Huawei CX916 Switch Module

V100R001

White Paper

Issue   01

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Huawei Technologies Co., Ltd.

About This Document

Overview

This document describes the functions, advantages, appearance, specifications, internal networking, standards, and certifications of the CX916 switch module.

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 guide are defined as follows.

Symbol	Description
DANGER	Indicates a hazard with a high level or medium level of risk which, if not avoided, could result in death or serious injury.
WARNING	Indicates a hazard with a low level of risk which, if not avoided, could result in minor or moderate injury.
CAUTION	Indicates a potentially hazardous situation which, if not avoided, could result in equipment damage, data loss, performance deterioration, or unanticipated results.
TIP	Provides a tip that may help you solve a problem or save time.
NOTE	Provides additional information to emphasize or supplement important points in the main text.

Change History

Issue 01 (2017-10-12)

This issue is the first official release.

Contents

1 Overview

1.1 Functions

The CX916 is a switching control unit that provides data switching functionality for compute nodes in the blade server chassis and centrally provides service and management ports to connect to external devices. The Ethernet and FC switching planes of the CX916 are physically isolated from each other and work independently.

The CX916 is installed in a rear slot of the E9000 chassis and is connected to compute nodes and management modules through the chassis midplane. It exchanges internal data packets and control and management packets through high-speed data transmission.

Table 1-1 describes the functions of the Ethernet switching plane. Table 1-2 describes the functions of the FC switching plane.

Table 1-1 Functions of the Ethernet switching plane

Function		Description
Ethernet features	Ethernet	- Full-duplex and autonegotiation working modes - Ethernet ports support 10GE, 25GE, and 40GE. **NOTE** - Downlink ports connected to compute nodes operate at 10GE. Uplink ports connected to aggregation switches operate at 10GE, 25GE, or 40GE. 25GE ports support 25GE passive direct attached cables, 25GE multi-mode or single-mode optical modules, 10GE passive cables, and 10GE multi-mode or single-mode optical modules. 40GE ports support multi-mode and single-mode optical modules and passive cables. A 40GE port can be split into four 10GE ports. - Port traffic control - Jumbo frames - Link aggregation - Load balancing among links of a trunk - Port isolation and forwarding restriction - Broadcast storm suppression 40GE port splitting 25GE ports can operate at 10GE. - Protocol-based packet statistics - M-LAG

Function		Description
	Virtual Local Area Network (VLAN)	- Multiple access modes: access, trunk, and hybrid - Port-based, MAC-based, and IP subnet-based VLANs - VLAN aggregation - Multiplex VLAN (MUX VLAN) - Transparent transmission of protocol packets in a VLAN - Batch configuration of VLANs
	QinQ (802.1Q in 802.1Q)	- Basic QinQ - Flexible QinQ
	VLAN mapping	1 to 1 2 to 1 2 to 2
	GARP VLAN Registration Protocol (GVRP)	GVRP
	Media Access Control (MAC)	- Sticky MAC - Automatic MAC address learning and aging - Static, dynamic, and blackhole MAC address entries - Filtering based on source MAC addresses - MAC address 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) - Bridge protocol data unit (BPDU), root, and loop protection - Partitioned STP and Layer-2 protocol transparent transmission
	Ethernet Ring Protection Switching (ERPS)	G.8032 v1/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 (Generic Routing Encapsulation) 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 Routing Information Protocol Next Generation (RIPng) - Open Shortest Path First version 2 (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
	Virtual Private Network (VPN) features	- 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 IPv6 - Protocol Independent Multicast Source-Specific Multicast (PIM-SSM) IPv4 and IPv6 - Multicast Listener Discovery version 1 (MLDv1) and MLDv2 - MLD Source-Specific Multicast (SSM) Mapping - Multiprotocol BGP (MBGP) - Multicast Source Discovery Protocol (MSDP) - Multicast routing policies - Reverse Path Forwarding (RPF) - Bidirectional PIM IPv4 and IPv6
Reliability	Bidirectional Forwarding Detection (BFD)	- BFD IPv4 and IPv6 - Association between BFD and Eth-Trunks - 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 Virtual Router Redundancy Protocol (VRRP) - Association between BFD and VRRP6
	Other	- VRRP and VRRP6 - Device Link Detection Protocol (DLDP) - Smart Link - Ethernet in the First Mile (EFM) 802.3ah

Function		Description
Layer-2 multicasting	Layer-2 multicasting	● IGMP snooping ● IGMP Proxy ● Fast leave mechanism ● Multicast traffic control ● Multicast VLAN
Quality of Service (QoS) features	Traffic classification	● Traffic classification based on the combination of the Layer-2 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 Virtual Extensible LAN (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
	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 splitting and merging - iStack dual-active detection - iStack version and configuration synchronization
Data center features	VXLAN	- Configuring a VXLAN tunnel manually - Configuring a VXLAN tunnel through the Ethernet VPN (EVPN) BGP dynamically
	Virtualization awareness	- Virtualization awareness - Automatic deployment of policies - Automatic migration of policies - Network Load Balancing (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
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 system	- File systems with 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 the ping command - Port mirroring and traffic mirroring

Function		Description
	Version upgrade	Software upgrade through the BootLoader menu **NOTE** To ensure service security, upgrade the switch module software version regularly.

