Web-Based Configuration Guide

The software version for this manual is: Release 7.5.x

Document Version：V7.0

Release Time：2026.05.18

Models Covered by This Manual

RP-ISG6300-D series:	RP-ISG6316I-4F-D, RP-ISG6324I-4F-D
RP-IPG6300-D series:	RP-IPG6304IX-2F-D, RP-IPG6308I-2F-D, RP-IPG6308IX-2F-D, RP-IPG6324I-4F-D, RP-IPG6308I-4F-D-12V, RP-IPG6308IX-4F-D-12V
RP-IPG63000-D series:	RP-IPG63240I-4FR, RP-IPG63240IX-4FR
RP-IPG65000-D series:	RP-IPG65240IX-4FR-D
RP-G83000-S series	RP-G83080I-2F-S, RP-G83240I-4F-S, RP-G83240IX-4F-S, RP-G83480IX-4F
RP-GS8000-S series	RP-GS8320I-8GC-S, RP-GS8320IX-8GC-S, RP-GS8348IX-S
RP-PG83000-S series	RP-PG83080I-2F-S, RP-PG83080IX-2F-S, RP-PG83240I-4F-S, RP-PG83240IX-4F-S, RP-PG83480I-4F-S, RP-PG83480IX-4F-S

Content

1. Web Overview

1.1 Brief

The device provides the Web-based network management function to facilitate the operations and maintenance on devices. Through this function, the administrator can visually manage and maintain network devices through the Web-based configuration interfaces. *Figure 1-1* shows a Web-based network management operating environment:

Figure 1-1 Web-based network management operating environment

1.2 Log in to the Web Interface

The device is provided with the default Web login information. The user can use the following default information to log in to the Web interface:

- **Username**: admin
- **Password**: admin
- **IP address of the device**: 192.168.56.166

To log in to the device through the Web interface:

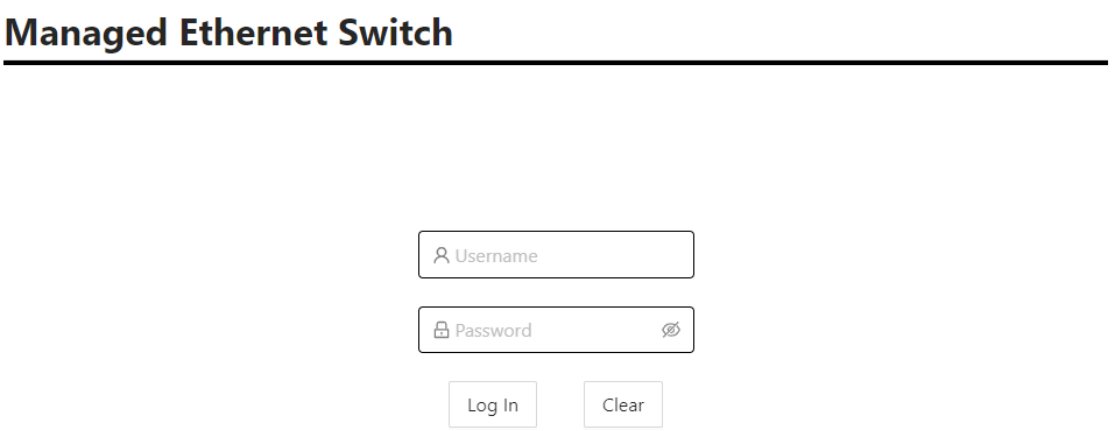
1. Connect the Ethernet interface of the device to the PC using a crossover Ethernet cable.
2. Configure an IP address for the PC and ensure that the PC and device can communicate with each other properly.
3. Modify the IP address of the PC to one that within the network segment 192.168.56.0/24 (except for 192.168.56.166), for example, 192.168.56.2.
4. Open the browser, and input the login information.

5. On the PC, open the browser, type the IP address http://192.168.56.166 in the address bar, press **Enter** and users can enter the login page of the Web interface, as shown in *Figure 1-2*. Input the username **admin** and password **admin**, and click Login.

NOTE:

- For better display results, please use Edge, Chrome or Firefox browser for that other browsers may have compatible issues.
- The specific operation process for changing the password can be found in Chapter 5.4 User Management.

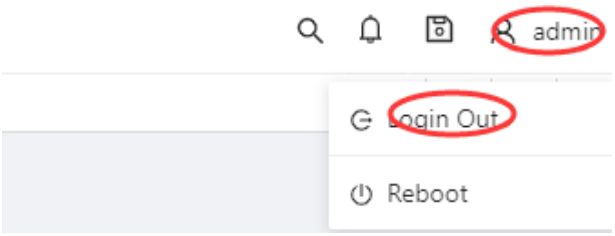
Figure 1-2 Login page of the Web interface



1.3 Log out of the Web Interface

Click **Logout** button in Auxiliary area to quit Web-based network management, as shown in *Figure 1-3*. The system does not save the current configuration before the user log out of the Web interface. Therefore, we recommend that the user save the current configuration before logout.

Figure 1-3 logging out of Web interface

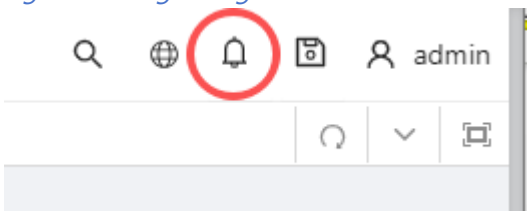


NOTE:

- You cannot log out by directly closing the browser.

1.4 Log Configuration

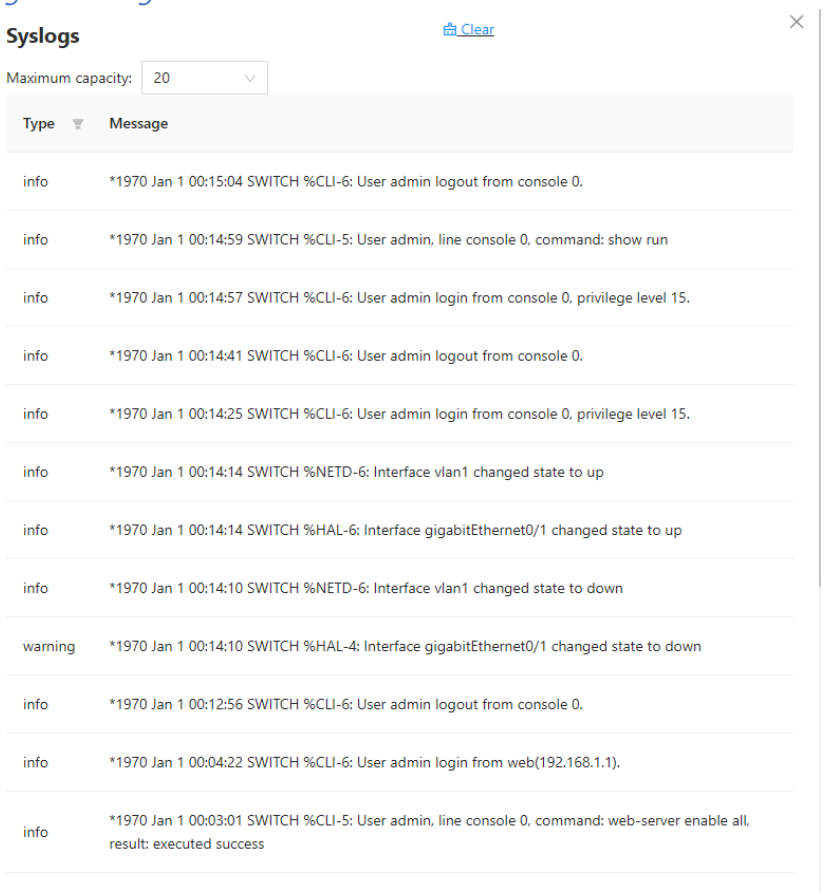
Figure 1-4 Log configuration



Click the **Log** button in Auxiliary area, as shown in *Figure 1-4*, and the Web will pop up the log message to display the relevant log information of the device, as shown in *Figure 1-5*.

This function enables capacity configuration, clearing and download of device logs with a default maximum capacity of 20 logs.

Figure 1-5 Log information

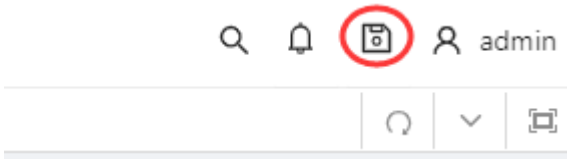


1.5 Save Configuration

The save configuration module provides the function to save the current configuration to the configuration file for the next startup.

Click the **Save** button in Auxiliary area to save the current configuration to the configuration file, as shown in *Figure 1-6*.

Figure 1-6 Save configuration



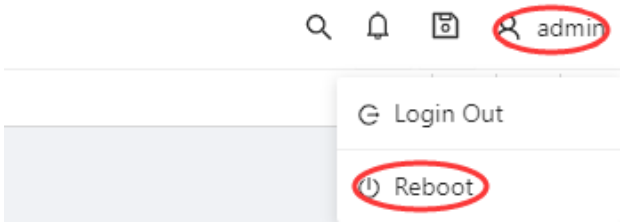
1.6 Reboot

NOTE:

- Before rebooting the device, save the configuration; otherwise, all unsaved configurations are lost after device reboot. After the device reboots, you must re-log in to the Web interface.

Click **Reboot** button in Auxiliary area to reboot the device, as shown in *Figure 1-7*.

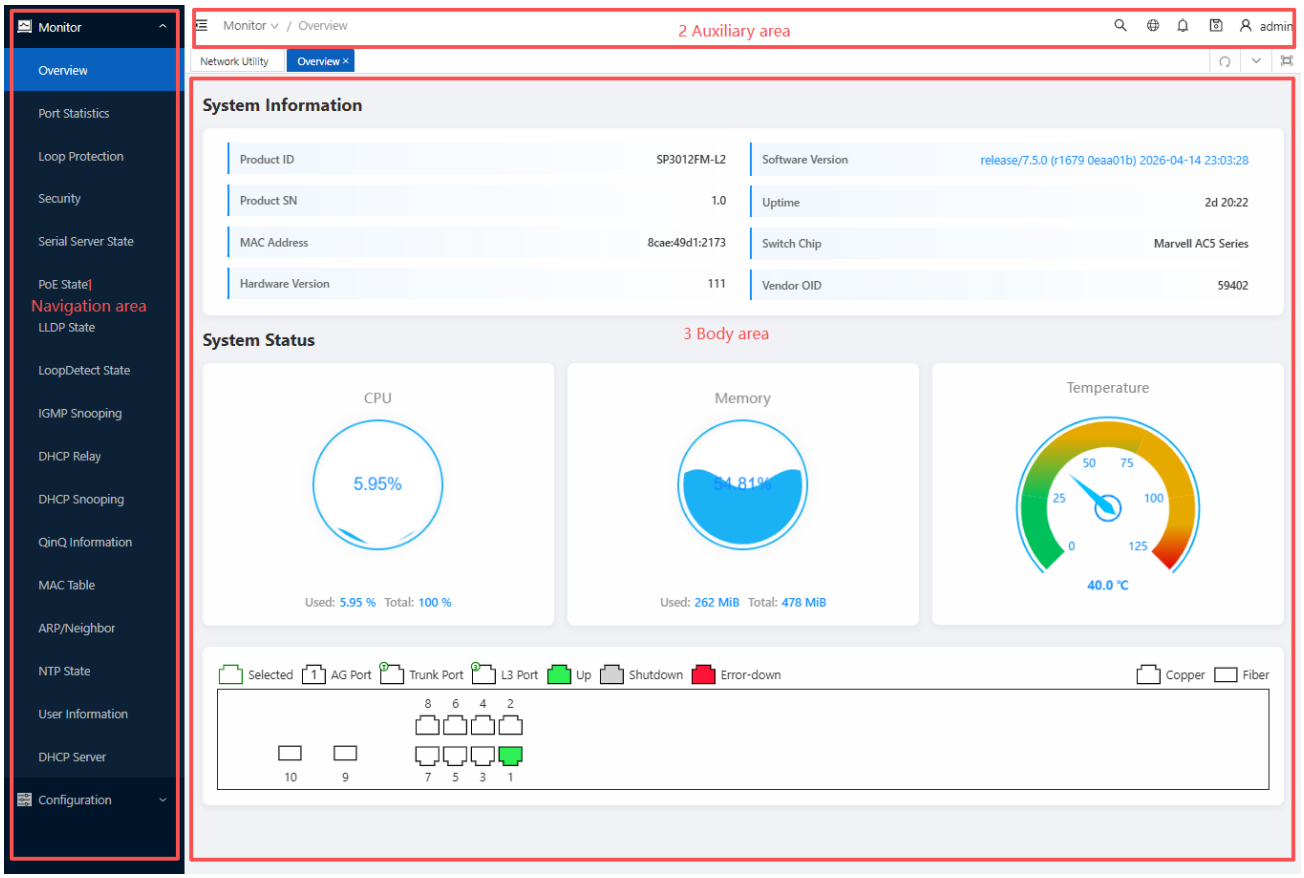
Figure 1-7 Reboot configuration



1.7 Introduction to the Web Interface

The Web interface is composed of three parts: navigation area, auxiliary area, and body area, as shown in *Figure 1-8*.

Figure 1-8 Web-based configuration interface



(1) Navigation area	(2) Auxiliary area	(3) Body area

- Navigation area: Organize the Web-based NM function menus in the form of a navigation area where the user can select function menus as needed. The result is displayed in the body area. The Web network management functions not supported by the device are not displayed in the navigation area.
- Auxiliary area: The area where the user can search, alarm message prompt, save, exit, restart device, etc.
- Body area: The area where you can configure and display a function.

