

Huawei E9000 Server V100R001

White Paper

Issue 19
Date 2018-12-04



Copyright © Huawei Technologies Co., Ltd. 2018. 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 Huawei Technologies Co., Ltd.

Trademarks and Permissions



HUAWEI and other Huawei trademarks are trademarks of Huawei Technologies Co., Ltd.

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

Notice

The purchased products, services and features are stipulated by the contract made between Huawei 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.

Huawei Technologies Co., Ltd.

Address: Huawei Industrial Base
Bantian, Longgang
Shenzhen 518129
People's Republic of China

Website: <http://e.huawei.com>

About This Document

Overview

This document describes E9000 server in terms of its system architecture, hardware architecture, features, typical applications, system ports and interfaces, reliability, technical specifications, standards compliance, and certifications. You can better understand the E9000 by reading this document.






Intended Audience

This document is intended for:

- Marketing engineers
- Technical support engineers
- Maintenance engineers

Symbol Conventions

The following table lists the symbols that may be found in this document.

Symbol	Description
	Indicates an imminently hazardous situation which, if not avoided, will result in serious injury or death.
	Indicates a potentially hazardous situation which, if not avoided, could result in serious injury or death.
	Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.
	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	Calls attention to important information, best practices and tips. NOTE is used to address information not related to personal injury, equipment damage, and environment deterioration.

Change History

Changes between document issues are cumulative. The latest document issue contains all the changes made in earlier issues.

Issue 19 (2018-12-04)

This issue is the nineteenth official release.

Category	Change Description
Add	Added the specifications of the CH221 V5 and CH225 V5.

Issue 18 (2018-04-16)

This issue is the eighteenth official release.

Category	Change Description
Add	Added the specifications of the CH121 V5, CH242 V5, CH121L V5, CX820, CX916, and MZ821.

Issue 17 (2017-05-31)

This issue is the seventeenth official release.

Category	Change Description
Add	Added the description about the working temperature compliance with the ASHRAE Class A3 standard in 8.3 "Environmental Specifications."
Modify	Modified 1.2 "Technical Features."
	Modified the internal port rate of the CX710 in 8.1 "Performance Specifications."
	Modified the altitude parameter in 8.3 "Environmental Specifications."

Issue 16 (2016-05-17)

This issue is the sixteenth official release.

Category	Change Description
Add	<ul style="list-style-type: none"> ● Added the content about the CX710 and CX220. ● Added the support for Intel® Xeon® E5-2600 v4 (Broadwell-EP) full-series processors by CH121 V3, CH220 V3, CH222 V3, and CH140 V3.

Issue 15 (2016-03-31)

This issue is the fifteenth official release.

Issue 14 (2015-11-09)

This issue is the fourteenth official release.

Category	Change Description
Add	<ul style="list-style-type: none"> ● Added the CH140 V3 and CH242 V3 DDR4 information and supported 3.5-inch hard disk types in 1.2 "Technical Features." ● Added the physical specifications of the CH226 V3 in 4.1 "Convergence of Computing, Storage, and Networking Resources." ● Added the specifications of the CH226 V3, CH140 V3, and CH242 V3 DDR4 in 8.1 "Performance Specifications."

Issue 13 (2015-02-16)

This issue is the thirteenth official release.

Issue 12 (2014-10-20)

This issue is the twelfth official release.

Category	Change Description
Modify	Modified Noise in 8.3 "Environmental Specifications."

Issue 11 (2014-09-15)

This issue is the eleventh official release.

Category	Change Description
Add	Added the following modules: <ul style="list-style-type: none">● Compute nodes CH121 V3 and CH222 V3● Switch modules CX111, CX210 and CX915

Issue 10 (2014-07-30)

This issue is the tenth official release.

Issue 09 (2014-05-23)

Category	Change Description
Modify	Modified the following detailed descriptions: <ul style="list-style-type: none">● 1.2 "Technical Features"● A COPYRIGHT NOTICE AND WARRANTY DISCLAIMER

Issue 08 (2014-03-20)

Category	Change Description
Modify	Modified the detailed descriptions in A COPYRIGHT NOTICE AND WARRANTY DISCLAIMER.

Issue 07 (2014-02-28)

Category	Change Description
Add	Added the specifications for the CH242 V3.

Issue 06 (2013-12-30)

Category	Change Description
Add	Added the specifications for the CH140 and MZ613.

Issue 05 (2013-11-18)

Category	Change Description
Delete	Deleted information about the CH242 V3 and CH243 V3.

Issue 04 (2013-08-30)

Category	Change Description
Add	Added B.10 SONCAP, B.11 SASO, and B.12 China Environmental Labeling.
Modify	Modified the detailed descriptions of components to the brief specification descriptions of the components in 8.1 "Performance Specifications."

Issue 03 (2013-05-20)

Category	Change Description
Add	Added 3.4 "Power Supply Unit Configure Policy" and 3.5 "Fan Module Configure Policy."
Modify	Modified the chassis depth to 840 mm (33.07 in.) in 8.3 "Environmental Specifications."
	Added certification information about C-tick, FCC, IC, UL, and CB which the E9000 has passed to 9.2 "Certifications and B Regulatory Compliance Standards."

Issue 02 (2013-04-01)

Category	Change Description
Add	Added the specifications for the CH220, CH221, CH222, CH240, CX110, CX310, CX311, and CX312.

Issue 01 (2013-01-15)

This issue is the first official release.

Contents

About This Document.....	ii
1 Overview.....	1
1.1 Positioning.....	1
1.2 Technical Features.....	2
2 System Architecture.....	5
2.1 Overview.....	5
2.2 Computing System.....	6
2.3 Switching System.....	7
2.4 Management and Electromechanical System.....	8
3 Hardware.....	10
3.1 Functions.....	10
3.2 Appearance.....	11
3.3 Hardware Structure.....	13
3.4 PSU Configuration Policy.....	16
3.5 Fan Module Configure Policy.....	28
4 Product Features.....	30
4.1 Convergence of Computing, Storage, and Networking Resources.....	30
4.2 Flexible Resource Configuration.....	32
4.3 Acceleration Components.....	33
4.4 Simple Deployment.....	33
5 Typical Applications.....	35
5.1 Cloud Computing.....	35
5.2 Traditional IT Applications.....	36
5.3 Hadoop.....	37
5.4 High Performance Computing.....	38
6 System Ports.....	40
6.1 Management Ports.....	40
6.2 Service Ports.....	42
7 Reliability.....	44
7.1 Fault Prevention.....	44

7.2 Fault Tolerance.....	44
7.3 Easy Maintenance.....	45
8 Technical Specifications.....	47
8.1 Performance Specifications.....	47
8.2 PSU and Power Specifications.....	58
8.3 Environmental Specifications.....	59
9 Standards and Certifications.....	64
9.1 Standards Compliance.....	64
9.2 Certifications.....	67
A COPYRIGHT NOTICE AND WARRANTY DISCLAIMER.....	69
B Regulatory Compliance Standards.....	76
C Glossary.....	80
D Acronyms and Abbreviations.....	86

1 Overview

1.1 Positioning

The E9000 is positioned as a high-end computing platform.

The E9000 is a high-performance, high-end enterprise server designed for elastic computing and telecom computing. The server converges computing, storage, and network resources to support operator and enterprise high-end core applications. The E9000 has industry-leading competitiveness as a hardware computing platform for its reliability, availability, and serviceability (RAS), computing density, energy conservation, emissions reduction, midplane bandwidth, intelligent management and service, elastic configuration and flexible expansion for computing and storage, short network latency, and acceleration. Its advantages are as follows:

- Enhances competitiveness for telecom operator services and enterprise software services by providing equivalent quality and service capability of midrange computers.
- Provides the same competitiveness as cost-effective servers for operators' universal services and Internet services.
- Provides the switching capability of high bandwidth and short latency for services that require the convergence of computing and data or media.

The E9000 meets various workload requirements in the following typical scenarios:

- Cloud computing: The E9000 uses high-performance CPUs and compute nodes with large-capacity memory to meet requirements for flexible virtual machine (VM) deployment. The built-in storage nodes with large capacity and low power consumption provide high-throughput shared storage to meet requirements for elastic computing applications.
- Traditional IT applications: The E9000, connected to external storage devices, enables office automation (OA), enterprise resource planning (ERP), and business intelligence (BI) by creating multiple VMs on compute nodes and deploying web servers, application servers (middleware), and databases on VMs.
- Hadoop applications: Working with high-bandwidth switch modules, the E9000 compute nodes that integrate computing and storage resources provide an efficient platform for addressing big data and high performance computing (HPC).
- HPC: The E9000 applies to HPC scenarios and provides InfiniBand switching capability with high performance and short latency.

1.2 Technical Features

The E9000 provides excellent performance, scalable architecture, and comprehensive out-of-band monitoring and management functions.

Excellent Performance

The E9000 offers industry-leading advantages in computing capability, memory capacity, switching types, power supply, and power efficiency.

- Compute nodes use the following CPUs:
 - Intel® Xeon® E5-2600 (Sandy Bridge-EP) series processors with up to 8 cores
 - Intel® Xeon® E5-2600 v2 (Ivy Bridge-EP) series processors with up to 12 cores
 - Intel® Xeon® E5-2600 v3 (Haswell-EP) series processors with up to 18 cores
 - Intel® Xeon® E5-2600 v4 (Broadwell-EP) series processors with up to 22 cores
 - Intel® Xeon® E5-4600 (Sandy Bridge-EP) series processors with up to 8 cores
 - Intel® Xeon® E5-4600 v2 (Ivy Bridge-EP) series processors with up to 12 cores
 - Intel® Xeon® E7-4800, E7-8800 (Westmere-EX) series processors with up to 10 cores
 - Intel® Xeon® E7-4800 v2/8800 v2 (Ivy Bridge-EX) series processors with up to 15 cores
 - Intel® Xeon® E7-4800 v3/E7-8800 v3 (Haswell-EX) series processors with up to 18 cores
 - Intel® Xeon® E7-4800 v4/8800 v4 (Broadwell-EX) series processors with up to 24 cores
 - Intel® Xeon® (Purley Skylake) series processors with up to 28 cores
- A half-width or full-width compute node provides two or four CPU sockets.
- A half-width 2-socket compute node CH121 with resource expansion supports a maximum of 24 dual in-line memory module (DIMM) slots and the following expansion configurations:
 - After a CH121 expands into a CH222, the CH222 supports up to fifteen 2.5-inch disks.
 - After a CH121 expands into a CH220, the CH220 supports four standard Peripheral Component Interconnect Express (PCIe) 3.0 x16 slots (x8 bandwidth).
 - After a CH121 expands into a CH221, the CH221 supports two PCIe 3.0 x16 slots for installing two full-length GPUs or SSDs.
- A half-width 2-socket compute node CH121 V3 supports a maximum of 24 DIMMs.
- A half-width 2-socket compute node CH121 V5 supports a maximum of 24 DIMMs.
- Full-width 2-socket compute nodes with storage expansion: The CH222 V3 supports a maximum of fifteen 2.5-inch hard disks. The CH225 V3 supports 12 NVMe SSDs. The CH226 V3 supports six 3.5-inch hard disks.
- A full-width 2-socket compute node with storage expansion: The CH225 V5 supports 12 SAS/SATA/NVMe hard disks and two 2.5-inch SAS/SATA/M.2 hard disks, and allows the HDDs and SSDs to be used together and hot-swapped. (NVMe PCIe SSDs support scheduled hot swap but not surprise hot swap.)

- A full-width 2-socket compute node CH220 V3 with resource expansion supports two x16 PCIe standard cards and four x8 PCIe standard cards.
- A full-width 2-socket compute node CH221 V5 with resource expansion supports two x16 PCIe standard cards (PCIe 3.0 x 16 + PCIe 3.0 x 8)
- The half-width 2-socket compute node CH121 V3, and full-width 2-socket compute nodes CH220 V3 and CH222 V3 use the Intel® Xeon® E5-2600 v3 (Haswell-EP) series processors with up to 18 cores or Intel® Xeon® E5-2600 v4 (Broadwell-EP) series processors with up to 22 cores.
- The half-width 2-socket compute node CH121 V5 uses the Intel® Xeon® (Purley Skylake) series processors with up to 28 cores, with the memory speed up to 2666 MHz.
- Each CH140 or CH140 V3 supports two child compute nodes. Each half-width 2-socket child compute node of the CH140 supports a maximum of eight DIMM slots with the maximum memory capacity of 256 GB. Each half-width 2-socket child compute node of the CH140 V3 supports a maximum of eight DIMM slots with the maximum memory capacity of 512 GB.
- A full-width 4-socket compute node CH240 supports a maximum of 48 DIMM slots with the maximum memory capacity of 1536 GB.
- A full-width 4-socket compute node CH242 supports a maximum of eight 2.5-inch disks, one PCIe card, one LSI SAS2208 or LSI SAS2308 RAID controller card, and 1 GB RAID cache.
- A full-width 4-socket compute node CH242 V3 8HDD supports a maximum of eight 2.5-inch disks, two customized PCIe cards, one LSI SAS2208, LSI SAS2308, LSI SAS3008, or LSI SAS3108 RAID controller card, and 1 GB or 2 GB RAID cache.
- A full-width 4-socket compute node CH242 V3 4HDD supports a maximum of four 2.5-inch disks, two customized PCIe cards, one standard full-height PCIe card, one LSI SAS2208, LSI SAS2308, LSI SAS3008, or LSI SAS3108 RAID controller card, and 1 GB or 2 GB RAID cache.
- A full-width 4-socket compute node CH242 V3 DDR4 supports a maximum of eight 2.5-inch HDDs/SSDs (or four HDDs/SSDs and four NVMe PCIe SSDs), two customized PCIe cards or one standard full-height half-length PCIe card, one LSI SAS2208, LSI SAS3008, or LSI SAS3108 RAID controller card, and 1 GB or 2 GB RAID cache.
- A full-width 4-socket compute node CH242 V5 provides significantly higher I/O performance when fully configured with SSDs than when configured with only HDDs or a mixture of SSDs and HDDs. An SSD supports approximately 100 times the I/O operations per second (IOPS) of an HDD.
- A compute node supports DIMMs with mainstream chips and 1.5 times the usual height.
- The supported 2.5-inch disks are SAS SSDs, SATA SSDs, PCIe SSDs, 12 Gbit/s or 6 Gbit/s SAS HDDs, 6 Gbit/s or 3 Gbit/s SATA HDDs. The supported 3.5-inch disks are 12 Gbit/s or 6 Gbit/s SAS HDDs, and 6 Gbit/s SATA HDDs.
- The E9000 supports Ethernet, Fiber Channel (FC), Fiber Channel over Ethernet (FCoE), and InfiniBand switching.
- The E9000 uses high-efficiency Titanium AC power supply units (PSUs) to provide up to 96% power conversion efficiency and supports intelligent PSU hibernation based on the dynamic energy management technology (DEMT).
- The E9000 adopts the following heat dissipation and power supply design: 900 W/half-width slot and 1800 W/full-width slot at 35°C (95°F); 700 W/half-width slot and 1400 W/full-width slot at 40°C (104°F).

Scalable Architecture

The E9000 adopts the modular design for computing, storage, switching, heat dissipation, and power supply functions and is scalable to a small-sized, medium-sized, or full-sized rack to achieve smooth service expansion.

- The E9000 supports flexible slot configuration to meet requirements for computing performance in various application scenarios. The 2-socket and 4-socket compute nodes can be flexibly combined by connecting half-width slots, and full-width slots through QuickPath Interconnect (QPI).
- Storage nodes can be added to expand the storage capacity of the E9000. A half-width compute node can become a half-width compute node after being configured with a hard disk drawer that contains fifteen 2.5-inch disks.
- The E9000 implements switching scalability by using different switch modules to provide different switching planes or by using mezzanine modules to add switching planes.
- Compute nodes can be configured with the desired type and quantity of mezzanine cards to add ports.
- The E9000 employs the following acceleration components to meet various requirements for storage expansion, security hardening, and refined service control:
 - Intelligent network interface card (iNIC), which provides virtual switching and security filtering
 - Expansion cards such as graphic processing unit (GPU) cards and SSD cards

Comprehensive Out-of-band Monitoring and Management

The E9000 manages devices over the Intelligent Platform Management Interface (IPMI). Every component provides a baseboard management controller (BMC). The E9000 also provides management modules to monitor the chassis and components. The management modules support remote and local maintenance. Remote maintenance methods include serial over LAN (SOL), keyboard, video, and mouse (KVM) over IP, and virtual media. To perform local maintenance, connect to the KVM port on the management module panel.

The E9000 has the following device management features:

- Comprehensive management system: Ethernet switch modules in the management modules and the midplane form the management planes in a dual-star structure. The BMC of each field replaceable unit (FRU) connects to the management modules over the management planes.
- Flexible management networking solutions:
 - Direct management network ports: An external management system connects to the BMC of each FRU over management network ports to manage these FRUs.
 - Centralized management: An external management system connects to management modules over management network ports to centrally manage system resources, implementing out-of-band management of chassis FRUs and power.
- User-friendly web interface (WebUI): The BMC WebUI of each FRU and management module WebUI can be used for managing alarms, topologies, configurations, and security features. The chassis provides a liquid crystal display (LCD) where users can view alarms and perform basic chassis configuration.

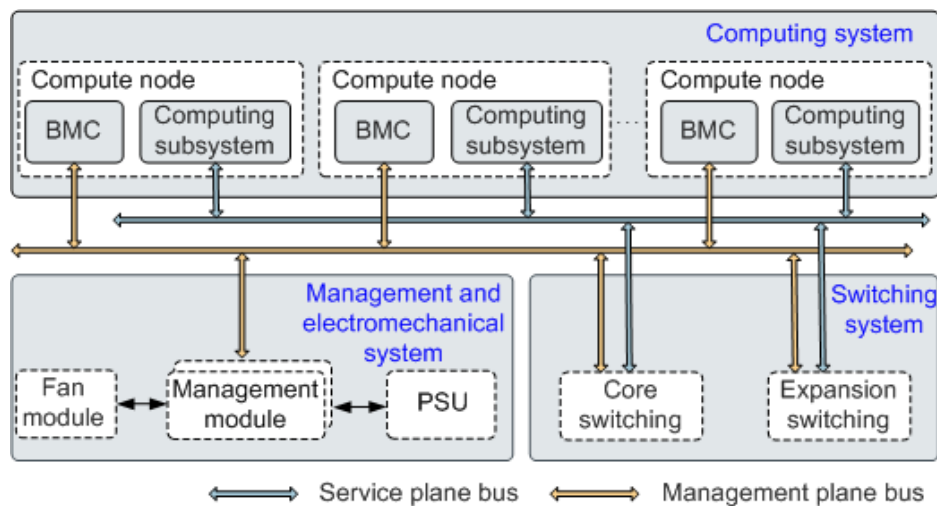
2 System Architecture

2.1 Overview

The E9000 system architecture logically consists of a computing system, switching system, and management and electromechanical system.

The three systems interwork with each other to form a unified switching architecture. The management and electromechanical system provides unified user interfaces (UIs) for device management. [Figure 2-1](#) shows the logical system architecture.

Figure 2-1 Logical system architecture



The computing system includes compute nodes and storage nodes. It provides external data ports through the input/output (I/O) module of the switching system and implements chassis-level or higher-level device management through the internal iBMC/iMana 200.