Security and management	System security	● Command line-based hierarchical protection to prevent unauthorized access
		● Secure Shell (SSH)
		● Remote Authentication Dial In User Service (RADIUS) IPv4 and IPv6 user authentication
		● Huawei Terminal Access Controller Access Control System (HWTACACS) IPv4 and IPv6 user 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
		● Unicast Reverse Path Forwarding (URPF)
		● 802.1x authentication

Function		Description
	Network management	● Internet Control Message Protocol (ICMP) for ping and Tracert ● Simple Network Management Protocol Version 1/2c/3 (SNMPv1/v2c/v3) ● Standard Management Information Base (MIB) ● Remote Network Monitoring (RMON) ● NetStream (traffic statistic packet formats: V5, V8, and V9) ● Sampled flow (sFlow) ● NETCONF interfaces ● Network Quality Analysis (NQA)

Table 1-2 Functions of the FC switching plane

Function		Description
FC switching	FC port	8G/16G FC autonegotiation and full duplex
	Switching	● Works in native FC switching mode and transparent transmission mode (referred to as Access Gateway mode by Brocade) as the NPV module. NPV is short for N-Port virtualization. ● Supports free mapping to internal FC ports and external FC ports in NPV mode. ● Supports network connection between E_Ports and Brocade FC switches in FC switching mode. A license is required for the function.
	N_Port ID Virtualization (NPIV)	A physical port supports multiple virtual N_Port IDs.
	Link aggregation	FC port link aggregation expands the port bandwidth and provides redundancy. ● Supports connection only to Brocade FC switches. ● Requires a license.
Configuration and maintenance	Configuration management	● Command line configuration ● HTTPS-based WebUI ● Simple Network Management Protocol Version 1/3 (SNMPv1/v3) ● FC Fabric Element management information base (MIB)

Function		Description
	Connection mode	• Ethernet connection (SSH, Web, SNMP) • Serial over LAN (SOL) connection
	Version upgrade	Supports online upgrades for software. Services are not interrupted during an upgrade. The upgrade takes effect after a restart. **NOTE** To ensure service security, upgrade the switch module software version regularly.
Network security	System security	• Hierarchical user permission management to prevent unauthorized access • Secure Shell (SSH) and Secure Sockets Layer (SSL) • Hypertext Transfer Protocol Secure (HTTPS) • SNMP v1/v3 • Remote Authentication Dial In User Service (RADIUS) user authentication • SSH authentication of "account and password" or "public and private keys"

1.2 Advantages

Main advantages:

- High performance and high port density

- Multiple switching planes: 10GE and FC

- Various uplink speeds: 10GE, 25GE, and 40GE

- Support for large data center networks

- High-performance stacking, easy deployment, simple maintenance

- On-demand configuration and flexible deployment

- Rich data center features

High Performance, High Port Density

Underpinned by the leading hardware platform, the CX916 provides high port density and line-speed forwarding capability. It supports next-generation server applications that require super high performance and density.

The Ethernet switching plane of the CX916 provides the following ports:

- 32 10GE downlink ports for connecting to high-performance compute nodes

- Eight 25GE SFP28 optical ports and two 40GE QSFP+ optical ports for connecting for uplink aggregation or core switches

- One 40GE port for interconnecting switch modules in slots 2X and 3X or those in slots 1E and 4E

- Two GE ports for connecting to active and standby MM910 modules
- Eight 16G FC ports for connecting to the external FC storage or SAN

The Ethernet switching plane supports low-latency forwarding: 642 Gbit/s line-speed switching capacity (1.284 Tbit/s throughput, excluding the PIC card) and line-speed Ethernet frame switching capability (packet length over 363 bytes) The forwarding latency for Layer-2 Ethernet frames in cut-through mode is less than 1.5 us.

The FC switching plane of the CX916 provides 384 Gbit/s line-speed switching capacity (768 Gbit/s throughput).

Multiple Switching Planes and Support for Large Data Center Networks

Up to 81920 MAC addresses in large MAC mode and up to 16000 Forwarding Information Bases (FIBs) in large route mode

High-Performance Stacking, Easy Deployment, and Simple Maintenance

Up to four CX916 switch modules can be stacked, with the following advantages:

- High performance: A single stack system provides more than thirty-two 10GE ports.
- Large bandwidth: 80 Gbit/s stack bandwidth (one 40GE port, bidirectional bandwidth), which can be increased to 240 Gbit/s through 40GE panel ports
- Easy deployment and maintenance
  - Pre-deployment and offline configuration are supported. The system can be pre-planned and pre-configured. Switch modules can be added as required.
  - The stack ID is the same as the switch module slot number to facilitate identification and maintenance.
  - Indicators on the front panel indicate the roles and statuses of stacked switch modules, so that the stack system can be maintained without using a terminal.
- Simple upgrade operations: The stack system supports quick and automatic software upgrades, simplifying upgrade operations and reducing the upgrade workload.
  - Quick software upgrade: The standby switch module is upgraded before the active switch module. This ensures that at least one switch module is operating.
  - Automatic software upgrade: The standby switch module automatically synchronizes its software version with the active switch module.

On-Demand Configuration and Flexible Deployment

The FC switching plane of the CX916 provides eight 16G FC ports. Four of the ports are activated by default, and the other four can be activated with licenses, which addresses diverse user needs.

📖**NOTE**

For details about licenses of the FC switching plane, see **MX210&MX220 Software Licensing Administrator Guide**.

Rich Data Center Features

- FC features
 - Supports seamless connection with the existing FC infrastructure, protecting investments on the FC SAN.

– Supports FIP Snooping Bridge (FSB), FCoE Forwarder (FCF), and N-Port Virtualization (NPV) to connect to the storage arrays or SAN.

● Virtualization and virtual machines (VMs)

– Supports server virtualization to improve the data center interface bandwidth usage.

– Supports virtualization awareness. During VM migration, network policies can be automatically migrated through virtualization awareness so that network resources can be allocated as required. Working with large Layer-2 networks, VMs can be freely migrated within the data center.

● 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.

1.3 Appearance

Appearance

Figure 1-1 shows a CX916.