1.8 Introduction to the Web-based Functions

Table 1-1 describes the Web-based network management functions in detail.

Table 1-1 Description of Web-based functions

Menu/ tab	Function Description

Monitor	Overview		Display the device's MAC address, serial number, software and hardware version, CPU usage, operating status such as uptime, and the link status and flow of the port
	Port Statistics		Display the count of ports
	Loop Protection		Display the loop protection status of the device
	Security		Display the security class relating status of the device
	Serial Server State		Display the working status of the serial port server of the device
	PoE State		Display the PoE working status of the device
	LLDP State		Display the LLDP working status of the device
	IGMP Snooping State		Display the device's IGMP Snooping status
	DHCP Relay		Display the DHCP relay information of the device
	DHCP Snooping State		Display the DHCP snooping status of the device
	QinQ Information		Display the device's QinQ status
	LoopDetect State		Display the port's loop status
	MAC Table		Display the MAC address table information
	ARP/Neighbor		Display the port's ARP/neighbor information
	NTP State		Display the device's NTP information
	User Information		Display the user information of the device
	DHCP Server		Display the DHCP server information of the device
Configuration	VLAN		Create, modify, delete VLANs, and configure port attributes and VLAN attribution
	Port	Port Configuration	Set ports' relating properties
		Port Extension	Set ports' rate limit, storm suppression and isolation

			Port Mirroring	Add/remove mirroring of ports
			Port Aggregation	Add/delete aggregation of ports
			Port Violation	Set the port's violation rule
			Port BackupLink	Set the port's back uplink configuration
		Spanning Tree		Set STP, RSTP, MSTP
		ERPS		Set ERPS single ring, tangent ring, intersecting ring
		PoE		Set PoE power, non-standard mode. Enable/disable PoE port power supply
		Security	Port Security	Configure and delete the port's security function
			IP Source Guard	Configure and delete the IP Source Guard function
			Dot1x	Configure 802.1X Authentication
			MAC Auth	Configure MAC Authentication Profiles
			RADIUS	Configure the RADIUS server
		Control	Serial Server	Configure serial server
			Relay Warning	Configure relay warning
		LoopDetect		Configure the port's loop detection function
		DNS		Configure the DNS of the device
		Time Range		Configure the device's time range
Advance		Layer 2	Voice VLAN	Configure the voice VLAN of the device
			LLDP Configuration	Configure and delete the LLDP function of the device
			IGMP Snooping	Display/Configure IGMP Snooping
			MAC Configuration	Configure the MAC address management mode of the device
			DHCP Snooping	Configure DHCP Snooping on the Device

		QinQ Configuration	Configure the QinQ function of the device
	Layer 3	ARP/Neighbor	Configure the ARP/Neighbor function
		Static Route	Configure the static route
		DHCP Relay	Configure the DHCP relay
		DHCP Server	Configure the DHCP server
	Security	ACL Configuration	Configure the ACL function of the device
		QoS Configuration	Configure the QoS function of the device
		DoS Configuration	Configure the DoS function of the device
		ARP Spoofing	Configure the ARP spoofing of the device
Maintenance	System Configuration		Set the electronic label of the device, enable/disable Telnet, SSH, HTTP, HTTPS functions
	IP Management		Set management IP
	File Management		Firmware upgrade management, configuration management, certificate management, page package management
	User Management		Create/delete users, set user passwords
	Time Management		Display/set system current date and time
	SNMP		Create, modify, delete SNMP configuration
	Syslog Server		Create a new, edit, and delete the Syslog server
Diagnosis	Network Utility		Execute ping/trace route operation and display the execution result
	Transceiver Information		View optical module information, such as manufacturer information, serial number, optical power, etc.
	One-click Collection		Generate a diagnostic information file and open the file for viewing or saving to the local host

	Dying Gasp	Enable/disable the power failure alarm function of dying gasp
	Cable Detect	Check the electrical port ‘s cable status

2. Monitor

2.1 Overview

Select **Monitor** > **Overview** from the navigation tree to enter the Overview page. As shown in *Figure 2-1*, The Overview page is divided into 3 sections, namely System Information, System Status and Panel Port.

1. In the **System Information** section, the user can check the product ID, SN, MAC Address, Hardware and Software Version of the device, and the specific parameters are described as shown in *Table 2-1*.

Figure 2-1 Overview page

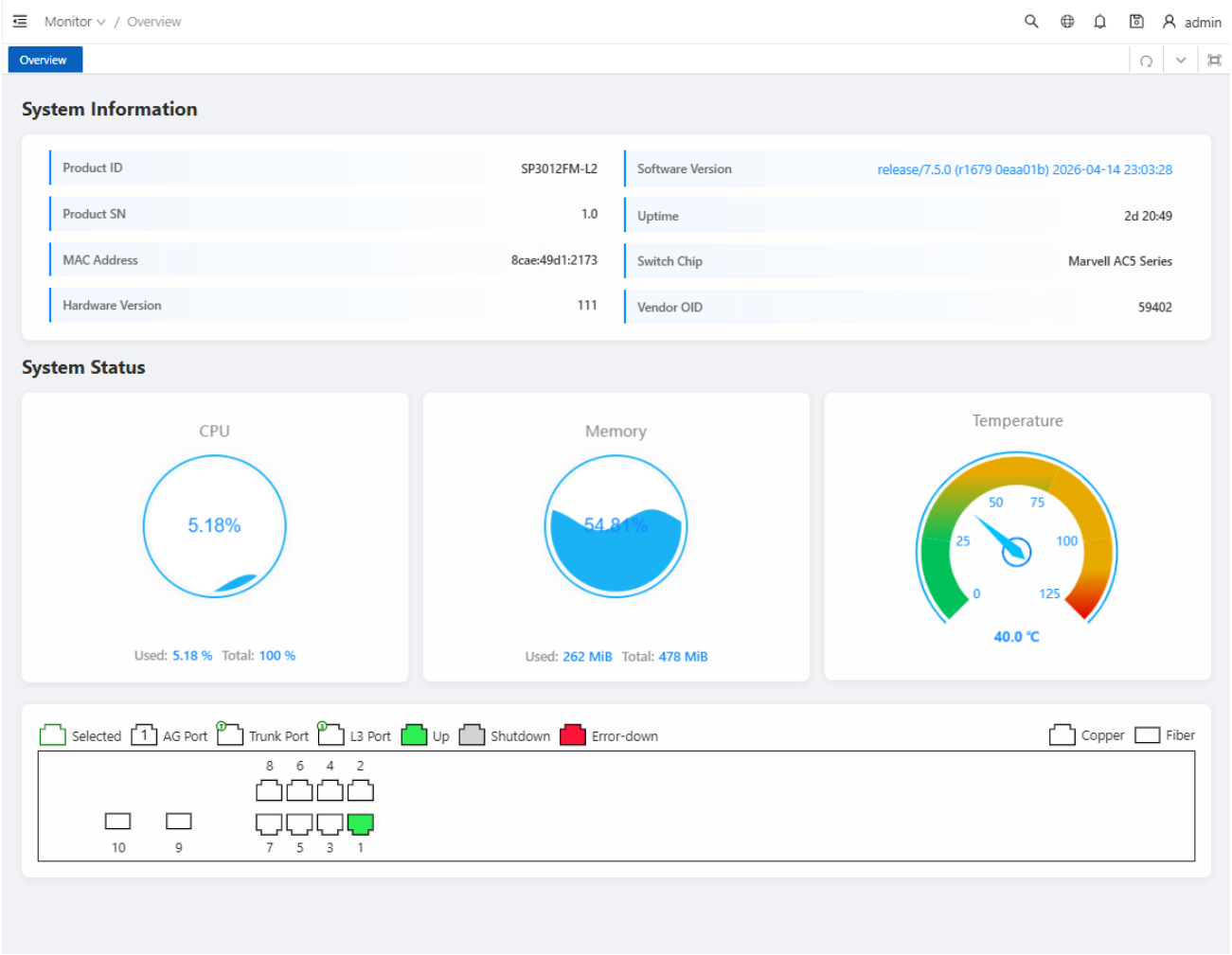


Table 2-1 Basic information configuration items

Item	Description

Product ID	Display the device product ID.
Product SN	Display the device's serial number.
MAC Address	Display the device's MAC address.
Hardware Version	Display the device's hardware version.
Software Version	Display the device's software version.
Release Date	Display the device software's release date.
Uptime	Display the device uptime.
Switch Chip	Display the device's chip type.
Vendor OID	Display the device's vendor OID.

2. In the **System Status** section, you can see the CPU, Memory and Temperature status of the device.
3. In the **Panel Port** section, the user can see the panel diagram of the device and the working conditions of the panel ports.

2.2 Port Statistics

The port statistics module displays statistics about the packets received and sent through ports.

Displaying Port Statistics

Select **Monitor** > **Port Statistics** in the navigation area to enter the page shown in *Figure 2-2*. The page display the port's Rx Load, Tx Load, Speed, Under Size, Over Size, CRC Error and Collision Count. *Table 2-2* describes the items of port statistics.

Figure 2-2 The port statistics page

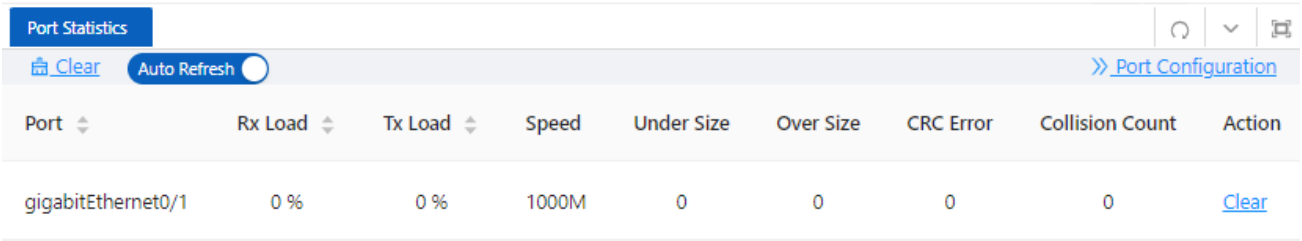


Table 2-2 The parameters of port statistics

Item	Description

Port	The name of the logical interface.
Rx Load	The port receives the load rate
Tx Load	The port sends the load rate.
Speed	The port operating rate.
Under Size	The number of packets received by the port is less than 64 bytes.
Over Size	The number of packets received by the port is greater than the maximum MTU configuration.
CRC Error	The number of packets received of CRC checking error.
Collision Count	The number of conflicting packets received by the port.
Clear	Click to clear the statistics.

2.3 Loop Protection

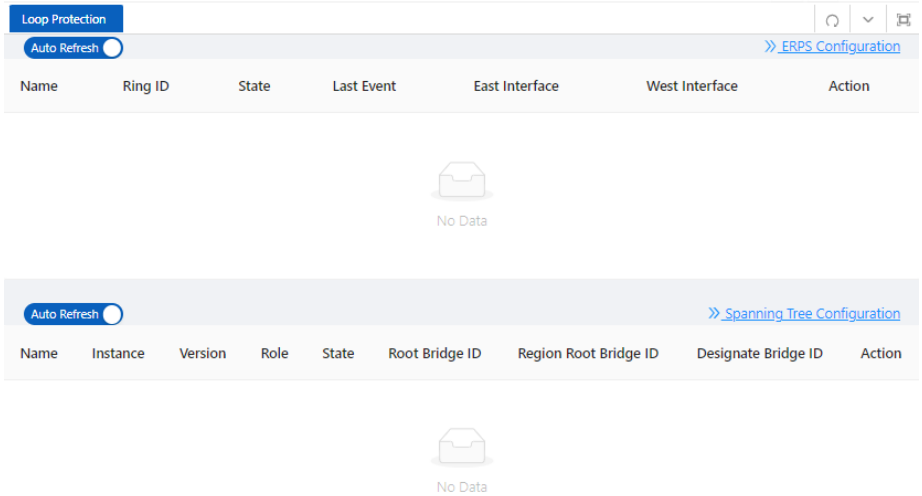
The Loop Protection page is used to display the working status of device loop-related protocols, such as ERPS and Spanning Tree Protocols.

1. Select **Monitor** > **Loop Protection** in the navigation area to enter the Loop Protection Status page, as shown in *Figure 2-3*.

2. The user can see the working status of the ERPS and Spanning Tree Protocol that have been enabled, and the specific parameters can be described in the relevant sections of the protocol.

3. Click the **ERPS Configuration** and **Spanning Tree Configuration** buttons to directly switch to the relevant configuration page.

Figure 2-3 Loop protection status

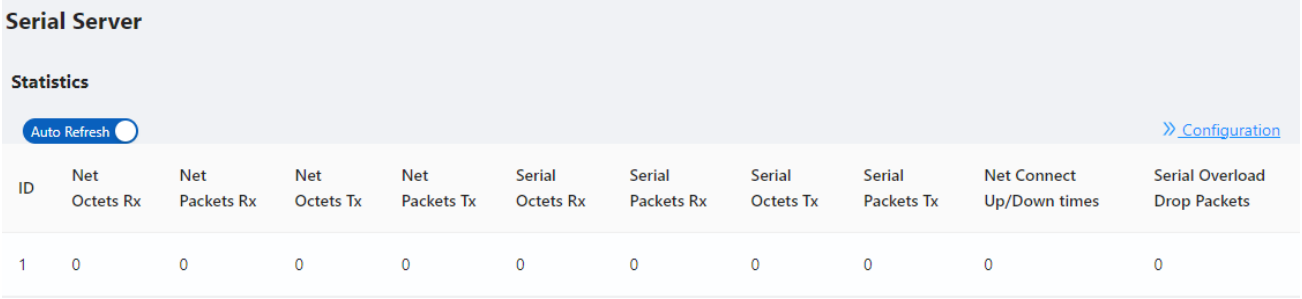


2.4 Serial Server State

The Serial Server State page is used to display the working status of serial server.

