Huawei CX320 Switch Module V100R001

White Paper

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HUAWEI

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About This Document

Purpose

E9000 This white paper describes the functions, advantages, appearance, specifications, networking, standards compliance, and certifications of Huawei's CX320 10GE/FCoE converged switch module. You can learn about the CX320 by reading this document.

Intended Audience

This document is intended for:

- Huawei presales engineers
- Channel partner presales engineers
- Enterprise presales engineers

Symbol Conventions

The symbols that may be found in this document are defined as follows:

Symbol	Description
⚠ DANGER	Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.
⚠ WARNING	Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.
⚠ CAUTION	Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.
⚠ NOTICE	Indicates a potentially hazardous situation which, if not avoided, could result in equipment damage, data loss, performance deterioration, or unanticipated results.
☞ TIP	**TIP** indicates a tip that may help you solve a problem or save time.

Symbol	Description
NOTE	**NOTE** provides additional information to emphasize or supplement important points of the main text.

Change History

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

Issue	Date	Description
04	2018-10-31	● Added the descriptions about how to query the MX517 and MX527 cards and how to use the MX517 card ports. ● Added the number of VLANs and PVs supported by the VBST.
03	2017-07-27	The maximum power consumption is changed to 142 W in **1.8 Technical Specifications**
02	2017-03-27	Added product model descriptions to **1.3 Appearance**.
01	2017-03-03	This issue is the first official release.

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1 Product Overview

About This Chapter

1.1 Functions

This topic describes the functions, protocols, and ports of the CX320 10GE/FCoE converged switch module (CX320 for short).

The CX320 is a switching control unit that provides data switching functionality for compute node slots in the system and centrally provides service and management ports to connect to external devices.

The CX320 switch modules are installed in rear slots of an E9000 chassis and are connected to compute nodes, storage nodes, and management modules through the E9000 midplane. It

exchanges data and control packets in the E9000 chassis and provides high-speed data transmission.

Table 1-1 Ethernet switching plane function description

Function		Description
Basic features	Ethernet	- Full-duplex and autonegotiation working modes - GE, 10GE, and 40GE (supported by Ethernet ports on the panel) **NOTE** 10GE optical ports support multi-mode and single-mode optical modules (GE or 10GE). 10GE optical ports support SFP electrical modules. 40GE optical ports on the panel support multi-mode optical cables, single-mode optical cables, and passive cables. Each 40GE optical port can be divided into four 10GE optical ports. 10GE optical ports on the panel support multi-mode optical cables, single-mode optical cables, and passive cables, and can be merged into 40GE optical ports. - MX517 PIC card with 10GE/8G FC unified ports. **NOTE** 10GE optical ports support multi-mode and single-mode optical modules (GE or 10GE). 10GE optical ports support SFP electrical modules. 10GE optical ports on the panel support multi-mode optical cables, single-mode optical cables, and passive cables. - Port traffic control - Jumbo frames - Link aggregation - Load balancing among links of a trunk - Port isolation and forwarding restriction on ports 40G port splitting - Protocol-based packet statistics on a port - Broadcast storm suppression - M-LAG
	FC	- MX517 PIC card with 10GE/8G FC unified ports. - MX527 PIC card with 16G FC ports

Function		Description
	VLAN	- Multiple access modes: access, trunk, and hybrid - Port-based, MAC address-based, and IP subnet-based VLAN assignment - VLAN aggregation - MUX VLAN - Transparent transmission of protocol packets in a VLAN - Batch configuration of VLANs
	QinQ	- Basic QinQ - Flexible QinQ
	VLAN Mapping	1 to 1 VLAN mapping 2 to 1 VLAN mapping 2 to 2 VLAN mapping
	GVRP	GARP VLAN Registration Protocol (GVRP)
	MAC	- Sticky MAC - Automatic MAC address learning and aging - Static, dynamic, and blackhole MAC address entries - Filtering based on source MAC addresses - Port-based MAC learning limiting
	Link Layer Discovery Protocol (LLDP)	LLDP
Ethernet loop protection	Multiple Spanning Tree Protocol (MSTP)	- Spanning Tree Protocol (STP) - Rapid Spanning Tree Protocol (RSTP) - MSTP - VLAN-based Spanning Tree (VBST), with the maximum number of protected VLANs of 128 and maximum number of PVs of 16000 - Bridge protocol data unit (BPDU), root, and loop protection - Partitioned STP and layer-2 protocol transparent transmission
	ERPS	G.8032 v1 or v2

Function		Description
IP features	Address Resolution Protocol (ARP)	- Static and dynamic ARP entries - ARP in a VLAN - ARP entry aging - Gratuitous ARP - Proxy ARP - ARP-Ping - ARP gateway anti-collision
	IPv6	- IPv4/IPv6 dual-stack - Neighbor Discovery (ND) - IPv6 over IPv4 manual tunnel - IPv6 over IPv4 GRE tunnel 6to4 tunnel
	Dynamic Host Configuration Protocol (DHCP)	- DHCP server - DHCP snooping - DHCP relay - DHCPv6 relay
IP forwarding	Unicast routing	- IPv4 and IPv6 static routing - Routing Information Protocol Version 1/2 (RIP-1/RIP-2) and RIPng - OSPFv2 and OSPFv3 - Intermediate System to Intermediate System (IS-IS) - Border Gateway Protocol Version 4 (BGP4) and BGP4+ - Routing policies - Policy-based routing - Unicast Reverse Path Forwarding (URPF) check
	MPLS	- LDP - MPLS QoS: Uniform, Pipe, and Short Pipe
	VPN	- Multi-VPN-Instance CE (MCE) and IPv6 MCE - GRE tunneling

