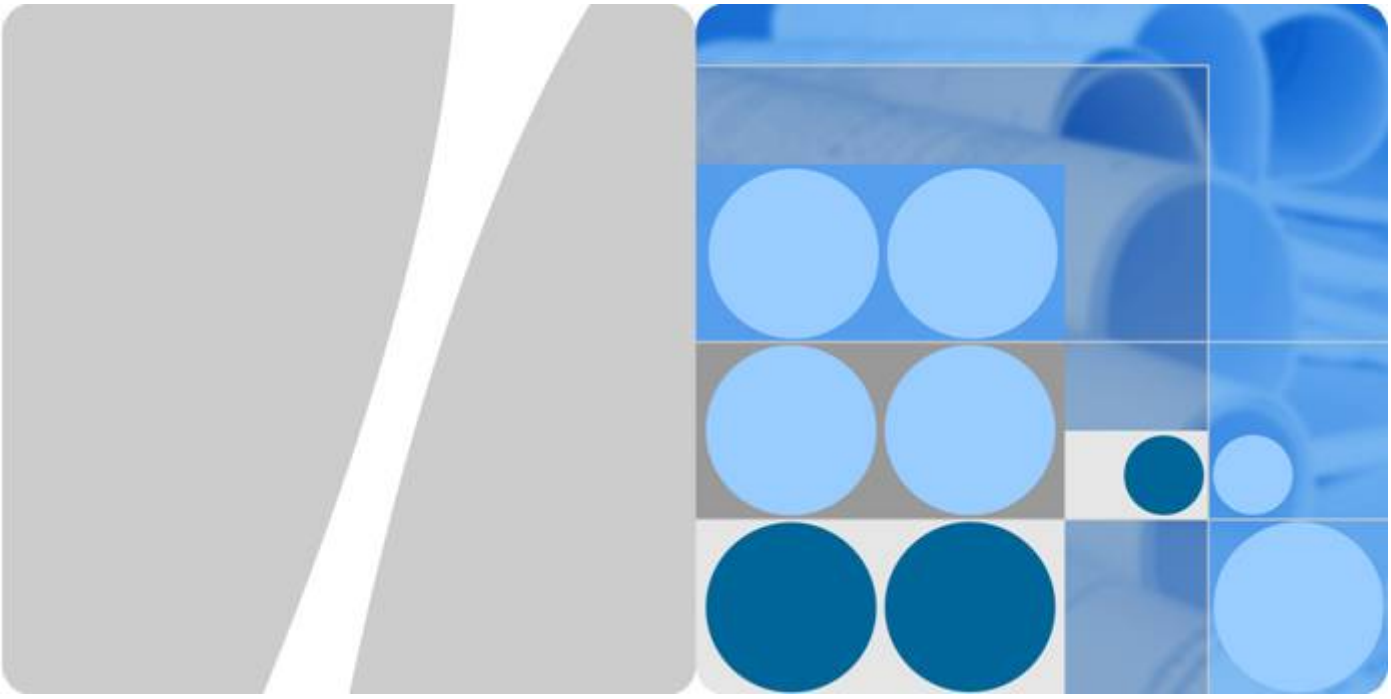

S2700 Series Ethernet Switches

V100R006C03

Product Description

Issue 02

Date 2012-10-27

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About This Document

Purpose

This document describes the positioning, characteristics, architecture, link features, service features, application scenarios, operation and maintenance functions, and technical specifications of the S2700.

This document helps you understand the characteristics and features of the S2700.

Intended Audience

This document is intended for:

- Network planning engineers
- Hardware installation engineers
- Commissioning engineers
- Data configuration engineers
- On-site maintenance engineers
- Network monitoring engineers
- System maintenance engineers

Symbol Conventions

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

Symbol	Description
 DANGER	Indicates a hazard with a high level of risk, which if not avoided, will result in death or serious injuries.
 WARNING	Indicates a hazard with a medium or low level of risk, which if not avoided, could result in minor or moderate injuries.
 CAUTION	Indicates a potentially hazardous situation that, if not avoided, could cause device damage, data loss, and performance degradation, or unexpected results.

Symbol	Description
TIP	Indicates a tip that may help you solve a problem or save you time.
NOTE	Provides additional information to emphasize or supplement important points of the main text.

Change History

Updates between document issues are cumulative. Therefore, the latest document version contains all updates made to previous versions.

Changes in Issue 02 (2012-10-27)

Based on issue 01 (2012-06-30), the document is updated as follows:

The following information is modified:

- The documentation is modified according to updates in product features.

Changes in Issue 01 (2012-06-30)

This is the first release.

Contents

1 Product Positioning and Characteristics

About This Chapter

1.1 Product Positioning

CAUTION

The S2700 Series Ethernet Switches are class A products. The switches that are operating may cause radio interference. Customers need to take prevention measures.

The S2700 Series Ethernet Switches (hereinafter referred to as the S2700) provide the access and data transport functions. They are developed by Huawei to meet the requirements for reliable access and high-quality transmission of multiple services on the enterprise network.

Positioned for the access layer of the enterprise network, the S2700 provides large capacity, high port density, and cost-effective packet forwarding capabilities. In addition, the S2700 provides multi-service access capabilities, excellent extensibility, quality of service (QoS) guarantee, powerful multicast replication, and carrier-class security, and can be used to build ring topologies of high reliability.

1.2 Product Characteristics

1.2.1 Flexible Networking Capability

The S2700 provides 10/100BASE-T Ethernet electrical interfaces, 10/100/1000BASE-T electrical interfaces, and 100/1000BASE-X Ethernet optical interfaces. It supports multiple interface types such as access, trunk, and hybrid.

The S2700 provides swappable Small Form-Factor Pluggable (SFP) optical modules for optical fiber connections.The length of optical fibers can be selected according to the transmission distance.

The S2700 can be used to construct a tree, star, or ring Ethernet network. For the ring Ethernet, the S2700 supports the Spanning Tree Protocol (STP) to prevent loops and provide rapid switchover.

1.2.2 High Extensibility

Based on the Huawei proprietary Versatile Routing Platform (VRP), the S2700 provides high-speed switching and various service features by integrating network management technologies.

1.2.3 Comprehensive Security Measures

The S2700 guarantees the security of network devices and data transmission. It provides the following security measures to protect the network against attacks initiated by malicious users:

- Packet filtering based on MAC addresses
- Various ACL policies
- Mechanism of searching the forwarding table based on VLAN IDs and MAC addresses
- Traffic suppression

In addition, the S2700 provides the following functions to ensure secure login of users:

- Providing login passwords and password encryption for login users
- Protecting commands through users levels and command levels
- Locking the configuration terminal through a certain command to prevent illegal use of the device
- Displaying confirm or prompt information for important commands that affect system performance

The S2700 provides the Automatic Laser Shutdown (ALS) function. That is, when the fiber is broken, the S2700 stops transmitting laser. This protects users against the laser.

1.2.4 Convenient Operation and Maintenance

In addition to collecting traffic statistics based on interfaces and VLANs, the S2700 provides fault detection and location tools such as ping and traceroute on an IP network. It can also work with the Huawei eSight network management system (NMS) to implement performance monitoring, alarm report, and fast fault location.

eSight provides various functions to help you manage the S2700, including resource management, topology management, and configuration file management, batch configuration. In addition, eSight can show important performance indicators in diagrams and tables to facilitate device management.

The S2700 supports the Huawei Group Management Protocol (HGMP). Through HGMP, an S2700 can manage multiple switches by automatically collecting topology information and using a uniform management channel.

1.2.5 Energy-Saving Design

The S2700 adopts the following measures to save energy:

- It adopts natural heat dissipation so that power consumed by fans is saved.

  NOTE

  Currently, The S2700-9TP-PWR-EI, S2700-9TP-SI/EI, S2700-18TP-SI/EI, and SS2700-26TP-SI/EI supports natural heat dissipation.

- The chip switches to the power saving mode when no connected device is detected on a service interface, that is, the interface is idle.
- It uses highly-integrated and energy-saving chips produced through advanced processing techniques. With the help of the intelligent device management system, the chips not only improve system performance but also greatly reduce power consumption of the entire system.

Natural heat dissipation has the following advantages:

- The product reliability is high.
- There is no noise pollution.
- You do not need to maintain the fans, which saves the maintenance cost.
- The system does not have additional power consumption generated by fans, which improves the power efficiency.
- Boards are prevented from being eroded.

1.2.6 Advanced Lightning Protection Technologies

The S2700 adopts the Huawei patented lightning protection technologies to protect the equipment. The lightning protection technologies reduce the probability of damages caused by lightning and increase the safety factor by 30 times, thus greatly improving the device reliability.