Figure 1-1 Appearance
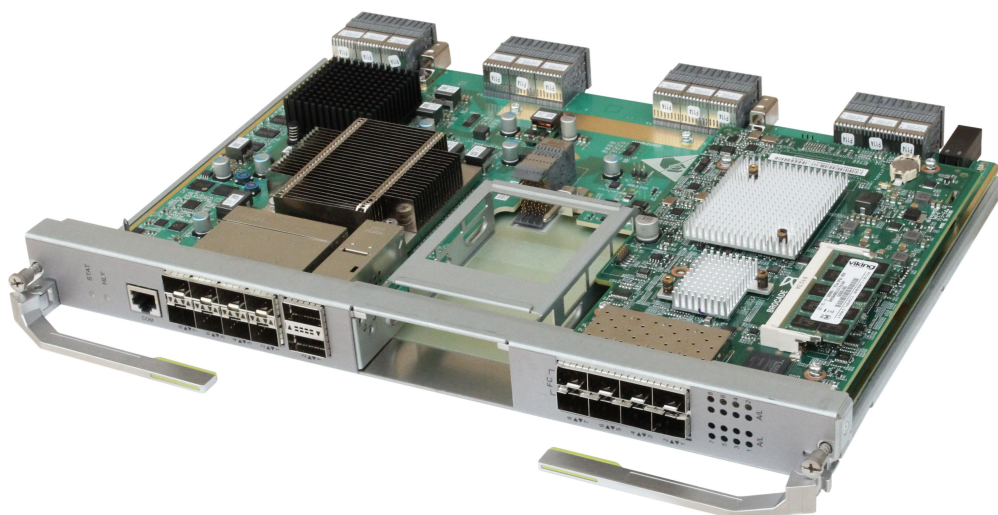
Installation Positions

The CX916 switch modules can be installed in slots 1E, 2X, 3X, and 4E at the rear of the E9000 chassis.

Figure 1-2 Installation positions and slot numbers
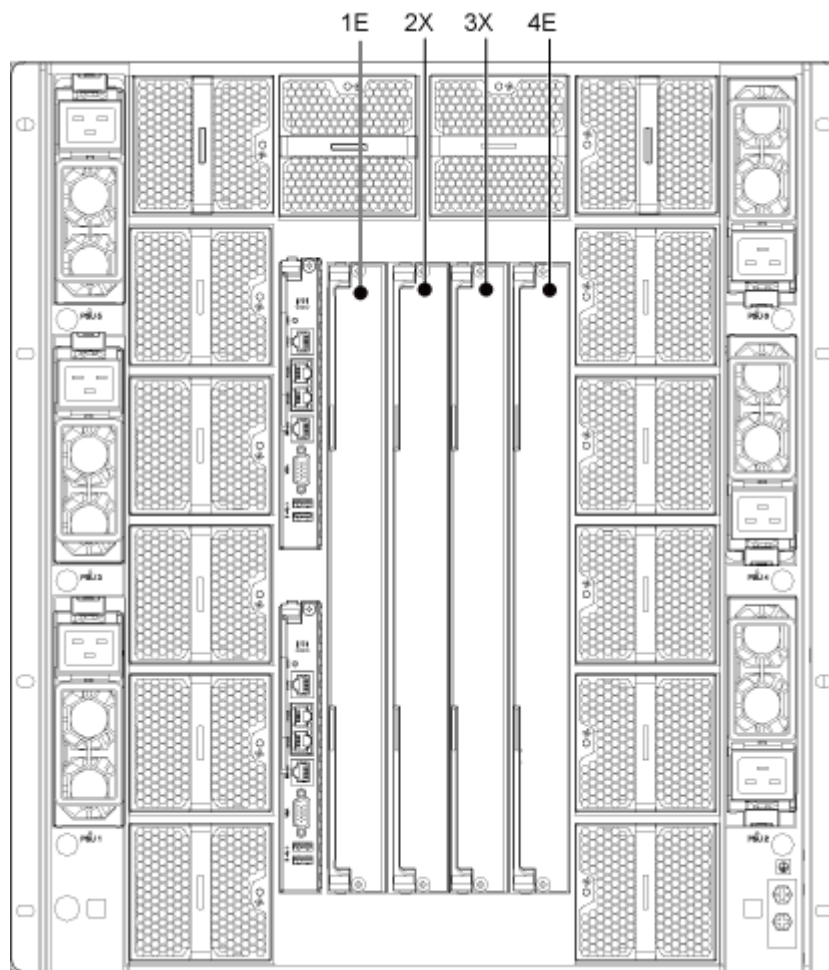
☐**NOTE**

- The LOM on a compute node connects only to slots 2X and 3X. Therefore, if the CX916 is installed in slot 1E or 4E, only its FC switching plane is useful and it provides the same function as the CX220. In this case, the CX220 is recommended.
- If the CX916 is installed in slot 2X or 3X, its Ethernet and FC switching planes can both work.

Panels

Figure 1-3 shows the panel of the CX916.