Function		Description
	Multicast routing	● Internet Group Management Protocol Version 1/2/3 (IGMPv1/v2/v3) ● Protocol Independent Multicast-Sparse Mode PIM-SM(IPv4) and PIM-SM (IPv6) ● Protocol Independent Multicast Source-Specific Multicast (PIM-SSM) (IPv4) and PIM-SSM (IPv6) ● MLDv1 and MLDv2 ● MLD SSM mapping ● Multiprotocol BGP (MBGP) ● Multicast Source Discovery Protocol (MSDP) ● Multicast routing policies ● Reverse Path Forwarding (RPF) ● Bidirectional PIM (IPv4) and Bidirectional PIM (IPv6)
Device reliability	Bidirectional Forwarding Detection (BFD)	● BFD (IPv4) and BFD (IPv6) ● Association between BFD and Eth-Trunk ports ● Association between BFD and OSPF ● Association between BFD and OSPFv3 ● Association between BFD and IS-IS ● Association between BFD and IS-IS IPv6 ● Association between BFD and BGP ● Association between BFD and BGP4+ ● Association between BFD and PIM (IPv4) ● Association between BFD and PIM (IPv6) ● Association between BFD and IPv4 static routing ● Association between BFD and IPv6 static routing ● Association between BFD and VRRP ● Association between BFD and VRRP6
	Others	● Virtual Router Redundancy Protocol (VRRP) and VRRP6 ● DLDP ● Smart Link ● Smart Channel ● EFM (802.3ah)
Layer 2 multicasting feature	Layer 2 multicasting	● IGMP snooping ● IGMP Proxy ● User fast leave mechanism ● Multicast traffic control ● Multicast VLAN

Function		Description
QoS features	Traffic classification	- Traffic classification based on the combination of the L2 protocol header, IP quintuple information, outbound port, and 802.1p priority - Traffic classification based on the C-VID and C-PRI of QinQ packets - Matching internal packet information encapsulated in a GRE tunnel - Matching internal packet information encapsulated in a TRILL tunnel - Matching internal packet information encapsulated in an MPLS or VXLAN tunnel
	Traffic behavior	- Access control after traffic classification - Traffic policing based on traffic classification - Re-marking based on the results of traffic classification - Class-based packet queuing - Association between traffic classification and traffic behavior
	Priority mapping	- Mapping from 802.1p priorities to PHBs and colors - Mapping from PHBs and colors to 802.1p priorities - Mapping from DSCP to PHBs and colors - Mapping from PHBs and colors to DSCP - Mapping from EXP priorities to PHBs and colors
	Queue scheduling	- Priority queuing (PQ) scheduling - Deficit round robin (DRR) scheduling - PQ+DRR scheduling - Weighted round robin (WRR) scheduling - PQ+WRR scheduling
	Congestion avoidance	- Tail-drop algorithm - Weighted Random Early Detection (WRED) drop algorithm
	Outbound port rate limiting	Outbound port rate limiting
	ACL-based simplified traffic policies	- ACL-based packet filtering - ACL-based redirection - ACL-based traffic statistics

Function		Description
Virtualization	Many-to-one virtualization	● Intelligent Stack (iStack) ● iStack split and merge ● iStack dual-active detection ● iStack version and configuration synchronization
Data center features	TRILL	● TRILL ● TRILL NSR ● TRILL ECMP ● IGMP over TRILL ● TRILL active-active multi-homing ● Association between TRILL and MSTP ● TRILL gateway
	DCB	● Data Center Bridging Exchange Protocol (DCBX) ● Priority-based Flow Control (PFC) ● Enhanced Transmission Selection (ETS)
	FCoE	● FCF ● NPV ● FSB
	VXLAN	● Manual VXLAN tunnel configuration ● Dynamic VXLAN tunnel configuration through EVPN BGP
	Virtualization awareness	**NOTE** Only the 10GE switching plane supports this feature. ● Virtualization awareness ● Automatic deployment of policies ● Automatic migration of policies ● NLB cluster association ● Association between one multicast MAC address and multiple outbound ports
	Server cluster	**NOTE** Only the 40GE switching plane supports this feature. NLB cluster association ● NLB cluster association ● Association between one multicast MAC address and multiple outbound ports
	VEPA forwarding	Virtual Ethernet Port Aggregator (VEPA)-based traffic forwarding

Function		Description
Configuration and maintenance	Terminal services	● Command line configuration ● Prompt and help information in English ● Terminal services such as Console and Telnet ● Information sending between terminal users
	File systems	● File systems, file directories, and file management ● Uploading and downloading files through File Transfer Protocol (FTP), Trivial File Transfer Protocol (TFTP), and Secure File Transfer Protocol (SFTP)
	Debugging and maintenance	● Unified management of logs, alarms, and commissioning information ● Electronic labels ● User operation logs ● Detailed debugging information for network fault diagnosis ● Network testing tools such as Tracert and Ping ● Port mirroring and traffic mirroring
	Version upgrading	● Device software loading and online software loading ● Online upgrade through the basic input/output system (BIOS) menu ● Online patching **NOTE** To ensure service security, upgrade the switch module software version regularly.

Function		Description

Security and management	System Security	● Command line-based hierarchical protection to prevent unauthorized access to switching modules
		
		● Secure Shell (SSH)
		
		● RADIUS (IPv4) and RADIUS (IPv6) user login authentication
		
		● HWTACACS (IPv4) and HWTACACS (IPv6) user login authentication
		
		● Access control list (ACL) filtering
		
		● Dynamic ARP inspection (DAI)
		
		● DHCP packet filtering (with the Option 82 field)
		
		● Prevention of control packet attacks
		
		● Attack defense
		
		   – Defense against flood attacks without IP payloads, attacks from IGMP null payload packets, LAND attacks, Smurf attacks, and attacks from packets with invalid TCP flag bits
		
		   – Defense against attacks from many fragments, attacks from many packets with offsets, attacks from repeated packet fragments, Tear Drop attacks, Syndrop attacks, NewTear attacks, Bonk attacks, Nesta attacks, Rose attacks, Fawx attacks, Ping of Death attacks, and Jolt attacks
		
		   – Defense against TCP SYN flood attacks, UDP flood attacks (including Fraggle attacks and UDP diagnosis port attacks), and ICMP flood attacks
		
		● Logs about attacking MAC addresses
		
		● URPF
		
		● 802.1x authentication

	Network management	● ICMP-based Ping and Tracert ● Simple Network Management Protocol Version 1/2c/3 (SNMPv1/v2c/v3) ● Standard Management Information Base (MIB) ● Remote Network Monitoring (RMON) ● NETCONF interfaces ● Network Quality Analysis (NQA)

1.2 Advantages

The CX320 provides high performance and high-density ports and supports flexible PIC cards. High-performance stacking facilitates deployment and maintenance. It is ideal for large data center networks.

High Performance, High Port Density, and Support for Flexible PIC Cards

Underpinned by the leading hardware platform, the CX320 provides a high port density and line-speed forwarding capability. It supports next-generation server applications that require super high performance and density.