1.2.7 Convenient PoE Power Supply

The S2700 PoE switches has the PoE function. It provides centralized power supply for the attached IP phone, wireless access point (AP), portable device charger, POS machine, camera, and data collector through twisted pairs.

The PoE function of the S2700 PoE switches complies with IEEE 802.3af and IEEE 802.3at. The S2700 can provide power for the devices of different vendors remotely. In IEEE 802.3at, the maximum power supply capability is 30 W. This capability ensures adequate power for IP video phone, dualband WiFi AP, IP camera, multi-function STB11, and RFID and simplifies the network.

The S2700 PoE switches has the ability to control power supply based on time range, thus effectively managing network devices, reducing power consumption, and lowering the OPEX.

2 Product Architecture

About This Chapter

2.1 Device Structure

This section describes the structure of the S2700.

The S2700 Ethernet switches adopt an integrated hardware platform. An S2700 consists of the chassis, power supply unit, fan, and switch control unit (SCU). The width of an S2700 complies with industry standards, and the S2700 can be installed in an IEC297 cabinet or an ETSI cabinet.

NOTE

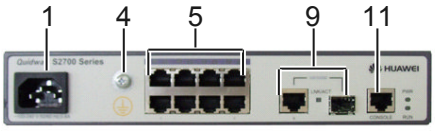
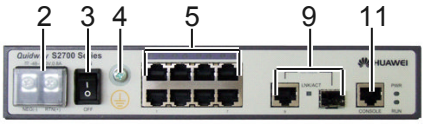
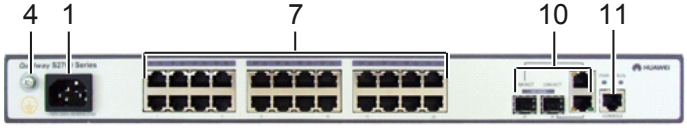
The S2700 is 1 U (1 U = 44.45 mm) high.

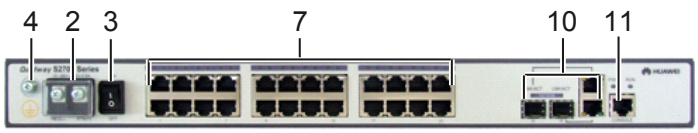
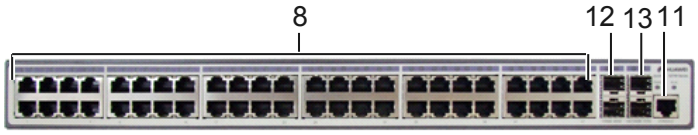
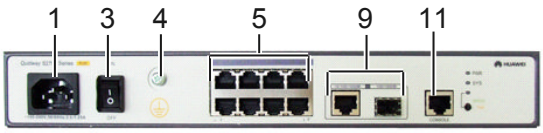
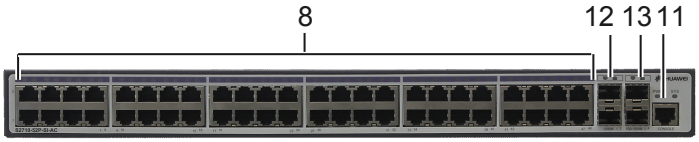
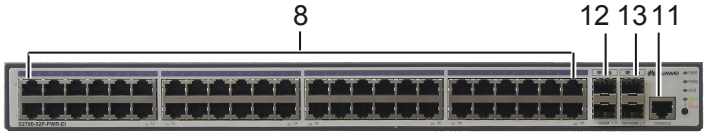
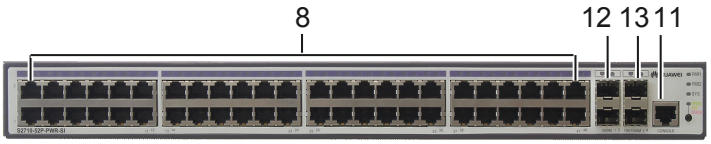
- The dimensions of S2700-9TP-SI-AC, S2700-9TP-EI-AC, or S2700-9TP-EI-DC are 250.0 mm x 180.0 mm x 43.6 mm (width x depth x height).
- The dimensions of S2700-9TP-PWR-EI are 320.0 mm x 220.0 mm x 43.6 mm (width x depth x height).
- The dimensions of S2700-52P-EI-AC, S2710-52P-SI-AC, S2700-18TP-SI-AC, S2700-18TP-EI-AC, S2700-26TP-SI-AC, S2700-26TP-EI-AC, or S2700-26TP-EI-DC are 442.0 mm x 220.0 mm x 43.6 mm (width x depth x height).
- The dimensions of S2700-26TP-PWR-EI, S2700-52P-PWR-EI, or S2710-52P-PWR-SI are 442.0 mm x 420.0 mm x 43.6 mm (width x depth x height).

S2700 Appearances

Table 2-1 shows the front views of S2700.

Table 2-1 S2700 front views

Model	Image
S2700-9TP-SI-AC S2700-9TP-EI-AC	
S2700-9TP-EI-DC	
S2700-18TP-SI-AC S2700-18TP-EI-AC	
S2700-26TP-SI-AC S2700-26TP-EI-AC	

Model	Image
S2700-26TP-EI-DC	
S2700-52P-EI-AC	
S2700-9TP-PWR-EI	
S2700-26TP-PWR-EI	
S2710-52P-SI-AC	
S2700-52P-PWR-EI	
S2710-52P-PWR-SI	

1. AC jack	2. DC jack	3. Switch	4. Ground screw
5. Eight 10/100BASE-T Ethernet interfaces	6. Sixteen 10/100BASE-T Ethernet interfaces	7. Twenty-four 10/100BASE-T Ethernet interfaces	8. Forty-eight 10/100BASE-T Ethernet interfaces

9. One 1000M combo interface (10/100/1000BASE-T+100/1000BASE-X)	10. Two 1000M combo interfaces (10/100/1000BASE-T+100/1000BASE-X)	11. One console interface	12. Two 1000M uplink interfaces (SFP)
13. Two 100/1000BASE-X Ethernet optical interfaces			

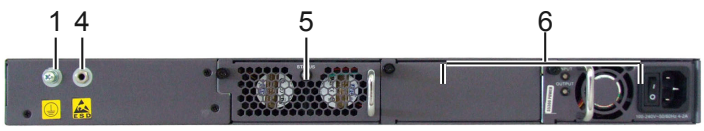
NOTE

By default, a combo interface works in the auto mode. In the auto mode, if the electrical interface is connected to a network cable first, the combo interface works as an electrical interface to transmit data; if the optical interface is connected to a fiber first, the combo interface works as an optical interface to transmit data.If the electrical interface and optical interface are connected simultaneously, the combo interface works as an optical interface.

Table 2-2 shows the rear views of S2700.

Table 2-2 S2700 rear views

Model	Image
S2700-9TP-SI-AC S2700-9TP-EI-AC S2700-9TP-EI-DC	
S2700-18TP-SI-AC S2700-18TP-EI-AC S2700-26TP-SI-AC S2700-26TP-EI-AC S2700-26TP-EI-DC	
S2700-52P-EI-AC S2710-52P-SI-AC	
S2700-9TP-PWR-EI	

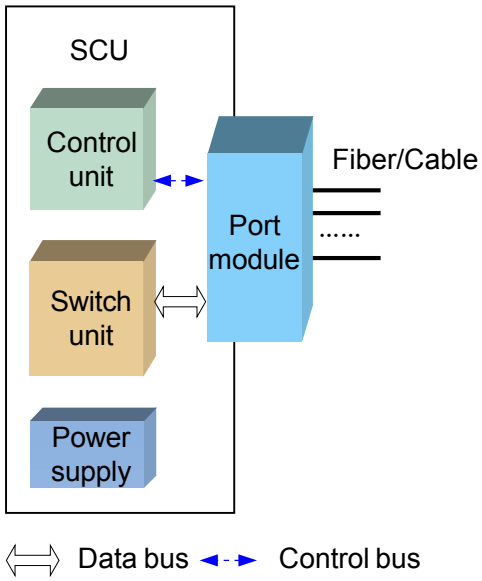
Model	Image
S2700-26TP-PWR-EI S2700-52P-PWR-EI S2710-52P-PWR-SI	

1. Ground screw	2. Switch	3. AC jack	4. ESD jack
5. Fan module	6. Power supply unit slot		

2.2 Hardware Modules

Figure 2-1 shows the logical structure of hardware modules of the S2700.