The switching system includes core switching and expansion switching. It performs switching between computing subsystems and provides external data ports through the I/O module. By connecting the switching system and the management and electromechanical system, you can set up a physical network where service switching and service management switching are combined or separated.

The management and electromechanical system consists of fan modules, power supply modules, and management modules. It manages components, supplies power, dissipates heat, and connects to the baseboard management controller (iBMC/iMana 200) of each compute node and storage node, and the iBMC/iMana 200 of each switch module.

2.2 Computing System

The computing system consists of the out-of-band management subsystem, service processor subsystem, and service application subsystem.

The computing system connects to the switching system over a network adapter and provides input/output (I/O) ports for connecting the keyboard, video, and mouse (KVM) and USB devices using high-density cables, as shown in [Figure 2-2](#).

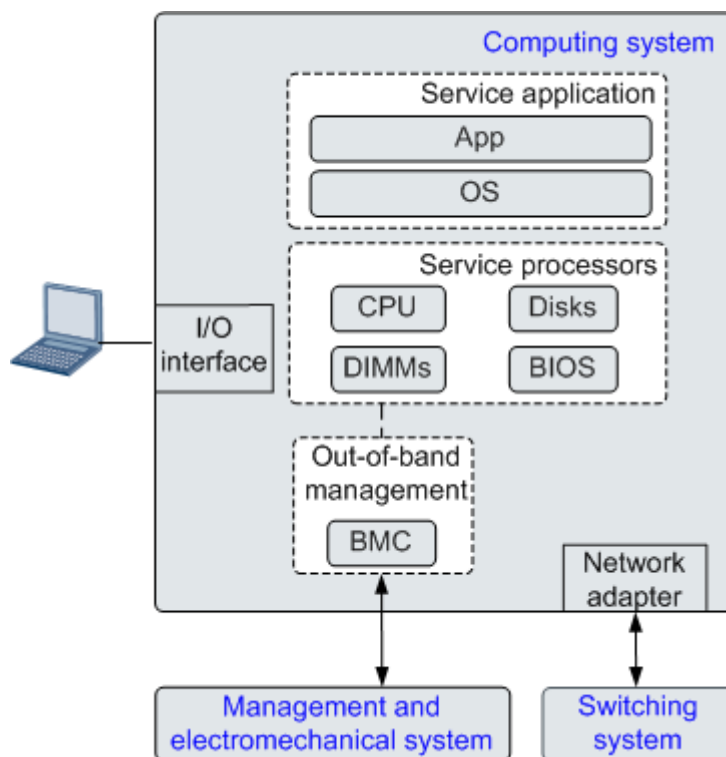
NOTE

The CH140, CH140 V3, CH226 V3, CH121 V5, CH242 V5, CH221 V5 and CH225 V5 connect to the keyboard, video, and mouse (KVM) and USB devices only by using the MM910.

The three computing subsystems are described as follows:

- The out-of-band management subsystem is the BMC. The BMCs connect to management modules to monitor and manage hardware for compute nodes, such as monitoring the temperature and voltage, performing power-on and power-off control for the service processor subsystem, serial over LAN (SOL), KVM over IP, and virtual media.
- The service processor subsystem provides physical computing resources which include the CPUs, dual in-line memory modules (DIMMs), disks, and basic input/output system (BIOS).
- The service application subsystem consists of the operating system (OS) and application processes. The OS of each compute node is pre-installed before delivery or installed onsite. After the OS installation, you can deploy application processes in the OS.

Figure 2-2 Computing system



2.3 Switching System

The switching system provides switching functions for compute nodes within a chassis or in different chassis and provides ports for connecting to an external network.

The switching system provides unified Ethernet switching and fiber channel (FC) or fiber channel over Ethernet (FCoE) storage switching and supports switching expansion.

The switching system provides independent Ethernet switching and storage switching planes. The Ethernet switching can be divided into multiple switching planes based on service requirements. The computing system connects to each switching plane over different mezzanine modules.

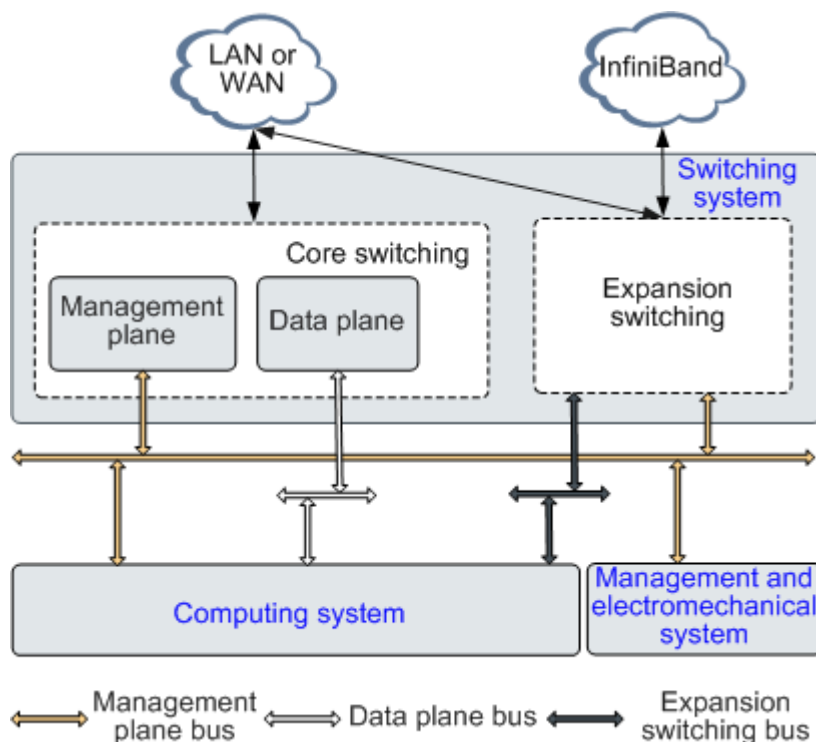
Figure 2-3 shows the switching planes. The switching system is divided into core switching and expansion switching.

- Core switching: The system converges Ethernet and virtual switching, including storage (FCoE) and computing (DCE) switching in data centers. The core switching logically consists of the management plane and data plane.
- Expansion switching: The expansion switching planes expand system switching capabilities such as InfiniBand switching and Ethernet switching.

NOTE

The E9000A chassis does not support IB switch modules: CX610, CX611 and CX620.

Figure 2-3 Switching system



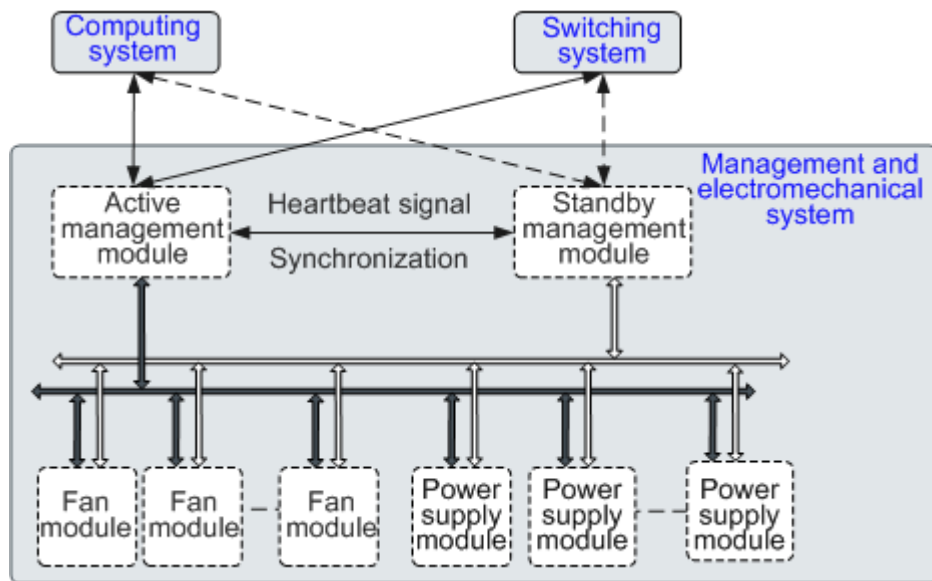
2.4 Management and Electromechanical System

The management and electromechanical system provides out-of-band management for compute nodes and switch modules and chassis management. The system supports asset management, environment monitoring, field replaceable unit (FRU) health monitoring, inband monitoring, channel commissioning, local keyboard, video, and mouse (KVM), KVM over IP, serial over LAN (SOL), and virtual media.

The management and electromechanical system supports active and standby management modules and active/standby failover for management modules. The active and standby management modules connect to the fan modules and power supply units (PSUs) over inter-integrated circuit (I2C) channels to manage these modules, as shown in [Figure 2-4](#). The system automatically adjusts the fan speed based on fan partitions, ambient temperature in the chassis, and temperature of each module. PSUs support hibernation and automatic protection against failures.

The management modules connect to the BMCs of compute nodes over Ethernet to provide ports on the management modules or through the switching system for connecting to the maintenance and management network. By default, the ports are provided through the switching system.

Figure 2-4 Management and electromechanical system



3 Hardware

3.1 Functions

This topic describes the E9000 compute node models, computing density, switching capacity, and switching protocols.

The E9000 is model of chassis product that Huawei developed. It can house the E9000 series compute nodes, storage nodes, and resource expansion nodes in its 12 U chassis. The E9000 has the following features and functions.

- Supports 8 full-width compute nodes or 16 half-width compute nodes for flexible slot configuration.
- Supports a compute node with 2 CPUs and 24 DIMMs or 2 x (2 CPUs + 8 DIMMs) in a half-width slot.
- Supports a compute node with 4 CPUs and 48 DIMMs in a full-width slot.
- Supports the computing density of 64 CPUs/1408 cores per chassis.
- Supports a maximum memory capacity of 24 TB per chassis.
- Supports the maximum switching capability (throughput) of 32 Tbit/s for midplane.
- Provides 4 switch modules (2 pairs), supporting Ethernet, fiber channel (FC), fiber channel over Ethernet (FCoE), InfiniBand switching and I/O ports.

NOTE

The E9000A chassis does not support IB switch modules: CX610, CX611 and CX620.

- Each chassis is configured with two management modules in active/standby mode. They support active/standby switchover, hot swap, and the protocols of Intelligent Platform Management Interface 2.0 (IPMI 2.0), Simple Network Management Protocol (SNMP) v3, SNMP Trap v1, SNMP Trap v2c, SNMP Trap v3, Secure Sockets Layer (SSL), Secure Shell (SSH), Secure File Transfer Protocol (SFTP), Hypertext Transfer Protocol Secure (HTTPS), Network Time Protocol (NTP), Domain Name Service (DNS), Lightweight Directory Access Protocol (LDAP), and Simple Mail Transfer Protocol (SMTP).
- A display is installed in the front lower part of the chassis. The display is used to set the basic chassis information and monitor the status of the chassis and components in the chassis.

3.2 Appearance

This topic describes the E9000 appearance.

Figure 3-1 shows the E9000.

Figure 3-1 Appearance



Front Panel

Figure 3-2 shows the front panel of the E9000.

Figure 3-2 Front panel



Rear Panel

Figure 3-3 shows the rear panel of the E9000.

Figure 3-3 Rear panel



3.3 Hardware Structure

This topic describes the E9000 hardware structure and components.

Hardware Structure

[Figure 3-4](#) shows the E9000 hardware structure.

Figure 3-4 Hardware structure

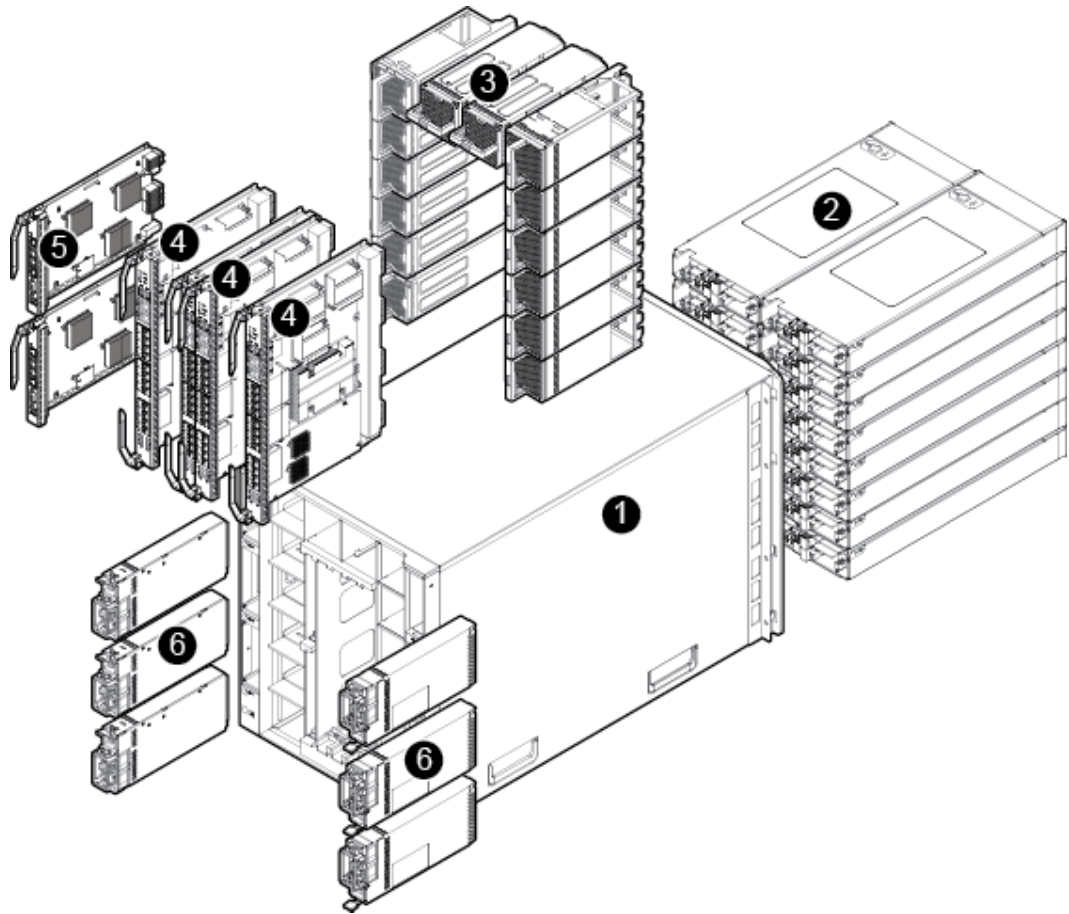


Table 3-1 describes the E9000 chassis components.

Table 3-1 E9000 chassis components

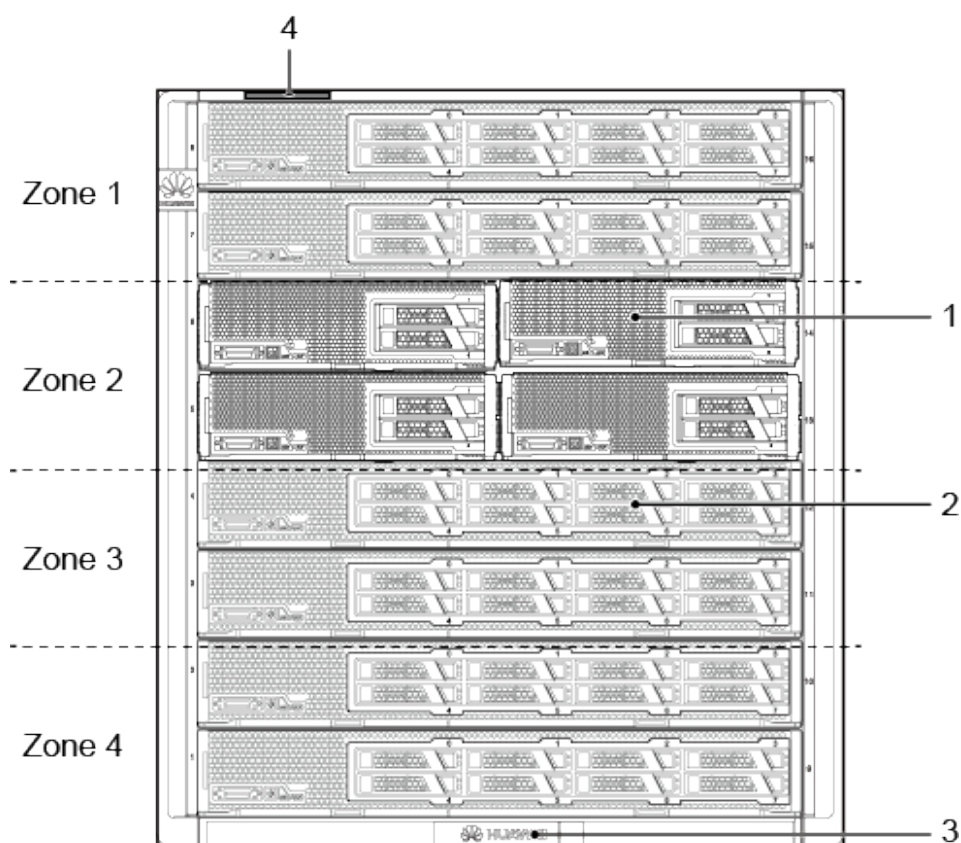
No.	Component	Description
1	Chassis	The chassis is 12 U high and provides 8 full-width or 16 half-width compute node slots at the front, and 2 management module slots, 6 PSU slots, 14 fan module slots, and 4 switch or pass-through module slots at the rear.
2	Compute nodes	A variety of half-width and full-width compute nodes are supported and can be flexibly selected based on service needs.
3	Fan modules	14 hot-swappable fan modules are supported and divided into three zones.
4	Pass-through or switch modules	Four pass-through or switch modules can be configured to provide external ports.
5	Management modules	Two management modules can be configured to manage all hardware devices in the chassis, with support for active/standby switchovers and hot-swap.

No.	Component	Description
6	PSUs	Six hot-swappable PSUs are in N+1 or N+N redundancy mode.

Front Panel

Figure 3-5 shows the front panel of the E9000.

