2C1, 2D1, 2E1
12	Balanced	1A1, 1B1, 1C1, 1D1, 1E1, 1F1	2A1, 2B1, 2C1, 2D1, 2E1, 2F1
13	Unbalanced	1A1, 1A2, 1B1, 1C1, 1D1, 1E1, 1F1	2A1, 2B1, 2C1, 2D1, 2E1, 2F1
14	Unbalanced	1A1, 1A2, 1B1, 1C1, 1D1, 1E1, 1F1	2A1, 2A2, 2B1, 2C1, 2D1, 2E1, 2F1
15	Unbalanced	1A1, 1A2, 1B1, 1B2, 1D1, 1D2, 1E1, 1E2	2A1, 2A2, 2B1, 2C1, 2D1, 2E1, 2F1
16	Balanced	1A1, 1A2, 1B1, 1B2, 1D1, 1D2, 1E1, 1E2	2A1, 2A2, 2B1, 2B2, 2D1, 2D2, 2E1, 2E2

DIMM Quantity	Memory Configuration	DIMM Slots of CPU 1	DIMM Slots of CPU 2
17	Unbalanced	1A1, 1A2, 1B1, 1B2, 1C1, 1C2, 1D1, 1E1, 1F1	2A1, 2A2, 2B1, 2B2, 2D1, 2D2, 2E1, 2E2
18	Unbalanced	1A1, 1A2, 1B1, 1B2, 1C1, 1C2, 1D1, 1E1, 1F1	2A1, 2A2, 2B1, 2B2, 2C1, 2C2, 2D1, 2E1, 2F1
19	Unbalanced	1A1, 1A2, 1B1, 1B2, 1C1, 1D1, 1D2, 1E1, 1E2, 1F1	2A1, 2A2, 2B1, 2B2, 2C1, 2C2, 2D1, 2E1, 2F1
20	Unbalanced	1A1, 1A2, 1B1, 1B2, 1C1, 1D1, 1D2, 1E1, 1E2, 1F1	2A1, 2A2, 2B1, 2B2, 2C1, 2D1, 2D2, 2E1, 2E2, 2F1
21	Unbalanced	1A1, 1A2, 1B1, 1B2, 1C1, 1C2, 1D1, 1D2, 1E1, 1E2, 1F1	2A1, 2A2, 2B1, 2B2, 2C1, 2D1, 2D2, 2E1, 2E2, 2F1
22	Unbalanced	1A1, 1A2, 1B1, 1B2, 1C1, 1C2, 1D1, 1D2, 1E1, 1E2, 1F1	2A1, 2A2, 2B1, 2B2, 2C1, 2C2, 2D1, 2D2, 2E1, 2E2, 2F1
23	Unbalanced	1A1, 1A2, 1B1, 1B2, 1C1, 1C2, 1D1, 1D2, 1E1, 1E2, 1F1, 1F2	2A1, 2A2, 2B1, 2B2, 2C1, 2C2, 2D1, 2D2, 2E1, 2E2, 2F1
24	Balanced	1A1, 1A2, 1B1, 1B2, 1C1, 1C2, 1D1, 1D2, 1E1, 1E2, 1F1, 1F2	2A1, 2A2, 2B1, 2B2, 2C1, 2C2, 2D1, 2D2, 2E1, 2E2, 2F1, 2F2

NOTE

The unbalanced memory configurations are not recommended.

GPU Cards

The GP316 supports only HHHL GPU cards. A maximum of 16 such cards are supported.

The GP308 supports a maximum of four dual-slot FHFL GPU cards. It also supports a maximum of eight single-slot full-height or half-height GPU cards.

For details about the supported GPU card models, see the **Compatibility Checker**.

Hard Disk

The G530 V5 can be configured with up to two 2.5" HDDs or SSDs. Each hard disk can be independently installed and removed and is hot-swappable. The G530 V5 supports LSI SAS3008 and LSI SAS3108 RAID controller cards. The RAID controller cards of the two chip models provide two SAS or SATA ports to connect to 2 x 2.5" SAS or SATA drives. The RAID controller cards support RAID 0 and RAID 1.

The LSI SAS3108 supports RAID 0, 1, 5, 6, and 10, using a maximum of 4 x 3.5" SAS/SATA drives in the GP308.

NOTE

After the OS is installed on a hard disk, do not move the hard disk to another compute node; otherwise, a virtual flash drive or CD/DVD-ROM may fail to be mounted on the KVM screen.

Table 3-4 lists the performance of different RAID levels, the minimum number of disks required, and disk usage.

Table 3-4 RAID level comparison

RAID Level	Reliability	Read Performance	Write Performance	Minimum Number of Hard Disks	Hard Disk 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%
Note: N indicates the number of member drives in a RAID array.					

I/O Expansion

The G530 V5 supports the following I/O extension options:

- One mezzanine card that connects to the PCIe switch of the GP316/GP308 through the chassis backplane and one I/O module that supports a maximum of two HHHL single-slot PCIe 3.0 x16 cards
- The LOM of the G530 V5 is an Intel X722 built in the PCH. It provides two SFP+ Ethernet ports through the management module and is compatible with 1/10GE rates.

PSU

The power supply of the G530 V5 and GP316/GP308 is provided by the PSUs of the FusionServer G5500 chassis. No independent power supply is required.

Peripheral

The G530 V5 supports peripherals, such as a USB DVD-ROM drive.

OS and Software

For details about the OSs and virtualization software supported by the G530 V5, see the **Compatibility Checker**.

4 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 the management module in a chassis and manages the compute nodes in the chassis through the chassis 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 4-1 describes the features of the iBMC.

Table 4-1 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, ensuring 24/7 reliable device running.

Feature	Description
Integrated KVM	Provides remote maintenance measures, such as KVM and KVM over IP, for troubleshooting, The maximum resolution is 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.

5 Maintenance and Warranty

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

For details about the warranty policy, visit **Warranty**.

6 Certifications

Region	Country	Certification	Certification Mark
China	China	CCC	
		RoHS	
Europe	European Union	CE-DOC	
		ROHS	NA
		REACH	NA
		WEEE	
	Russia	EAC&GOST	
	UK	UKCA	NA
North America	North America	NRTL-ETL/MET	
Asia Pacific	Japan	VCCI	
Global	IECEE members	CB	NA

7 Waste Product Recycling

If product users need product recycling service provided by xFusion after products are scrapped, contact technical support for services.