Figure 2-1 Logical structure of hardware modules of the S2700



Hardware modules of the S2700 refer to the SCU, power supply, and fan.

2.2.1 SCU

The SCU is fixed on the S2700. Each S2700 has one SCU.

The SCU is responsible for packet switching and device management. It integrates multiple functional modules, namely, the main control module, switching module, and interface module.

Main Control Module

The main control module implements the following functions:

- Processing protocols
- Functioning as an agent of the user to manage the system and monitor the system performance according to instructions of the user, and report the running status of the device to the user
- Monitoring and maintaining the interface module and switching module on the SCU.

Switching Module

The switching module, also called the switching fabric, is responsible for packet exchange, multicast replication, QoS scheduling, and access control on the interface module of the SCU.

The switching module adopts high performance ASIC chips to implement line-speed forwarding and fast switching of data with different priorities.

Interface Module

The interface module provides Ethernet interfaces for accessing Ethernet services.

2.2.2 Power Supply

The S2700 can use either the DC power supply or the AC power supply. But the switches with PoE can only use the AC power supply.

Table 2-3 Power supply

Device Name	AC	DC	1:1 Backup power supplies
S2700-9TP-SI-AC	Y	N	N
S2700-9TP-EI-AC	Y	N	N
S2700-9TP-EI-DC	N	Y	N
S2700-18TP-SI-AC	Y	N	N
S2700-18TP-EI-AC	Y	N	N
S2700-26TP-SI-AC	Y	N	N
S2700-26TP-EI-AC	Y	N	N
S2700-26TP-EI-DC	N	Y	N
S2700-52P-EI-AC	Y	N	N
S2710-52P-SI-AC	Y	N	N
S2700-9TP-PWR-EI	Y	N	N
S2700-26TP-PWR-EI	Y	N	Y
S2700-52P-PWR-EI	Y	N	Y

Device Name	AC	DC	1:1 Backup power supplies
S2710-52P-PWR-SI	Y	N	Y

2.2.3 Fan

The fans can work in the intelligent mode or forcible mode.

In the intelligent mode, the fans start to operate only when the environment temperature exceeds a specified value.

The S2700-52P-EI-AC, S2710-52P-SI-AC support the intelligent mode.

The S2700-26TP-PWR-EI, S2710-52P-PWR-SI and S2700-52P-PWR-EI support the hot pluggable fans. The fan module can be replaced on site and maintained in service.

2.3 Software Architecture

The S2700 runs on the latest VRP version 5 (VRPv5) to provide various features. VRPv5 consists of the following parts:

- System service plane

  This plane provides task and memory management, timer, software loading and patching on the basis of the operating system. In addition, it enhances modular technology to facilitate system upgrade and customization.
- General control plane

  This plane is the core of the VRP data communication platform, providing link management, IP protocol stack, and implementing the security and QoS functions. It is used to control the data forwarding plane and implement functions of the device.
- Data forwarding plane

  This plane forwards data under the control of the general control plane. The VRPv5 supports data forwarding based on software and hardware.
- Service control plane

  This plane controls and manages services based on users or interfaces. It implements the authentication, authorization, and accounting for users through DHCP Option 82 and implements authentication for access interfaces through IEEE 802.1x.
- System management plane

  This plane provides a graphic user interface and manages the input and output information for network management and maintenance.

3 Link Features

About This Chapter

3.1 Ethernet Features

3.1.1 Link Aggregation

Link aggregation is a function that binds multiple physical interfaces on one device into a logical interface (such as an Eth-Trunk). This logical interface is also called a load balancing group or a link aggregation group.

After multiple physical interfaces are bound into a logical interface, the S2700 load balances the traffic passing through the logical interface among the member interfaces. When a member interface fails, the traffic on this interface is shared by the other member interfaces without interrupting services. When the faulty interface recovers, the traffic is balanced among all interfaces again.

Currently, the S2700 implements link aggregation between GE interfaces or FE interfaces. Load balancing can be implemented based on the following information:

- Source MAC address
- Destination MAC address
- Source MAC address and destination MAC address

Using the link aggregation technology, you can increase the bandwidth and improve link reliability without upgrading the hardware, thus saving costs.

3.1.2 Flow Control on an Interface

Flow control on an interface is a method of congestion management. It applies to all types of flows. The S2700 implements flow control on an interface by using the hardware backpressure mechanism. When an interface works in full duplex mode, the S2700 implements flow control complying with IEEE 802.3x. When the interface works in half duplex mode, the S2700 implements flow control through the backpressure mechanism.

When congestion occurs, the S2700 sends continuous Pause frames to the upstream device, requesting it to stop sending data for a specified period of time. When the upstream device receives the pause frames, it reduces the volume of traffic sent from its outbound interface. Flow control on an interface does not identify flow types.

3.1.3 Traffic Suppression

Traffic suppression limits the number of unknown unicast packets, multicast packets, and broadcast packets within a proper range to ensure network efficiency.

The S2700 can suppress the packets based on interfaces. When traffic suppression is enabled on an interface, the interface monitors received unknown unicast packets, multicast packets, and broadcast packets to check whether their traffic exceeds the threshold. If traffic exceeds the threshold, the S2700 discards excessive packets to keep the traffic volume within the limit and thus services on the network run normally.

The S2700 can also control the percentage of unknown unicast packets, multicast packets, and broadcast packets on an interface.

3.1.4 VLAN

A local area network (LAN) can be divided into several logical LANs. Each logical LAN is a broadcast domain, which is called a virtual LAN (VLAN). To put it simply, devices on a LAN are logically grouped into different LAN segments, irrespective of their physical locations. In this manner, VLANs isolate broadcast domains on a LAN.

Methods to Define VLANs

A physical LAN can be divided into several VLANs, and several physical LANs can be grouped into a VLAN. Devices on a VLAN belong to the same broadcast domain and can communicate with each other. Different VLANs are isolated from each other, so devices on different VLANs cannot communicate with each other.

The S2700 supports the following methods to define VLANs:

- Based on interfaces

  After an interface is added to a VLAN, packets received by the interface are sent on the VLAN.

- Based on MAC addresses

  VLAN members are defined according to source MAC addresses of packets. When an interface of the S2700 receives a packet, the S2700 determines the VLAN ID of the packet according to the source MAC address of the packet and sends the packet on the corresponding VLAN.

  NOTE

  The S2700SI does not support defining VLANs based on MAC addresses.

Voice VLAN

A voice VLAN is used to transmit voice data flows. You can create a voice VLAN and add the interface connected to the voice device to the voice VLAN. Then voice data flows can be transmitted on the voice VLAN.

You can apply special QoS configuration to the voice data packets transmitted on the voice VLAN so that voice data packets are transmitted with high priority. The quality of the voice service is ensured.

NOTE

The S2700SI does not support the Voice VLAN.

VLAN Mapping

VLAN mapping means that the S2700 replaces the outer VLAN tags of data frames to the specified VLAN tags according to the preset VLAN mapping table so that services are transmitted according to the network planning of the carrier.

The S2700 supports the mapping from one or more customer VLAN IDs (C-VLANs) to a service VLAN ID (S-VLAN).

NOTE

- C-VLAN is the VLAN that a user-side interface belongs to. It identifies a user or a type of users.
- An S-VLAN is a VLAN defined on the public network by the carrier. The S-VLAN ID identifies a service.
- The S2700SI does not support the VLAN Mapping.

3.1.5 QinQ

NOTE

The S2700SI does not support the QinQ.

The 802.1Q-in-802.1Q (QinQ) protocol is a Layer 2 tunneling protocol based on the IEEE 802.1Q. A frame transmitted on the public network has double 802.1Q tags. One tag identifies the public network and the other identifies the private network.

Usually, carriers define VLANs on the public network, and users define VLANs on their own private networks. Therefore, different private networks may use the same VLAN ID. Through the QinQ function, the S2700 adds public VLAN tags to the packets from private networks. Then the private VLAN tag becomes the inner VLAN tag. In this way, packets from user networks are transmitted transparently on the public network, and thus user networks are separated from the public network.

The S2700 supports the basic QinQ function. That is, all the frames that reach the public network through an interface are tagged with the same public VLAN ID.

3.1.6 GVRP

NOTE

The S2700SI does not support the GVRP.

GVRP is a protocol used for dynamic registration and deregistration of VLANs. GVRP maintains the dynamic VLAN registration information in a switch and propagates the registration information to other switches on the network through GARP.

GVRP enables switches on the network to dynamically maintain and update VLANs. With GVRP, you do not need to expend time to analyze the topology and manage configurations. You can adjust the VLAN deployment on the entire network by configuring only a few devices.