Figure 3-5 Front panel



1	Half-width compute nodes	2	Full-width compute nodes
3	Chassis intelligent display	4	ESN label

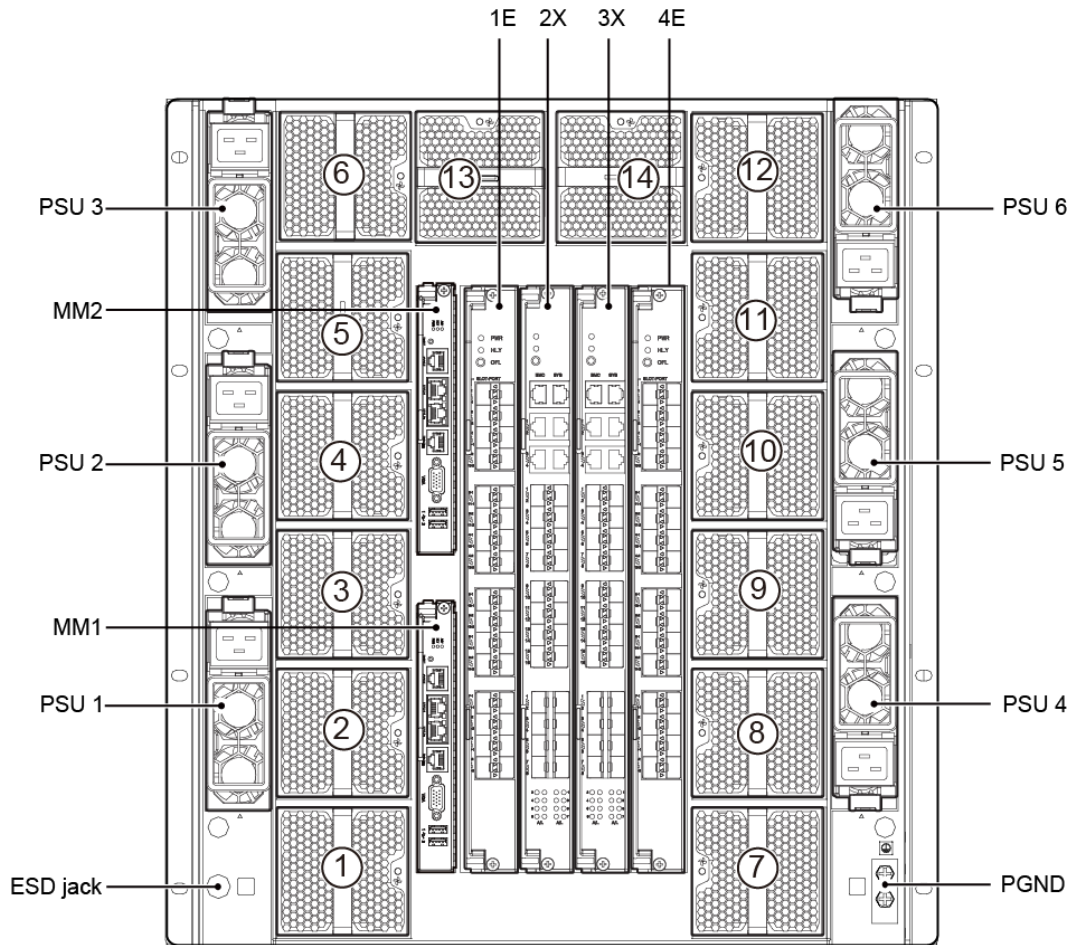
NOTE

The front slots of the E9000 are divided into four zones. Half-width and full-width compute nodes cannot be inserted in the same zone.

Rear panel

Figure 3-6 shows the rear panel of the E9000.

Figure 3-6 Rear panel



1E, 2X, 3X, and 4E	Slots for installing switch modules and pass-through modules. It is recommended that pass-through modules be installed in slots 1E and 4E to facilitate cable routing.	MM1 and MM2	Slots for installing management modules.
PSU 1 to PSU 6	Slots for installing PSUs.	(1) to (14)	Slots for installing fan modules.
ESD jack	A socket for inserting the ESD wrist strap.	PGND	Ground terminal.

3.4 PSU Configuration Policy

This section describes the PSU configuration policy for the E9000.

In real application scenarios, the E9000 power consumption varies with the system configuration. PSUs are configured based on the power consumption. [Table 3-2](#) lists the

maximum power consumption of major components. [Table 3-3](#), [Table 3-4](#), and [Table 3-5](#) list the PSU configuration policies.

Maximum Power Consumption of Major Components

[Table 3-2](#) lists the maximum power consumption of major components.

Table 3-2 Maximum power consumption

Category	Component	Maximum Power Consumption
Compute node	CH121	591 W
	CH140	783 W
	CH140 V3	763 W
	CH220	777 W
	CH221	777 W
	CH222	613 W
	CH225 V3	800 W
	CH225 V5	1000 W
	CH240	939 W
	CH242	1089 W
	CH242 V3	<ul style="list-style-type: none"> ● CH242 V3 8HDD: 1259 W ● CH242 V3 4HDD: 1265 W
	CH242 V3 DDR4	1312 W
	CH121 V3	521 W
	CH121 V5	730 W
	CH121L V5	715.2 W
	CH220 V3	973 W
	CH222 V3	629 W
	CH226 V3	640 W
	CH242 V5	1424 W
	CH221 V5	955 W
Pass-through module	CX116	28 W
	CX317	90 W
	CX318	50 W

Category	Component	Maximum Power Consumption
Switch module	CX910	128 W
	CX911	188 W
	CX912	178 W
	CX913	166 W
	CX310	112 W
	CX311	172 W
	CX312	126 W
	CX110	96 W
	CX610	144 W
	CX611	144 W
	CX111	65 W
	CX210	50 W
	CX820	128 W
	CX915	125 W
	CX916	199.7 W
	CX220	75 W
	CX710	180 W
	CX320	142 W
	CX620	154 W
	CX621	154 W
Management module	MM910	36 W
Fan module	-	65 W

Configuration Policy for the 3000 W AC PSU (Input Voltage 220 V AC to 240 V AC at 50 or 60 Hz and Output Power 3000 W)

The configuration policy for the 3000 W AC PSU (input voltage 220 V AC to 240 V AC at 50 or 60 Hz and output power 3000 W) is described in [Table 3-3](#).

Table 3-3 Configuration policy

Power Range	Redundancy Mode	PSU Qty	Recommended Slots
P < 3000 W	No redundancy	1	PSU1
3000 W < P < 6000 W	No redundancy	2	PSU1, PSU4
6000 W < P < 9000 W	No redundancy	3	PSU1, PSU2, PSU4
9000 W < P < 12000 W	No redundancy	4	PSU1, PSU2, PSU4, PSU5
12000 W < P < 15000 W	No redundancy	5	PSU1, PSU2, PSU3, PSU4, PSU5
15000 W < P < 18000 W	No redundancy	6	PSU1, PSU2, PSU3, PSU4, PSU5, PSU6
P < 3000 W	1+1 redundancy	2	PSU1, PSU4
3000 W < P < 6000 W	2+1 redundancy	3	PSU1, PSU2, PSU4
6000 W < P < 9000 W	3+1 redundancy	4	PSU1, PSU2, PSU4, PSU5
9000 W < P < 12000 W	4+1 redundancy	5	PSU1, PSU2, PSU3, PSU4, PSU5
12000 W < P < 15000 W	5+1 redundancy	6	PSU1, PSU2, PSU3, PSU4, PSU5, PSU6
3000 W < P < 6000 W	2+2 redundancy	4	PSU1, PSU2, PSU4, PSU5
6000 W < P < 9000 W	3+3 redundancy	6	PSU1, PSU2, PSU3, PSU4, PSU5, PSU6

Configuration Policy for the 3000 W AC PSU (Input Voltage 200 V AC to 220 V AC at 50 or 60 Hz and Output Power 2500 W)

The configuration policy for the 3000 W AC PSU (input voltage 200 V AC to 220 V AC at 50 or 60 Hz and output power 2500 W) is described in [Table 3-4](#).

Table 3-4 Configuration policy

Power Range	Redundancy Mode	PSU Qty	Recommended Slots
$P < 2500 \text{ W}$	No redundancy	1	PSU1
$2500 \text{ W} < P < 5000 \text{ W}$	No redundancy	2	PSU1, PSU4
$5000 \text{ W} < P < 7500 \text{ W}$	No redundancy	3	PSU1, PSU2, PSU4
$7500 \text{ W} < P < 10000 \text{ W}$	No redundancy	4	PSU1, PSU2, PSU4, PSU5
$10000 \text{ W} < P < 12500 \text{ W}$	No redundancy	5	PSU1, PSU2, PSU3, PSU4, PSU5
$12500 \text{ W} < P < 15000 \text{ W}$	No redundancy	6	PSU1, PSU2, PSU3, PSU4, PSU5, PSU6
$P < 2500 \text{ W}$	1+1 redundancy	2	PSU1, PSU4
$2500 \text{ W} < P < 5000 \text{ W}$	2+1 redundancy	3	PSU1, PSU2, PSU4
$5000 \text{ W} < P < 7500 \text{ W}$	3+1 redundancy	4	PSU1, PSU2, PSU4, PSU5
$7500 \text{ W} < P < 10000 \text{ W}$	4+1 redundancy	5	PSU1, PSU2, PSU3, PSU4, PSU5

Power Range	Redundancy Mode	PSU Qty	Recommended Slots
10000 W < P < 12500 W	5+1 redundancy	6	PSU1, PSU2, PSU3, PSU4, PSU5, PSU6
2500 W < P < 5000 W	2+2 redundancy	4	PSU1, PSU2, PSU4, PSU5
5000 W < P < 7500 W	3+3 redundancy	6	PSU1, PSU2, PSU3, PSU4, PSU5, PSU6

Configuration Policy for the 3000 W AC PSU (Input Voltage 100 V AC to 130 V AC at 50 or 60 Hz and Output Power 1200 W)

The configuration policy for the 3000 W PSU (input voltage 100 V AC to 130 V AC at 50 or 60 Hz and output power 1200 W) is described in [Table 3-5](#).

Table 3-5 Configuration policy

Power Range	Redundancy Mode	PSU Qty	Recommended Slots
P < 1200 W	No redundancy	1	PSU1
1200 W < P < 2400 W	No redundancy	2	PSU1, PSU4
2400 W < P < 3600 W	No redundancy	3	PSU1, PSU2, PSU4
3600 W < P < 4800 W	No redundancy	4	PSU1, PSU2, PSU4, PSU5
4800 W < P < 6000 W	No redundancy	5	PSU1, PSU2, PSU3, PSU4, PSU5
6000 W < P < 7200 W	No redundancy	6	PSU1, PSU2, PSU3, PSU4, PSU5, PSU6

Power Range	Redundancy Mode	PSU Qty	Recommended Slots
$P < 1200\text{ W}$	1+1 redundancy	2	PSU1, PSU4
$1200\text{ W} < P < 2400\text{ W}$	2+1 redundancy	3	PSU1, PSU2, PSU4
$2400\text{ W} < P < 3600\text{ W}$	3+1 redundancy	4	PSU1, PSU2, PSU4, PSU5
$3600\text{ W} < P < 4800\text{ W}$	4+1 redundancy	5	PSU1, PSU2, PSU3, PSU4, PSU5
$4800\text{ W} < P < 6000\text{ W}$	5+1 redundancy	6	PSU1, PSU2, PSU3, PSU4, PSU5, PSU6
$1200\text{ W} < P < 2400\text{ W}$	2+2 redundancy	4	PSU1, PSU2, PSU4, PSU5
$2400\text{ W} < P < 3600\text{ W}$	3+3 redundancy	6	PSU1, PSU2, PSU3, PSU4, PSU5, PSU6

Configuration Policy for the 2000 W AC PSU (Input Voltage 220 V AC to 240 V AC at 50 or 60 Hz and Output Power 2000 W)

The configuration policy for the 2000 W AC PSU (input voltage 220 V AC to 240 V AC at 50 or 60 Hz and output power 2000 W) is described in [Table 3-6](#).

Table 3-6 Configuration policy

Power Range	Redundancy Mode	PSU Qty	Recommended Slots
$P < 2000\text{ W}$	No redundancy	1	PSU1
$2000\text{ W} < P < 4000\text{ W}$	No redundancy	2	PSU1, PSU4

Power Range	Redundancy Mode	PSU Qty	Recommended Slots
4000 W < P < 6000 W	No redundancy	3	PSU1, PSU2, PSU4
6000 W < P < 8000 W	No redundancy	4	PSU1, PSU2, PSU4, PSU5
8000 W < P < 10000 W	No redundancy	5	PSU1, PSU2, PSU3, PSU4, PSU5
10000 W < P < 12000 W	No redundancy	6	PSU1, PSU2, PSU3, PSU4, PSU5, PSU6
P < 2000 W	1+1 redundancy	2	PSU1, PSU4
2000 W < P < 4000 W	2+1 redundancy	3	PSU1, PSU2, PSU4
4000 W < P < 6000 W	3+1 redundancy	4	PSU1, PSU2, PSU4, PSU5
6000 W < P < 8000 W	4+1 redundancy	5	PSU1, PSU2, PSU3, PSU4, PSU5
8000 W < P < 10000 W	5+1 redundancy	6	PSU1, PSU2, PSU3, PSU4, PSU5, PSU6
2000 W < P < 4000 W	2+2 redundancy	4	PSU1, PSU2, PSU4, PSU5
4000 W < P < 6000 W	3+3 redundancy	6	PSU1, PSU2, PSU3, PSU4, PSU5, PSU6

Configuration Policy for the 2000 W AC PSU (Input Voltage 200 V AC to 220 V AC at 50 or 60 Hz and Output Power 1800 W)

The configuration policy for the 2000 W AC PSU (input voltage 200 V AC to 220 V AC at 50 or 60 Hz and output power 1800 W) is described in [Table 3-7](#).

Table 3-7 Configuration policy

Power Range	Redundancy Mode	PSU Qty	Recommended Slots
$P < 1800\text{ W}$	No redundancy	1	PSU1
$1800\text{ W} < P < 3600\text{ W}$	No redundancy	2	PSU1, PSU4
$3600\text{ W} < P < 5400\text{ W}$	No redundancy	3	PSU1, PSU2, PSU4
$5400\text{ W} < P < 7200\text{ W}$	No redundancy	4	PSU1, PSU2, PSU4, PSU5
$7200\text{ W} < P < 9000\text{ W}$	No redundancy	5	PSU1, PSU2, PSU3, PSU4, PSU5
$9000\text{ W} < P < 10800\text{ W}$	No redundancy	6	PSU1, PSU2, PSU3, PSU4, PSU5, PSU6
$P < 1800\text{ W}$	1+1 redundancy	2	PSU1, PSU4
$1800\text{ W} < P < 3600\text{ W}$	2+1 redundancy	3	PSU1, PSU2, PSU4
$3600\text{ W} < P < 5400\text{ W}$	3+1 redundancy	4	PSU1, PSU2, PSU4, PSU5
$5400\text{ W} < P < 7200\text{ W}$	4+1 redundancy	5	PSU1, PSU2, PSU3, PSU4, PSU5
$7200\text{ W} < P < 9000\text{ W}$	5+1 redundancy	6	PSU1, PSU2, PSU3, PSU4, PSU5, PSU6
$1800\text{ W} < P < 3600\text{ W}$	2+2 redundancy	4	PSU1, PSU2, PSU4, PSU5
$3600\text{ W} < P < 5400\text{ W}$	3+3 redundancy	6	PSU1, PSU2, PSU3, PSU4, PSU5, PSU6

Configuration Policy for the 2000 W AC PSU (Input Voltage 100 V AC to 130 V AC at 50 or 60 Hz and Output Power 800 W)

The configuration policy for the 2000 W AC PSU (input voltage 100 V AC to 130 V AC at 50 or 60 Hz and output power 800 W) is described in [Table 3-8](#).

Table 3-8 Configuration policy

Power Range	Redundancy Mode	PSU Qty	Recommended Slots
$P < 800\text{ W}$	No redundancy	1	PSU1
$800\text{ W} < P < 1600\text{ W}$	No redundancy	2	PSU1, PSU4
$1600\text{ W} < P < 2400\text{ W}$	No redundancy	3	PSU1, PSU2, PSU4
$2400\text{ W} < P < 3200\text{ W}$	No redundancy	4	PSU1, PSU2, PSU4, PSU5
$3200\text{ W} < P < 4000\text{ W}$	No redundancy	5	PSU1, PSU2, PSU3, PSU4, PSU5
$4000\text{ W} < P < 4800\text{ W}$	No redundancy	6	PSU1, PSU2, PSU3, PSU4, PSU5, PSU6
$P < 800\text{ W}$	1+1 redundancy	2	PSU1, PSU4
$800\text{ W} < P < 1600\text{ W}$	2+1 redundancy	3	PSU1, PSU2, PSU4
$1600\text{ W} < P < 2400\text{ W}$	3+1 redundancy	4	PSU1, PSU2, PSU4, PSU5
$2400\text{ W} < P < 3200\text{ W}$	4+1 redundancy	5	PSU1, PSU2, PSU3, PSU4, PSU5

Power Range	Redundancy Mode	PSU Qty	Recommended Slots
3200 W < P < 4000 W	5+1 redundancy	6	PSU1, PSU2, PSU3, PSU4, PSU5, PSU6
800 W < P < 1600 W	2+2 redundancy	4	PSU1, PSU2, PSU4, PSU5
1600 W < P < 2400 W	3+3 redundancy	6	PSU1, PSU2, PSU3, PSU4, PSU5, PSU6

Configuration Policy for the 2500 W DC PSU (Input Voltage -48 V DC to -60 V DC and Output Power 2500 W)

The configuration policy for the 2500 W DC PSU (input voltage -48 V DC to -60 V DC and output power 2500 W) is described in [Table 3-9](#).

Table 3-9 Configuration policy

Power Range	Redundancy Mode	PSU Qty	Recommended Slots
P < 2500 W	No redundancy	1	PSU1
2500 W < P < 5000 W	No redundancy	2	PSU1, PSU4
5000 W < P < 7500 W	No redundancy	3	PSU1, PSU2, PSU4
7500 W < P < 10000 W	No redundancy	4	PSU1, PSU2, PSU4, PSU5
10000 W < P < 12500 W	No redundancy	5	PSU1, PSU2, PSU3, PSU4, PSU5
12500 W < P < 15000 W	No redundancy	6	PSU1, PSU2, PSU3, PSU4, PSU5, PSU6

Power Range	Redundancy Mode	PSU Qty	Recommended Slots
$P < 2500\text{ W}$	1+1 redundancy	2	PSU1, PSU4
$2500\text{ W} < P < 5000\text{ W}$	2+1 redundancy	3	PSU1, PSU2, PSU4
$5000\text{ W} < P < 7500\text{ W}$	3+1 redundancy	4	PSU1, PSU2, PSU4, PSU5
$7500\text{ W} < P < 10000\text{ W}$	4+1 redundancy	5	PSU1, PSU2, PSU3, PSU4, PSU5
$10000\text{ W} < P < 12500\text{ W}$	5+1 redundancy	6	PSU1, PSU2, PSU3, PSU4, PSU5, PSU6
$2500\text{ W} < P < 5000\text{ W}$	2+2 redundancy	4	PSU1, PSU2, PSU4, PSU5
$5000\text{ W} < P < 7500\text{ W}$	3+3 redundancy	6	PSU1, PSU2, PSU3, PSU4, PSU5, PSU6

Configuration Policy for the 3000 W HVDC PSU (Input Voltage 260 V DC to 400 V DC and Output Power 3000 W)

The configuration policy for the 3000 W HVDC PSU (input voltage 260 V DC to 400 V DC and output power 3000 W) is described in [Table 3-10](#).