Figure 1-3 Panel
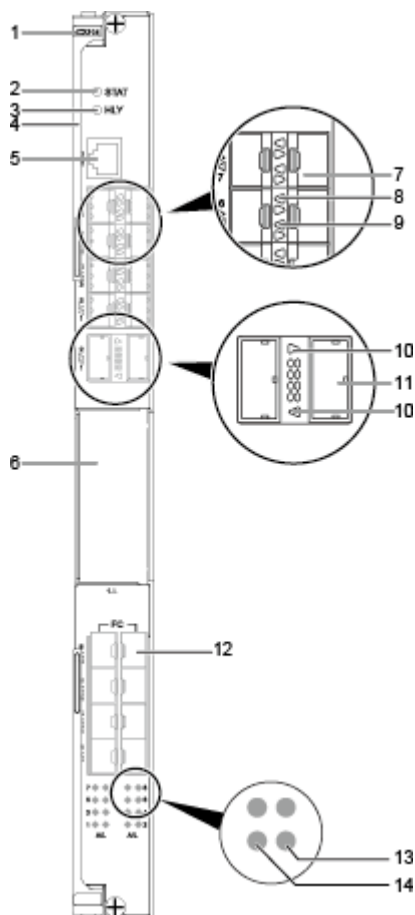
1	Product model	2	Stack status indicator
3	Health indicator	4	Ejector lever (with an ESN label)
5	Management serial port	6	PIC slot
7	25GE port	8	Connection status indicator of a 25GE port
9	Data transmission status indicator of a 25GE port	10	40GE port indicator
11	40GE port	12	16G FC port
13	Connection status indicator of a 16G FC port	14	Diagnosis status indicator of a 16G FC port

📖 **NOTE**

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

ESN

An Equipment Serial Number (ESN) is a string that uniquely identifies a server. An ESN is required when you apply for technical support to Huawei.

Figure 1-4 shows the ESN format.

Figure 1-4 ESN format

No.	Description
1	ESN ID (two digits)
2	Item identification code (eight characters)
3	Vendor code (two characters)
4	Year and month of production (two characters) The first character indicates the year. The digits 1 to 9 indicate 2001 to 2009, and the letters A to Z indicate 2010 to 2035. The second character indicates the month. The digits 1 to 9 indicate January to September, and the letters A to C indicate October to December.
5	Serial number (six digits)
6	RoHS compliance (one character)
7	Internal model number of the switch module

1.4 Ports

The CX916 provides ports to send and receive data.

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

- *Slot number* indicates the slot number of the switch module. The value ranges from 1 to 4, mapping to slot numbers 1E, 2X, 3X, and 4E.
- *Subcard number* ranges from 1 to 21.
- *Port serial number* indicates the serial number of the port on the subcard.

The FC ports on the CX916 are numbered 1 to 8.

For details, see **Table 1-3**, **Table 1-4**, and **Table 1-5**.

Figure 1-5 shows the port numbers.

Figure 1-5 Port numbering
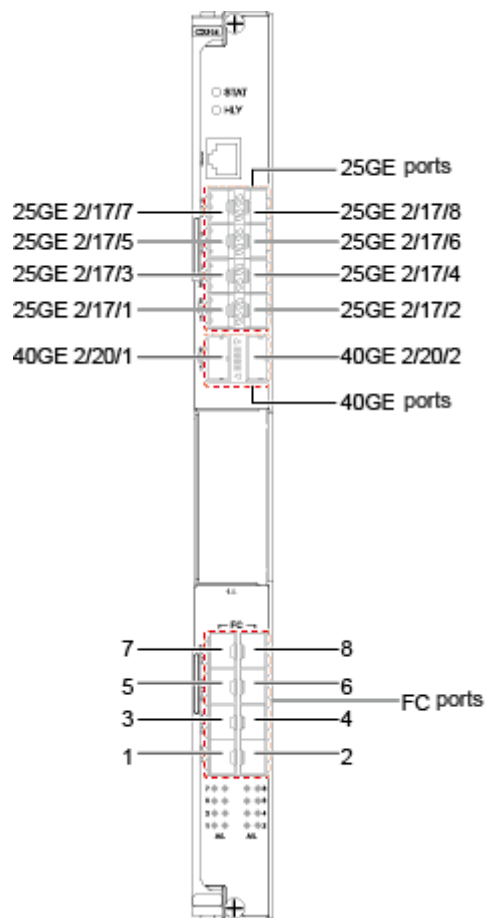
Table 1-3 describes the external ports on the CX916.

Table 1-3 External ports

Name	Type	Quantity	Subcard Number	Port Serial Number	Description
Serial port	RJ-45	1	-	-	Complies with the RS232 standard and has no indicators. This port is used for managing, maintaining, and commissioning the BMC, Ethernet switching plane, and FC switching plane. The serial port baud rates of the BMC and Ethernet switching plane are 115200 bit/s. The serial port baud rate of the FC switching plane is 9600 bit/s.
25GE port	SFP28	8	17	The value ranges from 1 to 8.	The Ethernet switching plane provides eight 25GE ports to connect to external networks. Each port has two indicators: the orange one indicates data transmission status, and the green one indicates the port connectivity status.
40GE port	QSFP+	2	20	1 and 2	The Ethernet switching plane provides two 40GE ports to connect to external networks. Each port has one status indicator.

Name	Type	Quantity	Subcard Number	Port Serial Number	Description
16G FC port	SFP+	8	–	-	The FC switching plane provides eight 16G FC ports for connecting to the storage network. Ports 1 to 4 are activated by default, and ports 5 to 8 can be activated with licenses. Each port has two indicators: the orange one indicates the diagnosis status, and the green one indicates the connection status.

Table 1-4 describes the internal ports on the Ethernet switching plane of the CX916.

Table 1-4 Internal ports of the Ethernet switching plane

Name	Type	Quantity	Subcard Number	Port Serial Number	Description	Example
10GE port	-	32	1 to 16	1 and 2	The ports are connected to front half-width slots 1 to 16. The port serial numbers are 1 and 2.	For the CX916 in slot 2X, the ports connected to the compute node in slot 1 are 10GE 2/1/1 and 10GE 2/1/2.
40GE port	-	1	18	1	The port is used to interconnect Ethernet switching planes of slots 1E and 4E, or slots 2X and 3X.	For the CX916 in slot 2X, the port is numbered 40GE 2/18/1.
GE port	-	2	19	1 and 2	The two GE ports are connected to the two MM910s respectively for communicating with internal ports eth0 and eth2 on the MM910s.	For the CX916 in slot 2X, the ports are numbered GE 2/19/1 and GE 2/19/2.