CX320The mainboard provides the following fixed ports: eight 10GE SFP+ optical ports and two 40GE QSFP+ optical ports for connecting to uplink aggregation or core switches, 32 10GE Ethernet electrical ports for connecting to high-performance compute nodes, one 40GE port for interconnecting switch modules, and two GE ports for connecting to MM910 management modules. The CX320 provides two PIC slots that support up to eight ports.

The CX320 supports two hot-swappable flexible PIC cards, which provide different types of ports to meet customers' requirements. Currently the supported PIC cards are MX517 and MX527. MX517 provides four 10GE or 8G FC unified ports. MX527 provides four 16G FC ports.

The CX320 supports low-latency forwarding, 1.3 Tbit/s line-speed switching capacity (throughput), and Ethernet line-speed forwarding.

High Specifications and Support for Large Data Center Networks

The CX320 provides high specifications: up to 288,000 MAC addresses and 128,000 forwarding information bases (FIBs).

High-Performance Stacking, Easy Deployment, and Simple Maintenance

The CX320 supports a stack system of four devices. It has the following advantages:

- High performance: A single stacking system can provide more than thirty-two 10GE ports.
- High bandwidth: The 240 Gbit/s stack bandwidth is supported.
- Easy deployment and maintenance
    - Pre-deployment and offline configuration are supported. The system can be pre-planned and pre-configured. Devices can be added as required.
    - The stack ID is the switch module slot number, facilitating identification and maintenance.
    - Indicators on the front panel indicate the roles and statuses of stacked switch modules, so that the stacking system can be maintained without a terminal.
- Simple upgrade operations: The stacking system supports quick and automatic software upgrades, simplifying upgrade operations and reducing the upgrade workload.
    - Rapid software upgrades: When two switch modules are stacked, the standby switch module is upgraded before the active switch module. This ensures that at least one switch module is operating.
    - Automatic software upgrades: When two switch modules are stacked, the software version is automatically synchronized from the active switch module to the standby one.

Rich Data Center Features

- Supports fibre channel over Ethernet (FCoE) and Data Center Bridging (DCB).
    - Supports fibre channel over Ethernet (FCoE), Data Center Bridging Exchange (DCBX), 802.1Qbb-compliant priority-based flow control (PFC), and 802.1Qaz-

compliant Enhanced Transmission Selection (ETS). With these features, the FC architecture can run on the lossless enhanced Ethernet to achieve a converged network and reduce networking costs.

- Supports FSB, FCF, and NPV to directly connect to FCoE (or FC) storage or switches.

● Supports Virtual Extensible Local Area Network (VXLAN).

- VXLAN encapsulates data packets sent from VMs into UDP packets and encapsulates IP and MAC addresses used on the physical network into outer headers. The network is only aware of the encapsulated parameters. This greatly reduces the number of MAC address entries required on large Layer-2 networks.

- VXLAN uses a VXLAN network identifier (VNI) field similar to the VLAN ID field of IEEE 802.1Q. The VNI field has 24 bits and can identify a maximum of 16 million [(2^24-1)/1024^2] VXLAN segments.

- If VXLAN is used to construct a large Layer-2 network, VM IP addresses and MAC addresses remain unchanged during VM migration.

● Supports virtualization/virtual machine (VM) access.

- Supports server virtualization, improving data center utilization.

- Supports virtual sensors. During migration of VMs, network policies can be automatically migrated using virtual sensors so that network resources can be allocated as required. Working with the Layer-2 network, VMs can be freely migrated within the data center.

● Supports the Transparent Interconnection of Lots of Links (TRILL) protocol.

- Complying with the Internet Engineering Task Force (IETF) standard, the TRILL protocol supports ultra-large networks and flexible networking modes.

- The TRILL protocol supports load balancing between paths, so that traffic can be shared by multiple paths according to service requirements.

- The TRILL protocol supports fast network convergence. Any changes on the network can be quickly sensed and fast convergence is performed.

1.3 Appearance

This section describes the appearances and panels of the CX320, MX517, and MX527, as well as the installation positions of the CX320 in the chassis.

□NOTE

The MX517 and MX527 cards can be installed in the same CX320 switch module.