The S2700 supports GARP and GVRP. Through GVRP, the S2700 can send VLAN declaration to other devices and dynamically create VLANs after receiving VLAN registration information from other devices.

3.2 STP/RSTP/MSTP

3.2.1 STP and RSTP

The Spanning Tree Protocol (STP) and the Rapid Spanning Tree Protocol (RSTP) are link-layer management protocols and are mainly applied to LANs to prevent loops. STP blocks redundant links and trims a network into a tree topology free from loops. RSTP enhances STP. It provides fast transition of interfaces status to speed up network convergence.

STP and RSTP prevent broadcast storms caused by loops and provides backup links for data forwarding.

3.2.2 MSTP

NOTE

The S2700SI does not support MSTP.

The Multiple Spanning Tree Protocol (MSTP) is developed based on STP and RSTP. MSTP divides a network into multiple regions. Based on VLAN tags, each region has several spanning trees that are independent of each other. As a result, the entire network is trimmed to a tree topology that is free from loops. Broadcast storms are thus prevented on the network.

MSTP associates VLANs with spanning trees so that packets of different VLANs are transmitted along different spanning trees. This speeds up network convergence and implements load balancing.

Different from STP and RSTP, MSTP provides multiple backup links to implement load balancing among VLANs.

3.2.3 MSTP Protection

BPDU Protection

The S2700 provides Bridge Protocol Data Unit (BPDU) protection when MSTP is enabled. When BPDU protection is enabled, the S2700 shuts down the edge port that receives a protocol BPDU instead of turning the edge port into a non-edge port. In this case, the spanning tree is not recalculated, and thus network flapping is prevented.

Root Protection

The S2700 provides root protection when MSTP is enabled. It retains the role of the root switch by maintaining the role of the designated port as follows:

When the designated port enabled with root protection receives a BPDU of higher priority, the port does not change to a non-designated port. Instead, it turns to the Listening state and stops forwarding packets. If the port does not receive protocol BPDUs of higher priority for a long time, it restores the Forwarding state. This prevents network flapping.

Loop Protection

After loop protection is enabled on the S2700, it sets the root port to the Blocking state if the root port does not receive protocol BPDUs from the upstream device. If the port receives protocol BPDUs again, it becomes the root port and changes to the Forwarding state. If no protocol BPDU is received, the port remains in the Blocking state and does not forward packets. In this way, loops are prevented on the network.

3.2.4 Partitioned STP and BPDU Tunnel

Partitioned STP

To improve the reliability of links on the enterprise network, the S2700 can be dual-homed to the upstream Ethernet. In addition, MSTP needs to run on the whole enterprise network to prevent loops. The traditional MSTP networks are not divided. In this case, the convergence speed of an MSTP network is low because the network is large. As a result, the forwarding capability of the network is degraded.

By using the partitioned STP technology, the S2700 logically allocates a VLAN for each partitioned STP network. The tagged BPDUs can be forwarded only within the VLAN that the tag belongs to. Partitioned STP allows BPDUs to be transmitted within a certain range. This prevents loops and speeds up convergence.

BPDU Tunnel

On a partitioned STP network, the S2700 considers the tagged BPDUs as common Layer 2 frames. That is, the S2700 forwards the BPDUs within the VLAN to which the tag belongs rather than sending them to the MSTP module. After the BPDU tunnel is configured, the devices on the MAN do not participate in the topology calculation of the partitioned STP network. Thus, the convergence speed of the network is improved.

To implement the BPDU tunnel function, the access device at the edge of the MAN must be configured with MSTP Snooping. If the forwarding path is changed because of the topology change on the partitioned STP network, the device can detect the topology change, and then notify other devices on the network of the topology change. In this way, the packets are forwarded according to the new topology.

NOTE

The S2700SI does not support the BPDU Tunnel.

3.3 Interface Security

Interface security is a security mechanism to control the access to a network. It checks whether the source MAC addresses of data frames received on an interface are valid. When detecting packets with invalid source MAC addresses, it takes certain actions to protect the interface.

After security protection is enabled on an interface, the S2700 considers the following types of MAC addresses valid:

- Static MAC addresses that are manually configured
- Dynamic or static MAC addresses in the DHCP snooping table
- Dynamic MAC addresses that are learned before the number of learned MAC addresses reaches the limit

When the interface receives frames with invalid source MAC addresses, the S2700 triggers the interface security function to discard the frames or generates an alarm according to the configuration.

3.4 Link Detection

Link detection includes loopback detection and virtual cable test (VCT). They provide users with two means to detect link faults on LANs.

- Loopback detection is used to check whether loops exist on a LAN. The S-switch sends specific packets to detect loopback on the entire LAN.
- VCT is mainly used to estimate the length of a network cable and locate the failure point of the cable. The S-switch simulates radar to detect cable faults and locate the failure points on the basis of a single link.

4 Service Features

About This Chapter

4.1 IPv6

The S2700 provides the IPv6 host function, which protects the investment of customers and prevents repeat investment during network upgrade.

The IPv6 functions supported by the S2700 include:

- IPv6 protocol stack
- ND, ICMP v6, Traceroute v6, Telnet v6, DNS, and IPv6 static route
- Simple IPv6 ACL

  NOTE

  The S2700SI does not support the IPv6 ACL.

4.2 Multicast

The Internet Group Management Protocol (IGMP) is a protocol used to manage IP multicast members. It sets up and maintains the member relationship between IP hosts and their directly connected multicast routers.

4.2.1 IGMP Snooping

Located between hosts and a multicast router, the S2700 supports static multicast forwarding entries and generates a dynamic Layer 2 multicast forwarding table with multicast groups and outbound interfaces by listening to IGMP messages.

When the S2700 receives a multicast packet, it forwards the packet only to the members on the VLAN corresponding to the multicast group. The multicast packet is transmitted in multicast mode on the VLAN according to the Layer 2 multicast forwarding table. This saves bandwidth and enhances the security of information transfer.

4.2.2 Prompt Leave of Multicast Member Interfaces

When a multicast member leaves a multicast group, the host sends an IGMP Leave message. When an interface on the S2700 is connected to only one host, the S2700 deletes the multicast forwarding entry of the interface immediately after receiving the IGMP Leave message. This saves bandwidth and system resources and implements fast switching of services.

4.2.3 Multicast Traffic Control

Unknown multicast packets refer to the multicast packets that do not have forwarding entries in the Layer 2 multicast forwarding table. When receiving unknown multicast packets, the S2700 discards the packets or broadcasts them on the VLAN that the inbound interface belongs to.

The S2700 can also control inbound multicast traffic volume by limiting the percentage of multicast packets on an Ethernet interface.

4.2.4 Controllable Multicast

Multicast protocols do not provide user authentication. Therefore, a user can join or leave a multicast group freely. The multicast source does not know when a user joins or leaves a

multicast group, so the number of users receiving multicast traffic on a network in a certain period is unknown. Therefore, the carrier cannot perform accounting for the users. The controllable multicast technology is introduced to solve these problems. Users have to pass authentication before receiving multicast traffic. Furthermore, only authorized multicast traffic can be received by users. Users who pass authentication are allowed to preview unauthorized multicast traffic and can receive multicast traffic in specified periods within a day. Controllable multicast does not apply to static multicast.

4.3 QoS

The S2700 provides the class-based QoS mechanism and supports the 802.1p priority. It provides guarantee of low end-to-end delay, jitter, and high bandwidth.

The S2700 classifies traffic according to certain rules and then performs corresponding actions on the packets such as priority re-marking, traffic policing, congestion management, congestion avoidance, and rate limit on the interface. In this way, value-added services such as NGN services, IPTV, and broadband access are provided with better network service.

4.3.1 Traffic Classification

Traffic classification is a function of identifying the packets of a certain type by matching information in the packet header. For example, the 802.1p priority of the packets sent by the Operating Support System (OSS) and NMS is set to 7; the 802.1p priority of VoIP packets is set to 6; the 802.1p priority of BTV packets and VOD packets is set to 5 or 4; the 802.1p priority of packets sent by VPN users is set to 3, 2, or 1 according to the level of VPN users; the 802.1p priority of packets of the Internet access service is set to 0. Then the packets can be classified based on their 802.1p priorities.

The S2700 adopts a hardware classifier to guarantee line-speed transmission of services data on interfaces.

Simple Traffic Classification

On the S2700, you can perform simple traffic classification for packets according to the mapping between priorities of packets and Per-Hop Behaviors (PHBs). If packets come from an upstream device, the S2700 maps priorities of the packets to PHBs and colors. On the S2700, congestion management is performed for packets according to PHBs of packets and congestion avoidance is performed for packets according to colors of packets. The downstream device provides QoS services according to the priorities of packets.