1. Select **Monitor** > **Serial Server State** in the navigation area to enter the Serial Server State page, as shown in *Figure 2-4*.

Figure 2-4 Serial server status



2. In this page, you can see the working status of the serial server. *Table 2-3* describes the items of port statistics.

Table 2-3 Items of serial server

Item	Description
ID	Serial port ID number of the serial port server
Net Octets Rx	The number of bytes received by the network
Net Packets Rx	The number of packets received by the network
Net Octets Tx	The number of bytes sent by the network
Net Packets Tx	The number of packets sent by the network
Serial Octets Rx	The number of bytes received by the serial port
Serial Packets Rx	The number of packets received by the serial port
Serial Octets Tx	The number of bytes sent by the serial port
Serial Packets Tx	The number of packets sent by the serial port
Net Connect Up/Down times	Number of network connections
Serial Overload Drop Packets	Number of packets discarded by serial port overflow

3. Click the **Configuration** button to directly switch to the relevant configuration interface.

2.5 Security

The Security page is used to display the working status of device security-related protocols, with three parts: Port Security, IP Source Guard, and MAC Auth.

1. Select **Monitor** > **Security** in the navigation area to enter the Port Security page, as shown in *Figure 2-5*, *Figure 2-6*, and *Figure 2-7*.

Figure 2-5 Port security state

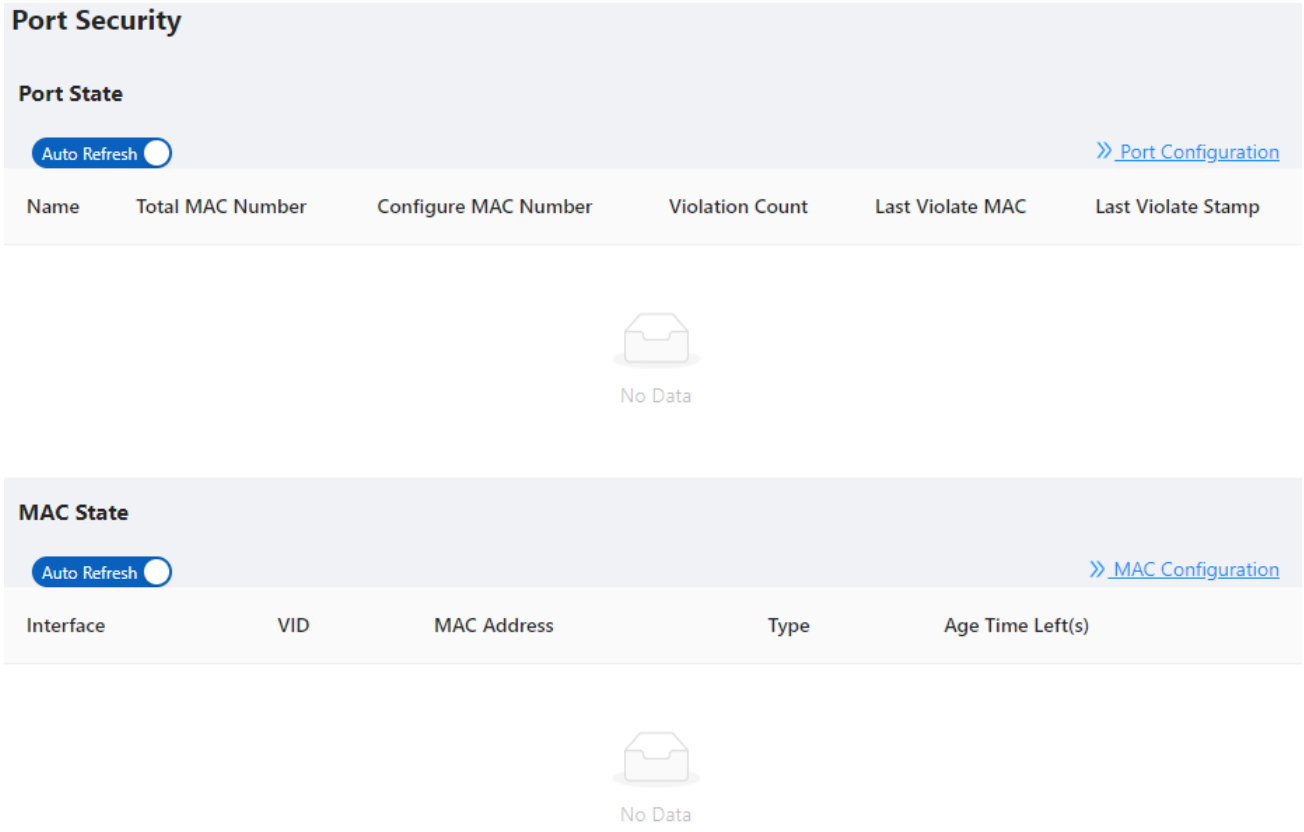


Figure 2-6 IP source guard state

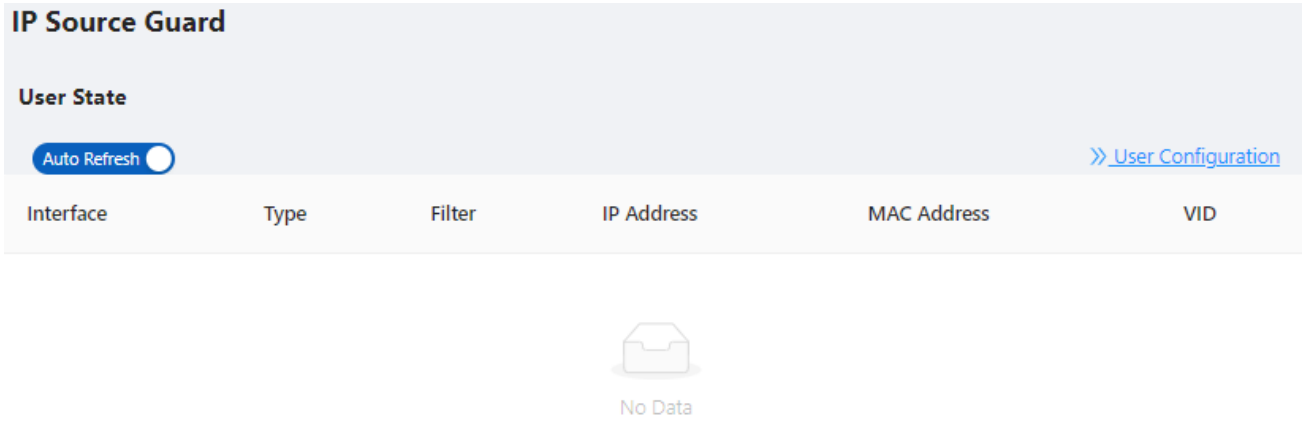
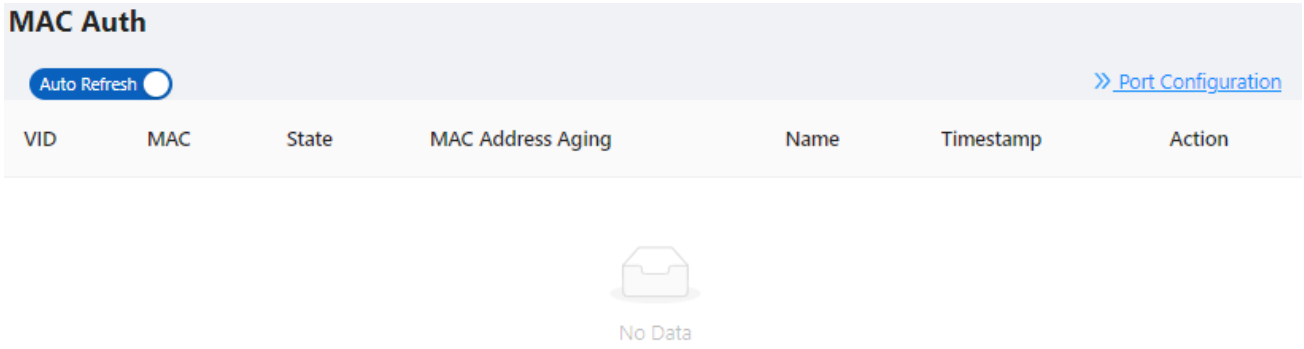


Figure 2-7 MAC Auth state



2. In this page, you can see the working status of the Port State, MAC State, IP Source Guard, and MAC Auth, and the specific parameters can be described in the relevant sections of the protocol.

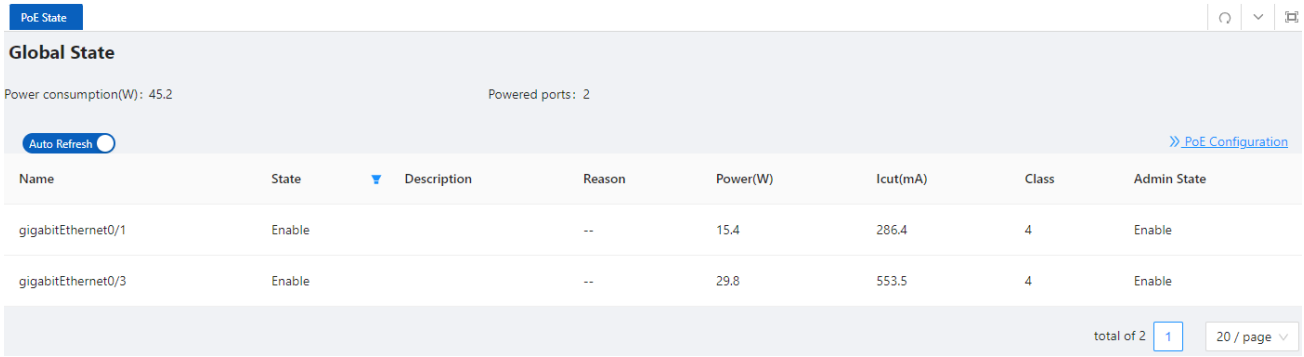
3. Click the corresponding **Port Configuration** button to directly switch to the relevant configuration interface.

2.6 PoE State

The PoE State page is used to display the current PoE working status of the device.

1. Select **Monitor** > **PoE State** in the navigation bar to enter the PoE Status page, as shown in *Figure 2-8*.

Figure 2-8 PoE state



2. On the current page, the user can see the total power supply of the device, the number of power supply ports, and the power supply status of each port. Specific parameter descriptions are shown in *Table 2-4*.

Table 2-4 Items of PoE state

Item	Description	
Global state	Power Consumption (W)	Current PoE external power supply of the device
	Powered ports	The current total number of powered up ports

Port	Name	Indication panel port number
	State	PoE current power supply status disable: power supply off state enable: power supply on state
	Description	PoE port description
	Reason	The reason why the port cannot supply power Short: load short Management: insufficient power
	Power(W)	The power consumed by the current port
	Icut(mA)	The working current of the current port
	Class	Class level of the PD device connected to this port
	Admin State	Display whether the PoE function of this port is enabled or disabled

3. Click the **PoE Configuration** button to directly switch to the PoE Configuration page.

2.7 LLDP State

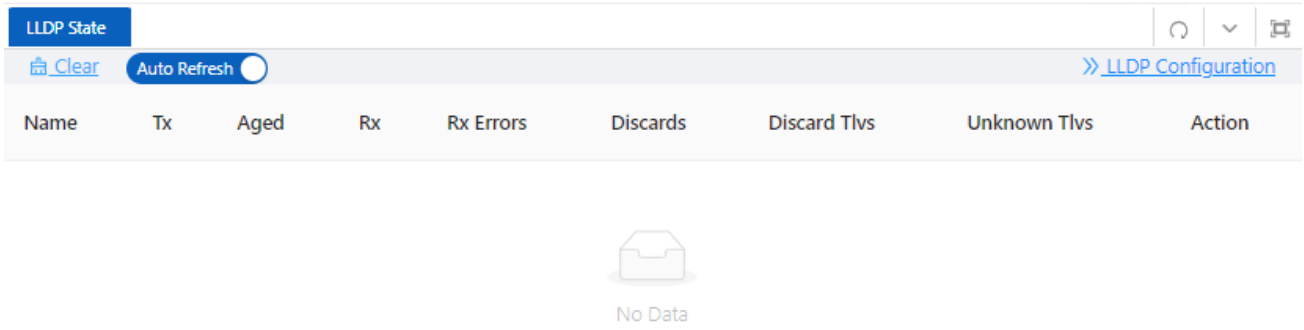
The LLDP Status page is used to display the device LLDP working status.

1. Select **Monitor** > **LLDP State** in the navigation area to enter the LLDP Status page, as shown in *Figure 2-9*.

2. The user can see the working status of the LLDP protocol that has been enabled in the page, and the specific parameters are described in the relevant sections of the protocol.