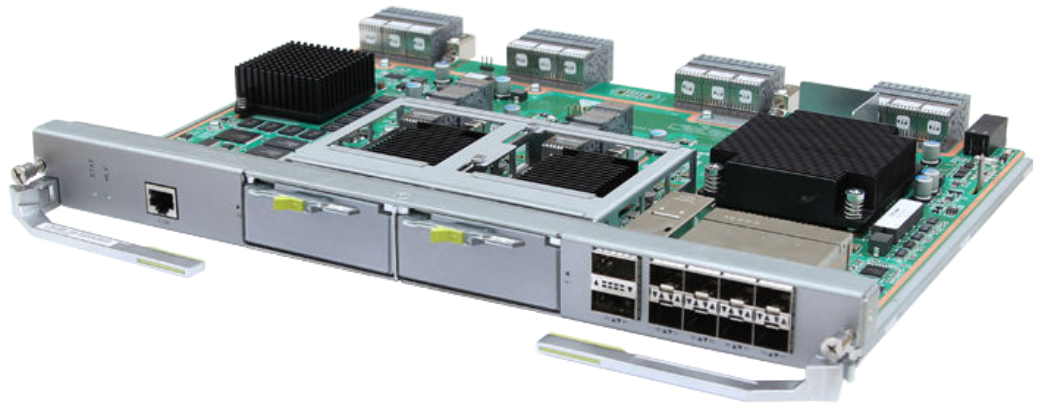**Appearance**

Figure 1-1 CX320

Figure 1-2 MX517 flexible PIC card
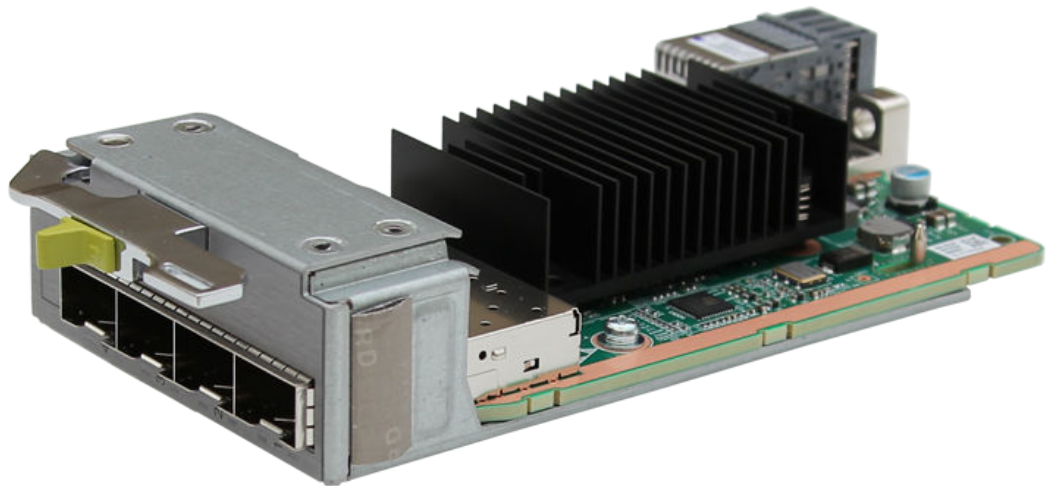
Figure 1-3 MX527 flexible PIC card
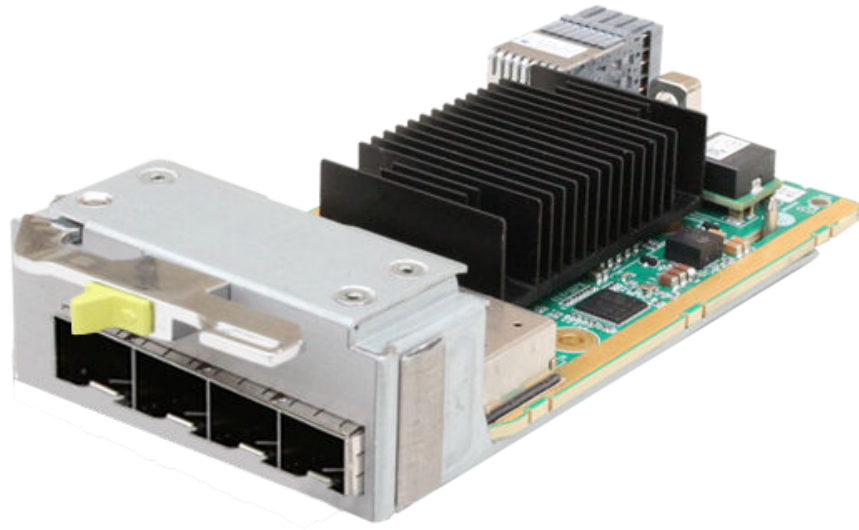
Installation positions

The CX320 can be installed in one of the four slots at the rear of the E9000 chassis. The four slots are 1E, 2X, 3X, and 4E.

Figure 1-4 Installation positions and slot numbers
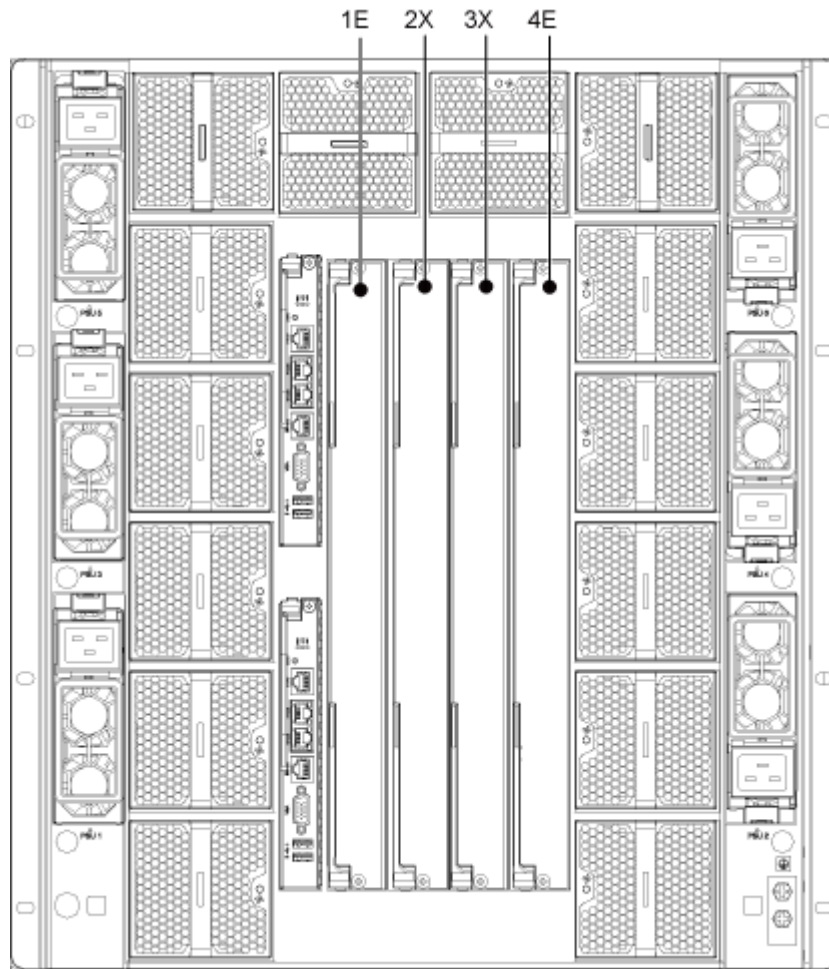
Panel

Figure 1-5 Panel
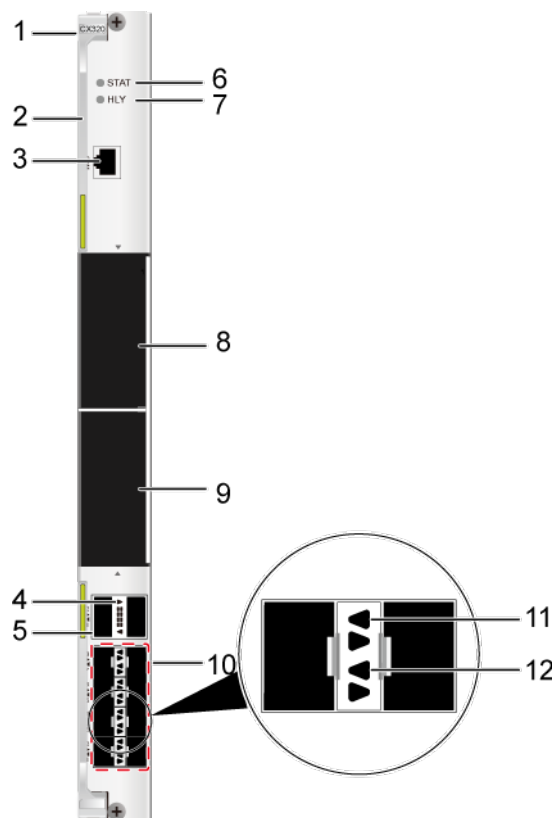
1	Product Model	2	Slide-out information label (with an ESN label)
3	Serial port	4	40GE optical port indicator
5	40GE optical port	6	Stacking status indicator
7	Health indicator	8	PIC slot 2
9	PIC slot 1	10	10GE optical port
11	Connection status indicator for the 10GE optical port	12	Data transmission status indicator for the 10GE optical port

NOTE

The numbers on the left of the panel are port numbers. The triangle mark directions indicate the port positions.