The S2700 only supports simple traffic classification according to the 802.1p priority of VLAN packets.

Complex Traffic Classification

NOTE

The S2700SI does not support complex traffic classification.

You can perform complex traffic classification according to Layer 2 or Layer 3 information in packets or through access control lists (ACLs). Then, you can bind a traffic classifier to a traffic behavior to process packets matching the traffic classifier.

The traffic behavior adopted is related to the current phase of packets and the current load of a network. For example, when packets enter an S2700, the S2700 performs traffic policing and

access control for the packets according to the committed information rate (CIR); when packets exit an S2700, the S2700 shapes the traffic of packets and re-marks the priorities of packets.

Complex traffic classification is based on:

- 802.1p priority of VLAN packets
- VLAN ID of packets
- Incoming interface
- Source MAC address
- Destination MAC address
- Protocol type field encapsulated in Layer 2 packets
- Layer 3 protocol type
- IP quintuple

4.3.2 Access Control and Re-marking

After traffic classification, the S2700 performs access control on the packets, that is, permits or denies the packets. Then, the S2700 re-marks the following fields in the packets:

- 802.1p field, that is, the PRI field in a VLAN tag
- DSCP field
- Local precedence
- VLAN ID, that is, the outer VLAN ID or inner VLAN ID of QinQ packets

4.3.3 Traffic Policing

The S2700 uses the token bucket algorithm to control the Committed Access Rate (CAR) of network traffic.

The S2700 controls the rate of traffic by adjusting the rate of placing tokens. Each token equals a forwarding rate of 64 kbit/s. The S2700 "punishes" the excessive traffic to limit the incoming traffic within a proper range and to protect the network resources.

4.3.4 Congestion Management

The S2700 manages traffic congestion through queue scheduling. Each outbound interface on the S2700 is configured with four queues. After traffic classification, packets are sent to the corresponding queues based on their priorities.

The S2700 provides the following queue scheduling policies:

- Priority Queuing(PQ)
- Weight Round Robin(WRR)
- Deficit Round Robin(DRR)
- PQ + WRR
- PQ + DRR

4.3.5 Rate Limit on an Interface

Rate limit on an interface is used to adjust the rate of traffic on an outbound interface or inbound interface to prevent burst traffic. The S2700 uses the token bucket and a buffer to limit the traffic rate on an outbound interface, implementing traffic shaping. When the rate of packets exceeds

the rate limit, the S2700 buffers excessive packets and sends them when the traffic rate falls below the limit. In this manner, the transmission rate is smoothed.

4.3.6 Aggregate CAR

Aggregate CAR is the CAR applied to multiple interfaces to implement traffic policing for service flows on the interfaces. The sum of rate limits on the interfaces must be equal to or smaller than the aggregate CAR.

4.4 Security

The S2700 guarantees both device security and service security.

4.4.1 Device Security

Hierarchical Command Protection

When a user logs in to the S2700 from an Ethernet interface through Telnet, the S2700 authenticates the user to ensure security. The user can configure and maintain the S2700 only after passing the authentication.

The S2700 adopts a hierarchical protection mode for commands. Commands are classified into the visit level, monitoring level, configuration level, and management level, with their levels in ascending order. Login users are also classified into four levels, corresponding to the four levels of commands. After logging in to the S2700, a user can run only the commands at the same or lower level. This mode effectively controls the user authority.

The S2700 extends command levels and user levels to 16 levels so that users are managed more refinedly.

Remote SSH Login

The S2700 supports the Secure Shell (SSH). On an insecure network, SSH provides powerful security guarantee and authentication for login users and can defend against various attacks.

Encrypted Authentication Through SNMPv3

The S2700 supports encrypted authentication through SNMPv3. When S2700 is managed by an NMS workstation through SNMP, it adopts the encrypted authentication mode in user-based security mode (USM) to ensure security.

AAA

The S2700 supports the Authentication, Authorization, and Accounting (AAA). Using AAA and hierarchical command protection, the S2700 can authenticate and authorize login users. In addition, it can authenticate the NMS administrator. AAA effectively prevents unauthorized users from logging in to the S2700.

The S2700 supports authentication methods such as local authentication, RADIUS authentication, and HWTACAS+ authentication.

CPU Channel Protection

The S2700 can filter the protocol packets and management packets sent to the CPU based on the protocol ID, interface, and combination of interface and VLAN. This protects the CPU channels against Denial of Service (DoS) attacks.

Limit of MAC Address Learning on Interfaces

You can set the maximum number of MAC addresses learned by an interface on the S2700 to prevent hackers from initiating source MAC address attack from the interface. This ensures that the MAC address entries of the S2700 will not be used up.

4.4.2 Service Security

VLAN

The S2700 supports the division of a LAN into multiple VLANs. Devices on different VLANs cannot communicate with each other. This isolates broadcast domains and improves service security.

Blackhole MAC Address Entry

The S2700 supports blackhole MAC address entries. When receiving a packet, the S2700 compares the source or destination MAC address of the packet with its MAC address entries. If the source or destination MAC address of packet is the same as a blackhole MAC address, the S2700 discards the packet.

When detecting attacking packets from a MAC address, you can set a blackhole MAC address entry on the S2700 to filter out the packets with the MAC address.

MAC Table Searching Based on VLAN+MAC

The S2700 supports MAC table searching based on VLANs and MAC addresses to improve interface security. You can add static MAC address entries in the MAC table to map specific MAC addresses to interfaces. In this way, specific devices are bound to interfaces so that hackers cannot attack the S2700 by using fake MAC addresses.

Port Isolation

Port isolation prevents ports on the same S2700 from sending Layer 2 packets to each other. The S2700 supports unidirectional and bidirectional port isolation. Port isolation ensures security of user networks and helps to construct low-cost intelligent community networks. Port isolation also limits unnecessary broadcast packets and thus increases network throughput.

Packet Filtering

Packet filtering is used to filter out invalid or unwanted packets.

The S2700 filters packets based on user-defined rules. For example, it filters packets by checking the MAC address, IP address, port number, and VLAN ID of packets. Packet filtering does not check the session status or analyze the data. By filtering packets, the S2700 can effectively control the packets passing through it.

4.4.3 Security Authentication

The 802.1x protocol is a port-based network access control protocol. It authenticates and controls access devices on a LAN based on interfaces. A user device can access resources on the LAN only after it passes the authentication on the access interface.

MAC address-based authentication controls the network access authority of a user based on the access interface and MAC address of the user. The user does not need to install any authentication client software. After detecting the MAC address of the user for the first time, the device starts authenticating the user. During the authentication, the user does not need to enter the user name or password.

NOTE

The S2700SI does not support the Security Authentication.

4.5 MAC-Forced Forwarding

NOTE

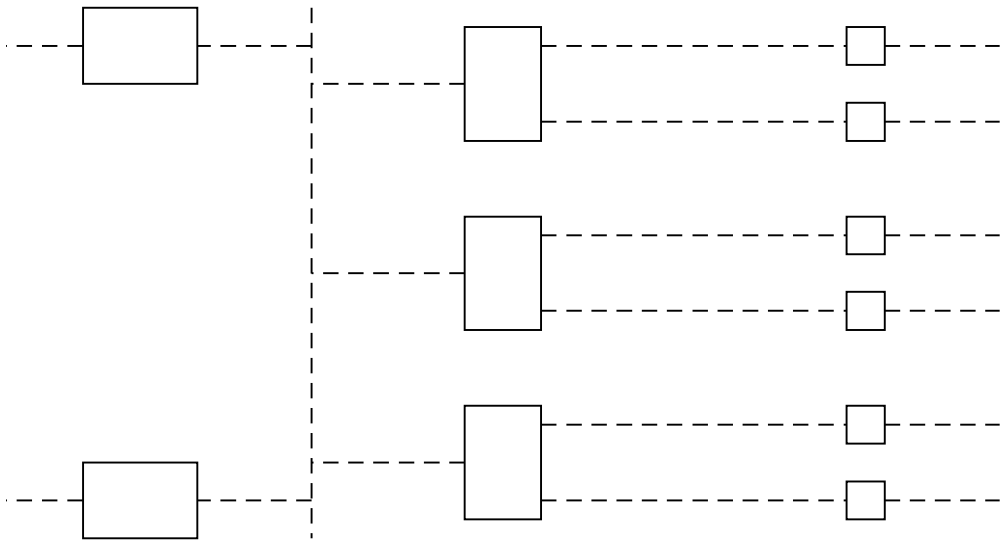
The S2700SI does not support the MAC-Forced Forwarding.