3. Click the **LLDP Configuration** button to directly switch to the LLDP Configuration interface.

Figure 2-9 LLDP state



2.8 IGMP Snooping

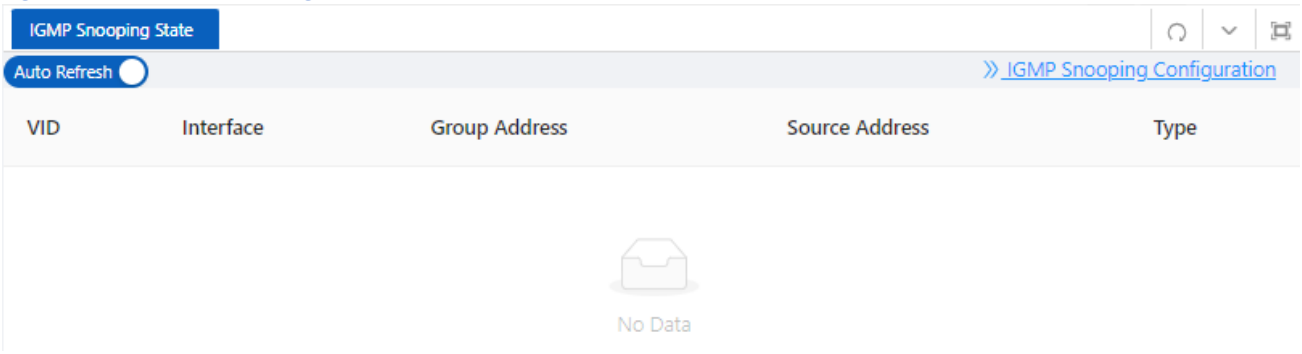
The IGMP Snooping State page is used to display the working status of the device IGMP Snooping protocol.

1. Select **Monitor** > **IGMP Snooping** in the navigation area to enter the IGMP Snooping page, as shown in *Figure 2-10*.

2. The user can see the working status of the IGMP snooping protocol that has been enabled in the page, and the specific parameters can be described in the relevant sections of the protocol.

3. Click the **IGMP Snooping Configuration** button to directly switch to the IGMP Snooping Configuration interface.

Figure 2-10 IGMP snooping state

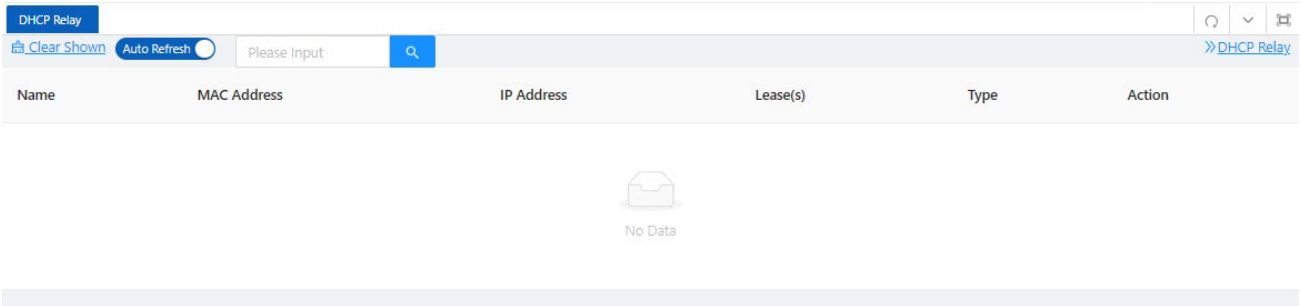


2.9 DHCP Relay

The DHCP Relay page is used to display the working status of the DHCP Relay of the device.

1. Select **Monitor** > **DHCP Relay** in the navigation area to enter the DHCP relay state page, as shown in *Figure 2-11*.

Figure 2-11 DHCP relay state page



2. You can see the working state of DHCP relay protocol that is enabled in the page, and the I cut specific parameters can be described in the relevant sections of the protocol.

3. Click the **DHCP Relay** button to enter the DHCP Relay Configuration page directly.

2.10 DHCP Snooping

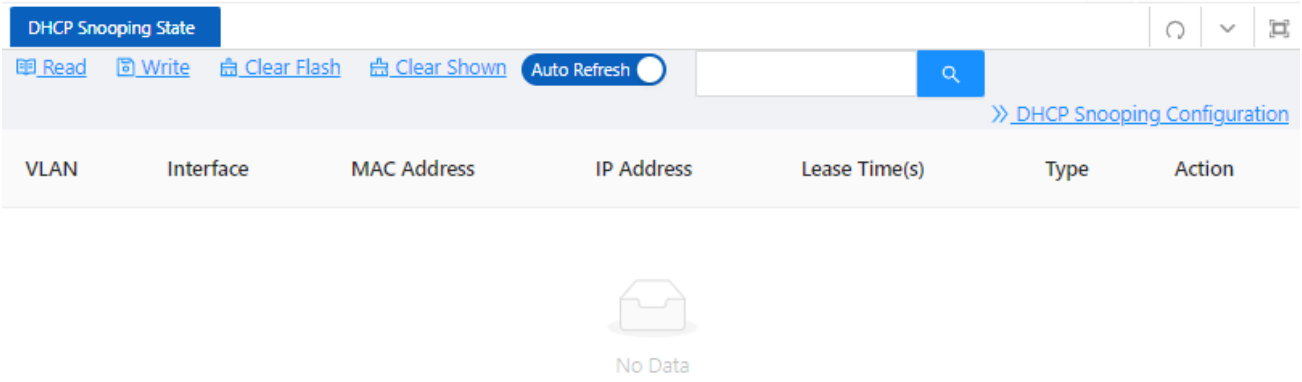
The DHCP Snooping State page is used to display the working status of the DHCP Snooping protocol of the device.

1. Select **Monitor** > **DHCP Snooping State** in the navigation area to enter the DHCP Snooping State page, as shown in *Figure 2-12*.

2. The user can see the working status of DHCP Snooping Protocol that has been enabled in the page, and the specific parameters can be described in the relevant sections of the protocol.

3. Click the **DHCP Snooping Configuration** button to directly switch to the DHCP Snooping Configuration interface.

Figure 2-12 DHCP snooping state



2.11 QinQ Information

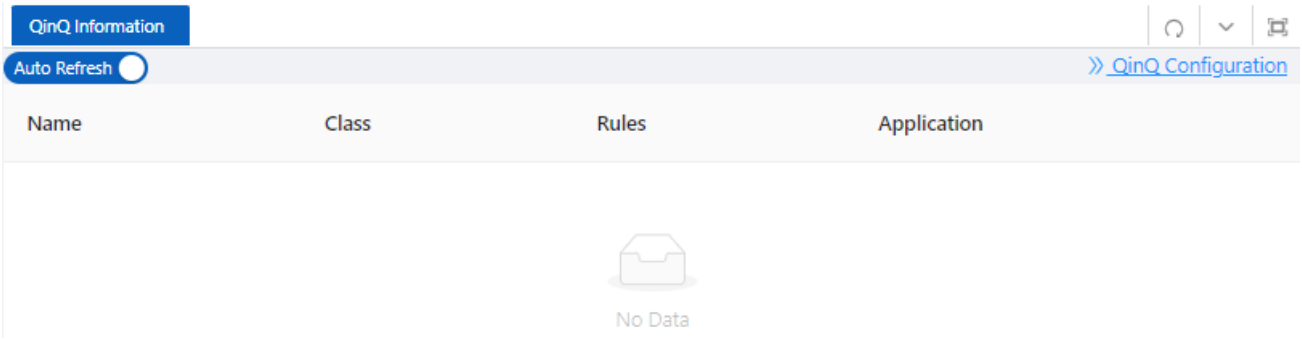
The QinQ Information page is used to display the working status of the device QinQ information.

1. Select **Monitor** > **QinQ Information** in the navigation area to enter the QinQ Status page, as shown in *Figure 2-13*.

2. The user can see the working status of QinQ that has been turned on in the page, and the specific parameters can be described in the relevant sections of the protocol.

3. Click the **QinQ Configuration** button to quickly switch to the QinQ Configuration interface.

Figure 2-13 QinQ information



2.12 LoopDetect State

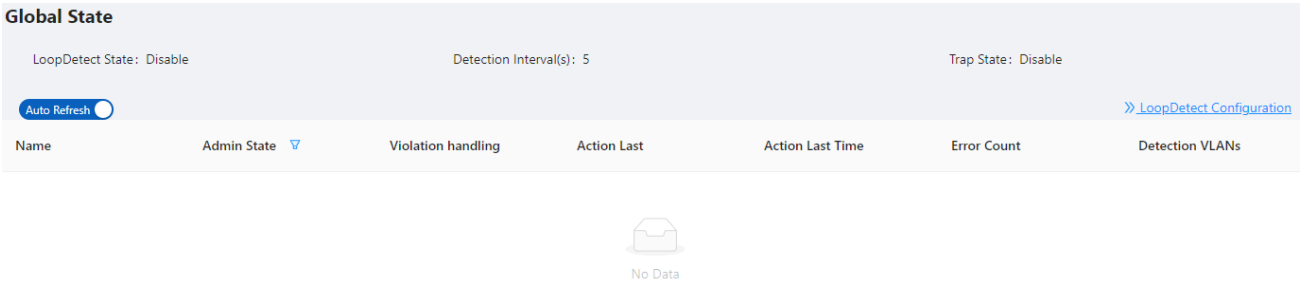
The LoopDetect State page is used to display the working status of the loop.

1. Select **Monitor** > **LoopDetect State** in the navigation area to enter the LoopDetect Status page, as shown in *Figure 2-14*.

2. The user can see the working status of loop detection that has been turned on in the page, and the specific parameters can be described in the relevant sections of the protocol.

3. Click the **LoopDetect Configuration** button to quickly switch to the LoopDetect Configuration interface.

Figure 2-14 LoopDetect state



2.13 MAC Table

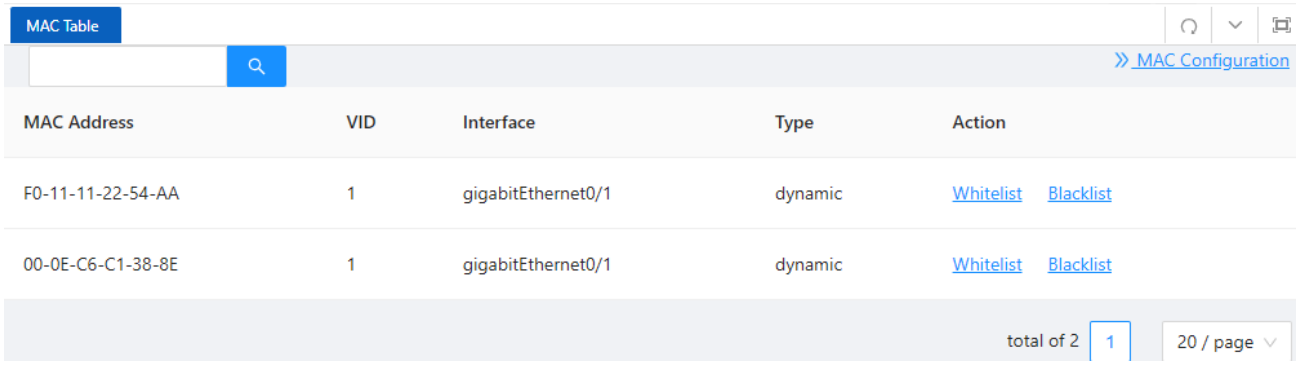
The MAC Table page is used to display the MAC address table item information.

1. Select **Monitor** > **MAC Table** in the navigation area to enter the MAC table page, as shown in *Figure 2-15*.

2. You can see the working information of MAC table that has been turned on in the page, and the specific parameters can be described in the relevant sections of the protocol.

3. Click the **MAC Configuration** button to quickly switch to the MAC Configuration page.

Figure 2-15 MAC table information



2.14 ARP/Neighbor

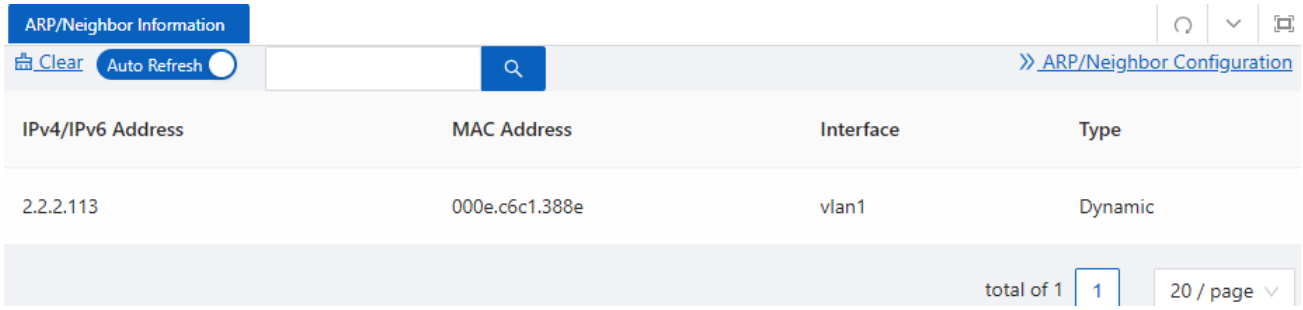
The ARP/Neighbor Information page is used to display the working status of the device ARP/Neighbor information.

1. Select **Monitor** > **ARP/Neighbor Information** in the navigation area to enter the ARP/Neighbor status page, as shown in *Figure 2-16*.

2. You can see the working status of ARP/Neighbor that has been turned on in the page, and the specific parameters can be described in the relevant sections of the protocol.

3. Click the **ARP/Neighbor Configuration** button to quickly switch to the ARP/Neighbor Configuration page.

Figure 2-16 ARP/Neighbor information



2.15 NTP State

The NTP State page is used to display the working status of the device NTP information.

1. Select **Monitor** > **NTP State** in the navigation area to enter the NTP State page, as shown in *Figure 2-17*.

2. You can see all NTP items of the device in the page, and the specific parameters can be described as the following *Table 2-5*.