Table 1-5 describes the internal ports on the FC switching plane of the CX916.

Table 1-5 Internal ports on the FC switching plane

Name	Port No.	Quantity	Description	Port Number
FC port	0	1	The port is connected to the front half-width slot numbered 16.	Port 0
FC port	9 to 23	15	The ports are connected to half-width front slots 1 to 15.	Port 9 is connected to compute node slot 1; port 10 is connected to compute node slot 2; and so on.

1.5 Indicators

The indicators on the CX916 display its working status. Table 1-6 describes the indicators on the CX916 panel.

Table 1-6 Indicators

Silkscreen	Meaning	Color	Description
STAT	Stack status indicator	Green	● Off: The switch module is not powered on. ● Blinking green (the first 10 times): The CX916 is being powered on. ● Blinking green: The CX916 is in the standby state in a stack and is operating properly. ● Steady green: The CX916 is in the active state in a stack or is not stacked, and is operating properly.

Silkscreen	Meaning	Color	Description
HLY	Health indicator	Red and green	- Off: The CX916 is not powered on. - Steady green: The CX916 is operating properly. - Blinking red (once per second): The CX916 has a major alarm. - Blinking red (four times per second): The CX916 has a critical alarm. - Blinking red (five times per second): The CX916 is not installed properly.
◀ and ▶	Data transmission status indicator of a 25GE port	Orange	- Off: No data is being transmitted over the port. - Blinking orange: Data is being sent or received over the port.
◀ and ▶	Connection status indicator of a 25GE port	Green	- Off: The port is not connected or not properly connected. - Steady green: The port is properly connected.
◀ and ▶	40GE port indicator	Green	- Off: The port is not connected or not properly connected. - Blinking green: Data is being sent or received over the port. - Steady green: The port is properly connected.
A	Diagnosis status indicator of a 16G FC port	Orange	- Off: If the L indicator is also off, no optical module is installed, or an exception occurs when the port is receiving optical signals. - Steady orange: The port is not synchronized, and a connection exception occurs. - Blinking orange (once every two seconds): The port is disabled. - Blinking orange (twice per second): The port is faulty.

Silkscreen	Meaning	Color	Description
L	Connection status indicator of a 16G FC port	Green	- Off: If the A indicator is also off, no optical module is installed, or an exception occurs when the port is receiving optical signals. - Steady green: The port is healthy and the link has been set up. - Blinking green (once every two seconds): The port is healthy but isolated. No link has been set up. - Blinking green (twice per second): The port has an inloop (in diagnosis mode). - Blinking green (four times per second): Data is being transmitted.

1.6 Internal Networking of a Chassis

For details about the networking between the CX916 switch modules and the mezzanine cards on compute nodes, see **E9000 Blade Server Mezz Module-Switch Module Interface Mapping Tool**.

Figure 1-6 and **Figure 1-7** show the networking between the CX916 switch modules and the compute nodes. The mezzanine cards and the 10GE LOM on each compute node provide ports to connect to the CX916 switch modules. (The LOM is available only on V5 compute nodes and provides two network ports.)

- The LOM connects to the Ethernet switching planes of the CX916 switch modules in slots 2X and 3X.

- Mezz 1 and Mezz 3 connect to the FC switching planes of the CX916 switch modules in slots 2X and 3X.

- Mezz 2 and Mezz 4 connect to the FC switching planes of the CX916 switch modules in slots 1E and 4E.