The access layer provides network connections between the user-side hosts and the enterprise-side access routers (ARs), especially the reliable connections between the hosts with the Internet or other IP networks.

The access layer can be divided into the user network and convergence network. The user network is connected to the access node (AN) through a subscriber line, which is a physical line and usually called "the first mile."

The subscriber line is then connected to the convergence network through the AN. In this manner, the AN is the border between the subscriber line and the convergence network. User traffic is centralized and aggregated on the convergence network, which is usually called "the second mile." For details, see **Figure 4-1**.

Figure 4-1 Connections at the access layer



At the access layer, the enterprise has the following requirements:

- In order that the enterprise uses the AR to perform secure filtering, policy scheduling, and accounting for the traffic, the ARs need to perform Layer 3 forwarding for the traffic of different user hosts in different networks. The ARs, however, cannot forward packets through Layer 2 switching.
- The efficiency of address assignment needs to be improved to save IPv4 addresses. The effectiveness of address assignment needs to be improved if an address is assigned from a large address pool rather than a small and independent network segment to the host.

To implement user isolation at the access layer and meet the preceding requirements of the enterprise, the MAC-Forced Forwarding (MFF) protocol is introduced.

MFF is a security protocol that isolates the user hosts accessing the same device. When MFF is running, its security program applies to any shared access media, bringing no extra problems to these networks.

In addition to Layer 2 isolation, the AN that runs MFF discards any upstream broadcast packets except for DHCP packets and ARP request packets. The AN discards DHCP response packets received through the subscriber line and limits the rate of DHCP broadcast packets.

The AN that runs MFF must track the IPv4 addresses allocated to the subscriber line. This is to discard the upstream traffic with the fake IPv4 source addresses.

4.6 Reliability

The S2700 supports MSTP to eliminate broadcast storms on a network and provide backup links for data transmission.

The S2700 provides the root protection function. When the designated port receives a BPDU of higher priority, it remains the designated port for a certain period of time to protect the role of the root switch. This prevents the network topology from changing by mistake.

The S2700 provides the loop protection function. When the root port cannot receive any BPDU from the upstream device, it enters the Blocking state and stops forwarding packets. At the same time, no new root port is elected. This prevents loops on the network.

4.7 LLDP

The S2700 supports the Link Layer Discovery Protocol (LLDP) that conforms to IEEE 802.1ab. LLDP is a link layer protocol used for interconnected devices to obtain the connection information of each other.

Using LLDP, the local NMS can obtain the link layer information of all devices on the local network and details about the network topology. Thus the NMS can manage a larger area on the network.

The LLDP-enabled interfaces on the S2700 periodically notify the neighbors of its own status. If the status of an interface changes, the interface sends status update messages to the directly connected neighboring device. The neighboring device stores the status update message in the standard SNMP MIB. Then the NMS can obtain the link layer information of the network from the MIB to calculate the topology of the entire network.

4.8 Cluster Management

The Huawei Group Management Protocol (HGMP) is a Huawei proprietary protocol used to manage multiple S2700s or other switches through one S2700. In HGMP implementation, the Neighbor Discovery Protocol (NDP) is used to collect information about directly connected neighbors including the device type, software version, hardware version, connected interface, and member ID. The Network Topology Discovery Protocol (NTDP) is used to collect topology information.

As defined in HGMP, a management domain (namely a cluster) consists of a command switch and multiple member switches. The S2700 can function as a command switch or a member switch.

- Command switch

  The command switch functions as the proxy of the external network management station or server to manage the member switches of a cluster. It has a public IP address and can manage other switches.

- Member switch

  A member switch is managed by the command switch. Member switches are usually Layer 2 switches and do not need public IP addresses. When the S2700 functions as a member switch, it is managed by a high-end device.

In actual application, the S2700 usually functions as a member switch.

HGMP saves public IP addresses by managing devices in a cluster.

4.9 Stacking

Stacking means that the switches located in the same place are connected through the stacking cable or high-speed uplink interfaces, and thus the switches form a reliable switch group. In a switch group, the S2700s are connected through the stack interfaces multiplexed with uplink GE interfaces. Through stacking, the user can manage and maintain the switches uniformly; therefore, the stacking reduces the maintenance cost of the user.The stacked switches must be of the same type.

4.10 Web Server

Users can manage network devices through the GUI provided by the Web Server. This reduces requirements for junior maintenance personnel.

5 Networking and Applications

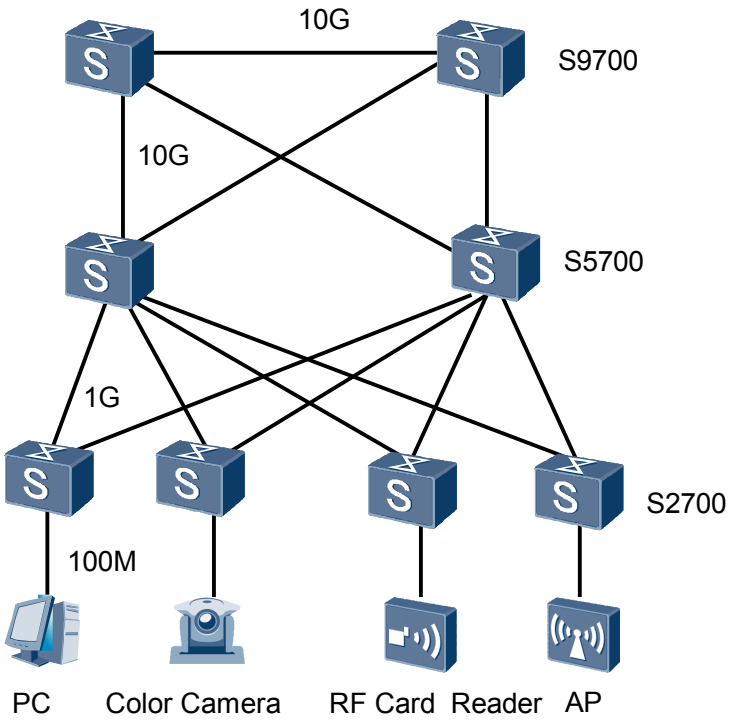
About This Chapter

5.1 Access Device for Enterprise Network or Campus Network

On the enterprise network or campus network shown in **Figure 5-1**, the S2700s connect to terminals using 100 Mbit/s electrical interfaces, and connect to aggregation switches using 1000 Mbit/s optical or electrical interfaces. The aggregation switches connect to the backbone network using bundles of 1000 Mbit/s interfaces or 10 Gbit/s interfaces. The network provides 10 Gbit/s rate for the backbone layer and 100 Mbit/s access rate for terminals. This solution provides high bandwidth and meets multi-service requirements.

The S2700s provide the PoE function in compliance with IEEE 802.3af and IEEE 802.3at. They can provide power for various powered devices (PDs), for example, 802.11n access points (APs), color cameras, and RF card readers. The S2700s with the PoE function use wireless and wired access methods to construct an intelligent enterprise network or campus network.

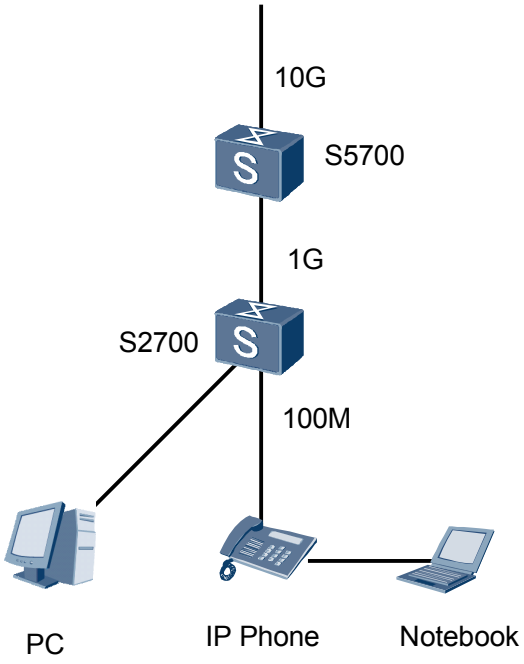
Figure 5-1 Access device for enterprise network or campus network



5.2 Desktop Access

As shown in **Figure 5-2**, the S2700 provides the functions such as PoE, voice VLAN and NAC. With a small size, the S2700 can be used for desktop access to provide various access functions.