3. Click the **NTP Configuration** button to quickly switch to the NTP Configuration page.

Figure 2-17 NTP information

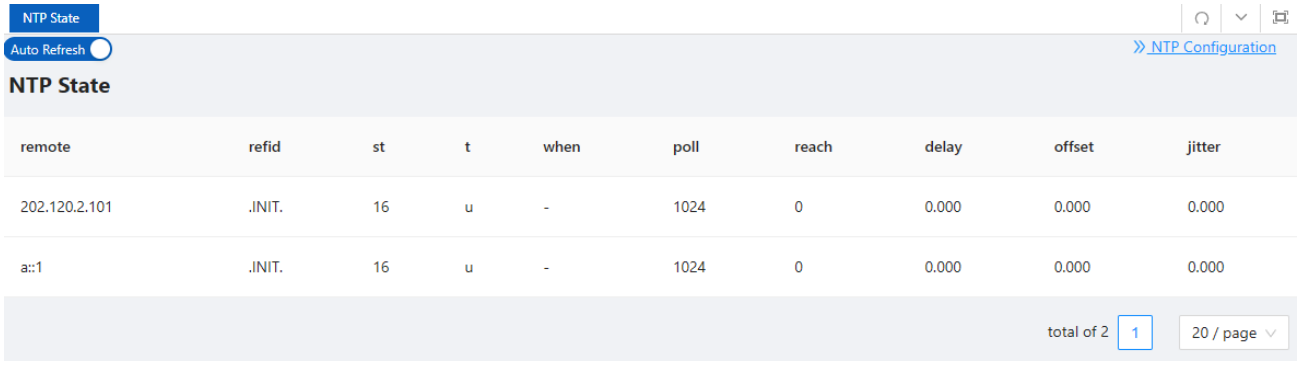


Table 2-5 NTP state parameters' description

Item	Description
remote	The host name or IP address of clock
refid	Reference ID
st	Stratum
t	Type u: unicast or manycast client b: broadcast or multicast client l: local (reference clock)
when	Sec/min/hr since the last synchronization time
poll	Poll interval (log2 s)
reach	The last 8 consecutive reach situation inquiry(octal)
delay	Round-trip delay
offset	Clock offset
jitter	Clock jitter

2.16 User Information

User Information page shows the user information table of the device.

1. Select **Monitor > User Information** in the navigation area to enter the User Information page, as shown in *Figure 2-18*.

Figure 2-18 User information page

2. In this page, you can check all the online user information of the device, and the specific parameters description can be check in the relevant chapter.

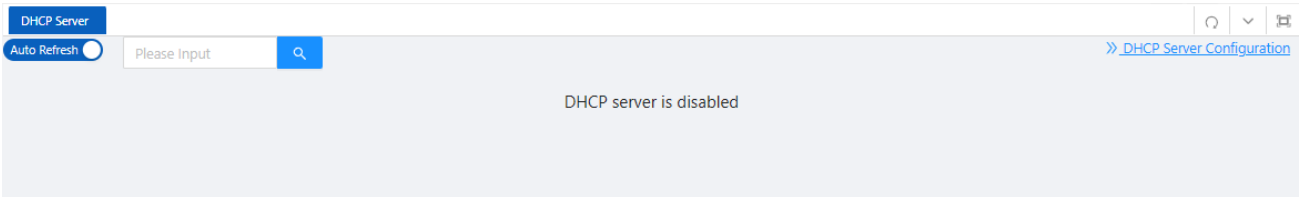
3. Click the **User Management** button can switch to the User Management page directly.

2.17 DHCP Server

DHCP Server page shows the DHCP sever state of the device.

1. Select **Monitor > DHCP Server** in the navigation area to enter the DHCP server page, as shown in *Figure 2-19*.

Figure 2-19 DHCP server state page



2. You can check the all the DHCP Relay state of the device, and the specific parameters description can be checked in the relevant sections.

3. Click the **DHCP Relay Configuration** button can switch to the User Management page directly.

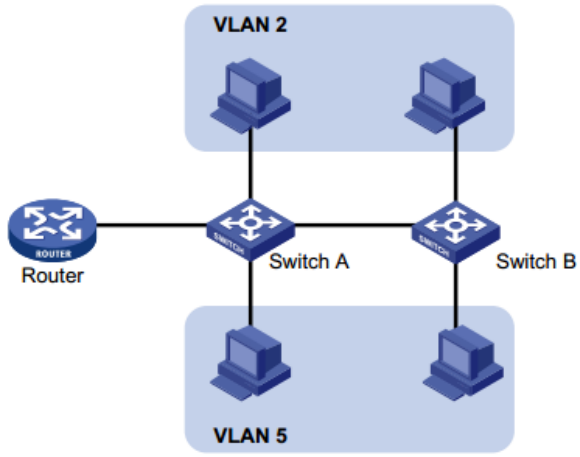
3. Configuration

3.1 VLAN

3.1.1 Introduction

Ethernet is a network technology based on the Carrier Sense Multiple Access/Collision Detect (CSMA/CD) mechanism. As the medium is shared, collisions and excessive broadcasts are common on an Ethernet. To address the issue, virtual LAN (VLAN) was introduced. The idea is to break a LAN down into separate VLANs, that is, Layer 2 broadcast domains whereby frames are switched between ports assigned to the same VLAN. VLANs are isolated from each other at Layer 2. A VLAN is a bridging domain, and ll broadcast traffic is contained within it, as shown in *Figure 3-1*.

Figure 3-1 A VLAN diagram



A VLAN is logically divided on an organizational basis rather than on a physical basis. For example, all workstations and servers used by a particular work group can be connected to the same LAN, regardless of their physical locations. VLAN technology delivers the following benefits:

- Confining broadcast traffic within individual VLANs. This reduces bandwidth waste and improves network performance.
- Improving LAN security. By assigning user groups to different VLANs, you can isolate them at Layer 2. For hosts in different VLANs to communicate, routers or Layer 3 switches are required.

- Flexible virtual work group creation. As users from the same work group can be assigned to the same VLAN regardless of their physical locations, network construction and maintenance is much easier and more flexible.

The user can create VLANs based on:

- Port
- MAC address
- Protocol
- IP subnet
- Policy
- Other criteria

Because the Web interface is available only for port-based VLANs, this chapter introduces only port-based VLANs.

3.1.1.1 VLAN Mode

Depending on the tag handling mode, the VLAN Mode of a port can be one of the following three:

- Access:

An access port belongs to only one VLAN and usually connects to a user device.

- Trunk:

A trunk port can join multiple VLANs to receive and send traffic for them. It usually connects to a network device.

- Hybrid:

A hybrid port can join multiple VLANs to receive and send traffic for them. It can connect either a user device or a network device.

A hybrid port is different from a trunk port in that:

- A hybrid port allows traffic of multiple VLANs to pass through untagged.
- A trunk port allows only traffic of the default VLAN to pass through untagged.

3.1.1.2 Port Link Type

By default, VLAN 1 is the default VLAN for all ports. However, you can change the default VLAN for a port as required. When doing that, follow these guidelines:

- Because an access port can join only one VLAN, its default VLAN is the VLAN to which it belongs and cannot be configured.
- Because a trunk or hybrid port can join multiple VLANs, you can configure a default VLAN for the port.

3.1.1.3 Frame Handling Methods

Table 3-1 A port configured with a default VLAN handles a frame as follows:

<table>
<tr><th rowspan="2">Port type</th><th colspan="2">Actions (in the inbound direction)</th><th rowspan="2">Actions (in the outbound direction)</th></tr>
<tr><th>Untagged frame</th><th>Tagged frame</th></tr>
<tr><td>Access</td><td>Tag the frame with the default VLAN tag.</td><td>• Receive the frame if its VLAN ID is the same as the default VLAN ID
• Drop the frame if its VLAN ID is different from the default VLAN ID.</td><td>Remove the default VLAN tag and send the frame.</td></tr>
<tr><td>Trunk</td><td rowspan="2">Check whether the default VLAN is carried on the port:
• If yes, tag the frame with the default VLAN tag.
• If not, drop the frame.</td><td rowspan="2">• Receive the frame if its VLAN is carried on the port.
• Drop the frame if its VLAN is not carried on the port.</td><td>• Remove the tag and send the frame if the frame Carries the default VLAN tag.
• Send the frame without removing the tag if its VLAN is carried on the port but is different from the default one.</td></tr>
<tr><td>Hybrid</td><td>Send the frame if its VLAN is carried on the port. The frame is sent with the VLAN tag removed or intact depending on your configuration.</td></tr>
</table>

3.1.2 Configure VLAN

3.1.2.1 VLAN Configuration Overview

Configure VLAN based on the Access port

Table 3-2 VLAN configuration steps based on Access ports

Step	Configuration Task	Explanation
1	Configure the connection type of the port	Optional The connection type of the port is set to Access. By default, the connection type of the port is Access.
2	Create VLAN	Required Create one or more VLANs
3	Configure the default VLAN of the port	Configure the default VLAN for the Access port

Configure VLAN based on the Trunk port

Table 3-3 VLAN configuration steps based on Trunk ports

Step	Configuration Task	Explanation	
1	Configure the connection type of the port.	Required The connection type of the port is set to Trunk. By default, the connection type of the port is Access.	By default, the Untagged VLAN (i.e., the default VLAN) of the Trunk port is VLAN 1. Note: When changing the Untagged VLAN (i.e., the default VLAN) of a Trunk port, the original Untagged VLAN of that port will automatically become its Tagged VLAN.
2	Create the VLANs that need to be added to this Trunk port.	You must create one or more VLANs.	
3	Configure the Trunk to which the VLAN belongs.	Select the corresponding Trunk port and add the VLAN.	Required A Trunk port has only one Untagged VLAN, which is its default VLAN.

3.1.2.2 Configure VLAN

1. Select **Configuration** > **VLAN** in the navigation area. The system automatically enters the VLAN page as shown in *Figure 3-2*. *Table 3-4* describes the configuration items of creating a VLAN.

Figure 3-2 VLAN configuration page

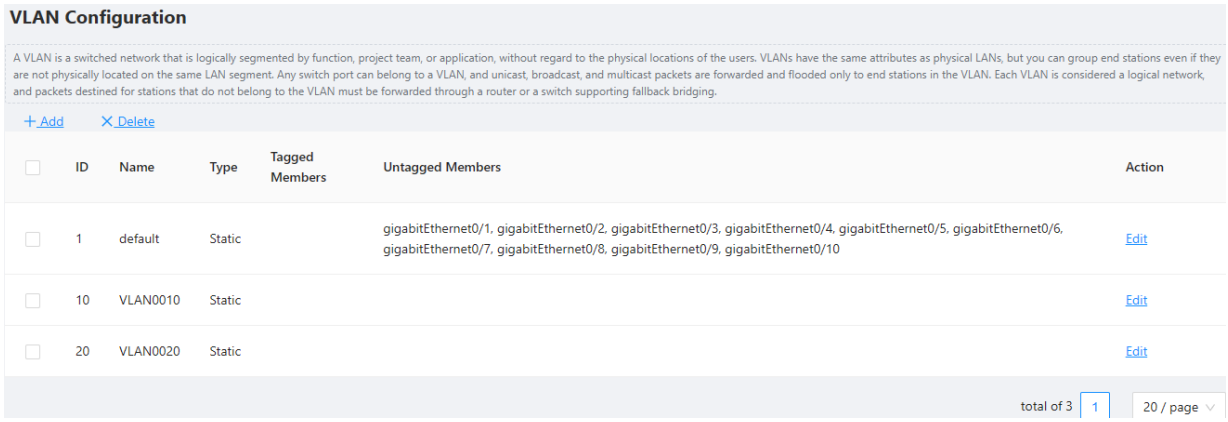


Table 3-4 VLAN configuration items

Item	Description
ID	This field displays the ID of the VLAN
Name	By default, the description string of a VLAN is its VLAN ID, such as VLAN 0002
Type	Display the type of VLAN
Tagged Members	Indicate that the port sends the traffic of the VLAN without removing the VLAN tag
Untagged Members	Indicate that the port sends the traffic of the VLAN with removing the VLAN tag
Edit	Click to enter the VLAN editing page
Add	Click to enter the VLAN adding page
Delete	Select the VLAN ID, click to delete

2. Click **+Add** button to enter the page for creating a VLAN, as shown in *Figure 3-3*.

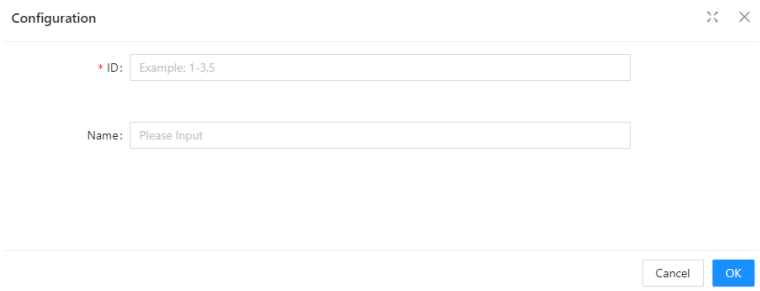
3. Type VLAN number into the **ID** box.

4. Input a VLAN name.

5. Click **OK** to complete the configuration and click **Save** in the auxiliary area to save such configuration.

6. When you need to configure the VLAN port member, click the **Edit** button, select the port member required to join the VLAN in the port panel, and click the **OK** button to complete the operation.