Figure 1-6 Connections between the CX916 switch modules and the NICs on a half-width compute node
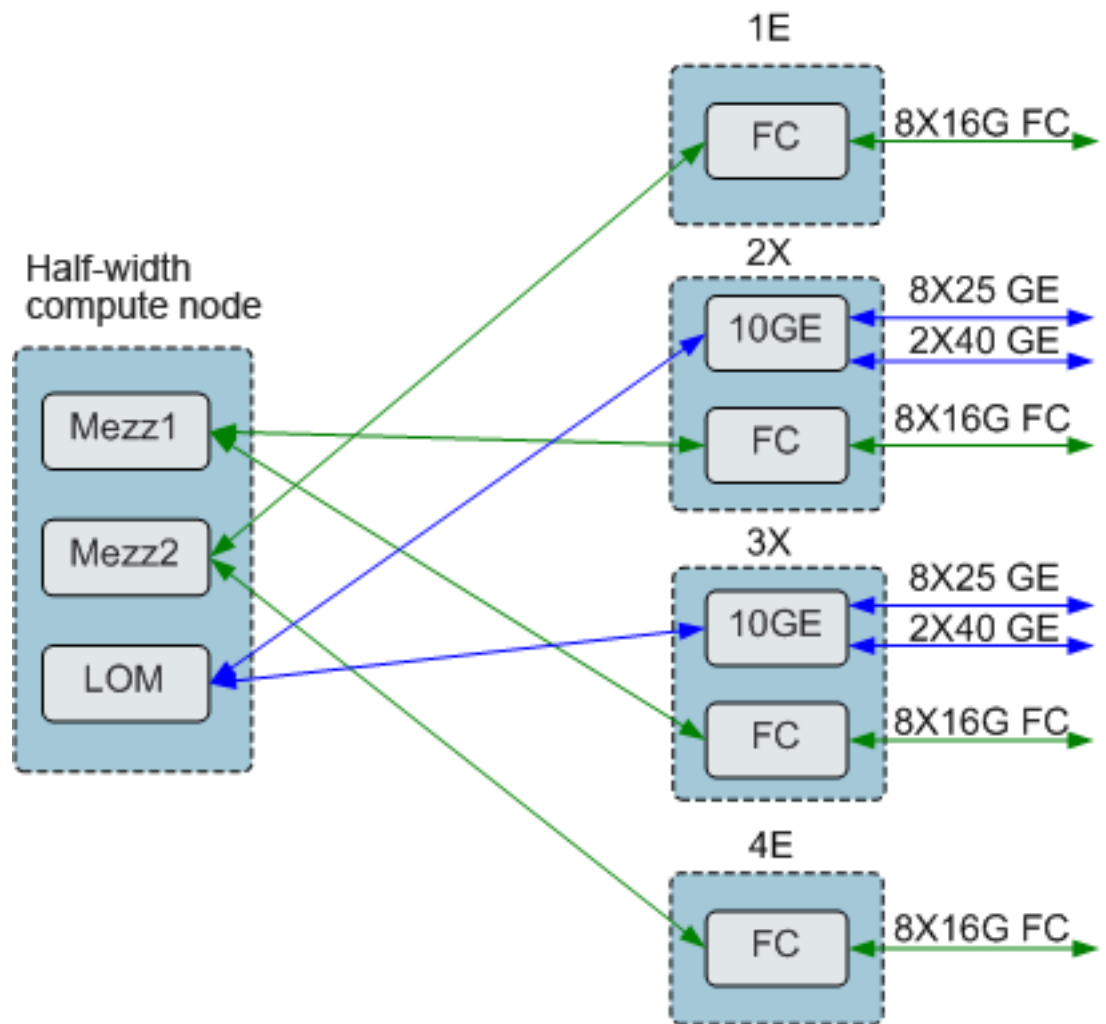
Figure 1-7 Connections between the CX916 switch modules and the NICs on a full-width compute node
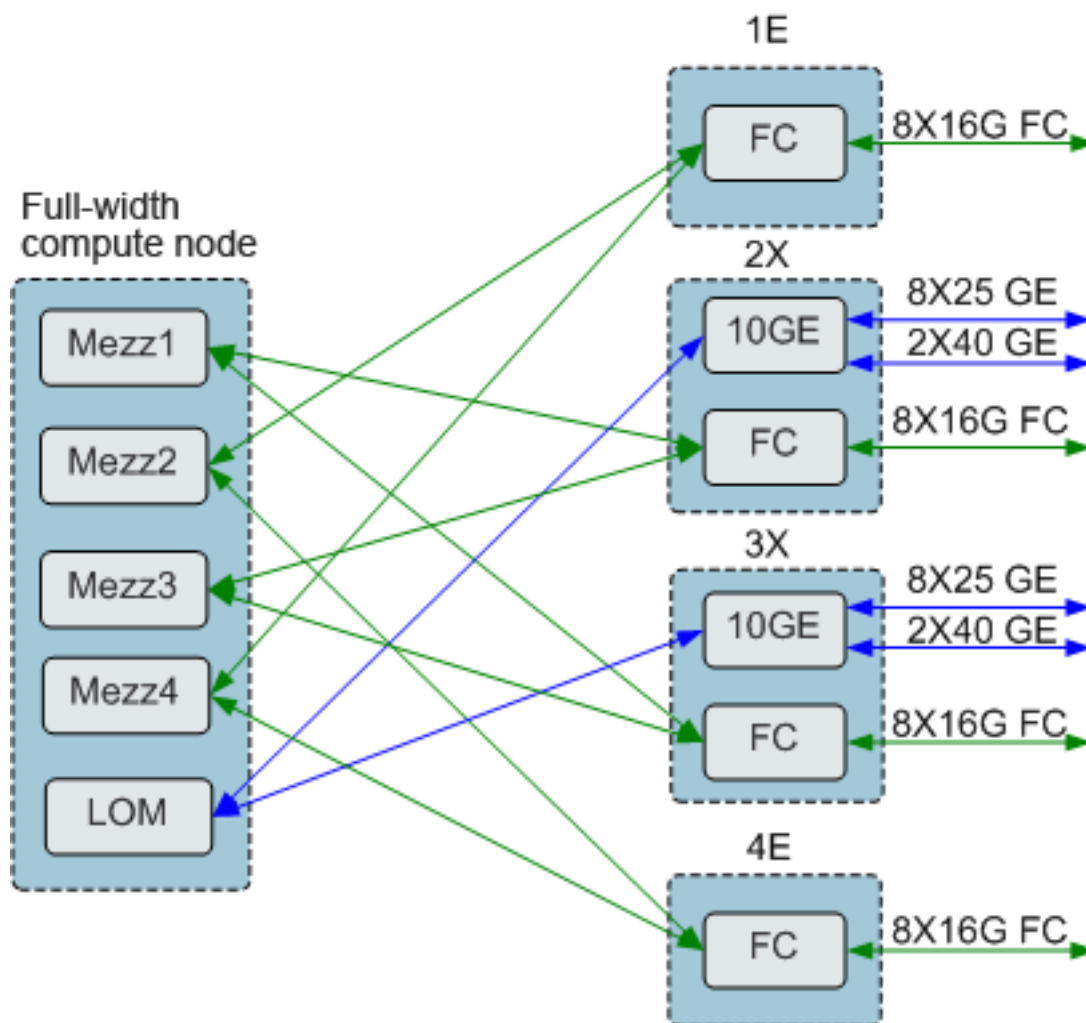
Connections Between CX916 Switch Modules and an MZ220 NIC

The MZ220 provides two 16G FC ports (ports 1 and 2). Ports 1 and 2 are connected to the FC switching planes of the CX916 switch modules in slots 2X and 3X respectively, as shown in **Figure 1-8**.

The following assumes that the CX916 switch modules are installed in slots 2X and 3X and connected to Mezz 1. If the CX916 switch modules are installed in slots 1E and 4E, they are connected to Mezz 2.