Table 3-10 Configuration policy

Power Range	Redundancy Mode	PSU Qty	Recommended Slots
$P < 3000\text{ W}$	No redundancy	1	PSU1
$3000\text{ W} < P < 6000\text{ W}$	No redundancy	2	PSU1, PSU4

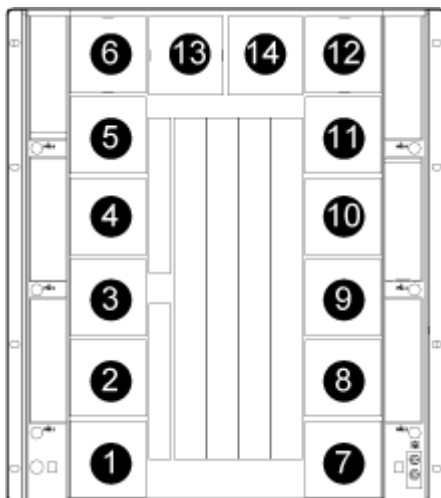
Power Range	Redundancy Mode	PSU Qty	Recommended Slots
6000 W < P < 9000 W	No redundancy	3	PSU1, PSU2, PSU4
9000 W < P < 12000 W	No redundancy	4	PSU1, PSU2, PSU4, PSU5
12000 W < P < 15000 W	No redundancy	2	PSU1, PSU2, PSU3, PSU4, PSU5
P < 3000 W	1+1 redundancy	2	PSU1, PSU4
3000 W < P < 6000 W	2+1 redundancy	3	PSU1, PSU2, PSU4
6000 W < P < 9000 W	3+1 redundancy	4	PSU1, PSU2, PSU4, PSU5
9000 W < P < 12000 W	4+1 redundancy	5	PSU1, PSU2, PSU3, PSU4, PSU5
12000 W < P < 15000 W	5+1 redundancy	6	PSU1, PSU2, PSU3, PSU4, PSU5, PSU6
3000 W < P < 6000 W	2+2 redundancy	4	PSU1, PSU2, PSU4, PSU5
6000 W < P < 9000 W	3+3 redundancy	6	PSU1, PSU2, PSU3, PSU4, PSU5, PSU6

3.5 Fan Module Configure Policy

This topic describes the rules for configuring fan modules when a chassis houses different number of compute nodes.

Fan modules in a chassis must provide a sufficient cooling capacity to ensure the compute nodes and the system operate properly. [Figure 3-7](#) shows the slot numbers of fan modules.

Figure 3-7 Slot numbers of fan modules



NOTICE

Configure fan modules based on the following rules; otherwise, compute nodes may power off due to the insufficient cooling capacity.

Fan modules are configured based on the following rules:

- When a chassis houses eight or fewer half-width compute nodes or four or fewer full-width compute nodes, install fan modules in slots 1, 2, 3, 4, 7, 8, 9, 10, 13, and 14.
- When a chassis houses more than eight half-width compute nodes or more than four full-width compute nodes, fully configure fan modules.

4 Product Features

4.1 Convergence of Computing, Storage, and Networking Resources

The E9000, as a universal service processing platform, provides an industry-leading hardware infrastructure by integrating computing, storage, and networking resources in a 12 U chassis.

High-performance Compute Node

- The E9000 supports full series of Intel® x86 CPUs to meet requirements for CPU evolution in the future.
- The E9000 supports compute nodes of various specifications: 2-socket, 4-socket, 8-socket, half-width, and full-width compute nodes.
- Compute nodes support various network ports on mezzanine modules and acceleration cards to meet demands for high-performance processing.

Large-Capacity Storage

The E9000 provides a half-width storage resource expansion module, which is integrated with a half-width compute node to form a full-width compute node. This node integrates storage and computing resources.

- The E9000 supports fifteen 2.5-inch Serial Attached SCSI (SAS) or Serial Advanced Technology Attachment (SATA) disks or solid-state drives (SSDs). SCSI refers to Small Computer System Interface.
- Disks are installed through removable drive trays and support hot swap.
- Power-off protection is supported for the write cache.

The E9000 provides one or more full-width storage resource expansion modules:

- The E9000 supports two 2.5-inch hard disk drives (HDDs) or solid-state drives (SSDs) and six 3.5-inch HDDs.
- A single disk is hot-swappable.
- Power-off protection is provided for the write cache.

Large-Capacity Switching

The E9000 provides the new-generation switch modules that support data center features. The switch modules can be used as switching units in the hardware platform or function as the aggregation switches for medium- and small- capacity cascaded chassis. This simplifies data center networking and reduces costs.

The switch modules use the new-generation Huawei VRP operating system (OS) and support various data center features and high-performance stacking. The switch modules can work independently or with external large-capacity switches to construct data center networks that feature elastic, virtualization, and convergence.

High Performance

- Supports 1.28 Tbit/s switching capability and 960 Mpps forwarding capability.
- Provides 32 internal 10GE ports (two for each slot) and 24 external 10GE ports.
- Supports stacking of a maximum of four switch modules over internal 40GE ports on the midplane or external 10GE ports to provide the stacking bandwidth up to 200GE.
- Supports redundancy on the control plane and data plane in the stacking system to minimize the risk of single point of failures, which enhances the system reliability.

Flexible Deployment

- The built-in switch modules comply with the Internet Engineering Task Force (IETF) standard Transparent Interconnection of Lots of Links (TRILL) and support the combination of 10GE and GE compute nodes in a network. A maximum of more than 200 compute nodes can be deployed in the super large-scale Layer 2 network to support flexible service deployment and large-scale migration of virtual machines (VMs).
- The routing protocol Intermediate System to Intermediate System (IS-IS) and time to live (TTL) are used to prevent Layer 2 loops. This enhances network stability and speeds up network convergence.
- Data packets are quickly forwarded over the TRILL network based on the shortest path first (SPF) and equal-cost multi-path routing (ECMP) policies, resolving the problem of sub-optimal routes in the Spanning Tree Protocol (STP) and improving the bandwidth usage rate by 100%.
- The switch modules support a maximum of 16 layer-2 equal-cost paths based on TRILL, which notably improves load sharing capability for links and ensures smooth expansion of the network scale.

Convergence Enhanced Ethernet

- Supports fiber channel over Ethernet (FCoE) to implement convergence exchange for storage services, data services, and computing services, which reduces network construction costs and maintenance costs.
- Provides centralized FCoE/FC gateway deployment solutions. The centralized FCoE/FC gateway provides compatibility with the FC storage area network (SAN) and eliminates FC processing for the devices accessed from the Ethernet. This simplifies operation and maintenance.
- Supports the priority-based flow control (PFC), enhanced transmission selection (ETS), and data center bridging exchanging (DCBX) features for data centers, meeting requirements for low latency and no-packet loss for storage services and high-performance computing services.

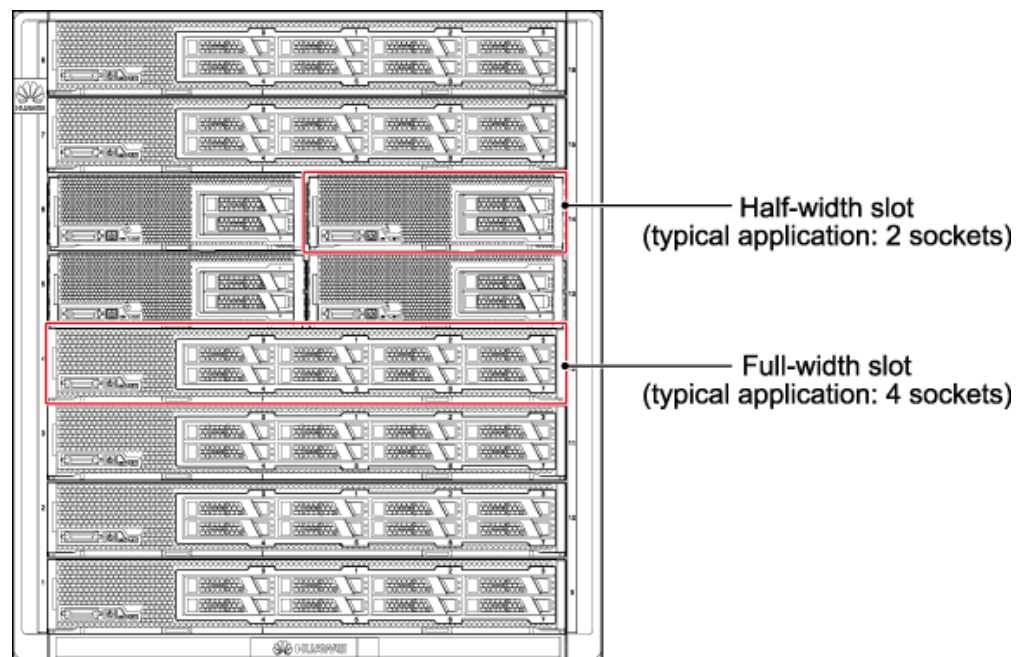
4.2 Flexible Resource Configuration

The E9000 support flexible configuration and expansion for computing, storage, and networking resources. This feature allows optimal resource configuration and meets demands for resources in various service application scenarios.

Flexible configuration for computing, storage, and network resources is described as follows:

- The chassis can be flexibly configured with half-width and full-width compute nodes and storage nodes, as shown in [Figure 4-1](#).

Figure 4-1 Flexible configuration



The flexible configuration of compute nodes and storage nodes is reflected in free combinations as follows:

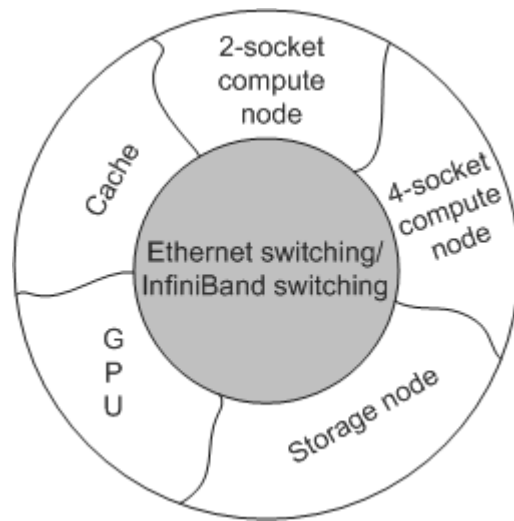
- Full-width compute nodes
- Half-width compute nodes
- Half-width compute nodes and half-width storage resource expansion modules
- Half-width compute nodes and acceleration components such as graphics processing units (GPUs), solid-state drives (SSDs), and nonvolatile dual in-line memory modules (NVDIMMs)

The configuration can be further optimized based on service requirements.

- Switch module slots can be configured to support Ethernet switching, straight out Ethernet, fiber channel (FC) switching, fiber channel over Ethernet (FCoE) switching, and InfiniBand switching to meet different networking requirements.

The compute nodes, storage nodes, switch modules, and acceleration components can be flexibly configured and allocated on demand over a high-speed network to meet different requirements. For example, a compute node can be configured with multiple GPUs, and InfiniBand switching can be added while Ethernet switching exists, as shown in [Figure 4-2](#).

Figure 4-2 Flexible resource expansion



4.3 Acceleration Components

The E9000 compute nodes support various acceleration components through dual in-line memory module (DIMM) slots, PCIe slots, mezzanine modules, and resource expansion modules. These acceleration components work with various application software to meet acceleration requirements for storage, network, and graphics processing applications.

The E9000 acceleration components and its functions are described as follows:

- The expanded graphics processing unit (GPU) cards and the virtual GPU technology apply to 2D and 3D graphics processing applications.
- The Peripheral Component Interconnect Express (PCIe) solid-state drive (SSD) cards increase the storage input/output operations per second (IOPS) by over 100 K.
- The intelligent network interface cards (iNICs) implement local switching for VMs, which notably improves performance and achieves security hardening.
- The nonvolatile dual in-line memory modules (NVDIMMs), working with cloud computing software, provide high-performance read and write cache to form highly cost-effective storage solutions with hard disk drives (HDDs).

4.4 Simple Deployment

The E9000 supports various software deployment modes, including remote system startup, remote or local virtual DVD-ROM drives, and automatic configuration restoration.

The E9000 supports the following software deployment modes:

- Remote preboot execution environment (PXE) startup: The compute nodes support remote PXE startup for the operating system (OS).
- Remote fiber channel (FC) storage area network (SAN) startup: The compute nodes support remote FC SAN startup.
- Local centralized virtual CD-ROM: The management modules support virtual media. You can install an OS and other application software for a server using a keyboard,

video, and mouse (KVM) after connecting to compute nodes and the management modules through a USB drive or any other media.

- Remote virtual CD-ROM: The E9000 supports remote virtual media through the management modules or BMC web user interface (WebUI) to remotely install the OS or application software on compute nodes.
- Automatic data saving and distributing for switch modules in the chassis: The switch modules automatically save its data configuration files to a local folder, and manage modules can obtain the data configuration file to implement configuration distribution and automatic configuration restoration for the switching system.

5 Typical Applications

5.1 Cloud Computing

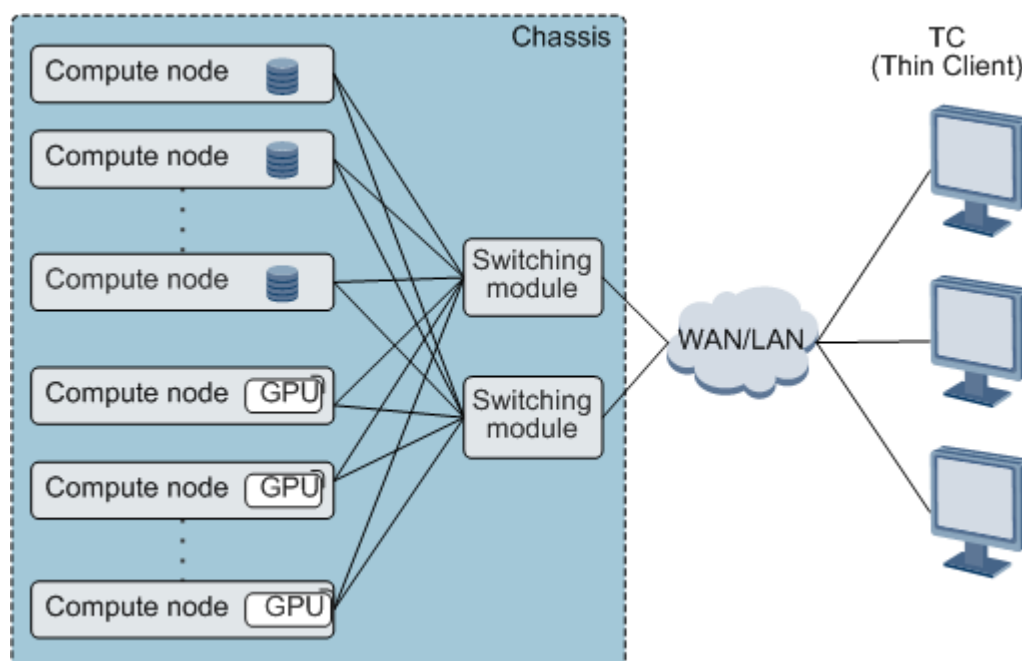
This topic describes the networking and configuration of the E9000 in the Desktop Cloud solution.

The Desktop Cloud is a Virtual Desktop Infrastructure (VDI) solution provided by Huawei. It is an infrastructure as a service (IaaS) solution that provides desktop services for users.

The E9000 integrates computing, storage, and networking resources. All the VDI applications can be deployed in an E9000 chassis to implement the Desktop Cloud solution.

Figure 5-1 shows the networking for the E9000 in the Desktop Cloud solution.

Figure 5-1 Desktop Cloud



In this example, the E9000 provides full-width compute nodes that can be configured with disks or graphics processing unit (GPU) cards. A compute node configured with disks supports more than 40 virtual machines (VMs). One E9000 supports hundreds of VMs, meeting application requirements of most enterprises. The E9000's features are described as follows:

- A compute node configured with disks provides high-reliability distributed storage up to dozens of TB. The compute nodes configured with nonvolatile random access memory (NVRAM) provide high-speed cache to improve the storage throughput.
- Compute nodes configured with GPU cards apply to professional graphics processing workstations.
- The E9000 has switch modules to provide multiple service switching planes. The E9000 is configured with GE switch modules to exchange data between compute nodes in a chassis. Expansion can be easily performed by cascading multiple chassis.

NOTE

- The distributed storage software provided in the Desktop Cloud solution fully utilizes the E9000 storage hardware to reduce procurement and maintenance costs on IP storage area network (SAN) and fiber channel (FC) SAN devices.
- The switch modules help reduce costs on external Ethernet switches and maintenance.

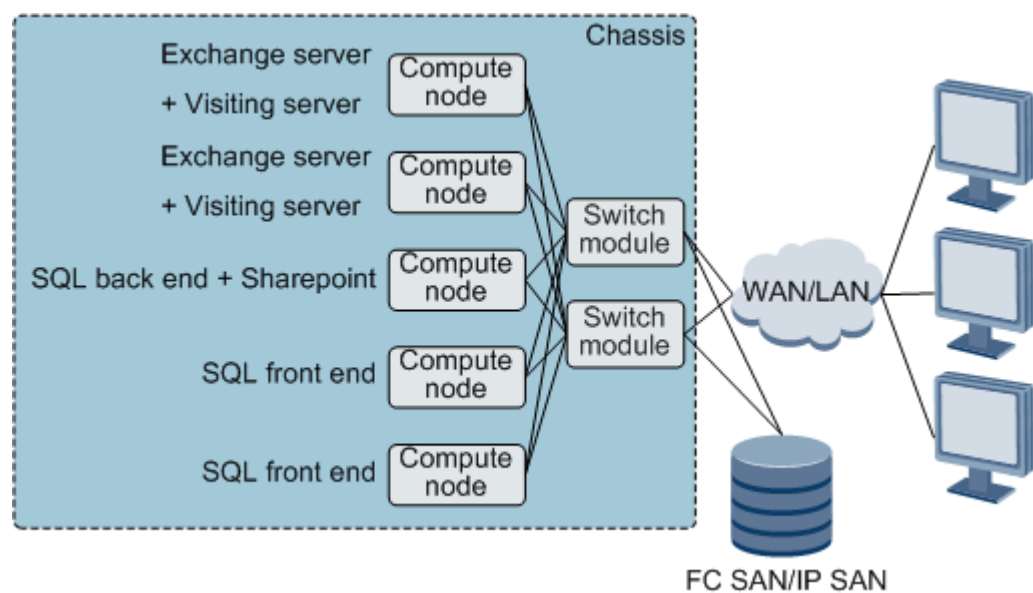
5.2 Traditional IT Applications

The topic uses the office automation (OA) FusionCube solution as an example to describe the configuration and networking of the E9000 for traditional IT applications.

The E9000 implements OA, enterprise resource planning (ERP), and business intelligence (BI) by creating multiple VMs on compute nodes and deploying web servers, application servers (middleware), and databases on VMs.

Figure 5-2 shows the networking of the E9000 in the OA FusionCube solution. OA FusionCube deploys the Microsoft office systems such as the Exchange mail system, SharePoint collaboration office system, and SQL Server to one set of devices.

Figure 5-2 OA FusionCube



In the OA FusionCube scenario:

- Data is stored on fiber channel (FC) storage area network (SAN) or IP SAN.
- Multiple virtual machines are deployed on half-width compute nodes. Service processes, such as Microsoft SharePoint, Exchange, and SQL Server, are deployed on VMs to create the large-scale mail and office collaboration environment.