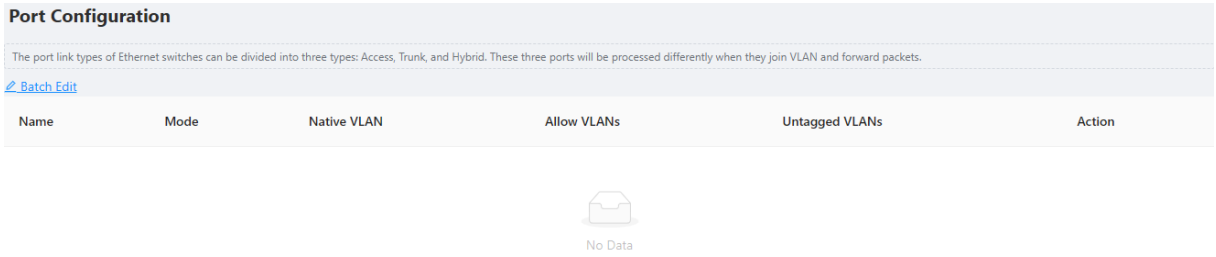
Figure 3-3 Create VLAN



3.1.2.3 Configure Port

1. Select **Configuration** > **VLAN** in the navigation area to enter the VLAN page as shown in *Figure 3-4*. *Table 3-5* describes the configuration items of configuring a port.

Figure 3-4 Port configuration page

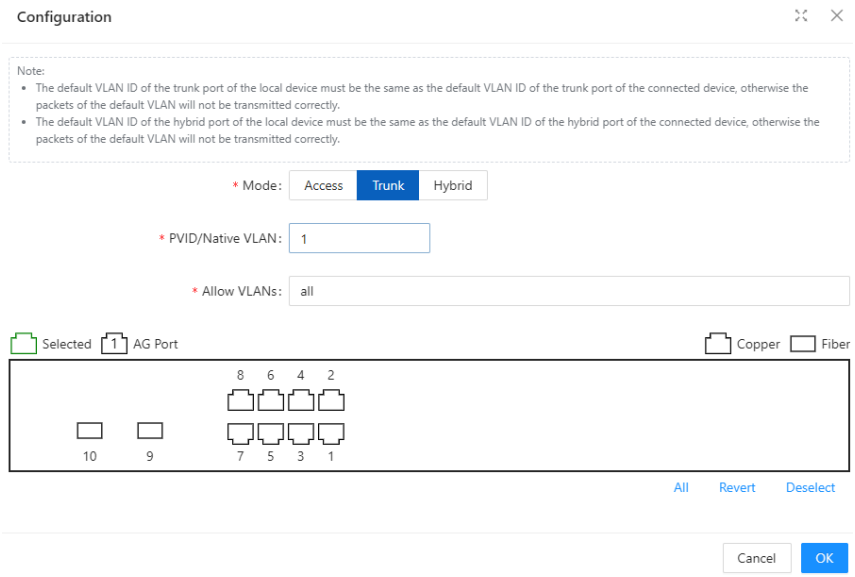


2. Click **Batch Edit** button below Port Configuration to enter the Port Configuration page, as shown in *Figure 3-5*. *Table 3-5* describes the configuration items of configuring a VLAN.

Table 3-5 The description of the trunk configuration

Item		Description
Mode	Access	Set the port's VLAN Mode to access
	Trunk	Set the port's VLAN Mode to trunk
	Hybrid	Set the port's VLAN Mode to hybrid
PVID		Set the port's default VLAN ID, only exist in access mode. The trunk ports at the two ends of a link must have the same PVID. Otherwise, the link cannot properly transmit packets
Native VLAN		VLAN（Native VLAN）, only exist in Trunk mode
Allow VLANs		Select the VLANs that are allowed through the port

Figure 3-5 Interface configuration page



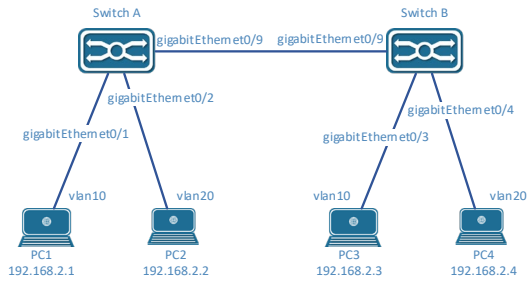
3. Select the VLAN Mode, type VLAN number in PVID and Allow VLANs box, click **OK** button to complete the configuration.

4. Click the **Save** in the auxiliary area to save the configuration.

3.1.3 A Configuration Example

Case requirement: Switch A and Switch B are interconnected through trunk ports. PCs in the same VLAN can communicate with each other, while PCs in different VLANs are prohibited from communicating. The network topology is shown in *Figure 3-6*.

Figure 3-6 Topology for VLAN configuration example



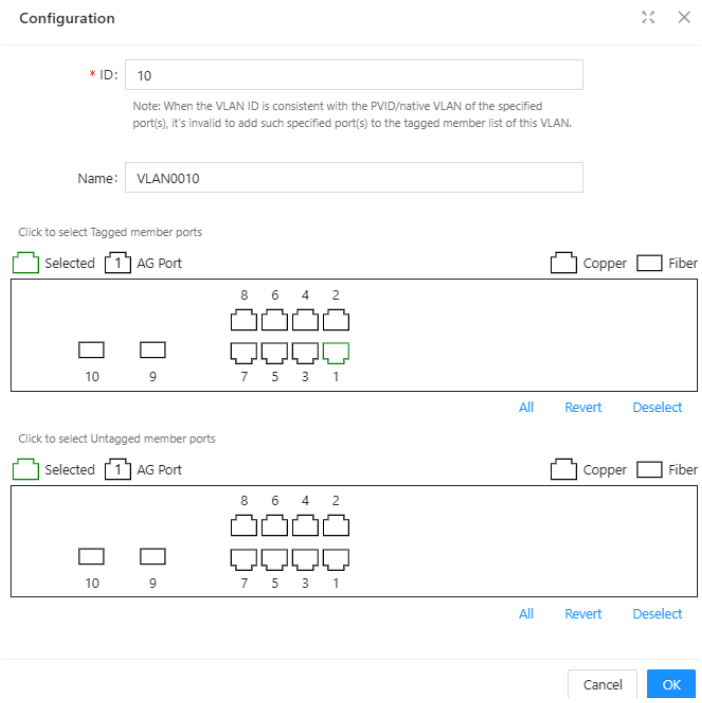
Switch A Configuration:

Step 1: Configure GigabitEthernet 0/1 as an access port with PVID set to 10, and GigabitEthernet 0/2 as an access port with PVID set to 20.

In the navigation bar, select **Configuration > VLAN** to enter the VLAN Configuration page. Click the **Add** button, and in the pop-up modal, enter "10" in the ID field. Select the port

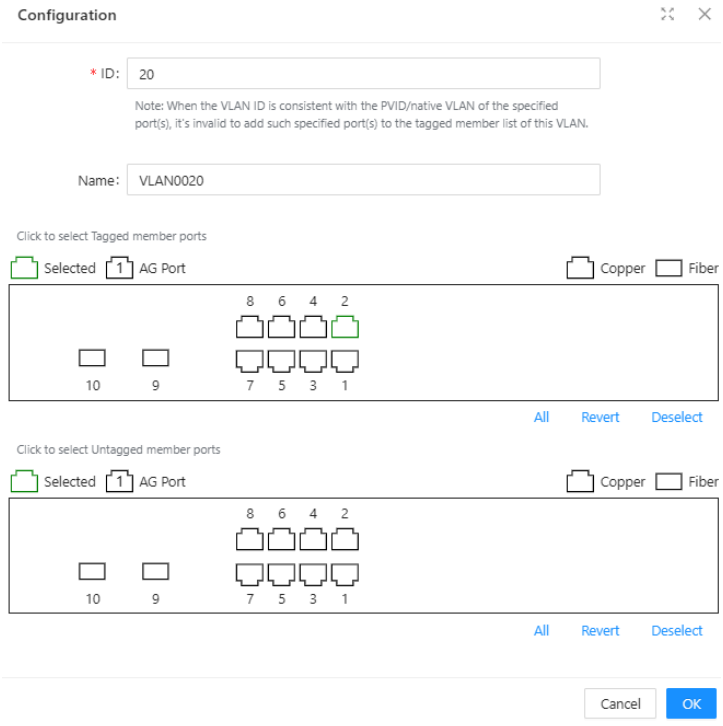
GigabitEthernet 0/1 and click the **OK** button to complete the configuration. As shown in *Figure 3-7*.

Figure 3-7 VLAN configuration page



Follow the same steps to configure the port GigabitEthernet 0/2, as shown in *Figure 3-8*.

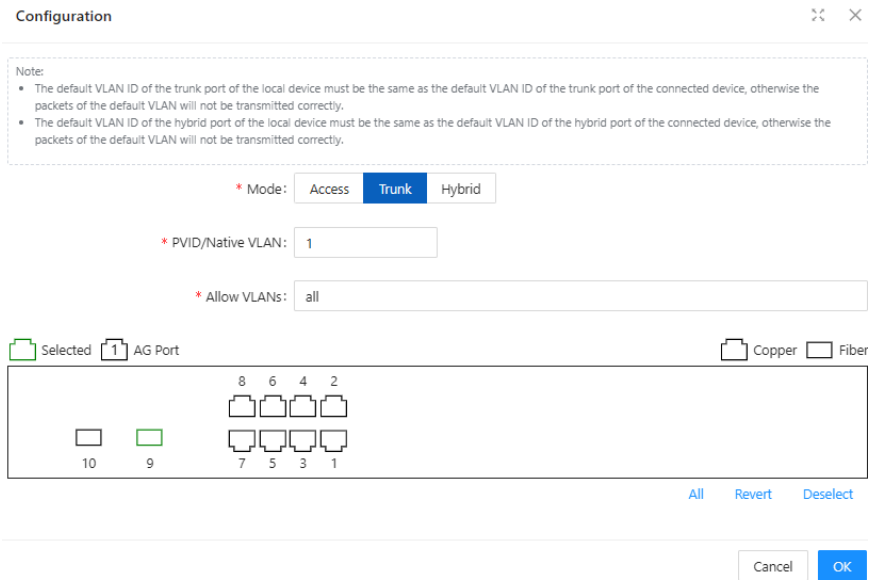
Figure 3-8 VLAN configuration page



Step 2: Create Trunk Port GigabitEthernet 0/9

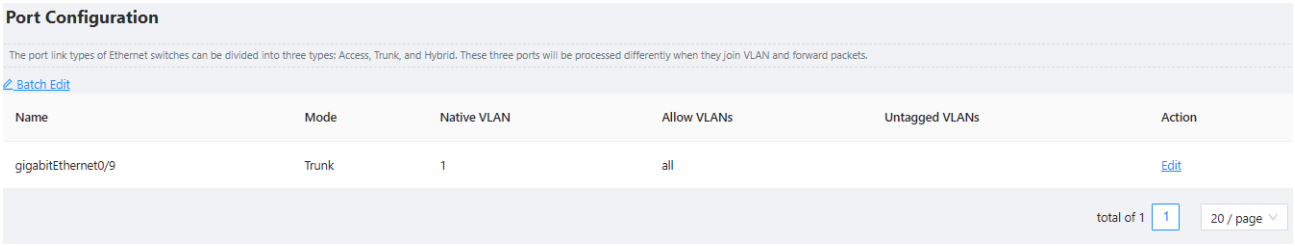
On the current interface, click the **Batch Edit** button below the Port Configuration as shown in *Figure 3-9*. Select "Trunk", set "Native VLAN" to "1", "Allow VLANs" to "all", and click on the GigabitEthernet 0/9 panel to select it. Then click the **OK** button to complete the configuration.

Figure 3-9 Add VLAN page



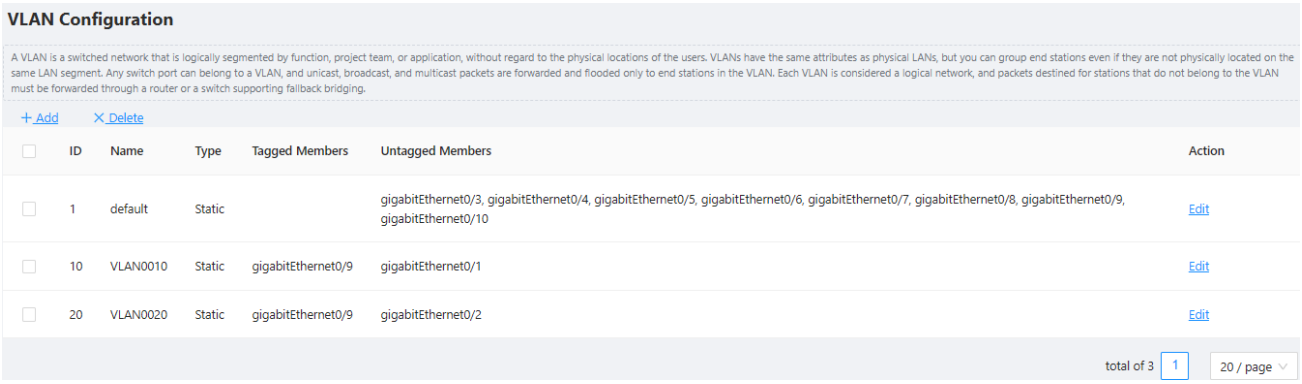
The successfully configured Trunk port GigibitEthernet0/9 is shown in *Figure 3-10*.

Figure 3-10 Trunk configuration page



The list of configured VLANs is shown in *Figure 3-11*.