Figure 5-2 Desktop access



6 Maintenance and Network Management System

About This Chapter

6.1 Maintenance and Management

6.1.1 Various Configuration Methods

Configuration Modes

The S2700 supports the following configuration and management modes:

- Command line

  A user connects to the console port of the S2700 through the console terminal, and then configures various functions and sets parameters in the command line interface (CLI).
- Network management station

  A user configures and manages the S2700 through the SNMP protocol.
- HGMP

  A user logs in to the S2700 to manage Layer 2 switches or other S2700s in the same cluster based on HGMP.
- AutoConfig

  When the S2700 starts with the default configuration file, a user can automatically obtain and run the configuration file through AutoConfig.

Login Modes

The S2700 provides a console port. A user can connect to the console port through the serial port on a console terminal, and then configure the S2700 locally or remotely.

In addition, the user can telnet to the service interface of the S2700 for configuration and management.

The S2700 supports multiple authentication modes, including non-authentication, local authentication, and AAA.

6.1.2 Monitoring and Maintenance

Hardware Monitoring

The S2700 provides the following hardware monitoring functions:

- Provides the re-detection function to prevent incorrect detection because of instant interference.
- Checks version matching automatically when the system is running.

Device Management and Maintenance

The S2700 provides various management and maintenance functions:

- Provides flexible online help for the command line in Chinese or English.
- Provides hierarchical commands and user authority management.

- Provides an information center to uniformly manage logs, traps, and debugging information and redirects information as required.
- Provides the electronic labels. A user can view the basic information about the SCU and optical modules through the CLI, and back up the information to an external server through FTP.
- Supports the display of the software version, module status, ambient temperature, CPU usage, and memory usage.

6.1.3 Diagnosis and Debugging

Ping and TraceRoute

On traditional IP networks, the S2700 provides the following tools to check network connectivity:

- Ping
- TraceRoute

Debugging

The S2700 provides various debugging commands for each software feature. Each debugging command supports multiple parameters and can be flexibly controlled. The debugging commands display the detailed information about processes, packet receiving and sending, and error check during the running of a feature.

Black Box

The S2700 provides the black box function to record information on the feature modules, tasks, and events. In addition, the black box records the final results, process status, and function calling track to facilitate fault location.

Mirroring

The S2700 supports interface- or flow-based mirroring on a single switch. In addition, it supports the interface-based remote mirroring among multiple switches.

- Port mirroring

  The incoming traffic, outgoing traffic, or both incoming and outgoing traffic at an observed interface is completely copied to an observing interface.
- Flow mirroring

  The traffic at an observed interface is completely copied to an observing interface.
- Remote mirroring

  With the Remote Switched Port Analyzer (RSPAN), the observing interfaces and observed interfaces can be located on different switches on the network. This facilitates the remote management on the switches through NMS.

By connecting a monitoring host to an observing interface on the S2700, a network administrator can easily observe the packets that pass through the S2700 in real time. The mirroring result serves as a basis for traffic detection, fault location, and data analysis.

6.1.4 Software Upgrade and In-Service Patching

Software Upgrade

The S2700 controls the use of features through the license file and can detect the integrity and validity of the system software before the upgrade and provides various methods of upgrading the software:

- Local upgrade

  When the S2700 is powered on, the software can be loaded and upgraded through the BootROM menu.

- Remote in-service upgrade

  When the S2700 runs normally, it can download the software through FTP or TFTP. The new software is run when the S2700 is restarted. This realizes the remote seamless software upgrade.

In-Service Patching

The S2700 supports in-service patching to protect services from being affected when a patch is installed. The software can be restored to the earlier version, and the device data before and after in-service patching is recorded.

In addition, the S2700 provides the one-key operation for patches. That is, based on the slot ID of a board, a user can quickly obtain information about the compatibility of a patch and the system software, status of a patch, and history operations of a patch.

6.1.5 Hardware Fault Handling

The S2700 supports automatic and manual intervention when a hardware fault occurs, for example, a chip on a board fails. The maintenance personnel can locate a hardware fault and handle it quickly to shorten service interruption.

6.2 eSight

The S2700 supports the eSight network management systems. The eSight network management system manages enterprise networks using the following features:

- Security Management

  This section describes how to ensure eSight security by managing users, roles, rights, and operation sets.

- Log Management

  Logs record important user operations. With log management, you can view and filter logs, and view detailed system logs. eSight manages operation, security, and system logs. There are three log levels: warning, minor, and risk.

- Resource Management

  With resource management, you can add and delete NEs, and manage them by subnet depending on their physical locations.

- Topology Management

With topology management, managed NEs and their connection status are displayed in the topology view. The managed objects are organized in subviews. You can use the topology view to check the status of the entire network in real time.

- Alarm Management

  Alarm management allows you to monitor the network operating status in real time. You can browse alarms, handle alarms, set alarm rules, and send remote alarm notifications.

- Performance Management

  eSight can monitor the key performance indicators (KPIs) of a network in real time and collect performance statistics. eSight provides graphical user interfaces (GUIs) so that you can manage network performance easily.

- Physical Resource Management

  eSight allows you to query devices, frames, boards, subcards, and ports.

- Report Management

  eSight generates instant and periodic reports, and allows you to export reports to a file in any of the following formats: PDF, Excel, Word, and PowerPoint. eSight provides a variety of report templates, and it also provides a report design tool that allows you to flexibly customize report templates.

- Custom Device Management

  eSight provides user-defined device management to help enterprise users manage devices from different manufacturers. You can customize device types, performance counters, alarm parameters, configuration file parameters, and device panels.

- Configuration File Management

  eSight allows you to back up, restore, and compare device configuration files, and manage baseline file versions. When faults occur on the network, you can compare the configuration file in use with the configuration file that was saved when the network was running normally. By checking the added, modified, and deleted information, you can quickly locate the fault and resolve it.

- Smart Configuration Tool

  The smart configuration tool uses templates and planning tables to configure services for Huawei devices in batches. The template applies when multiple devices have the same configurations and the planning table applies when multiple devices have similar configurations.

- SLA Management

  SLA management measures and diagnoses the network performance, by sending diagnostic messages between devices or links.

- Lower-Layer NMSs

  eSight allows you to divide a network into several layers to manage NEs on the network by layer. eSight provides links for lower-layer NMSs. By clicking a link, you can view alarms, performance counters, reports, and the network topology on a lower-layer NMS.

- eSight Home Page

  The eSight home page displays important monitoring information and allows you to specify the type of monitoring information displayed.

- Data Backup and Restoration

  eSight provides an independent Web service to back up or restore the database.

7 System Technical Specifications

About This Chapter

7.1 Physical Specifications

Table 7-1 Physical specifications

Item		Description
Dimensions (width x depth x height)		● S2700-9TP-SI/EI: 250.0 mm x 180.0 mm x 43.6 mm ● S2700-18TP-SI/EI: 442.0 mm x 220.0 mm x 43.6 mm ● S2700-26TP-SI/EI: 442.0 mm x 220.0 mm x 43.6 mm ● S2700-52P-EI: 442.0 mm x 220.0 mm x 43.6 mm ● S2700-9TP-PWR-EI: 320.0 mm x 220.0 mm x 43.6 mm ● S2700-26TP-PWR-EI: 442.0 mm x 420.0 mm x 43.6 mm ● S2700-52P-PWR-EI: 442.0 mm x 420.0 mm x 43.6 mm ● S2710-52P-SI-AC: 442.0 mm x 220.0 mm x 43.6 mm ● S2710-52P-PWR-SI: 442.0 mm x 420.0 mm x 43.6 mm
Maximum power (full configuration)		● S2700-9TP-SI/EI: 12.8 W ● S2700-18TP-SI/EI: 14.5 W ● S2700-26TP-SI/EI: 15.5 W ● S2700-52P-EI: 38 W ● S2700-9TP-PWR-EI: 154 W (Dissipated power: 30 W, PoE: 124 W) ● S2700-26TP-PWR-EI: 808 W (Dissipated power: 68 W, PoE: 740 W) ● S2700-52P-PWR-EI: 880 W (Dissipated power: 128 W, PoE: 740 W) ● S2710-52P-SI-AC: 38 W ● S2710-52P-PWR-SI: 880 W (Dissipated power: 128 W, PoE: 740 W)
Weight		Non-PWR: ⩽ 3.5 kg PWR: ⩽ 8 kg
DC input voltage	Rated voltage	–48V DC to –60V DC
	Maximum voltage	–36V DC to –72V DC

Item		Description
AC input voltage	Rated voltage	100V AC to 240V AC
	Maximum voltage	90V AC to 264V AC
Temperature	operating temperature	-5°C to 50°C **NOTE** S2700-52P-PWR-EI, S2710-52P-PWR-SI: 0°C to 50°C
	Storage temperature	-40°C to 70°C
Relative humidity		10%RH to 90%RH
Altitude		0 m to 2000 m