Figure 1-6 MX517 flexible card panel
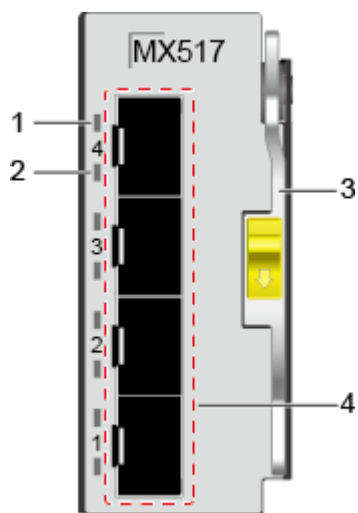
1	Connection status indicator	2	Data transmission status indicator
3	PIC card handle	4	10GE/8G FC unified port

NOTE

You can configure the four ports of the MX517 card as follows:

- Configure all ports as Ethernet ports and install GE/10GE multi-mode and single-mode optical modules, SFP electrical modules, or passive cables to implement Ethernet functions.
- Configure all ports as FC ports and install the 16G/8G SFP+ optical modules to implement the FC function.
- Configure some ports as Ethernet ports and the others as FC ports. Then install the corresponding optical modules to implement mixed applications of the Ethernet and FC functions.

Figure 1-7 MX527 flexible card panel
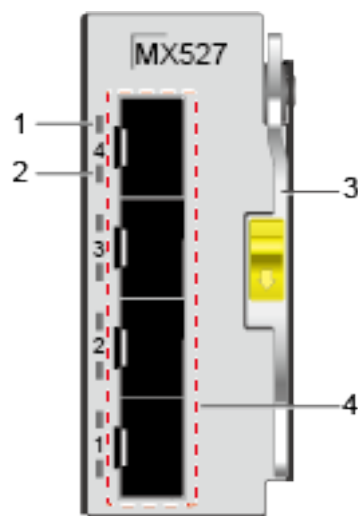
1	Connection status indicator	2	Data transmission status indicator
3	PIC card handle	4	16G FC port

ESNs

An Equipment Serial Number (ESN) uniquely identifies a server. An ESN is required when you request Huawei technical support.

Figure 1-8 ESN example

No.	Description
1	ESN ID.
2	Material identification code.
3	Vendor code.
4	Year and month. ● The first character indicates the year. Digits 1 to 9 indicate 2001 to 2009, and letters A to Z indicate 2010 to 2035. ● The second character indicates the month. Digits 1 to 9 indicate January to September, and letters A to C indicate October to December.
5	Serial number.
6	RoHS compliance.
7	Internal model number of the board.

1.4 Ports

This topic describes the features, numbering rules, names, types, and quantity of the CX320 ports.

The CX320 provides ports for users to operate and configure. The ports are used to send and receive data.

The CX320 Ethernet ports are numbered in the *Slot number/Subcard number/Port number* format.

● *Slot number* indicates the slot number of the current switch module. The value ranges from 1 to 4, mapping to slot numbers 1E, 2X, 3X, and 4E.

● *Subcard number* indicates the number of a subcard with ports. The value ranges from 1 to 22. For details, see **Table 1-2**, **Table 1-3**, and **Table 1-4**.

● *Port number* indicates the serial number of the port on the subcard. For details, see **Table 1-2**, **Table 1-3**, and **Table 1-4**.

For example, if the CX320 is in slot 2X, the first optical Ethernet port on the upper right of the panel is numbered 40GE 2/20/2, as shown in **Figure 1-9**.
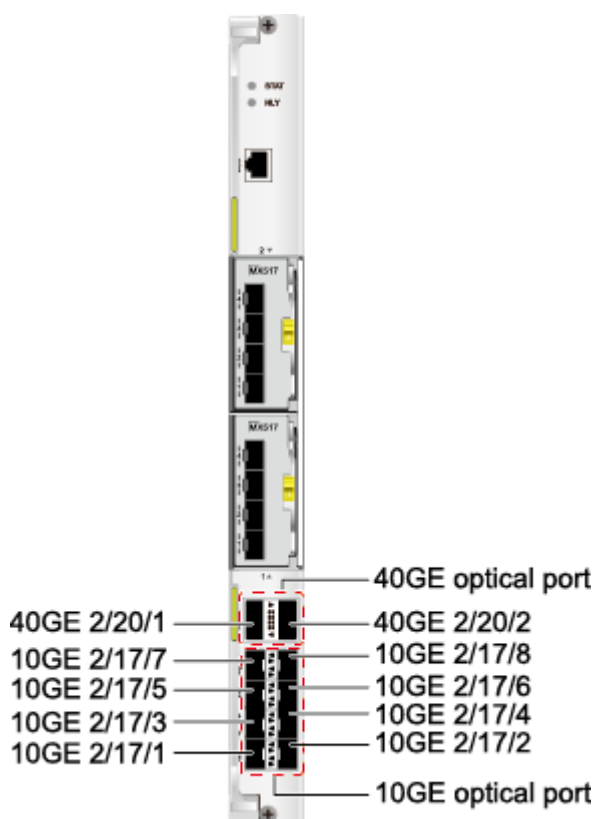
Figure 1-9 Port numbering

Table 1-2 External ports

Name	Type	Quantity	Subcard Number	Port Serial Number	Description
Serial port	RJ-45	1	-	-	The serial port can be used to connect to the BMC or converged switching plane. During the BMC startup, the serial port is used by the BMC. In other cases, the serial port is used by the 10GE converged switching plane by default, and can be switched to the BMC over SOL. The baud rate is 115200 bit/s when the serial port is connected to the BMC or converged switching plane.
10GE optical port	SFP+	8	17	1 to 8	The panel provides eight 10GE optical ports to connect to external networks.
40GE optical port	QSFP+	2	20	1 to 2	The panel provides two 40GE optical ports to connect to external networks or serve as stacking ports.
PIC 1	-	-	21	-	A flexible card can be installed in slot PIC 1 for port expansion. The expanded ports depend on the flexible PIC card type.
PIC 2	-	-	22	-	A flexible card can be installed in slot PIC 2 for port expansion. The expanded ports depend on the flexible PIC card type.