Figure 3-11 VLAN page

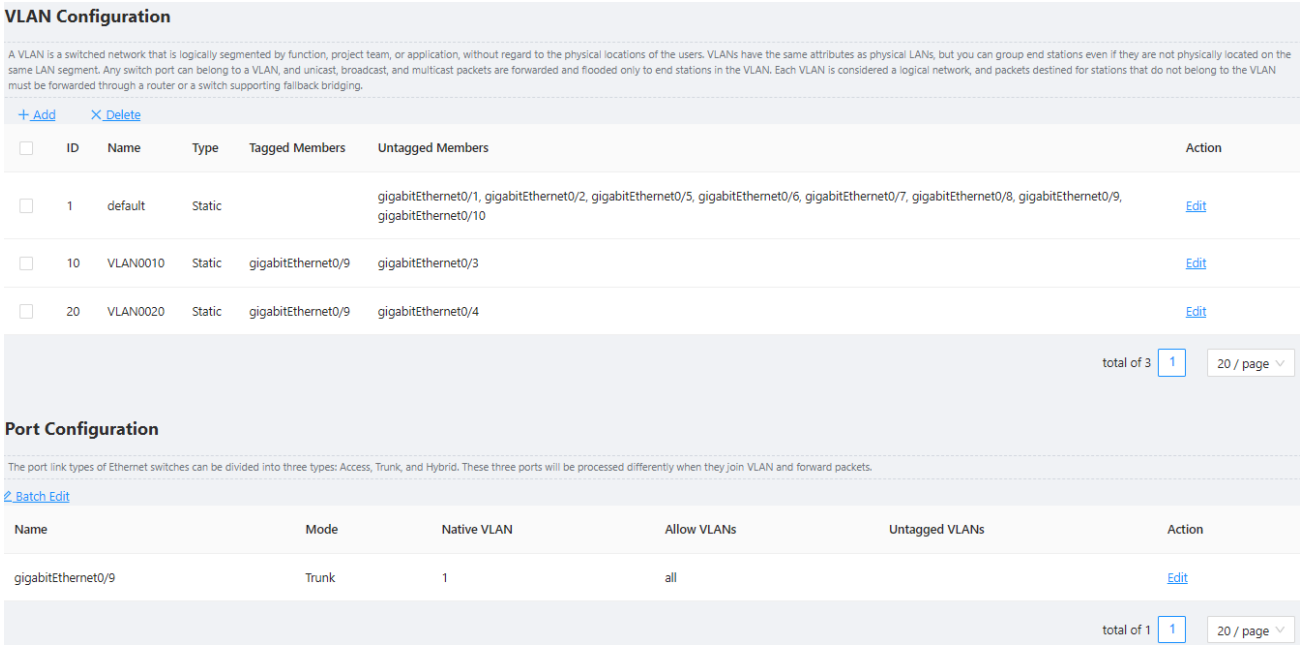


Step 3: Click the **Save** in the auxiliary area to save the configuration.

Switch B Configuration:

The configuration method is the same as that of Switch A. Configure GigabitEthernet 0/9 as a trunk port. Create VLAN 10 and VLAN 20 and complete the corresponding port configuration. After the configuration is completed, the VLAN interface will be as shown in *Figure 3-12*.

Figure 3-12 Switch B VLAN page

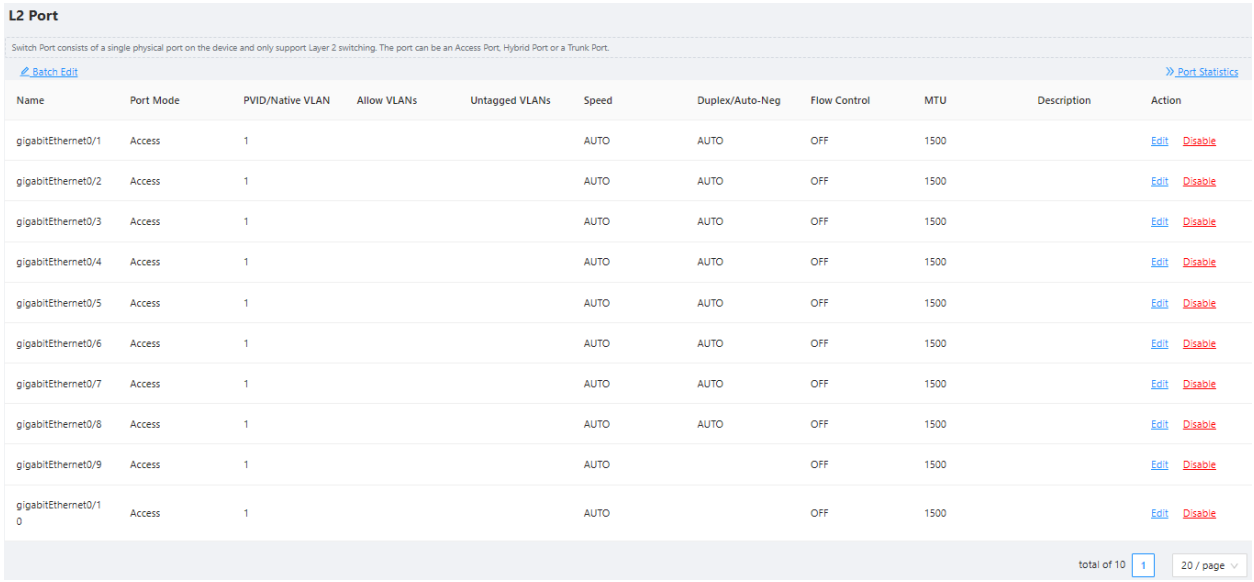


3.2 Port

3.2.1 Port Configuration

The user can use the interface management feature to view interface information, create/remove logical interfaces, change interface status, and reset interface parameters, as shown in *Figure 3-13*.

Figure 3-13 Port configuration page



Configuring Interface Management

1. Select **Configuration** > **Port** > **Port Configuration** in the navigation area to enter the Port Configuration page as shown in *Figure 3-13*.

2. Select the ports to be configured, click **Edit** button to enter the page for configuring an interface, as shown in *Figure 3-14*. *Table 3-6* describes the configuration items of configuring an interface.

Figure 3-14 Port configuration page

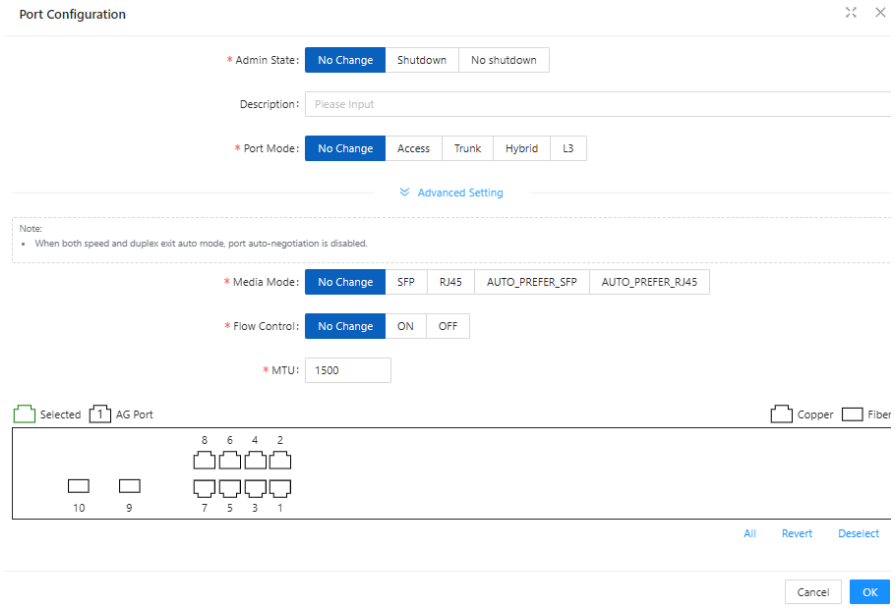


Table 3-6 Configuration items of ports

Item	Description
Admin State	Shutdown/no shutdown the port.

Description	Set the description of a logical interface.
Port Mode	Set the port's vlan mode, access or trunk.
PVID/Native VLAN	Set the port's PVID or native VLAN.
Medium type	Set the medium type of the combo ports: • RJ45：the mode of port is 10/100/1000BASE-T • SFP：the mode of port is 1000BASE-X • AUTO_PREFER_SFP：set the port as AUTO_PREFER_SFP mode. • AUTO_PREFER_RJ45：set the port as AUTO_PREFER_RJ45 mode. Note: only for combo ports.
Speed(copper)	Set the port's transmission rate: 10: indicate 10 Mbps 100M：indicate 100 Mbps 1000M：indicate 1000 Mbps Auto: indicate auto-negotiation Note: only for copper ports.
Duplex(copper)	Set the port's duplex mode: • AUTO：indicate auto-negotiation • FULL：indicate full duplex • HALF：indicate half duplex Note: only for copper ports.
Speed(fiber)	Set the port's mode: • 100BASE-FX：indicate the port mode is 100BASE-FX • 1000BASE-X：indicate the port mode is 1000BASE-X • 2500BASE-X：indicate the port mode is 2.5G BASE-X • 10G BASE-X: indicate the port mode is 10G BASE-X Note: only for fiber ports.
Autoneg(fiber)	Enable or disable port's autoneg. Display the auto-negotiation function needs to be enabled or disabled at the same time as the peer end, otherwise a link failure will occur. Note: only for fiber ports.
Flow control	Enable or disable port's flow control.
MTU	Allow or forbid jumbo frames to pass through the port. Default length of packets is 46-1500 bytes.

Admin Shutdown	Shutdown/no shutdown the port.

3.2.2 Port Extension

3.2.2.1 Rate Limiting

Port-based rate limiting allows the user to limit the speed at which network traffic is sent or received by a device that is connected to a port on the switch. Unlike 802.1p Quality of Service (QoS), port-based rate limiting does not prioritize information based on type. Rate limiting simply means that the switch will slow down traffic on a port to keep it from exceeding the limit that you set. If you set the rate limit on a port too low, you might see degraded video stream quality, sluggish response times during online activity, and other problems.

The best use of rate limiting is to keep low-priority devices that are connected to the switch from using too much of the bandwidth and slowing down your other connected devices. A combination of rate limiting and QoS can help the user maximize your network's efficiency and prioritize devices and activities.

Configure Port Rate limit

1. Select **Configuration** > **Port** > **Port Extension** in the navigation area to enter the Port Rate Limiting module as shown in *Figure 3-15*.

2. Click the **Batch Edit** button below Rate Limiting to enter the Rate Limiting page, as shown in *Figure 3-16*, and type the parameter in the modal. *Table 3-7* describes the items of configuring such a function.

3. Click the **OK** button.

4. Click the **Save** button in the auxiliary area.

Figure 3-15 Port rate limit page

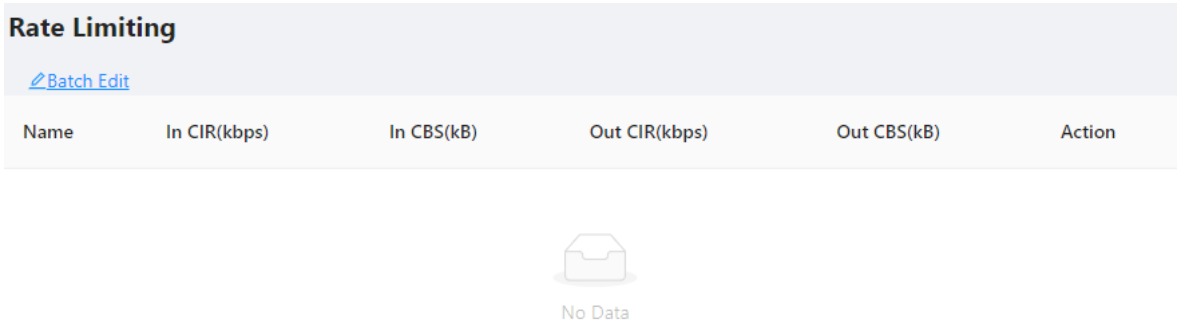
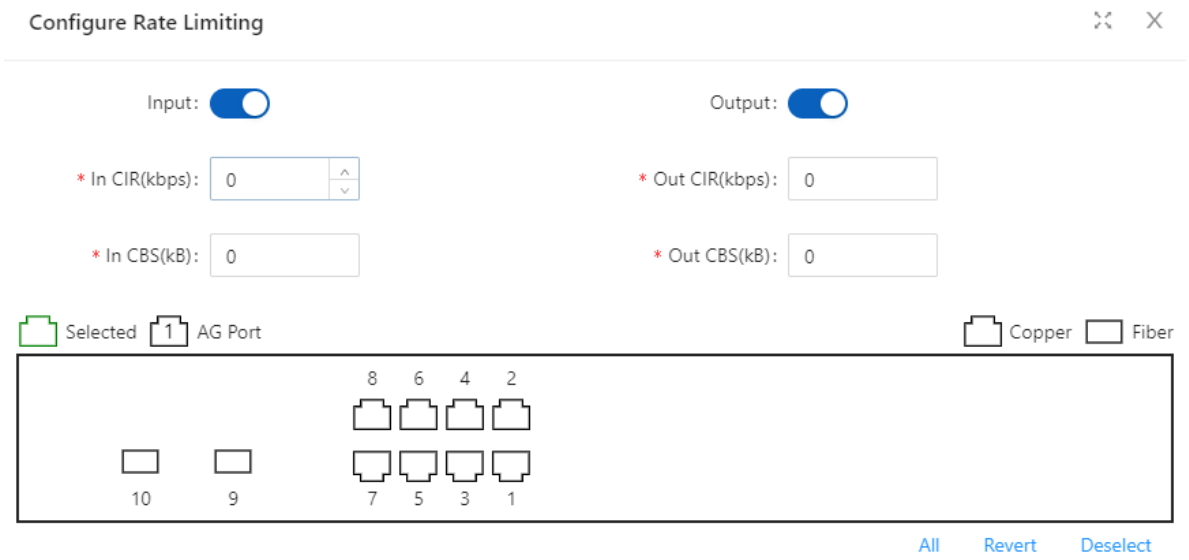


Figure 3-16 Port rate limit configuration



NOTE:

- CBS embodies a rate-limit feature for policing traffic. When policing traffic with CBS, here recommends the burst value 4 times of the limit value. If the burst values are too low, then the achieved rate is often much lower than the configured rate.