📖**NOTE**

If the CX916 switch modules are installed in slots 1E and 4E, only their FC planes are useful. If they are installed in slots 2X and 3X, both the Ethernet and FC switching planes can work.

Figure 1-8 Connections between CX916 switch modules and an MZ220 NIC
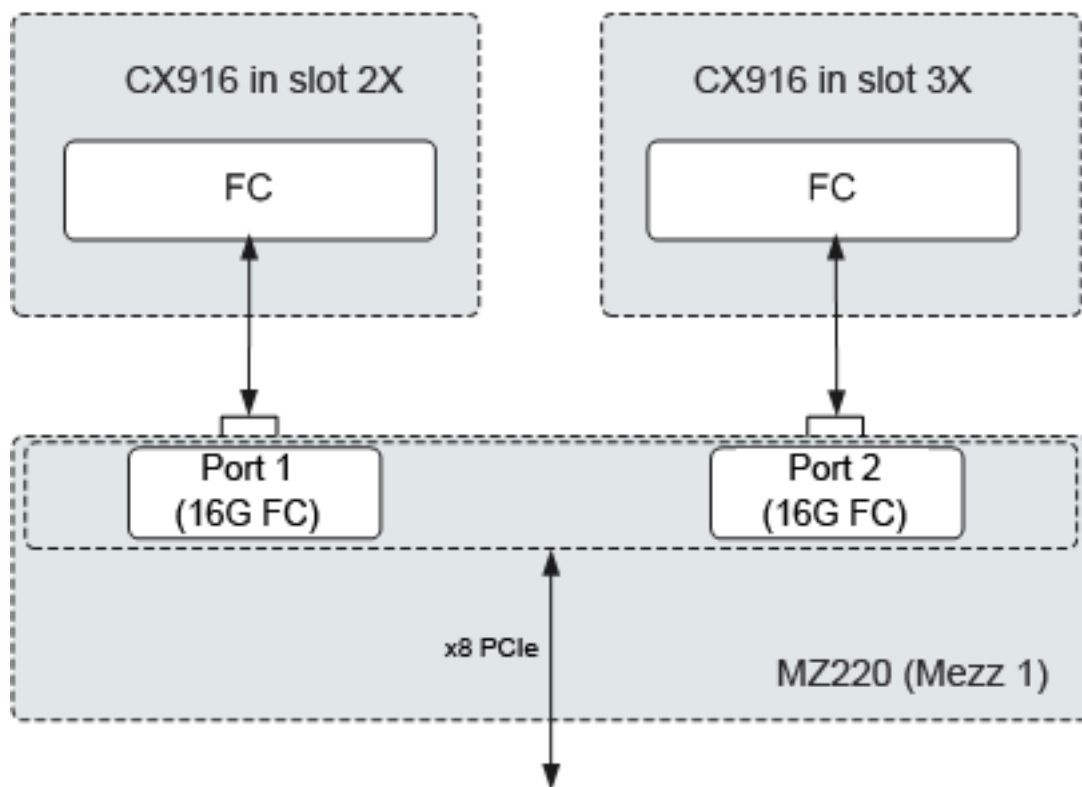
1.7 Software and Hardware Compatibility

Use the **Huawei Server Compatibility Checker** to check the software and hardware supported by the CX916.

Supported Mezzanine Cards

The CX916 connects to mezzanine cards of compute nodes.

Table 1-7 Supported mezzanine cards

Model	Specifications
MZ220	Provides two 16G FC ports.

Supported Pluggable Modules and Cables

Table 1-8 Supported pluggable modules and cables

Type	Specifications
SFP28 multi-mode optical module (25GE)	Supports 25GBASE-SR.

Type	Specifications
DAC cable (25GE)	Supports 25GBASE-CR. 1 m, 3 m, and 5 m passive DAC cables can be used.
AOC cable (25GE)	Supports 25GBASE-SR. 3 m, 5 m, 7 m, 10 m, and 20 m AOC cables can be used.
AOC cable (40GE)	Supports 40GE AOC cables.
QSFP+ single-mode optical module (40GE)	Supports 40GE single-mode optical modules.
QSFP+ multi-mode optical module (40GE)	Supports 40GE multi-mode optical modules.
DAC cable (40GE)	Supports 1 m, 3 m, and 5 m passive DAC cables.
1 to 4 DAC cable (40GE to 4 x 10GE)	Supports 1 m, 3 m, and 5 m passive DAC cables.
MPO to 4 x DLC multi-mode fiber (MMF)	Insert the MPO connector to a QSFP+ optical module, and insert the DLC connectors to SFP+ optical modules.
SFP+ multi-mode optical module (10GE)	Supports 10GBASE-SR.
SFP+ single-mode optical module (10GE)	Supports 10GBASE-LR.
DAC cable (10GE)	Supports 10GBASE-CR. 7 m and 10 m active DAC cables, or 1 m, 3 m, and 5 m passive DAC cables can be used.
16G/8G SFP+ multi-mode optical module (Brocade)	Supports FC-PI-45.
16G/8G SFP+ single-mode optical module (Brocade)	Supports FC-PI-45.
Multi-mode optical fiber (MMF)	Supports 850 nm OM1, OM2, and OM3 MMFs.
Single-mode optical fiber (SMF)	Supports 1310 nm SMFs.
Console cable	Supports the RJ45 connector and connects to an RS232 serial port.
This table is for reference only. For details about the components that can be purchased, consult the local Huawei sales representatives.	

The CX916 supports multiple pluggable optical modules, fibers, and network cables. You can choose the modules and cables based on site requirements.