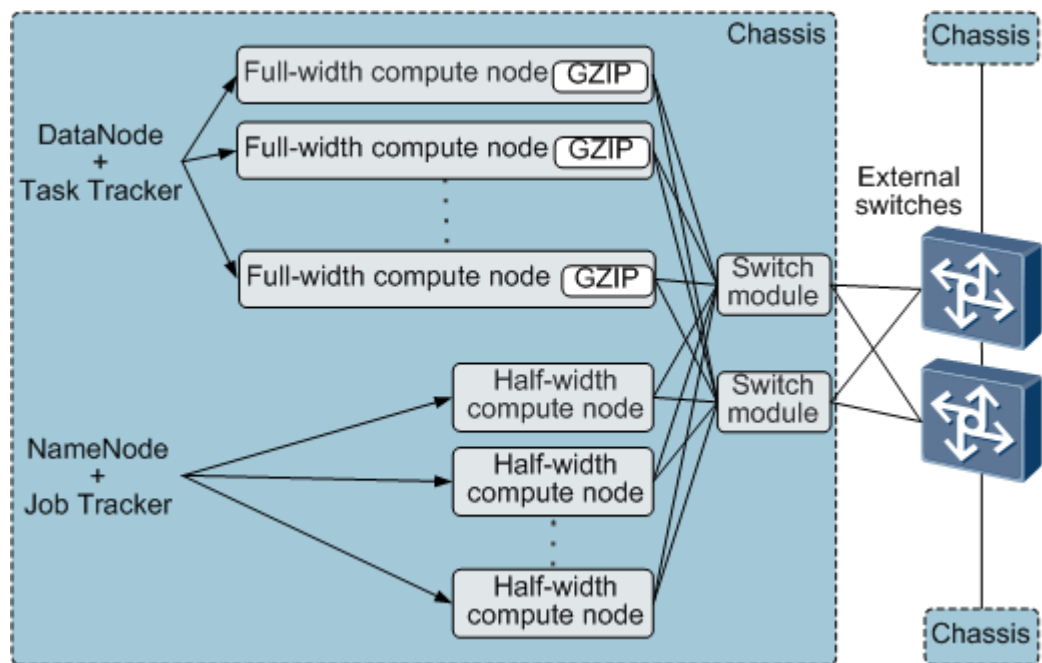
5.3 Hadoop

The following describes the E9000 configuration and network in the Hadoop application scenario.

Hadoop is a distributed data processing system. It supports large-capacity data storage and analysis capability to provide high-reliability, scalable, and cost-effective data storage and analysis services.

Figure 5-3 shows the E9000 in the network of the Hadoop application scenario.

Figure 5-3 Hadoop big data mining



NameNode: used to manage the file system's namespaces, index, and metadata and support backup.	DataNode: used to store data blocks of each file and report the storage status to the NameNode periodically.
JobTracker: manages job scheduling for the MapReduce.	TaskTracker: executes a task assigned by the JobTracker.

The following describes the E9000 technical specifications in the Hadoop computing application scenario:

- A master and a slave NameNodes and a master and a slave JobTrackers are deployed on a half-width compute node.
- A full-width compute node that is deployed with the DataNode and TaskTracker has the following features:
 - A full-width compute node supports fifteen 2.5-inch disks to support massive-data storage for the Hadoop Distributed File System (HDFS).
 - Each compute node is configured with two eight-core CPUs and dual in-line memory modules (DIMMs) with the capacity of 768 GB to provide powerful computing and analyzing capability.
- The E9000 chassis provides built-in 10GE switch modules. The switching capability of 10GE is available for cascaded chassis, which provides high-bandwidth and short-latency transmission channels for each node and meets throughput requirements for large-scale data mining.
- As requirements for big-data analysis develop rapidly, you can add more E9000 chassis to establish the computing cluster with hundreds of nodes to meet requirements for super large-scale data mining.

5.4 High Performance Computing

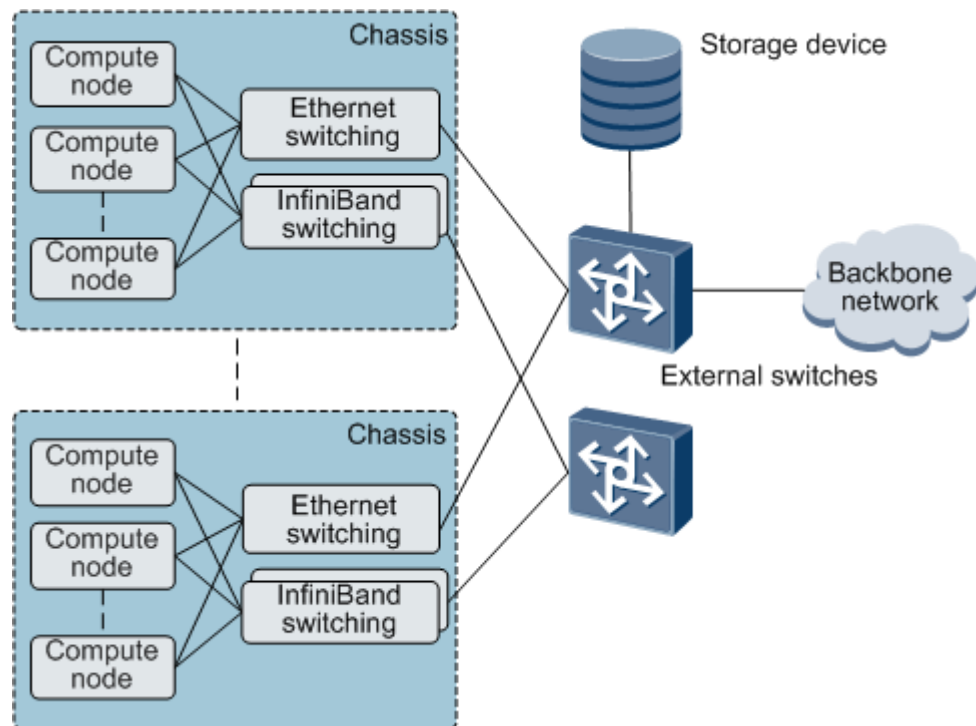
The E9000 incorporates InfiniBand switching to provide high-performance computing.

High-performance computing is used to solve difficult computing problems, such as hydrodynamics, collision simulation, seismic processing, graphics comparison, and price modeling, that require a lot of computing resources. Multiple E9000 chassis are cascaded over InfiniBand. The compute nodes constitute computing clusters. Massive data is divided and distributed to multiple compute nodes for concurrent processing.

Figure 5-4 shows the networking of the E9000 for high-performance computing. Each two of the four switch modules in the chassis form an Ethernet switching network and an InfiniBand switching network respectively.

- The Ethernet switching network connects to the external backbone network. It receives data computing tasks and returns the computing results.
- The InfiniBand switching network serves as the internal computing cluster network. It provides high-bandwidth and low-latency parallel computing network resources.

Figure 5-4 High-performance computing



6 System Ports

6.1 Management Ports

This topic describes the E9000 hardware management ports and software management interfaces.

Hardware Management Ports

[Table 6-1](#) shows the E9000 hardware management ports.

Table 6-1 Hardware management ports

Port Name	Port Type	Standard and Protocol	Description	Cable Routing
Management and maintenance network port	RJ45	1000BASE-T	One on each MM910	Cables are routed out through the rear.
Chassis stacking network port	RJ45	1000BASE-T	One on each MM910	Cables are routed out through the rear.
Management and maintenance serial port	RJ45	RS232	<ul style="list-style-type: none"> ● One on each MM910 ● At least one on each switch module 	Cables are routed out through the rear.
			One provided by each compute node over a high-density cable	Cables are routed out through the front.

Port Name	Port Type	Standard and Protocol	Description	Cable Routing
Power distribution and management port	RJ45	RS485	One on each MM910	Cables are routed out through the rear.
Local KVM port	USB VGA	USB 1.0/1.1/2.0 VGA	One video graphics array (VGA) port and two USB ports provided on the panel of each MM910.	Cables are routed out through the rear.
			One VGA port and three USB ports provided by each compute node over a high-density cable	Cables are routed out through the front.
USB port	USB	USB 1.0/1.1/2.0	One or two USB ports on the printed circuit board (PCB) of each compute node, for connecting to USB flash drives or flash cards	-

Software Management Interfaces

[Table 6-2](#) and [#EN-US_TOPIC_0073987727/table4809124132610](#) shows the E9000 software management interfaces.

Table 6-2 Software management interfaces (MM910)

Interface Type	Standard and Protocol	Description
CLI	-	Command-line interfaces (CLIs), including the serial port, Telnet, and Secure Shell (SSH). The following components provide the CLIs: <ul style="list-style-type: none"> ● Management modules ● Switch modules ● BMC of each compute node
SNMP	SNMP v1/v2c/v3	The following components provide the Simple Network Management Protocol (SNMP) interfaces: <ul style="list-style-type: none"> ● Management modules ● Switch modules ● BMC of each compute node

Interface Type	Standard and Protocol	Description
WebUI	HTTP1.0/ HTTP1.1	MM910 and compute node BMC provides web user interfaces (WebUIs).
IPMI	RMCP/ RMCP+	Compute node BMC provides the remote Intelligent Platform Management Interface (IPMI).
HMM	Redfish 1.0	RESTful interfaces used to manage and configure the compute nodes and chassis.

6.2 Service Ports

This topic describes the E9000 service ports in terms of its names, types, standards, protocols, quantity, and cable routing.

Table 6-3 describes the service ports on the E9000.

Table 6-3 Service ports

Port Name	Port Type	Standard and Protocol	Quantity	Cable Routing
GE electrical port	RJ45	1000 BASE-T	<ul style="list-style-type: none">● 32 on each CX116● 12 on each CX110● 4 on each CX910● 4 on each CX911● 4 on each CX912● 4 on each CX913● 12 on each CX111● 12 on each CX915	Cables are routed out through the rear.

Port Name	Port Type	Standard and Protocol	Quantity	Cable Routing
10GE optical port	SFP+	10GBASE-SR/LR/CR	<ul style="list-style-type: none"> ● 4 on each CX110 ● 16 on each CX310 ● 16 on each CX311 ● 24 on each CX312 ● 16 on each CX910 ● 16 on each CX911 ● 16 on each CX912 ● 16 on each CX913 ● 32 on each CX317 ● 32 on each CX318 ● 8 on each CX320 ● 4 on each CX111 ● 4 on each CX915 	Cables are routed out through the rear.
40GE optical port	QSFP+	40GBASE-SR4/CR4	<ul style="list-style-type: none"> ● 8 on each CX710 ● 2 on each CX320 	Cables are routed out through the rear.
8 Gbit/s FC optical port	FC SFP+	FC-PI-4	<ul style="list-style-type: none"> ● 8 on each CX311 ● 8 on each CX911 ● 8 on each CX912 ● 8 on each CX913 ● 8 on each CX210 ● 8 on each CX915 ● 4 on each CX320 	Cables are routed out through the rear.
16 Gbit/s FC optical port	FC SFP+	FC-PI-5	8 on each CX220	Cables are routed out through the rear.
InfiniBand optical port	IB QSFP+	IBTA	<ul style="list-style-type: none"> ● 18 on each CX610 ● 18 on each CX611 ● 18 on each CX620 	Cables are routed out through the rear.

7 Reliability

7.1 Fault Prevention

Faults may occur in a device after long-term operation. The E9000 uses methods such as derating, fault warning, and sub-health check to prevent faults.

Passive Backplane

The E9000 chassis uses a highly reliable passive backplane that has no active component except connectors, ensuring high reliability.

Derating Design

The derating design ensures that the stresses of components in the device are within the rated ranges, which slows performance deterioration, prolongs the service life, and reduces faults. The E9000 adopts the derating design for the electrical stress and thermal stress of components to enhance the reliability.

Fault Warning

Fault warnings are reported prompting you to prepare spare parts early, which shortens maintenance time and improves system availability. The E9000 reports fault warnings for key components such as disks and fan modules.

Sub-health Check

Sub-health is the status between healthy and faulty conditions. Services are affected if you do not handle sub-health problems properly. The E9000 supports sub-health check for key components such as dual in-line memory modules (DIMMs) and network ports and allows you to set alarm thresholds. When status values of components exceed the thresholds, alarms are reported prompting you to handle the sub-health problems immediately.

7.2 Fault Tolerance

The impact of device faults on services reflects the system fault tolerance capability. The E9000 adopts the redundancy design for all components to prevent single point of failures.

Compute modules provide the fault tolerance capability to ensure normal system running if a single CPU or DIMM fails.

Redundancy Design

The E9000 provides redundancy on slots, switch modules, management modules, fan modules, and power supply modules.

- Two neighboring slots provide heartbeat and backup channels for active and standby modules.
- Switch modules use a 1+1 redundancy design. Each pair of switch modules works in active/standby mode or load sharing mode. Services running on the system are not affected if either switch module fails.
- Management modules use a 1+1 redundancy design. Two management modules work in active/standby mode. Device management is not affected if either management module fails.
- Fan modules provide redundancy and automatic speed adjustment.
 - The 14 fan modules are separated into three zones. Each fan module contains two fan units. If one fan module in a zone fails or a fan unit of the fan module fails, heat dissipation effect is not affected.
 - The fan modules automatically adjust their speed based on the ambient temperatures to ensure that components continuously operate at a normal temperature, which ensures long-term system reliability.
- Power supply modules use a 3+3 redundancy design. Power supplied to the system is not affected if one to three power supply modules fail.

Fault Tolerance of Compute Nodes

Compute nodes provide fault tolerance for internal components:

- If one CPU or one DIMM fails, the compute node is still proper to process services. However, its performance may slightly deteriorate.
- Compute nodes implement memory scrubbing to read its own memory when CPUs are idle to detect and fix errors.
- Memory performs error checking and correcting (ECC) to locate and correct errors, which increases reliability for data storage and security and stability for memory use.

7.3 Easy Maintenance

You can locate faulty components by observing indicator status and replace the faulty hot-swappable components. This function facilitates maintenance and helps rectify faults quickly.

Indicators

Components such as compute nodes, storage nodes, disks, network ports, power supply modules, and fan modules provide indicators on the panel to show component operating status.

Hot Swap

The following components support hot swap for onsite replacement and maintenance:

- Compute nodes
- Storage nodes
- Management modules
- Switch modules
- Pass-through modules
- Disks
- Power supply modules
- Fan modules

8 Technical Specifications

8.1 Performance Specifications

This section describes the performance specifications of the E9000 compute nodes and switch modules.

The E9000 components include the compute nodes, pass-through modules, switch modules, management modules, and mezzanine cards. [Table 8-1](#) describes the component models and specifications.

Table 8-1 Hardware list

Category	Model	Specifications
Chassis	E9000	A 12U chassis, which is equipped with a high-performance midplane and provides 16 half-width or eight full-width front slots.
Compute node	CH121	A half-width compute node with one or two Intel® Xeon® E5-2600/2600 v2 (Sandy Bridge-EP or Ivy Bridge-EP) processors, up to 24 DDR3 DIMMs, two 2.5-inch HDDs or SSDs, one PCIe x16 standard card (x8 bandwidth), and two PCIe x16 mezzanine cards.
	CH121 V3	A half-width compute node with one or two Intel® Xeon® E5-2600 v3 (Haswell-EP) or E5-2600 v4 (Broadwell-EP) processors, up to 24 DDR4 DIMMs, two 2.5-inch HDDs or SSDs, one PCIe x16 standard card (x16 bandwidth) and two PCIe x16 mezzanine cards.
	CH121 V5	A half-width compute node with one or two Intel® Xeon® (Purley Skylake) processors, up to 24 DDR4 DIMMs, two 2.5-inch HDDs or SSDs, one PCIe x16 standard card (x16 bandwidth), and two PCIe x16 mezzanine cards.

Category	Model	Specifications
	CH121L V5	A half-width compute node with one or two Intel® Xeon® Scalable (Bronze 3100, Silver 4100, Gold 5100/6100, or Platinum 8100) processors, up to 24 DDR4 DIMMs, two 2.5-inch HDDs or SSDs, and two PCIe x16 mezzanine cards.
	CH140	A half-width compute node, which consists of two child compute nodes. A half-width compute node can contain two PCIe x8x8 mezzanine cards. A child compute node can contain one or two Intel® Xeon® E5-2600/2600 v2 (Sandy Bridge-EP or Ivy Bridge-EP) processors, up to eight DDR3 DIMMs, and one 2.5-inch HDD or SSD.
	CH140 V3	A half-width compute node, which consists of two child compute nodes. A half-width compute node can contain two PCIe x8x8 mezzanine cards. A child compute node can contain one or two Intel® Xeon® E5-2600 v3 (Haswell-EP) or Intel® Xeon® E5-2600 v4 (Broadwell-EP) processors, up to eight DDR4 DIMMs, and one 2.5-inch HDD or SSD.
	CH220	A full-width I/O expansion compute node with one or two Intel® Xeon® E5-2600/2600 v2 (Sandy Bridge-EP or Ivy Bridge-EP) processors, up to 24 DDR3 DIMMs, two 2.5-inch HDDs or SSDs, four PCIe x16 standard cards (x8 bandwidth), and two PCIe x16 mezzanine cards.
	CH220 V3	A full-width I/O expansion compute node with one or two Intel® Xeon® E5-2600 v3 (Haswell-EP) or E5-2600 v4 (Broadwell-EP) processors, up to 16 DDR4 DIMMs, two 2.5-inch HDDs or SSDs, two PCIe x16 cards, four PCIe x8 cards, two PCIe x16 mezzanine cards, and two PCIe x8 mezzanine cards.
	CH221 V5	A full-width I/O expansion compute node with one or two Intel® Xeon® (Purley Skylake) processors, up to 24 DDR4 DIMMs, two 2.5-inch HDDs or SSDs, two PCIe x16 standard cards (PCIe 3.0 x 16 + PCIe 3.0 x 8), and two PCIe x16 mezzanine cards.
	CH221	A full-width I/O expansion compute node with one or two Intel® Xeon® E5-2600/2600 v2 (Sandy Bridge-EP or Ivy Bridge-EP) processors, up to 24 DDR3 DIMMs, two 2.5-inch HDDs or SSDs, two PCIe x16 standard cards, and two PCIe x16 mezzanine cards.

Category	Model	Specifications
	CH222	A full-width storage expansion compute node with one or two Intel® Xeon® E5-2600/2600 v2 (Sandy Bridge-EP or Ivy Bridge-EP) processors, up to 24 DDR3 DIMMs, fifteen 2.5-inch HDDs or SSDs, one PCIe x16 standard card (x8 bandwidth), and two PCIe x16 mezzanine cards.
	CH222 V3	A full-width storage expansion compute node with one or two Intel® Xeon® E5-2600 v3 (Haswell-EP) or E5-2600 v4 (Broadwell-EP) processors, up to 24 DDR4 DIMMs, fifteen 2.5-inch HDDs or SSDs, one PCIe x16 standard card (x16 bandwidth), and two PCIe x16 mezzanine cards.
	CH225 V3	A full-width compute node with one or two Intel® Xeon® E5-2600 v3 (Haswell-EP) or E5-2600 v4 (Broadwell-EP) processors, up to 24 DDR4 DIMMs, two 2.5-inch HDDs, twelve 2.5-inch NVMe PCIe SSDs, and four PCIe x16 mezzanine cards.
	CH225 V5	A full-width 2-socket compute node with two Intel® Xeon® (Purley Skylake) series processors, up to 24 DDR4 DIMMs, two 2.5-inch SAS/SATA/M.2 hard disks, 12 SAS/SATA/NVMe hard disks, and four PCIe x16 mezzanine cards. The CH225 V5 allows mixed configuration and hot swap of HDDs and SSDs. (NVMe PCIe SSDs support scheduled hot swap but not surprise hot swap.)
	CH240	A full-width compute node with up to four Intel® Xeon® E5-4600/4600 v2 (Sandy Bridge-EP, IvyBridge-EP) processors, 48 DDR3 DIMMs, eight 2.5-inch HDDs or SSDs, and two PCIe x16 mezzanine cards.
	CH242	A full-width compute node with up to four Intel® Xeon® E7-4800/8800 (Westmere) processors, 32 DDR3 DIMMs, eight 2.5-inch HDDs or SSDs, one PCIe x16 full-height half-length SSD card (x8 bandwidth), and four PCIe mezzanine cards (mezzanine 1 with x16 bandwidth, and the others with x8 bandwidth).