▣**NOTE**

● You can run the corresponding command to query the type of the installed PIC card. For details, see "display device card" in the *CX320 Switch Module V100R001 Command Reference*.

● The MX517 and MX527 cards can be installed in the same CX320 switch module.

Table 1-3 External ports on a PIC card

Name	Type	Specifications	Quantity	Port Serial Number	Description
MX517 PIC card	SFP+	10GE/8G FC unified port	4	1 to 4	PIC port numbers are related to the PIC slot. For example, if the PIC card is in slot 1, the first Ethernet port number is 10GE x/21/1, and the first FC port number is FC x/21/1 (x indicates the switch module slot, and 21 indicates PIC slot 1.) The MX517 ports are Ethernet ports by default. To convert them to FC ports, see the **port mode fc** command in *CX320 Switch Module Command Reference*. **NOTE** You can run the corresponding command to query the operating type of the optical module installed on the MX517 card. For details, see "display interface transceiver" in the *CX320 Switch Module V100R001 Command Reference*. The **Transceiver Type** information in the command output indicates the operating type of the optical module.
MX527 PIC card	SFP+	16G FC port	4	1 to 4	PIC port numbers are related to the PIC slot. For example, if the PIC card is in slot 1, the first FC port number is FC x/21/1 (x indicates the switch module slot, and 21 indicates PIC slot 1.)

Table 1-4 Internal ports

Name	Type	Quantity	Subcard Number	Port Serial Number	Description
10GE port	-	32	1 to 16	1 to 2	The ports are connected to half-width compute node slots 1 to 16. The subcard numbers are consistent with the compute node slot numbers and range from 1 to 16.
40GE port	-	1	18	1	The port is used to interconnect the switch modules in slots 1E and 4E or in slots 2X and 3X.
GE port	-	2	19	1 to 2	The two GE ports are connected to the two MM910 management modules respectively to communicate with internal ports eth0 and eth2 of the MM910 management modules.

1.5 Indicators

By observing the indicators, you can determine the current operating status of the CX320. **Table 1-5** and **Table 1-6** describes the indicators on the CX320 panel.

Table 1-5 Indicators

Label	Meaning	Color	Description
STAT	Stacking status indicator	Green	● Off: The CX320 is not powered on. ● Blinking green for only 10 times: The CX320 is being powered on. ● Blinking green: The CX320 is in standby or slave state in a stack and is operating properly. ● Steady green: The CX320 is in the active state in a stack or is not stacked, and is operating properly.

Label	Meaning	Color	Description
HLY	Health indicator	Red and green	• Off: The CX320 is not powered on. • Steady green: The CX320 is operating properly or has minor alarms. • Blinking red (1 Hz): A major alarm is generated. • Blinking red (4 Hz): A critical alarm is generated. • Blinking red (5 Hz): The CX320 is not securely installed. **NOTE** It is difficult to identify the difference between blinking frequencies of 4 and 5 Hz. If the indicator is blinking red quickly, check whether the device has been installed properly and then check whether a critical alarm has been generated.
◀ and ▶	Connection status indicator for the 10GE optical port	Green	• Off: The port is not properly connected. • Steady green: The port is properly connected.
◀ and ▶	Data transmission status indicator for the 10GE optical port	Orange	• Off: No data is being transmitted over the port. • Blinking orange: Data is being sent or received over the port.
◀ and ▶	40GE optical port indicator	Green	• Off: No data is being transmitted over or the port is not connected. • Blinking green: Data is being sent or received over the port. • Steady green: The port is properly connected.

Table 1-6 PIC card Indicators

PIC Card Name	Identifier	Description	Color	Description
MX517 PIC card		Connection status indicator for the unified optical port	Green	• Off: The port is not connected or not properly connected. • Steady green: The port is properly connected.
		Data transmission status indicator for the unified optical port	Orange	• Off: No data is being transmitted over the port. • Blinking orange: Data is being sent or received over the port.
MX527 PIC card		Connection status indicator for the FC optical port	Green	• Off: The port is not connected or not properly connected. • Steady green: The port is properly connected.
		Data transmission status indicator for the FC optical port	Orange	• Off: No data is being transmitted over the port. • Blinking orange: Data is being sent or received over the port.

1.6 Internal Networking of a Chassis

This topic describes connection relationships between the CX320 and mezzanine cards on compute nodes.

Figure 1-10 shows the internal chassis networking between the CX320 and compute nodes. On each compute node, two mezzanine cards provide ports to connect to the CX320 switch modules as follows:

- The Mezz1 position connects to the converged switching plane of the CX320 switch modules in slots 2X and 3X.
- The Mezz2 position connects to the converged switching plane of the CX320 switch modules in slots 1E and 4E.