7.2 Optical Module Attributes

Table 7-2 Attributes of the SFP (FE) optical module

Attribute	Specification
Transmission distance	2 km
Center wavelength	1310 nm
Transmitting power	-19.0 dBm to -14.0 dBm
Receiver sensitivity	-30.0 dBm
Overload power	-14.0 dBm
Extinction ratio	10 dB
Type of the optical connector	LC
Fiber type	Multi-mode

Table 7-3 Attributes of the ESFP (FE) optical module

Attribute	Specification				
Transmission distance	15 km	15 km (single-mode bidirectional fiber)	15 km (single-mode bidirectional fiber)	40 km	80 km
Center wavelength	1310 nm	Sending: 1310 nm Receiving: 1550 nm	Sending: 1550 nm Receiving: 1310 nm	1310 nm	1550 nm
Transmitting power	-15.0 dBm to -8.0 dBm	-15.0 dBm to -8.0 dBm	-15.0 dBm to -8.0 dBm	-5.0 dBm to 0 dBm	-5.0 dBm to 0 dBm
Receiver sensitivity	-31.0 dBm	-32.0 dBm	-32.0 dBm	-34.0 dBm	-34.0 dBm
Overload power	-8.0 dBm	-8.0 dBm	-8.0 dBm	-10.0 dBm	-10.0 dBm
Extinction ratio	8.2 dB	8.5 dB	8.5 dB	10.0 dB	10.0 dB
Type of the optical connector	LC	LC/PC	LC/PC	LC	LC
Fiber type	Single mode	Single mode	Single mode	Single mode	Single mode

Table 7-4 Attributes of the ESFP (GE) optical module

Attribute	Specification							
Transmission distance	0.5 km	10 km	10 km (single-mode bidirectional fiber)	10 km (single-mode bidirectional fiber)	40 km	40 km	80 km	100 km
Center wavelength	850 nm	1310 nm	Sending: 1310 nm Receiving: 1490 nm	Sending: 1490 nm Receiving: 1310 nm	1550 nm	1310 nm	1550 nm	1550 nm

Attribute	Specification							
Transmitting power	-9.5 dBm to -2.5 dBm	-9.0 dBm to -3.0 dBm	-9.0 dBm to -3.0 dBm	-9.0 dBm to -3.0 dBm	-5.0 dBm to 0 dBm	-5.0 dBm to 0 dBm	-2.0 dBm to 5.0 dBm	0 dBm to 5.0 dBm
Receiver sensitivity	-17.0 dBm	-20.0 dBm	-19.5 dBm	-19.5 dBm	-22.0 dBm	-22.0 dBm	-22.0 dBm	-30.0 dBm
Overload power	0 dBm	-3.0 dBm	-3.0 dBm	-3.0 dBm	-3.0 dBm	-3.0 dBm	-3.0 dBm	-9.0 dBm
Extinction ratio	9.0 dB	9.0 dB	6.0 dB	6.0 dB	8.5 dB	9.0 dB	9.0 dB	8.0 dB
Type of the optical connector	LC	LC	LC	LC	LC	LC	LC	LC
Fiber type	Multi-mode	Single mode	Single mode	Single mode	Single mode	Single mode	Single mode	Single mode

Table 7-5 Attributes of the ESFP (CWDM) optical module

Attribute	Specification							
Transmission distance	80 km	80 km	80 km	80 km	80 km	80 km	80 km	80 km
Center wavelength	1571 nm	1591 nm	1551 nm	1511 nm	1611 nm	1491 nm	1531 nm	1471 nm
Transmitting power	0 dBm to 5.0 dBm	0 dBm to 5.0 dBm	0 dBm to 5.0 dBm	0 dBm to 5.0 dBm	0 dBm to 5.0 dBm	0 dBm to 5.0 dBm	0 dBm to 5.0 dBm	0 dBm to 5.0 dBm
Receiver sensitivity	-28.0 dBm	-28.0 dBm	-28.0 dBm	-28.0 dBm	-28.0 dBm	-28.0 dBm	-28.0 dBm	-28.0 dBm
Overload power	-9.0 dBm	-9.0 dBm	-9.0 dBm	-9.0 dBm	-9.0 dBm	-9.0 dBm	-9.0 dBm	-9.0 dBm
Extinction ratio	8.5 dB	8.5 dB	8.5 dB	8.5 dB	8.5 dB	8.5 dB	8.5 dB	8.5 dB

Attribute	Specification							
Type of the optical connector	LC	LC	LC	LC	LC	LC	LC	LC
Fiber type	Single mode							

7.3 System Configuration

Table 7-6 System configuration

Item	Parameter
Processor	Dominant frequency: 200 MHz
Switching capacity	● S2700-9TP: 3.6 Gbit/s ● S2700-18TP: 7.2 Gbit/s ● S2700-26TP: 8.8 Gbit/s ● S2700-52P: 17.6 Gbit/s ● S2710-52P: 17.6Gbit/s
Packet forwarding capacity	● S2700-9TP: 2.68 Mpps ● S2700-18TP: 5.36 Mpps ● S2700-26TP: 6.55 Mpps ● S2700-52P: 13.1 Mpps ● S2710-52P 13.1Mpps
DDR memory	128 MB for S2700-52P and 64 MB for others
Flash Memory	16 MB

7.4 List of Software Features

Table 7-7 List of software features

Attribute		Description
Ethernet features	Ethernet	● Operating modes, including full duplex, half duplex, and auto-negotiation ● Operating rates of an Ethernet interface, including 10 Mbit/s, 100 Mbit/s, 1000 Mbit/s, and auto-negotiation ● Flow control on interfaces ● Jumbo frames ● Link aggregation ● Load balancing among the links of a trunk ● Port isolation and forwarding restriction on ports ● Traffic suppression
	VLAN	● Access modes of access, trunk, hybrid, and QinQ ● Default VLAN ● VLAN mapping ● Voice VLAN
	MAC	● Automatic learning and aging of MAC addresses ● Static, dynamic, and blackhole MAC address entries ● Packet filtering based on source MAC addresses ● Limitation on MAC address learning on interfaces
	ARP	● Static and dynamic ARP entries ● ARP on a VLAN ● Aging of ARP entries
	LLDP	LLDP
Ethernet loop protection	MSTP	● STP ● RSTP ● MSTP ● BPDU protection, Root protection, loop protection ● Partitioned STP and BPDU tunnels
Layer 2 multicast	Layer 2 multicast	● IGMP snooping ● Prompt leave ● Multicast traffic control ● Controllable multicast

Attribute		Description
QoS	Traffic classification	● Traffic classification based on the combination of the L2 protocol header, IP quintuple, outgoing interface, and 802.1p field ● Traffic classification based on the C-VID and C-PRI of QinQ packets
	Traffic behaviors	● Access control after traffic classification ● Traffic policing based on traffic classification ● Re-marking based on traffic classification ● Class-based packet queuing ● Combination of traffic classification and traffic behaviors
	Queue scheduling	● PQ ● WRR ● PQ+WRR
	Rate limit on interfaces	Rate limit on interfaces
Configuration and maintenance	Terminal service	● Configurations through command lines ● Help information in English and Chinese ● Login through console and Telnet terminals ● Information exchange between terminals through the send function
	File system	● File system ● Directory and file management ● File upload and download through FTP or TFTP
	Debugging and maintenance	● Centralized management of logs, alarms, and debugging information ● Electronic label ● User operation logs ● Detailed debugging information for diagnosing network faults ● Network test tools such as traceroute and ping commands ● Interface mirroring and flow mirroring
	Version upgrade	● Software loading on the entire equipment and online software loading ● Online upgrade of the BootROM ● In-service patching

Attribute		Description
Security and management	System security	● Hierarchical command line protection to prevent unauthorized users from accessing the S2700 ● SSH v2.0 ● RADIUS authentication and HWTACACS authentication ● ACL filtering ● DHCP packet filtering (with Option 82) ● Defense against control packet attacks ● Defense against attacks of source address spoofing, LAND, SYN flood (TCP SYN), smurf, ping flood (ICMP echo), Teardrop, and Ping of Death
	Network management	● Ping and traceroute ● SNMPv1/v2c/v3 ● Standard MIB ● RMON
	Cluster management	● HGMPv2 ● S2700 functioning as the command switch ● S2700 functioning as the member switch ● S2700 joining cluster automatically ● Member switches using private IP addresses ● Logging in to the member switch through Telnet