Category	Model	Specifications
	CH242 V3	<p>A full-width compute node with up to four Intel® Xeon® E7-4800 v2/8800 v2 (Ivy Bridge-EX) processors and 32 DDR3 DIMMs.</p> <p>The CH242 V3 has two types of specifications:</p> <ul style="list-style-type: none"> ● CH242 V3 8HDD Supports HDD or SSD disks, and provides two customized PCIe cards. ● CH242 V3 4HDD Supports HDD or SSD disks, and provides one full-height, half-length standard PCIe card and two customized PCIe cards.
	CH242 V3 DDR4	<p>A full-width compute node with up to four Intel® Xeon® E7-4800 v3/8800 v3 (Haswell-EX) or E7-4800 v4/8800 v4 (Broadwell-EX) processors, 32 DDR4 DIMMs, eight 2.5-inch HDDs/SSDs (or four HDDs/SSDs and four NVMe PCIe SSDs), two customized PCIe cards, and four PCIe x16 mezzanine cards.</p>
	CH242 V5	<p>A full-width compute node with up to four Intel® Xeon® Scalable (Gold 5100/6100 or Platinum 8100) processors with up to 28 cores, 48 DDR4 DIMMs, four 2.5-inch HDDs or SSDs, one half-height half-length PCIe riser card, one half-height half-length PCIe standard card, and four PCIe x16 mezzanine cards.</p>
Pass-through module	CX116	<p>A GE pass-through module, which provides 32 internal GE channels (two for each half-width slot) that connect to each front slot through the midplane and offers 32 external GE electrical ports.</p>
	CX317	<p>A 10GE pass-through module, which provides 32 internal 10GE channels (two for each half-width slot) that connect to each front slot through the midplane and offers 32 external 10GE optical ports.</p>
	CX318	<p>A 10GE pass-through module, which provides 32 internal 10GE channels (two for each half-width slot) that connect to each front slot through the midplane and offers 32 external 10GE optical ports.</p>

Category	Model	Specifications
Switch module	CX910	A 10GE switch module, which provides GE and 10GE switching. It provides forty 10GE channels (three for each of half-width slots 1 to 8, two for each of half-width slots 9 to 16), sixteen GE channels (one for each half-width slot), and two 40GE (for connecting two switch modules) channels for the internal components, and sixteen 10GE optical ports and four GE electrical ports for the external network. It provides Layer-2 or Layer-3 switching capability.
	CX911	A 10GE/FC multi-plane switch module, which provides GE, 10GE, FC, and FCoE switching. It provides forty 10GE channels (three for each of half-width slots 1 to 8, two for each of half-width slots 9 to 16), sixteen GE channels (one for each half-width slot), twelve 10 Gbit/s FCoE channels, and four 8 Gbit/s FC channels for internal components, and sixteen 10GE optical ports, four GE electrical ports, and eight 8 Gbit/s FC optical ports. It provides Layer-2 or Layer-3 switching capability.
	CX912	A 10GE/FC multi-plane switch module, which provides GE, 10GE, FC, and FCoE switching. It provides forty 10GE channels (three for each of half-width slots 1 to 8, two for each of half-width slots 9 to 16), sixteen GE channels (one for each half-width slot), sixteen 8 Gbit/s FC channels for internal components, and sixteen 10GE optical ports, four GE electrical ports, and eight 8 Gbit/s FC optical ports. It provides Layer-3 switching capability.
	CX913	A 10GE switch module, which provides GE and 10GE switching and FC pass-through ports. It provides forty 10GE channels (three for each of half-width slots 1 to 8, two for each of half-width slots 9 to 16), sixteen GE channels (one for each half-width slot), and eight 8 Gbit/s FC channels (one for each of slots 1 to 8) for internal components, and sixteen 10GE optical ports, four GE electrical ports, and eight 8 Gbit/s FC optical ports. It provides Layer-2 or Layer-3 switching capability.

Category	Model	Specifications
	CX916	A 10GE/FC multi-plane switch module, which uses 10GE, 25GE, and 40GE ports to connect to aggregation switches. It provides an Ethernet switching plane and an FC switching plane. Its internal ports are thirty-two 10GE ports (two for each half-width slot) and sixteen 16 Gbit/s FC ports. Its external ports are eight 25GE optical ports, two 40GE optical ports, and eight 16 Gbit/s FC ports. It provides Layer-2 or Layer-3 switching capability.
	CX310	A 10GE converged switch module, which provides 1.28 Tbit/s switching capacity. It provides thirty-two 10GE channels (two for each half-width slot) and one 40GE (for connecting two switch modules) channel for internal components, and sixteen 10GE optical ports for external components. The maximum stacking bandwidth is 160 GE. It provides Layer-3 switching capability.
	CX311	A 10GE/FCoE converged switch module, which provides 1.28 Tbit/s switching capacity. It provides thirty-two 10GE channels (two for each half-width slot) and one 40GE (for connecting two switch modules) channel for internal components, and sixteen 10GE optical ports and eight 8 Gbit/s FC channels for external components. The maximum stacking bandwidth is 160 GE. It provides Layer-3 switching capability.
	CX312	A 10GE converged switch module, which provides 1.28 Tbit/s switching capacity. It provides thirty-two 10GE channels (two for each half-width slot) and one 40GE (for connecting two switch modules) channel for internal components, and twenty-four 10GE optical ports for external components. The maximum stacking bandwidth is 200 GE. It provides Layer-3 switching capability.
	CX110	A GE switch module that provides the switching capacity of 336 Gbit/s. This switch module provides the following ports: 32 internal GE ports (two ports for each half-width slot), two internal 40GE ports for connecting to another switch module, and four external 10GE optical ports and 12 external GE electrical ports. The maximum stack bandwidth is 80GE. It provides Layer-3 switching capability.

Category	Model	Specifications
	CX610	An InfiniBand (IB) switch module, which provides sixteen internal FDR ports (one for each half-width slot) and eighteen external QSFP+ optical ports for transmitting FDR10 signals. The maximum port speed is 40 Gbit/s.
	CX611	An InfiniBand switch module with 16 internal FDR ports (one port for each half-width slot) and 18 external QSFP+ optical ports for transmitting FDR14 signals. The maximum port speed is 56 Gbit/s.
	CX111	It is a GE switch module, providing the switching capacity of 172 Tbit/s. The switch module provides 32 internal GE ports (two ports for each half-width slot). These ports are converted into four external 10GE optical ports and 12 external GE electrical ports.
	CX210	It is an FC switch module, providing the switching capacity of 172 Tbit/s. The switch module provides 16 internal 8 Gbit/s FC ports. These ports are converted into eight external 8 Gbit/s FC ports.
	CX915	It is a GE/FC multi-plane switch module, providing GE and FC switching capability. The switch module provides 32 internal GE ports (two ports for each half-width slot) and 16 internal 8 Gbit/s FC ports. These ports are converted into four external 10GE optical ports, 12 GE electrical ports, and eight 8 Gbit/s FC optical ports.
	CX220	It is an FC switch module, providing the switching capacity of 384 Tbit/s. The switch module provides 16 internal 16 Gbit/s FC ports. These ports are converted into eight external 16 Gbit/s FC ports.
	CX710	A 40GE converged switch module, which provides 2.08 Tbit/s switching capacity. It provides sixteen 40GE channels (one for each half-width slot), two 40GE (for connecting two switch modules) channels for internal components, and eight 40GE optical ports for external connections. The 40GE port on the panel can be split into four 10GE ports through a splitter cable.

Category	Model	Specifications
	CX320	A 10GE/FCoE converged switch module, which provides 10 Gbit/s and FCoE switching capacity. Its internal ports are thirty-two 10GE ports (two for each half-width slot), one 40GE port (for connecting to another switch module), and two GE ports (for connecting to the MM910). Its external ports are eight 10GE optical ports and two 40GE optical ports. It provides two PIC slots that support up to eight 10GE/8 Gbit/s FC unified ports. It provides Layer-2 or Layer-3 switching capability. The largest stack bandwidth is 240 GE.
	CX620	An InfiniBand switch module with 16 internal EDR ports (one port for each half-width slot) and 18 external QSFP+ optical ports (up to 100 Gbit/s) for transmitting EDR signals
	CX621	An InfiniBand switch module with 16 internal EDR ports (one port for each half-width slot) and 18 external QSFP+ optical ports (up to 100 Gbit/s) for transmitting EDR signals
	CX820	An OPA switch module with 16 internal OPA ports (one port for each half-width slot) and 20 external OPA ports. Each port supports up to 100 Gbit/s.
Management module	MM910	A management module, which manages the chassis and modules using the keyboard, video, and mouse (KVM).
Fan module	-	<p>A chassis houses a maximum of 14 fan modules which are separated into three zones. Each fan module contains two fan units. Every zone is configured in N+1 redundancy, which ensures that the heat dissipation effect is not affected even if a fan or a fan module fails. When fan modules are fully configured, the maximum heat dissipation power consumption for the slots is as follows:</p> <ul style="list-style-type: none"> ● Compute node slot: 35°C (95°F) <ul style="list-style-type: none"> - Half-width slot: 900 W - Full-width slot: 1800 W ● Switch module slot: 280 W ● Management module slot: 80 W

Category	Model	Specifications
PSU	-	<p>A chassis houses a maximum of six PSUs. When PSUs are fully configured, the rated power of the chassis is 9000 W to 15,000 W. The PSUs include DC and AC PSUs. The following information lists the rated voltage of each type of PSU:</p> <ul style="list-style-type: none"> ● DC: -48 V to -60 V ● AC: 100 V AC to 130 V AC, 200 V AC to 220 V AC, and 220 V AC to 240 V AC (50 Hz or 60 Hz) <p>NOTE All the PSUs support double-pole/neutral fusing.</p>
Mezzanine card (installed on compute nodes)	MZ110	<p>4-port GE NIC (mezzanine card)</p> <p>The mezzanine card can work with the following recommended switch modules:</p> <ul style="list-style-type: none"> ● CX116 ● CX110
	MZ111	<p>4-port GE dual-chip NIC (mezzanine card)</p> <p>The mezzanine card can work with the following recommended switch modules:</p> <ul style="list-style-type: none"> ● CX116 ● CX110
	MZ312	<p>4-port 10GE dual-chip NIC (mezzanine card)</p> <p>The mezzanine card can work with the following recommended switch modules:</p> <ul style="list-style-type: none"> ● CX317 ● CX318 ● CX310 ● CX320
	MZ510	<p>2-port 10GE CNA (mezzanine card)</p> <p>The mezzanine card can work with the following recommended switch modules:</p> <ul style="list-style-type: none"> ● CX317 ● CX318 ● CX310 ● CX311 ● CX320

Category	Model	Specifications
	MZ512	4-port 10GE CNA (dual-chip mezzanine card) The mezzanine card can work with the following recommended switch modules: <ul style="list-style-type: none"> ● CX317 ● CX318 ● CX310 ● CX311 ● CX320
	MZ520	2-port 10GE CNA (mezzanine card) The mezzanine card can work with the following recommended switch modules: <ul style="list-style-type: none"> ● CX317 ● CX318 ● CX310 ● CX311 ● CX320
	MZ522	4-port 10GE CNA (dual-chip mezzanine card) The mezzanine card can work with the following recommended switch modules: <ul style="list-style-type: none"> ● CX317 ● CX318 ● CX310 ● CX311 ● CX320
	MZ610	2-port IB quad data rate (QDR) mezzanine card The mezzanine card can work with the CX610 and CX611.
	MZ611	2-port IB fourteen data rate (FDR) mezzanine card The mezzanine card can work with the CX610, CX611, and CX620.
	MZ612	2-port IB FDR mezzanine card The mezzanine card can work with the CX610, CX611, CX620, and CH140 V3.
	MZ613	2-port IB QDR mezzanine card The mezzanine card can work with the CX610, CX611, and CH140 V3.

Category	Model	Specifications
	MZ220	2-port 16 Gbit/s FC HBA (mezzanine card) The mezzanine card can work with the following recommended switch modules: <ul style="list-style-type: none"> ● CX210 ● CX220
	MZ310	2-port 10GE NIC (mezzanine card) The mezzanine card can work with the following recommended switch modules: <ul style="list-style-type: none"> ● CX310 ● CX320 ● CX317 ● CX318
	MZ620	2-port IB enhanced data rate (EDR) mezzanine card The mezzanine card can work with the following recommended switch modules: <ul style="list-style-type: none"> ● CX611 ● CX620
	MZ622	2-port IB EDR mezzanine card The mezzanine card can work with the following recommended switch modules: <ul style="list-style-type: none"> ● CX611 ● CX620
	MZ710	2-port 40GE RDMA over Converged Ethernet (RoCE) mezzanine card The mezzanine card can work with the CX710 switch module.
	MZ821	Single-port Intel Omni-Path Fabric (OPF) module with one 100 Gbit/s Omni-Path Host Fabric Interface (HFI). The mezzanine card can work with the CX820 switch module.
	MZ912	4-port multi-function mezzanine card (2 x 10GE +2 x 16 Gbit/s FC) The mezzanine card can work with the CX912 switch module.

8.2 PSU and Power Specifications

This topic describes the technical specifications of the E9000 power supply units (PSUs) and power.

The E9000 provides six slots for installing PSUs. [Table 8-2](#) describes the PSUs and power.

Table 8-2 PSU and power specifications

PSU Type	Input Parameter	Maximum Output Power	Output Voltage	Power Cable
3000 W AC PSU	100 V to 130 V AC 50 Hz/60 Hz 16 A	Six AC PSUs support the N+N or N+1 redundancy mode, and each provides the output power of 1200 W. The system provides a maximum output power of 3600 W (3+3) or 6000 W (5+1).	12.3 V DC	16 A power cables complying with IEC320 C19 and IEC320 C20
	200 V to 220 V AC 50 Hz/60 Hz 16 A	Six AC PSUs support the N+N or N+1 redundancy mode, and each provides the output power of 2500 W. The system provides a maximum output power of 7500 W (3+3) or 12500 W (5+1).		
	220 V to 240 V AC 50 Hz/60 Hz 16 A	Six AC PSUs support the N+N or N+1 redundancy mode, and each provides the output power of 3000 W. The system provides a maximum output power of 9000 W (3+3) or 15000 W (5+1).		

PSU Type	Input Parameter	Maximum Output Power	Output Voltage	Power Cable
2000 W AC PSU	100 V to 130 V AC 50 Hz/60 Hz 10 A	Six AC PSUs support the N+N or N+1 redundancy mode, and each provides the output power of 800 W. The system provides a maximum output power of 2400 W (3+3) or 4000 W (5+1).	12.3 V DC	10 A power cables complying with IEC320 C13 and IEC320 C14
	200 V to 220 V AC 50 Hz/60 Hz 10 A	Six AC PSUs support the N+N or N+1 redundancy mode, and each provides the output power of 1800 W. The system provides a maximum output power of 5400 W (3+3) or 9000 W (5+1).		
	220 V to 240 V AC 50 Hz/60 Hz 10 A	Six AC PSUs support the N+N or N+1 redundancy mode, and each provides the output power of 2000 W. The system provides a maximum output power of 6000 W (3+3) or 10000 W (5+1).		
DC PSU	-48 V to -60 V DC 63 A	Six DC PSUs support the N+N or N+1 redundancy mode, and each provides the output power of 2500 W. The system provides a maximum output power of 7500 W (3+3).	12.3 V DC	OT6-4 terminal

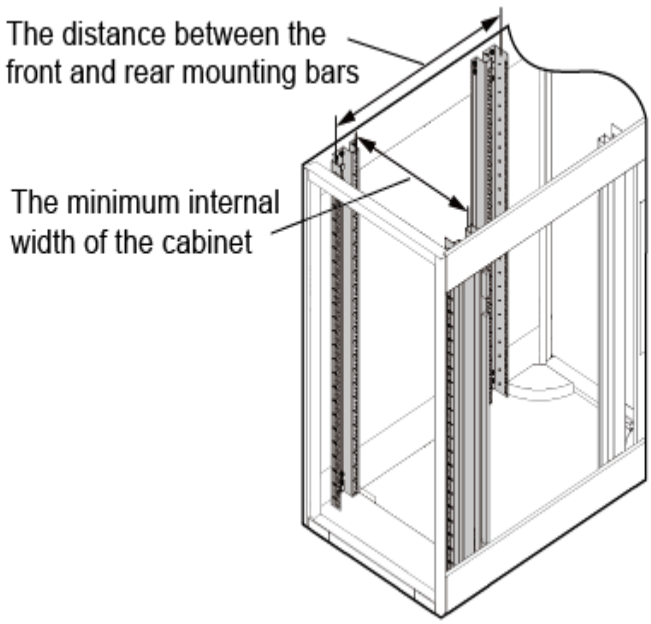
8.3 Environmental Specifications

This section describes the environmental specifications of the E9000 in terms of dimensions, weight, temperature, relative humidity, altitude, noise, operational vibration, and operational shock.

Table 8-3 describes the environmental requirements of the E9000.

Table 8-3 Environmental specifications

Item	Specifications
Chassis dimensions (H x W x D)	530.6 mm x 442 mm x 840 mm (20.89 in. x 17.40 in. x 33.07 in.)