Figure 1-10 Mapping between the CX320 and mezzanine cards on compute nodes
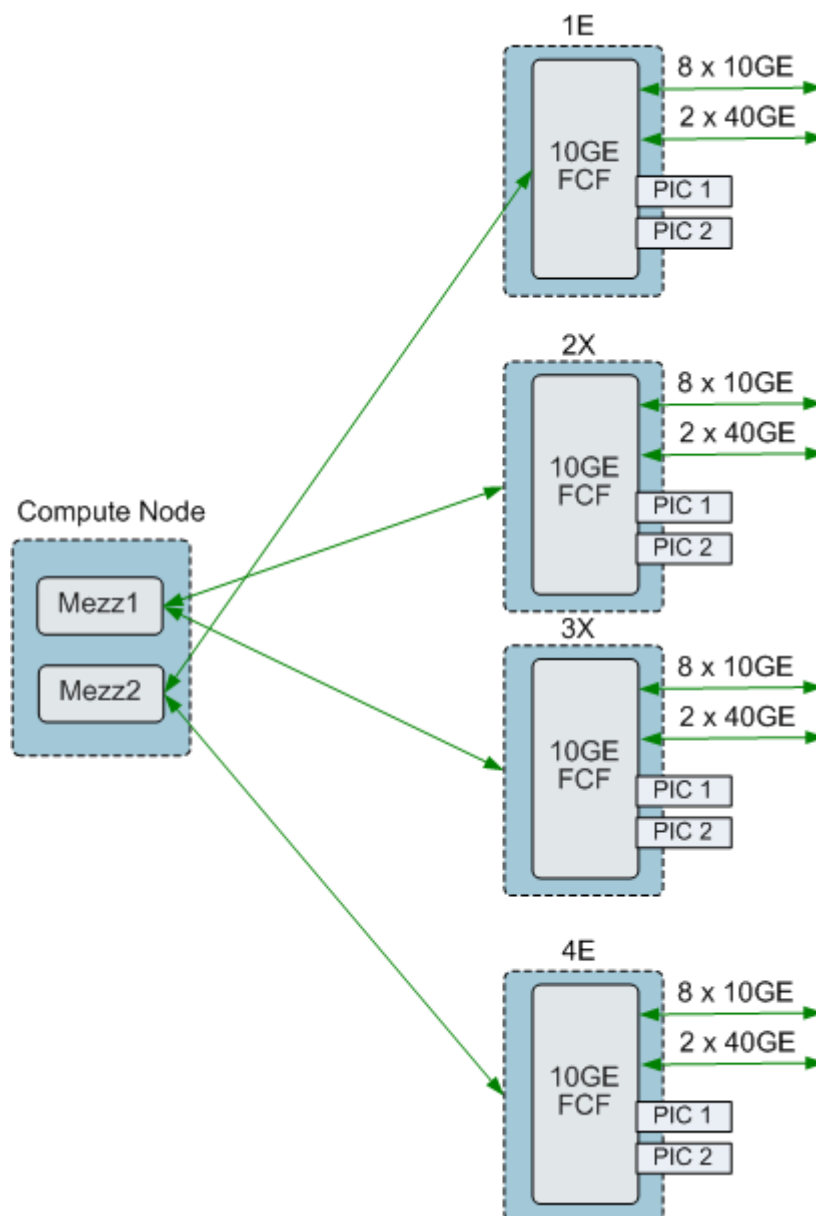
The following describes the mapping between the CX320 switch modules and mezzanine cards, assuming that the CX320 switch modules are installed in slots 2X and 3X and connect to Mezz 1.

Mapping Between Switch Modules and Mezzanine Card Ports

Mapping between CX320 switch modules and ports on the MZ510

The MZ510 provides two 10GE ports (ports 1 and 2), which connect to the 10GE switching planes of the CX320 switch modules in slots 2X and 3X respectively.

Figure 1-11 Mapping between CX320 switch modules and ports on the MZ510
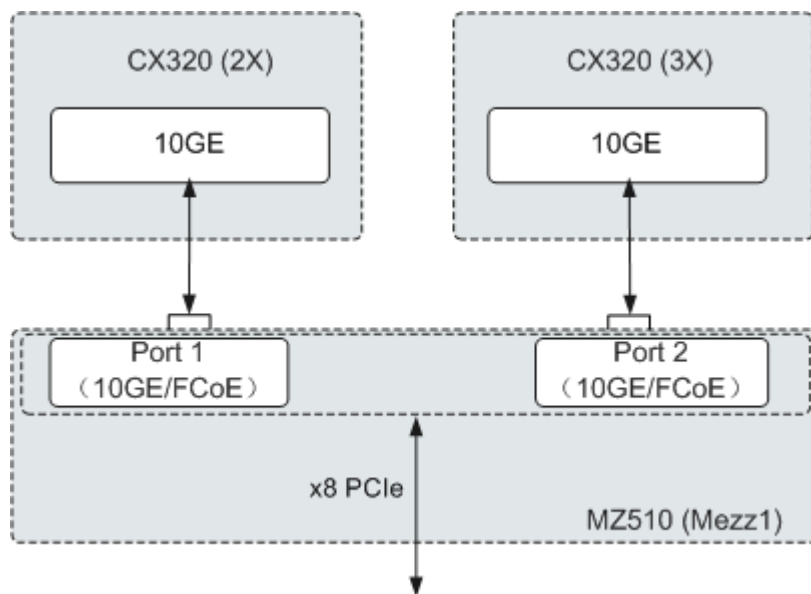
Mapping between CX320 switch modules and ports on the MZ512

The MZ512 provides four 10GE ports (ports 1 to 4). Ports 1 and 3 connect to the converged switching plane of the CX320 in slot 2X, and ports 2 and 4 connect to the converged switching plane of the CX320 in slot 3X.

Figure 1-12 Mapping between CX320 switch modules and ports on the MZ512
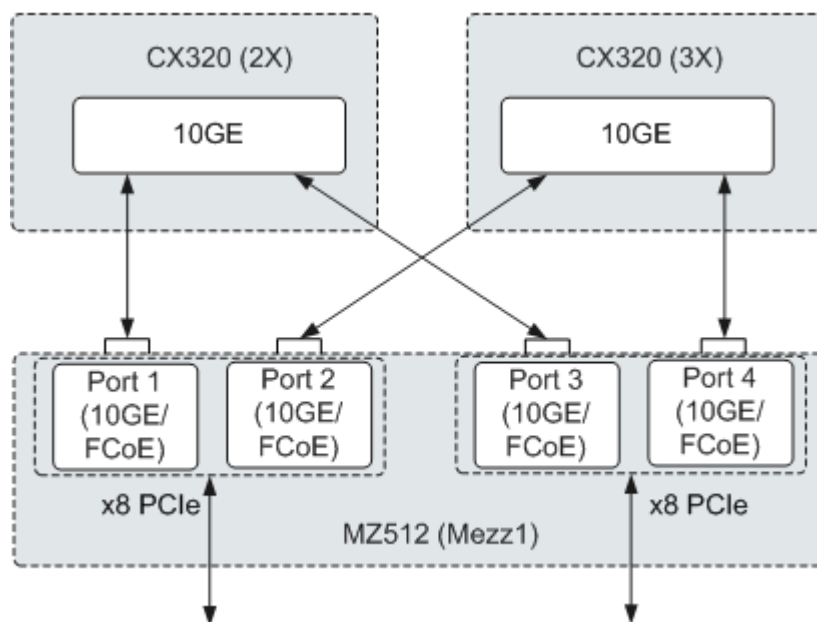
1.7 Software and Hardware Compatibility

For details about the software and hardware supported by the CX320, see the **Huawei Server Compatibility Checker**.