● The CX916 provides the following functions for 25GE applications:

- – Provides SFP28 optical ports that support multi-mode SFP28 optical modules.
  - – Supports 25GE passive DAC cables (25GBASE-CR) of 1 m, 3 m, and 5 m.
  - – Supports 25GE AOC cables (25GBASE-SR) of 3 m, 5 m, 7 m, 10 m, and 20 m.
- ● The CX916 provides the following functions for 40GE applications:
  - – Provides QSFP+ optical ports that support single-mode and multi-mode QSFP+ optical modules.
  - – Supports QSFP+ cables (40GE). 1 m, 3 m, and 5 m passive DAC cables can be used.
  - – The 40GE port on the panel can be split into four 10GE ports.
- ● The CX916 provides the following functions for 10GE applications:
  - – Provides SFP28 and SFP+ optical ports that support single-mode and multi-mode SFP+ optical modules.
  - – Supports DAC cables (10GE). 7 m and 10 m active DAC cables, or 1 m, 3 m, and 5 m passive DAC cables can be used.
- ● The CX916 provides the following functions for FC applications:
  - – Provides SFP+ optical ports that support single-mode and multi-mode 16G/8G SFP + optical modules.
  - – 16G SFP+ optical modules support 16 Gbit/s and 8 Gbit/s. 8G SFP+ optical modules support 8 Gbit/s.
  - – The CX916 supports various fibers. You can choose them based on site requirements.

📖**NOTE**

FC ports of the CX916 support only single-mode and multi-mode Brocade pluggable optical modules.

1.8 Technical Specifications

Table 1-9 lists the technical specifications. **Table 1-10** describes the network performance of the Ethernet switching plane.

To learn about the network performance of the FC switching plane, see **MX210&MX220 Fabric OS Administrator Guide**.

Table 1-9 Technical Specifications

Category	Item	Specifications
Physical specifications	Dimensions (H x W x D)	388.55 mm × 35.06 mm × 272.15 mm (15.3 in. x 1.38 in. x 10.71 in.)
	Color	Silver
	Weight	2.9 kg
Environmental specifications	Temperature	● Operating temperature: 5℃ to 40℃ (41℉ to 104℉) (ASHRAE Class A3 compliant) ● Storage temperature: －40°C to +65°C (－40°F to +149°F) ● Temperature change rate < 20℃ (36℉)/hour

Category	Item	Specifications
	Humidity	• Operating humidity: 5% RH to 85% RH (non-condensing) • Storage humidity: 5% RH to 95% RH (non-condensing) • Temperature change rate < 20% RH/hour
	Altitude	40℃@900 m When the device is used at an altitude from 900 m (2952.76 ft) to 5000 m (9842.52 ft), the highest operating temperature decreases by 1°C (1.8°F) for every increase of 300 m (984.25 ft).
Input power	Rated input voltage	12 V DC
Power consumption	Maximum power consumption	199.7 W

Table 1-10 Network switching specifications

Category	Item	Specifications
Overall performance	Number of ports on the panel	• One serial port • Eight 25GE ports • Two 40GE ports • Eight 16G FC ports
	Port rate	• The Ethernet switching plane supports 10GE, 25GE, and 40GE ports. • The FC switching plane supports 16G/8G FC ports.
	Service port stacking	The following ports can be used for stacking: Four consecutive 25GE ports(numbered 1 to 4 or 5 to 8) on the panel, 40GE port on the panel, and internal 40GE port. Note that a logical stack port cannot contain both 25GE and 40GE ports.
	Throughput	• Ethernet switching plane: 1.284 Tbit/s. The frame length is over 363 bytes. • FC switching plane: 768 Gbit/s
	Packet forwarding rate	720 Mpps
Ethernet service	Number of MAC addresses	81920

Category	Item	Specifications
	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 modified.
	Number of Eth-Trunks	128 Eth-Trunks, each with up to 16 member ports 64 Eth-Trunks, each with up to 32 member ports
	Number of ARP table entries	116000 (large ARP mode)
	Jumbo frame length	9216 bytes
IP unicast	Number of route table entries	262000 (large route mode)
	Number of IPv4 FIBs	262000 (large route mode)
	Number of IPv6 FIBs	131000 (large route mode with the subnet mask less than or equal to 64)
NOV3	Number of VXLAN tunnels	15000
	Number of broadcast domains	8000

2 Standards and Certifications

2.1 Standards Compliance

2.2 Certifications

2.1 Standards Compliance

International Standards

Table 2-1 lists the international standards.

Table 2-1 Standards and communication protocols

Standard	Protocol
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	Fibre Channel. Physical Interface-4 8G FC port
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 MMFs
IEEE 802.1Q	Virtual Bridged Local Area Networks (VLAN)
IEEE 802.1s	Multiple Spanning Tree Protocol (MSTP)
IEEE 802.1w	Rapid Spanning Tree Protocol (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 1149.1-2001	IEEE Standard Test Access Port and Boundary-Scan Architecture
RFC2837	Fabric Element MIB Specification
SFF-8431	Enhanced Small Form Factor Pluggable Module SFP+
SFF-8472	Diagnostic Monitoring Interface for Optical Transceivers

Industry Standards

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

Communication Protocols

Table 2-3 lists the 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

Protocol	Description
GVRP	GARP VLAN Registration Protocol
HTTPS	Hypertext Transfer Protocol Secure
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
SFTP	Secure File Transfer Protocol
SNMP	Simple Network Management Protocol
SSH	Secure Shell
SSL	Secure Socket Layer
STP	Spanning Tree Protocol
TCP	Transmission Control Protocol
Telnet	Remote Terminal Protocol
TFTP	Trivial File Transfer Protocol
UDP	User Datagram Protocol
VRRP	Virtual Router Redundancy Protocol

2.2 Certifications

This section describes the certifications that the E9000 has passed.

Table 2-4 lists the certifications passed by the E9000.

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
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