Item	Specifications
<p>Cabinet dimensions (H x W x D)</p>	<ul style="list-style-type: none"> ● For a 1200 mm (47.24 in.) deep cabinet, the minimum internal width of the cabinet is greater than 473 mm (18.62 in.); the distance between the front rack rail and the front inner side is 65 mm (2.56 in.) to 115 mm (4.53 in.); the distance between the front and rear mounting bars is from 689 mm (27.13 in.) to 929 mm (36.57 in.). The recommended guide rail is 21240817, which does not occupy extra space. ● For a 1100 mm (43.31 in.) deep cabinet, the minimum internal width of the cabinet is greater than 473 mm (18.62 in.); the distance between the front rack rail and the front inner side is 65 mm (2.56 in.) to 115 mm (4.53 in.); the distance between the front and rear mounting bars is from 689 mm (27.13 in.) to 929 mm (36.57 in.). The recommended guide rail is 21240817, which does not occupy extra space. ● For a 1000 mm (39.37 in.) deep cabinet, the minimum internal width of the cabinet is greater than 449 mm (17.68 in.); the distance between the front rack rail and the front inner side is 65 mm (2.56 in.) to 115 mm (4.53 in.); the distance between the front and rear mounting bars is from 500 mm (19.69 in.) to 858 mm (33.78 in.). The recommended guide rail is 21241598, which occupies 1U space. <p>NOTE</p> <ul style="list-style-type: none"> ● Do not adjust the distance between the front and rear columns to exceed the chassis depth 840 mm (33.07 in.). In addition, ensure that sufficient space is reserved inside the cabinet for routing cables from power distribution units (PDUs) and other modules. ● If the cabinet is customized or is to be transported with the guide rails installed, you can find the guide rail information in the BOM. ● The following figure shows the minimum internal width of the cabinet and the distance between the front and rear mounting bars. <div style="text-align: center;">  <p>The distance between the front and rear mounting bars</p> <p>The minimum internal width of the cabinet</p> </div>

Item	Specifications
Weight	<p>Net weight:</p> <ul style="list-style-type: none"> ● Empty chassis (including the midplane): 70 kg (154.35 lb) ● Fully configured chassis: ≤ 230 kg (507.15 lb) <p>Packaging materials:</p> <ul style="list-style-type: none"> ● Chassis packaging materials: 30 kg (66.15 lb) ● Half-width node packaging materials: 2.3 kg (5.07 lb) ● Full-width node packing materials: 3.6 kg (7.94 lb)
Floor bearing capacity	<p>The weight of a cabinet without any chassis is about 200 kg (441 lb). A cabinet occupies an area of 1.44 m² (15.50 ft.²). The following lists requirements for the floor bearing capacity based on the weight of a cabinet that has different chassis configurations:</p> <ul style="list-style-type: none"> ● One E9000 chassis: 347.2 kg/m² ● Two E9000 chassis: 555.5 kg/m² ● Three E9000 chassis: 763.9 kg/m²
Temperature	<p>Server:</p> <ul style="list-style-type: none"> ● Operating temperature: 5°C to 40°C (41°F to 104°F) (ASHRAE Class A3 compliant) ● Storage temperature: - 40°C to +65°C (- 40°F to +149°F) ● Temperature change rate < 20°C (36°F)/hour <p>PSUs:</p> <ul style="list-style-type: none"> ● Operating temperature: - 5°C to +50°C (23°F to 122°F) ● Storage temperature: - 40°C to +85°C (- 40°F to +185°F) <p>Fan modules:</p> <ul style="list-style-type: none"> ● Operating temperature: - 10°C to +70°C (14°F to 158°F) ● Storage temperature: - 40°C to +75°C (- 40°F to +167°F)
Relative humidity (RH)	<ul style="list-style-type: none"> ● Operating humidity: 5%-85% RH (non-condensing) ● Storage humidity: 5%-95% RH (non-condensing) ● Humidity change rate < 20% RH/hour
Altitude	<ul style="list-style-type: none"> ● CH140 compute node 35°C@900 m or 95°F@2952.72 ft. ● Other modules 40°C@900 m or 104°F@2952.72 ft. <p>When the device is used at an altitude of 900 m to 5000 m (2952.72 ft. to 16404 ft.), the highest operating temperature decreases by 1°C (1.8°F) for every increase of 300 m (984.24 ft.). At an altitude of over 3000 m (9842.4 ft.), only Titanium PSUs can be used.</p>

Item	Specifications
Noise	<p>The data listed in the following is the declared A-weighted sound power level (LwAd) and declared average bystander position A-weighted sound pressure level (LpAm) when the server is operating in a 23°C (73.4°F) ambient environment. Noise emissions are measured in accordance with ISO 7999 (ECMA 74) and declared in accordance with ISO 9296 (ECMA 109).</p> <p>Idle:</p> <ul style="list-style-type: none"> ● LwAd: 7.2 Bels ● LpAm: 53 dBA <p>NOTE The actual sound levels generated during server operating vary depending on the server configuration, load, and ambient temperature.</p>
Corrosive air pollutant	<ul style="list-style-type: none"> ● Corrosion rate of the copper test piece < 300 Å/month (in compliance with the ANSI/ISA-71.04-2013 gaseous corrosion level G1) ● Corrosion rate of the silver test piece < 200 Å/month
Particulate pollutant	<ul style="list-style-type: none"> ● The ISO14664-1 Class 8 requirements are met. It is recommended that a professional company monitor particulate pollutants in the equipment room. ● There is no explosive, conductive, magnetic, or corrosive dust in the equipment room.
Operational vibration	<ul style="list-style-type: none"> ● 5 Hz to 500 Hz, 0.3 Grms, 3 axes, and 15 min/axis ● PSD: <ul style="list-style-type: none"> - 5 Hz to 350 Hz: 0.0002 g²/Hz - 350 Hz to 500 Hz: -3 dB
Operational shock	50 Gs/2 ms, 1 time/face orientation of use only

 **NOTE**

- The temperature and relative humidity tests are performed on the place 1.5 m above the floor and 0.4 m away from the rack while the front and rear doors are not installed on the rack.
- A short term refers to a period less than or equal to 48 consecutive hours and a total of less than or equal to 15 days in a year.

9 Standards and Certifications

9.1 Standards Compliance

This topic describes the international and industrial standards and communication protocols that the E9000 complies with.

International Standards

[Table 9-1](#) lists the international standards.

Table 9-1 Standards and protocol compliance

Standard	Protocol
IEEE 802.3	Ethernet
IEEE 802.3u	Fast Ethernet
IEEE 802.3x	Flow control
IEEE 802.3z	Gigabit Ethernet
IEEE 802.3ap	10 Gigabit Ethernet
IEEE 802.3ba	40 Gigabit Ethernet
IEEE 802.1P	QoS (CoS)
IEEE 802.1Qbb	QoS (PFC)
IEEE 802.1Qaz	QoS (ETS)
IEEE 802.1Q	VLAN
IEEE 802.1D	Bridge/Spanning Tree
IEEE 802.1Qbg	Network virtualization (VEB, VEPA, MultiChannel)
FC-PI-4	8 Gbit/s FC port

Standard	Protocol
FC-LS	FC Link Service
FC-FS-2	FC Framing and Signaling
FC-GS-5	FC Generic Service
FC-SW-4	FC Switch Fabric
FC-VI	FC Virtual Interface Architecture Mapping
FCP-3	Fibre Channel Protocol for SCSI
IBTA Release 1.2.1 Volume 1	InfiniBand Architecture
IBTA Release 1.2.1 Volume 2	Physical Aspect of InfiniBand Architecture
PCIe Base Specification Revision 3.0	PCIe 3.0 Specification
PCIe Base Specification Revision 2.0	PCIe 2.0 Specification
PCIe Base Specification Revision 1.0	PCIe 1.0 Specification
SFF-8431	Enhanced Small Form Factor Pluggable Module SFP+
SFF-8436	QSFP+ 10 Gbit/s 4x Pluggable Transceiver (40 Gbit/s or 56 Gbit/s)
SAS-2	6 Gbit/s SAS port
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	Reliability, maintainability, and availability compliance standard
IEC 60297	Chassis compliance
IEC 60950	Safety
IEC 60825-1/2/6	Safety
IEC 60215	Safety
IEC 61000	EMC standard

Industrial Standards

[Table 9-2](#) lists the industrial standards.

Table 9-2 Industrial standards

Standard	Description
UL60950	Safety (North America)
EN60950	Safety (Europe)
ECMA TR/70	Environmental protection
GR-929	Reliability
Telcordia SR-332	Reliability

Communication Protocols

Table 9-3 lists the communication protocols.

Table 9-3 Communication protocols

Protocol	Description
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
TCP	Transmission Control Protocol
UDP	User Datagram Protocol
RIPv2	Routing Information Protocol v2
OSPF	Open Shortest Path First
TFTP	Trivial File Transfer Protocol
FTP	File Transfer Protocol
GVRP	GARP VLAN Registration Protocol
GMRP	GMRP Multicast Registration Protocol
STP	Spanning Tree Protocol
RSTP	Rapid Spanning Tree Protocol
MSTP	Multiple Spanning Tree Protocol

Protocol	Description
IPMI	Intelligent Platform Management Interface
SSL	Secure Socket Layer
SSH	Secure Shell

9.2 Certifications

This topic describes the certifications that the E9000 has passed.

Table 9-4 lists the certifications.

Table 9-4 Certifications

Country /Region	Certification	Standard
Europe	WEEE	2002/96/EC, 2012/19/EU
Europe	RoHS	2002/95/EC, 2011/65/EU, EN 50581: 2012
Europe	REACH	EC NO. 1907/2006
Europe	CE	Safety: EN 60950-1: 2006+A11: 2009+A1: 2010+A12: 2011 EMC: <ul style="list-style-type: none"> ● EN 55022: 2010 ● CISPR 22: 2008 ● EN 55024: 2010 ● CISPR 24: 2010 ● ETSI EN 300 386 V1.6.1: 2012 ● ETSI ES 201 468 V1.3.1: 2005
China	RoHS	SJ/T-11363-20006 SJ/T-11364-20006 GB/T 26572-2011
China	China Environmental Labeling	GB/T24024: 2001 idt ISO14024: 1999 HJ 2507-2011
Australia	C-tick	AS/NZS CISPR22: 2009
America	UL	UL 60950-1
America	FCC	FCC Part 15 (Class A)

Country /Region	Certification	Standard
America	NTRL-UL	UL 60950-1, 2nd Edition, 2011-12-19 (Information Technology Equipment - Safety - Part 1: General Requirements) CSA C22.2 No.60950-1-07, 2nd Edition, 2011-12 (Information Technology Equipment-Safety-Part 1: General Requirements)
Canada	IC	ICES-003 Class A
Nigeria	SONCAP	IEC 60950-1: 2005 (2nd Edition) + A1: 2009 EN 60950-1: 2006+A11: 2009+A1: 2010 + A12: 2011
Kingdom of Saudi Arabia (KSA)	SASO	IEC 60950-1: 2005 (2nd Edition) + A1: 2009 EN 60950-1: 2006+A11: 2009+A1: 2010 + A12: 2011
Global	CB	IEC 60950-1
Japan	VCCI	VCCI V-4: 2012

A COPYRIGHT NOTICE AND WARRANTY DISCLAIMER

COPYRIGHT NOTICE AND WARRANTY DISCLAIMER

This product incorporates open source software components covered by the terms of third party copyright notices and license agreements contained below.

IPMItool 1.8.11:

Copyright (C) 1989-2007 Free Software Foundation, Inc

The BSD License

<http://www.opensource.org/licenses/bsd-license>

Net SNMP - net-snmp 5.6.1:

Copyright (c) 2001-2003, Networks Associates Technology, Inc

The BSD License

<http://www.opensource.org/licenses/bsd-license>

u-boot-2009.11 master-20110410:

GNU GENERAL PUBLIC LICENSE

Version 2, June 1991

<http://www.gnu.org/licenses/gpl-2.0.html>

GoAhead WebServer 2.1.8:

Copyright (c) Go Ahead Software Inc., 1995-2000. All Rights Reserved

GoAhead WebServer Opensource License

<http://embedthis.com/products/goahead/index.html>

Net SNMP - net-snmp 5.7.1:

Copyright (c) 2001-2003, Networks Associates Technology, Inc

The BSD License

<http://www.opensource.org/licenses/bsd-license>

OpenSSL 1.0.0e:

Copyright (c) 1998-2011 The OpenSSL Project. All rights reserved.

OpenSSL Combined License

<http://www.openssl.org/source/license.html>

Apache-HTTP Server 2.2.25:

Copyright (C) 2012 The Apache Software Foundation

Apache License Version 2.0

<http://www.apache.org/licenses/LICENSE-2.0>

Apache-HTTP Server 2.4.6:

Copyright (C) 2012 The Apache Software Foundation

Apache License Version 2.0

<http://www.apache.org/licenses/LICENSE-2.0>

Boost C++ Libraries - boost 1.42.0:

Copyright Rene Rivera 2006-2007

Boost Software License Version 1.0

http://www.boost.org/LICENSE_1_0.txt

Bzip2 1.0.6:

Copyright (C) 1996 - 2013 julian@bzip.org

<http://www.ingate.com/files/422/fwmanual-en/xx12652.html>

bzip2 license

DNP 0.0.1:

Copyright (C) 2007 Turner Technologies Inc

MIT License

<http://www.opensource.org/licenses/mit-license>

flot 0.6:

Copyright (c) 2007-2009 IOLA and Ole Laursen

MIT License V2

<http://opensource.org/licenses/mit-license.php>

form 3.32.0-2013.04.09:

Copyright 2006-2013 (c) M. Alsup

MIT License

<http://malsup.github.com/mit-license.txt>

gPXE 1.0.1:

Copyright (C) 1989, 1991 Free Software Foundation, Inc.

GPL V2.0

<http://www.gnu.org/licenses/gpl-2.0.html>

ipxe 1.0.0

Copyright (C) 1989, 1991 Free Software Foundation, Inc.

GPL V2.0

<http://www.gnu.org/licenses/gpl-2.0.html>

ISC DHCP 4.1-ESV:

Copyright (c) 2004 by Internet Systems Consortium, Inc. ("ISC")

DHCP License

<https://www.isc.org/downloads/software-support-policy/isc-license/>

jquery:1.8.0:

Copyright 2013 jQuery Foundation and other contributors

MIT License V2

<https://github.com/jquery/jquery/blob/master/MIT-LICENSE.txt>

jQuery Corner Plugin: 2.12

Copyright 2013 jQuery Foundation and other contributors

MIT License V2

<http://www.opensource.org/licenses/mit-license.php>

jQuery plugin: Autocomplete: 1.1

Copyright (c) 2009 Jörn Zaefferer

MIT License V2

<http://www.opensource.org/licenses/mit-license.php>

jquery-ajax-history 1.4.5:

Copyright (c) 2009 John Resig

Apache License Version 2.0

<http://www.apache.org/licenses/LICENSE-2.0>

jqueryjs 1.3.2:

Copyright 2005, 2012 jQuery Foundation, Inc. and other contributors

MIT License

<http://www.opensource.org/licenses/mit-license>

jQuery Form Plugin 3.32.0-2013.04.09:

Copyright 2006-2013 (c) M. Alsup

MIT License V2

<http://opensource.org/licenses/mit-license.php>

Open LDAP 2.4.16:

Copyright 1998-2013 The OpenLDAP Foundation All rights reserved.

Open LDAP Public License for 2.8

<http://www.openldap.org/software/release/license.html>

Open LDAP 2.4.37:

Copyright 1998-2013 The OpenLDAP Foundation All rights reserved.

Open LDAP Public License for 2.8

<http://www.openldap.org/software/release/license.html>

Open LDAP 2.4.38:

Copyright 1998-2013 The OpenLDAP Foundation All rights reserved.

Open LDAP Public License for 2.8

<http://www.openldap.org/software/release/license.html>

PHP 5.4.24:

Copyright © 2001-2014 The PHP Group. All rights reserved

PHP 3.01 License

http://www.php.net/license/3_01.txt

PHP 5.3.27:

Copyright (c) 1999 - 2006 The PHP Group. All rights reserved

PHP 3.01 License

http://www.php.net/license/3_01.txt

Raphael JavaScript Library 2.1.0:

Copyright (c) 2008-2013 Dmitry Baranovskiy

MIT License

<http://raphaeljs.com/license.html>

SQLite 3.7.5:

The author disclaims copyright to this source code.

Public Domain

http://en.wikipedia.org/w/index.php?title=Public_Domain&redirect=no

SQLite 3.7.17:

The author disclaims copyright to this source code.

Public Domain

http://en.wikipedia.org/w/index.php?title=Public_Domain&redirect=no

webrtc-ndk master-20111009:

Copyright (c) 2011, Google Inc. All rights reserved.

BSD 2.0

<https://github.com/roisagiv/webrtc-ndk/blob/master/LICENSE>

zTree 3.4:

Copyright (c) 2010 Hunter.z

MIT License V2

<http://www.opensource.org/licenses/mit-license.php>

BusyBox 1.15.3:

Copyright © 1999-2008 Erik Andersen

GPL V2.0

<http://www.gnu.org/licenses/gpl-2.0.html>

bgiframe

Copyright (c) 2013 Brandon Aaron

MIT License V2

<http://opensource.org/licenses/mit-license.php>

OpenSSH 6.2p1

Copyright © 1999-2009 OpenBSD

BSD 2.0

<https://github.com/roisagiv/webrtc-ndk/blob/master/LICENSE>

jquery.base64.js 0.0.2

Copyright (c) 2013 Yannick Albert

MIT License V2

<http://opensource.org/licenses/mit-license.php>

Apache Portable Runtime (APR) 1.4.8

Copyright © 2008-2014, The Apache Software Foundation

Apache License Version 2.0

<http://www.apache.org/licenses/LICENSE-2.0>

Apache Portable Runtime Utilities (APR-util) 1.5.2

Copyright © 2008-2014, The Apache Software Foundation

Apache License Version 2.0

<http://www.apache.org/licenses/LICENSE-2.0>

PCRE 8.33

Copyright (c) 1997-2013 University of Cambridge

Copyright (c) 2010-2013 Zoltan Herczeg

Copyright (c) 2009-2013 Zoltan Herczeg

Copyright (c) 2007-2012, Google Inc.

Das U-Boot - Universal Bootloader 2011.06

Copyright (C) 1989, 1991 Free Software Foundation, Inc.

GNU GENERAL PUBLIC LICENSE Version 2, June 1991

<http://www.gnu.org/licenses/gpl-2.0.html>

TIPC: Carrier Grade Cluster Protocol - tipc-linux 1.7.7

Copyright (c) 2005-2006, Ericsson AB

Copyright (c) 2005-2008, 2010-2011, Wind River Systems

GNU GENERAL PUBLIC LICENSE Version 2, June 1991

<http://www.gnu.org/licenses/gpl-2.0.html>

TFTP Server 1.64

Copyright (C) 2005 by Achal Dhir

GNU GENERAL PUBLIC LICENSE Version 2, June 1991

<http://www.gnu.org/licenses/gpl-2.0.html>

luasocket master-20100929

Copyright (c) 2004-2007 Diego Nehab

MIT License

<http://www.opensource.org/licenses/mit-license.php>

dosfstools 3.0.9

Copyright (C) 1993 Werner Almesberger <werner.almesberger@lrc.di.epfl.ch>

Copyright (C) 1998 Roman Hodek <Roman.Hodek@informatik.uni-erlangen.de>

GNU GENERAL PUBLIC LICENSE Version 3, 29 June 2007

<http://www.gnu.org/licenses/gpl-3.0.html>

p7zip - p7zip 9.20

Copyright (C) 1999-2010 Igor Pavlov

GNU Lesser General Public License Version 2.1, February 1999

<http://www.gnu.org/licenses/gpl-2.0.html>

WRITTEN OFFER

If you would like a copy of the GPL source code contained in this product shipped on a CD, for a charge no more than the cost of preparing and mailing a CD to you, please contact foss@huawei.com.

B Regulatory Compliance Standards

Regulatory Compliance Standards

This section describes the certifications that the product passes and the standards that the product complies with.

WEEE

This product passes the Waste Electrical and Electronic Equipment (WEEE) certification.