1.8 Technical Specifications

This topic describes the physical, environmental, power, and network switching specifications of the CX320.

Table 1-7 Technical specifications

Category	Item	Specifications
Physical specifications	Dimensions (H x W x D)	388.55 mm x 35.06 mm x 272.15 mm (15.30 in. x 1.38 in. x 10.71 in.)
	Color	Silver
	Weight	2.9 kg
Environmental specifications	Temperature	● 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) ● Long-term storage temperature: 21°C to 27°C (69.8°F to 80.6°F) ● Temperature change rate < 20°C/h (36°F/h)
	Humidity	● Operating humidity: 5% RH to 85% RH ● Storage humidity: 5% RH to 95% RH ● Long-term storage humidity: 30% RH to 69% RH ● Humidity change rate < 20% RH/h
	Altitude	At an altitude of 900 m (2952.72 ft), the highest operating temperature is 40°C (104°F). When the device is used at an altitude of 900 m to 5000 m, the highest operating temperature decreases by 1°C (1.8°F) for every increase of 300 m (984.24 ft).
	Corrosive air pollutant	● 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	● 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.

Category	Item	Specifications
Input power supply	Rated input voltage	12 V DC
Power consumption	Maximum power consumption	142 W 199.7 W

Table 1-8 Network switching specifications

Attribute	Service Feature	Performance Specifications
Device performance	Switching capacity (throughput)	1.3 Tbit/s
	Packet forwarding rate (mpps)	960
	Number of stacked devices	4
Ethernet service	Number of MAC addresses	288000
	Number of VLANs	4063 **NOTE** The switch module has 31 reserved VLANs, which are VLANs 4064 to 4094 by default. This reserved consecutive VLAN range can be configured.
	Number of Address Resolution Protocols (ARPs) for the device	128000
	Jumbo frame length (in byte)	9216
L3VPN	VRF	1024 (Multiprotocol Label Switching L2VPN is not supported).
IP unicast	Number of host table entries	128000

Attribute	Service Feature	Performance Specifications
	Number of IPv4 forwarding information bases (FIBs)	256000
	Number of IPv6 forwarding information bases (FIBs)	128000
	Virtual Router Redundancy Protocol (VRRP)	64
NOV3	Number of VXLAN tunnels	15000
	Number of broadcast domains	4000
Enhanced Ethernet feature	TRILL	• Number of network nodes: 512 • Number of CE-VLANs: 4000 • Load-sharing specifications: 16 links

2 Standards and Certifications

About This Chapter

2.1 Standards Compliance

This topic describes the international and industry standards and communication protocols that the CX320 complies with.

International Standards

Table 2-1 Standards and communication protocols

Standard	Protocol
DCBX	Data Center Bridging eXchange
FC-BB-5	Fibre Channel - Backbone – 5 (FCOE)
FC-DA	FC Device Attach
FC-FS-2	FC Framing and Signaling
FC-GS-5	FC Generic Service
FC-LS	FC Link ServiceFC Link Service
FC-MI-2	FC Methodologies for Interconnects
FC-PI-4	FC Physical Interface-4 (8G FC Interface)

Standard	Protocol
FC-SW-4	FC Switch Fabric
FC-VI	FC Virtual Interface Architecture Mapping
FCP-3	Fibre Channel Protocol for SCSI
IEEE 802.1x	Port-based Network Access Control
IEEE 802.3x	Flow control and Back pressure
IEEE 802.3z	1000BASE-X Gbit/s Ethernet over Fiber-Optic at 1 Gbit/s
IEEE 802.3aq	10GBASE-LRM 10 Gbit/s Ethernet over multimode fiber
IEEE 802.1Qbb	Priority-based Flow Control (PFC)
IEEE 802.1Qaz	Enhanced Transmission Selection (ETS)
IEEE 802.1Q	Virtual Bridged Local Area Networks (VLAN)
IEEE 802.1s	Multiple Spanning Trees (MSTP)
IEEE 802.1w	Rapid Reconfiguration of Spanning Tree (RSTP)
IEEE 802.1ab	Station and Media Access Control Connectivity Discovery (LLDP)
IEEE 802.1ad	Virtual Bridged Local Area Networks: Provider Bridges (QinQ)
IEEE 802.3ad	Link Aggregation Control Protocol (LACP)
IEEE 802.1Qbg	Edge Virtual Bridging (VEPA)
IEEE 802.3ah	Ethernet in the First Mile OAM

Industry Standards

Table 2-2 Industry standards

Organization	Standard
ECMA TR/70	Environmental protection
EN60950	Safety (Europe)
GR-929	Reliability
IEC 812	Failure Mode and Effects Analysis (FMEA)
IEC 863	Reliability, maintainability and availability predictions
IEC60297	Chassis standards
IEC60950	Safety

Organization	Standard
IEC60825-1/2/6	Safety
IEC60215	Safety
IEC61000	EMC standards
Telcordia SR-332	Reliability
UL60950	Safety (North America)

Communication Protocols

Table 2-3 Communication protocols

Protocol	Description
ARP	Address Resolution Protocol
BFD	Bidirectional Forwarding Detection
BGP	Border Gateway Protocol
DHCP	Dynamic Host Configuration Protocol
DLDP	Device Link Detection Protocol
FTP	File Transfer Protocol
GMRP	GMRP Multicast Registration Protocol
GVRP	GARP VLAN Registration Protocol
HTTP	Hypertext Transfer Protocol
ICMP	Internet Control Message Protocol
IGMP	Internet Group Management Protocol
IPMI	Intelligent Platform Management Interface
IPv4/IPv6	IPv4 or IPv6 Internet Protocol
MSTP	Multiple Spanning Tree Protocol
NTP	Network Time Protocol
OSPF	Open Shortest Path First
RADIUS	Remote Authentication Dial In User Service
RIP	Routing Information Protocol
RSTP	Rapid Spanning Tree Protocol
SNMP	Simple Network Management Protocol

Protocol	Description
SSH	Secure Shell
SSL	Secure Socket Layer
STP	Spanning Tree Protocol
TCP	Transmission Control Protocol
TELNET	Remote terminal protocol
TFTP	Trivial File Transfer Protocol
TRILL	Transparent Interconnection of Lots of Links
UDP	User Datagram Protocol
VRRP	Virtual Router Redundancy Protocol

2.2 Certifications

This topic describes the certifications that the E9000 has passed.

Table 2-4 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: ● 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

Country /Region	Certification	Standard
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)
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