As defined in the prEN50419 standard, the WEEE certification applies to electrical and electronic equipment, which:

- Has a rated operating voltage not exceeding 1000 V AC or 1500 V DC.
- Is dependent on electric currents or electromagnetic fields.
- Generates, transfers, or measures the currents or electromagnetic fields.

In addition, the WEEE standard defines equipment manufacturers, who are engaged in the following activities:

- Manufacturing and selling electrical and electronic equipment of their own brand.
- Selling electrical and electronic equipment labeled with their own brand but manufactured by other manufacturers. If a product is labeled with the brand of its manufacturer, the seller of the product cannot be regarded as the manufacturer.
- Importing or exporting electrical and electronic equipment in professional fields from or to each member country.

RoHS

The product passes the Restriction of Hazardous Substances (RoHS) certification and the contents of hazardous substances in the product comply with SJ/T-11363-2006 (requirements for concentration limits for certain hazardous substances in electronic information products).

REACH

The high-risk materials will be tested and declared by supplier during the Registration, Evaluation, Authorization and Restriction of Chemicals (REACH) Substances of Very High Concern (SVHC) certification process. According to the environmental requirements of Huawei, the evaluation results are summarized based on the product's Bill of Material (BOM). [Table B-1](#) shows the evaluation results and declaration documents provided by the applicant.

Table B-1 Evaluation results of high-risk SVHC samples

Category	High-Risk Samples in Article	Tested Samples	Samples with an SVHC Concentration of Over 0.1% (w/w)
Component	10	10	0
Cable	3	3	0
Mechanical Part	3	3	0
Total	16	16	0

 **NOTE**

The high-risk materials include solder, plating layer, Acrylonitrile Butadiene Styrene (ABS) plastic, Polyvinyl Chloride (PVC) plastic, Polypropylene (PP) plastic, Polyester Terephthalate (PET) plastic, Polybutylene Terephthalate (PBT) plastic and coatings.

CE

The product passes the Conformity with European (CE) certification.

European Union Notice: Products that bear the CE marking comply with the following directives issued by the Commission of the European Union:

- EMC: 2004/108/EC
- The Low Voltage Directive: 2006/95/EC
- ROHS: 2002/95/EC & 2011/65/EU
- WEEE: 2002/96/EC&2012/19/EU
- REACH: 2006/1907/EC
- ErP: (EU) No 617/2013

The product is a Class A device. Using this product in a residential area is likely to cause radio interference. In this case, users need to take corrective measures.

C-tick

The product passes the C-TICK certification.

In Australia, electromagnetic compatibility (EMC) is monitored by the Australian Communications Authority (ACA). In Australian EMC system, products are divided into three classes. The providers must register in the ACA and apply for a C-TICK label before they sell Class B or Class C products.

FCC

The product passes the Federal Communications Commission (FCC) certification.

The product has been tested and found to comply with the limits for a Class A digital product, pursuant to Part 15 of the FCC Rules.

These limits are designed to provide reasonable protection against harmful interference when the product is used in a commercial environment. This product generates, uses, and radiates radio frequency energy. If it is not installed and used in accordance with instructions, it may cause harmful interference to radio communications.

Operating this product in a residential area may also cause harmful interference. In this case, users need to prevent the interference by taking protective measures.

If you perform any change to this product, which is explicitly prohibited by FCC regulations, your right to operate the product shall be deprived.

IC

Industry Canada (IC) is a standard developed by Industry Canada and used for testing modules and digital terminal equipment. Any wireless products to be sold in Canada must pass the IC certificate.

UL

The product passes the Underwriters Laboratories Inc (UL) certification.

UL is a non-profitable product safety test and certification institute.

UL has its own certification system for the whole product, components, and materials. All electric products that are exported to the USA must pass the UL certification.

CB

The Certification Bodies (CB) system (the IEC system for testing and certifying electrical products) is part of the IEC System for Conformity Testing to Standards for Safety of Electrical Equipment (referred to as the IECEE). Members of the IECEE test product performance based on the use of specific IEC standards for electrical equipment. The test results are CB test reports and certificates, which are recognized by members of the IECEE.

The CB system is based on the international IEC standard. Member countries are allowed to have standards that are different from the IEC standard, but they are required to notify other member countries. The CB test certification indicates that the sample has successfully passed the test and complies with requirements of the IEC and member countries.

SONCAP

As required by Standards Organization of Nigeria, products exported to Nigeria must be certified by SON Conformity Assessment Program (SONCAP) before custom clearance. As SONCAP aims at protecting human safety, its standards are also concerned about safety requirements in addition to performance.

SASO

Saudi Arabian Standards Organization (SASO) launched the International Conformity Certification Program (ICCP) with the authorization of the government. Products exported to Saudi Arabia must have the COC certificate granted by the SASO to get customs clearance.

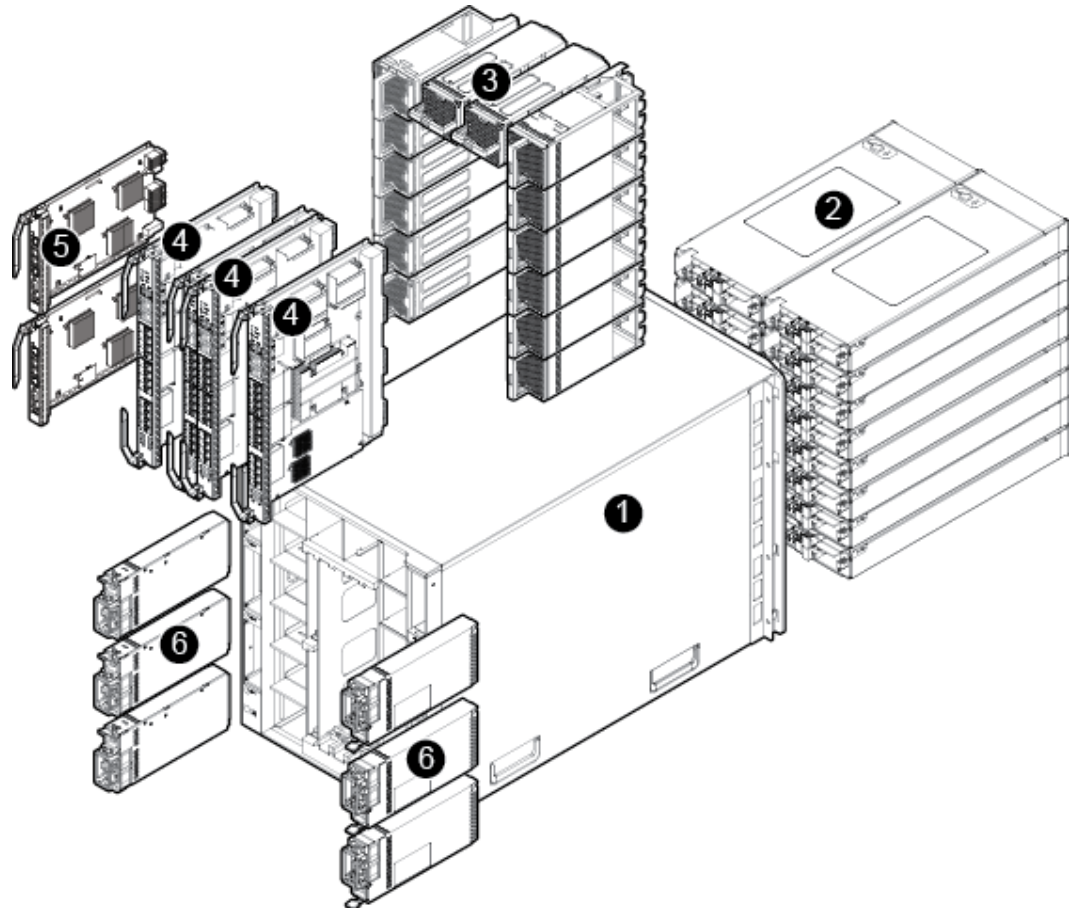
China Environmental Standards

This section describes the China environmental standards that the product complies with.

Disassembly

The product is easy to disassemble and meets the GB/T22421 requirements for recycling and treatment of telecommunication infrastructure equipment. **Figure B-1** shows a disassembled product.

Figure B-1 Physical structure



Recycling and Treatment

Huawei Technologies Co., Ltd. has set up an effective recycling system around the world and signed the end-of-life product recycling agreement with well-known recycling and treatment suppliers in China and other countries. In China, Huawei recycles end-of-life products and then sends them to a contracted recycling and treatment supplier (for example, Dongjiang Environmental Company Limited DJE) for processing.

If a product is at the end of its service life, you can contact Huawei technical support to recycle the product if needed (except that the contract has clearly stated that the customer has the responsibility for recycling and treatment). You can use any of the following contact methods: Call 4008229999, send an email to ChinaEnterprise_TAC@huawei.com, or visit <http://e.huawei.com>.

C Glossary

- 48 V DC	The nominal power supply voltage for a chassis. The power supply voltage ranges from - 36 V DC to - 72 V DC under normal operating conditions.
A	
active/standby failover	The process of switching the data and status of the active board to the standby one, that is to say, the active board is switched to the standby one and vice versa. The active/standby failover enhances system usability to ensure tolerant running of the system.
B	
BMC	Baseboard management controller. The BMC is the core of the Intelligent Platform Management Interface (IPMI) standard, responsible for collecting, processing, and storing sensor signals, and monitoring the operating status for each component. The BMC provides the hardware status and alarm information of the managed object for the chassis management module. Using the information, the management module manages the device.
C	
captive screw	A threaded screw which is held captive to a panel. When being unscrewed from its main nut, it remains fixed to the panel.
chassis	A frame that consists of the slots, midplanes, cooling devices, power supply modules, and management modules. Components are placed and interconnected in the chassis. The chassis protects the components against dust and damage.

configuration file	A file that saves board configurations made by users and records the complete configuration process in command text format. It allows users to check and view the configurations conveniently.
configuration restoration	A mode of recovering configurations. When replacing a board in a slot, a user can choose to automatically recover the configuration data of the original board in the same slot to the new board through the management module.
critical alarm	An alarm for critical faults. If a critical fault occurs on the managed device, a critical alarm is generated in the system. A threshold for generating a critical alarm can be set.
D	
disk monitoring	A function for monitoring disk status. If a disk is damaged, an alarm is generated prompting you to back up the data on the disk. This helps to detect and eliminate any hidden risk early.
E	
Ethernet	A baseband local area network (LAN) architecture developed by Xerox Corporation in cooperation with DEC and Intel. Ethernet uses Carrier Sense Multiple Access/Collision Detection (CSMA/CD) and supports The data transfer rate of 10 Mbit/s on multiple cables. The Ethernet specification is the basis for the IEEE 802.3 standard.
F	
fast Ethernet	Extended and enhanced Ethernet standards against traditional sharing media, which carry traffic at the rate of 100 Mbit/s and complies with IEEE 802.3u.
FC	A high-speed transport technology used to build storage area networks (SANs). Fiber channels can be on the networks carrying ATM and IP traffic. It is primarily used for transporting Small Computer System Interface (SCSI) traffic from servers to disk arrays. Fiber channels support single-mode and multi-mode fiber connections. Fiber channel signaling can run on both twisted pair copper wires and coaxial cables. Fiber channels provide both connection-oriented and connectionless services.
FCoE	An encapsulation of Fiber Channel frames over Ethernet networks. This allows Fiber Channel to transmit SAN data over the Ethernet and protects customer investments in existing FC-SAN (such as FC-SAN tools, staff training, constructed FC-SAN facilities and the management architecture) by providing input/output (I/O) integration solutions based on the FC storage protocol.

floating IP address	An IP address that a high availability (HA) system uses to communicate with the external system. The primary server and secondary server have separate IP addresses. For example, the IP address of the primary server is IP1 and the IP address of the secondary server is IP2. When communicating with the external client, the primary or secondary server uses IP3, and IP3 is bound to the network adapter of the primary server. At this time, the primary server has two IP addresses, namely IP1 and IP3. The secondary server has only IP2. Therefore, it does not provide services to the external client. When an active/standby failover occurs, the primary server releases IP3, and IP3 is bound to the network adapter of the secondary server. This is called floating.
FRU	Field replaceable unit. A module or component that can be replaced in its entirety as part of a field service repair operation. Examples of this type of FRUs include: power supply modules, fan modules, compute nodes, storage nodes, switch modules, pass-through modules, and management modules. Not all FRUs support hot swap.
H	
hot swap	A feature wherein insertion or removal of a board, when the system is running, does not affect normal running of the system.
HyperTerminal	A program that can be called to connect to other computers, or log in to a remote site, bulletin board system (BBS), online services, and hosts by using modem or NULL modem cables.
I	
I2C	A multi-master serial single-ended computer bus invented by Philips that is used to attach low-speed peripherals to a motherboard, embedded system, cellphone, or other electronic device.
impact response spectrum	A curve of the maximum acceleration response generated by the equipment under specified impact excitation. Impact response spectrum II means that the duration of semi-sine impact response spectrum is 6 ms.
InfiniBand	A switched fabric communications link. The InfiniBand architecture is a conversion cable technology that supports multiple concurrent links. In the technology, each link can reach a running speed of 2.5 Gbit/s. This architecture supports a speed of 500 Mbit/s for one link, 2 Gbit/s for four links, and 6 Gbit/s for 12 links.

Intelligent Platform Management Interface	A specification and mechanism defined for providing inventory management, monitoring, logging, and control for the elements of a computer system.
IPMI	An open-standard hardware management interface specification, which defines a specific method for communication between embedded management subsystems.
M	
major alarm	An alarm for major faults. If a major fault occurs on the managed device, a major alarm is generated in the system. A threshold for generating a major alarm can be set.
mezzanine card	A printed circuit board that plugs directly into another plug-in card. For example, a mezzanine card, also known as a "daughter board", might plug into a VMEbus card, CompactPCI card or PCI card in order to extend its functionality. Adapter cards are also available that enable a mezzanine card to plug into the larger slot of the target bus. Smaller than standard expansion cards, mezzanine cards are typically designed for rugged industrial use and are often bolted down after being plugged in. IndustryPack, PMC, PC*MIP and PC/104+ are commonly used mezzanine cards.
midplane	A circuit board in a chassis, used for device interconnection. A midplane provides the support for power distribution and management, and auxiliary signal connections.
midrange computer	A high-performance 64-bit computer that uses eight to 32 CPUs and fall in between mainframe computers and microcomputers in performance and price.
minor alarm	An alarm for minor faults. If a minor fault occurs on the managed device, a minor alarm is generated in the system. A threshold for generating a minor alarm can be set.
Mpps	Millions of packets per second, which is the unit for the packet forwarding rate and an important performance indicator for devices such as routers, firewalls, and switches.
O	
out-of-band	A channel independent of services.
P	
panel	The front-most element of a board, perpendicular to the PCB, which serves to mount connectors, indicators, controls, and mezzanine modules, and also seals the front and rear of the chassis for airflow and electromagnetic compatibility (EMC).s

PCIe	A short form of Peripheral Component Interconnect Express (PCIe). It is a new bus standard, which can replace PCI and AGP interface specifications. Through the point-to-point and bi-directional interconnection technology, PCI or AGP parallel data transmission is changed into serial data transmission. Using this standard, the data transmission speed between devices can be improved greatly.
PXE	Pre-boot execution environment, a technology that enables computers to boot from the network. This technology is the successor of Remote Initial Program Load (RPL). The PXE works in client/server mode. The PXE client resides in the ROM of a network adapter. When the computer is booted, the BIOS invokes the PXE client to the memory, and the PXE client obtains an IP address from the DHCP server and downloads the operating system from the remote server using TFTP.
S	
SDR	Sensor data record. A platform management data record that provides the sensor type, location, event generation, and access information.
SEL	System event log. A non-volatile storage area and associated interfaces for storing system platform events for later retrieval.
sensor	A device that measures a physical quantity and converts it into a signal which can be read by an observer or by an instrument. Typically a sensor consists of a sensitive component that measures a quantity, a component that converts the quantity into a signal, and an auxiliary electronic circuit.
short-term operating	A period less than or equal to 48 consecutive hours, or a total of less than or equal to 15 consecutive days in a year.
slot	A position that hosts one module and determines the module position.
SNMP	Simple Network Management Protocol, a widely accepted industry standard and the network management protocol that is used mostly on Transmission Control Protocol (TCP)/IP networks. SNMP ensures management information transmission between any two nodes, implementing the functions such as monitoring network devices, managing configurations, and collecting statistics.

SSD	Solid-state drive, a data storage device that uses integrated circuit assemblies as memory to store data persistently, consisting of the control unit and the storage unit (DRAM or flash chip). The storage unit is responsible for storing data, and the control unit is responsible for reading and writing data.
static IP address	A four-byte TCP/IP network address permanently assigned to an individual machine or account.
static payload	The capability of the equipment in package to bear the pressure from the top in normal pile-up method.
T	
Telnet	A standard terminal emulation protocol in the TCP/IP protocol stack. Telnet allows users to log in to remote systems and use resources as if they were connected to a local system.
U	
U	A unit defined in International Electrotechnical Commission (IEC) 60297-1 to measure the height of a cabinet or chassis. 1U = 44.45 mm = 1.75 in.

D Acronyms and Abbreviations

B	
BIOS	basic input/output system
BMC	baseboard management controller
C	
CA	content adapter
CLI	command-line interface
CMS	content management system
D	
DC	direct current
DCBX	data center bridging exchange
DIMM	dual in-line memory module
E	
ECMP	equal-cost multipath
ECC	error checking and correcting
EMC	electromagnetic compatibility
EPG	electronic program guide
ETS	Enhanced Transmission Selection
F	
FC	fiber channel
FCC	Federal Communications Commission (USA)

B	
FCoE	fiber channel over Ethernet
FTP	File Transfer Protocol
FRU	field replaceable unit
G	
GE	gigabit Ethernet
GPU	graphic processing unit
H	
HDFS	Hadoop distributed file system
I	
IaaS	infrastructure as a service
I2C	Inter-Integrated Circuit
IEC	International Electrotechnical Commission
IEEE	Institute of Electrical and Electronics Engineers
IETF	Internet Engineering Task Force
IOPS	input/output operations per second
IP	Internet Protocol
IPMI	Intelligent Platform Management Interface
IS-IS	Intermediate System to Intermediate System
K	
KVM	keyboard, video, and mouse
L	
LAN	local area network
M	
MAC	Medium Access Control
MDN	media delivery network
MEM	Media Entertainment Middleware
Mpps	millions of packets per second
MPU	main processing unit

B	
N	
NVRAM	nonvolatile random access memory
P	
PC	personal computer
PFC	priority-based flow control
PXE	preboot execution environment
Q	
QPI	
R	
RAS	Reliability, Availability, and Serviceability
S	
SAS	Serial Attached SCSI
SCG	service control gateway
SCSI	Small Computer System Interface
SLB	service load balancer
SMM	shelf management module
SNMP	Simple Network Management Protocol
SOL	serial over LAN
SPF	shortest path first
SSD	solid-state drive
STP	Spanning Tree Protocol
T	
TCP	Transmission Control Protocol
TFTP	Trivial File Transfer Protocol
TRILL	Transparent Interconnection of Lots of Links
U	
UL	Underwriters Laboratories Inc

B	
USB	Universal Serial Bus
V	
VDI	Virtual Desktop Infrastructure
VGS	value growing server
W	
WebUI	web user interface