Table 3-7 Port rate limit configuration items

Item	Description
In CIR (kbps)	Specify the rate limit in the inbound direction (Kbits).
In CBS (KB)	Specify the burst size in the inbound direction (Kbits).
Out CIR (kbps)	Specify the rate limit in the outbound direction (Kbits).
Out CBS (KB)	Specify the burst size in the outbound direction (Kbits).

3.2.2.2 Storm Control

A traffic storm occurs when a large amount of broadcast, multicast, or unicast packets congest a network.

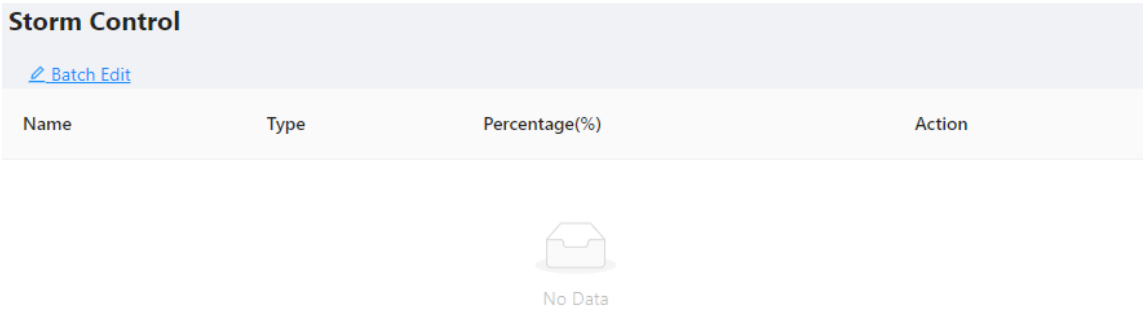
The user can use the storm suppression function to limit the size of a particular type of traffic (currently broadcast, multicast and unknown unicast traffic) on a per-interface basis in Ethernet port view or port group view.

In the port or port group view, the user set the maximum broadcast, multicast or unknown unicast traffic allowed to pass through a port or each port in a group. When the broadcast, multicast, or unknown unicast traffic on the interface exceeds the threshold, the system discards packets until the traffic drops below the threshold.

Configure the Storm Control

1. Select **Configuration** > **Port** > **Port Extension** in the navigation area to enter the Storm Control section as shown in *Figure 3-17*.

Figure 3-17 Storm Control page



2. Select the type, input the Percentage, and select the port in the port panel, as shown in *Figure 3-18*. *Table 3-8* describes the items of configuring storm control.

3. Click the **OK** button to complete the configuration.

4. Click the **Save** in the auxiliary area to save such configuration.

Figure 3-18 Storm control configuration

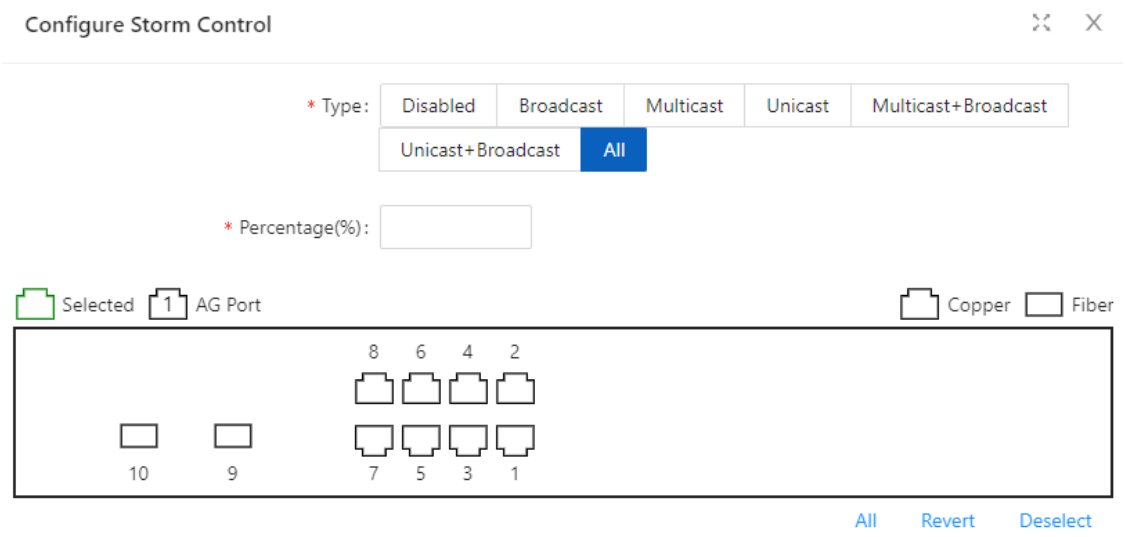


Table 3-8 Items of the storm control

Item		Description
Type	Disabled	Disable storm control.
	Broadcast	Select the parameter used in broadcast suppression and set its value in the percentage box.
	Multicast	Select the parameter used in multicast suppression and set its value in the percentage box.
	Unicast	Select the parameter used in unicast suppression and set its value in the percentage box.
	Multicast-broadcast	Select the parameter used in multicast and broadcast, suppression and set its value in the percentage box.
	Unicast-broadcast	Select the parameter used in unicast and broadcast, suppression and set its value in the percentage box.
	All	Select the parameter used in unicast and unicast, broadcast, suppression and set its value in the percentage box.
Percentage (%)		Indicate the maximum percentage of traffic to the total transmission capability of an Ethernet interface.

3.2.2.3 Isolation

In some application scenarios, it is required that certain ports on a device cannot communicate with each other. In such environments, the communication between these ports, whether it is a

unicast frame, a broadcast frame, or a multicast frame, cannot be forwarded. This can be achieved by setting these ports as isolated ports. Currently, the port isolation function only supports Layer 2 isolation.

Isolation group

If bidirectional isolation is required between two ports, these two ports need to be added to the same isolation group. The core forwarding rules of the isolation group are as follows:

- The internal ports of the isolation group and the external ports of the isolation group can communicate normally without any isolation restrictions. The ports within the isolation group can communicate normally with each other, without any isolation restrictions.
- Within the same isolation group, ports are in a bidirectional Layer 2 isolation mode and cannot perform Layer 2 communication.

Unidirectional isolation

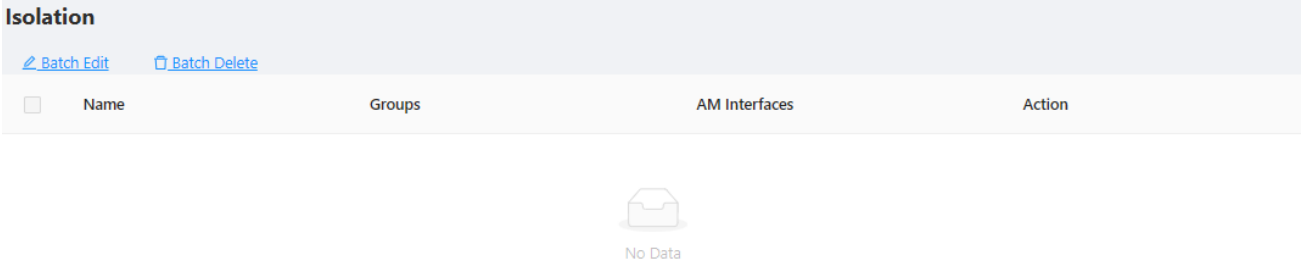
The unidirectional isolation of the switch is a non-symmetric port forwarding control rule. After configuring the unidirectional isolation policy for the opposite port B (the unidirectional isolated port) on port A, the rule for packet forwarding is:

- All packets received by port A are prohibited from being forwarded to port B.
- All packets received by port B can be normally forwarded to port A.

Configure an Isolation Group

1. Select **Configuration** > **Port** > **Port Extension** in the navigation area to enter the Isolation section as shown in *Figure 3-19*.

Figure 3-19 Isolation page



2. Click the **Batch Edit** button below Isolation, and enter the Port Isolation Configuration modal, as shown in *Figure 3-20*. The parameter configuration is as follows in the table. Click the **OK** button to complete the configuration.

Figure 3-20 Port isolate modal

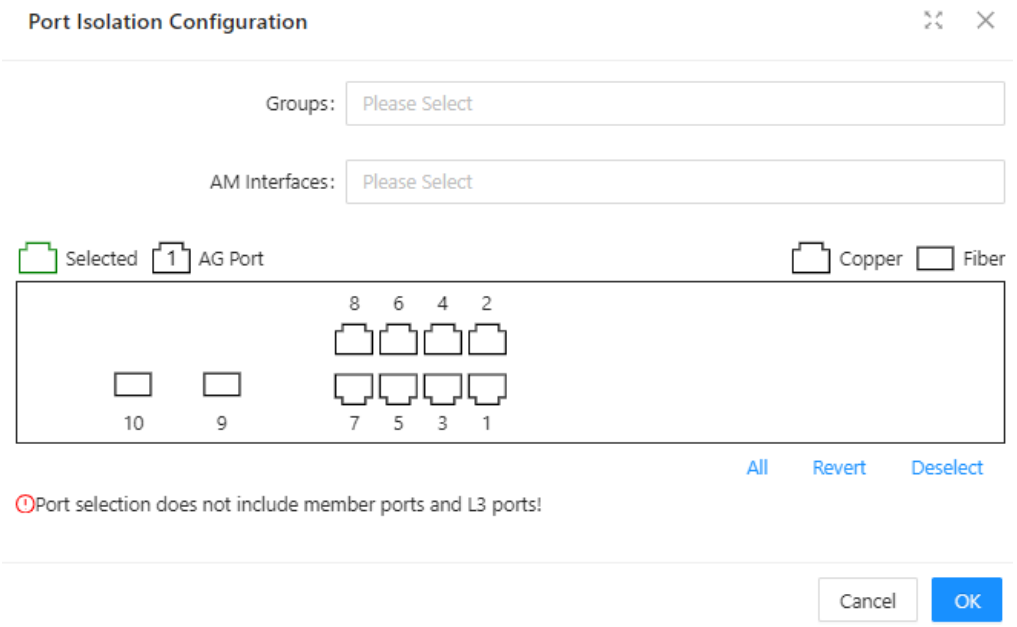


Table 3-9 Parameter description

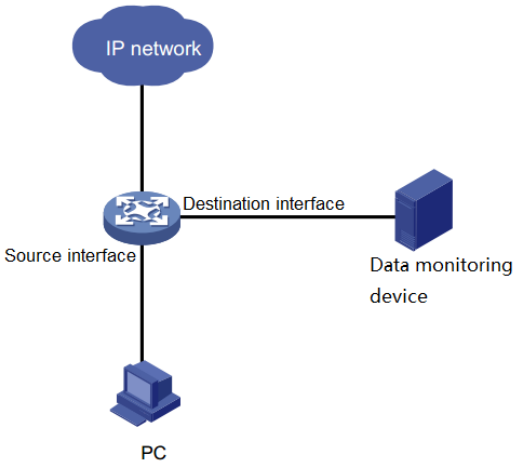
Item	Description
Groups	Configure the port to join the isolation group. The GID value should be within the range of <1 - 32>. Up to 32 isolation groups can be supported. By default, port isolation is disabled. The group GID can be omitted. By default, it joins group 1 and enables port isolation. When exiting the isolation group, the port isolation function is turned off and all existing isolation groups are exited, as well as the one-way isolation configuration for this port is deleted.
AM Interfaces	Configure unidirectional isolation. Support single-port or range multi-select mode.
OK	Confirm the issuance of the configuration

3. Click **Save** in the auxiliary area.

3.2.3 Port Mirroring

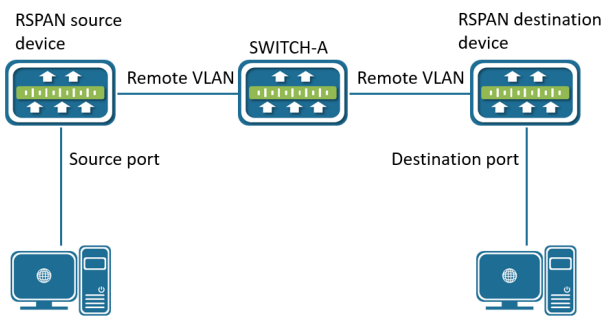
Port mirroring (SPAN) is to copy the packets passing through one or multiple ports (called source interface) to a port (called the destination interface) on the local device. The source interface is connected with a monitoring device. By analyzing on the monitoring device, the packets mirrored to the destination interface, the user can monitor the network and troubleshoot possible network problems.

Figure 3-21 A port mirroring implementation



The Remote Switch Port Analyzer (RSPAN) is an extension of the SPAN. Between the remote mirror source port and the destination port; the user can span multiple network devices. The principle of RSPAN is that the original device, the intermediate one and the destination one creates a Remote VLAN to which all the ports participating in the session are added. The mirror message is broadcast in the Remote VLAN so that it is transmitted from the source port of the source device to the destination port of the destination device, as shown in *Figure 3-22*.

Figure 3-22 Remote port mirror



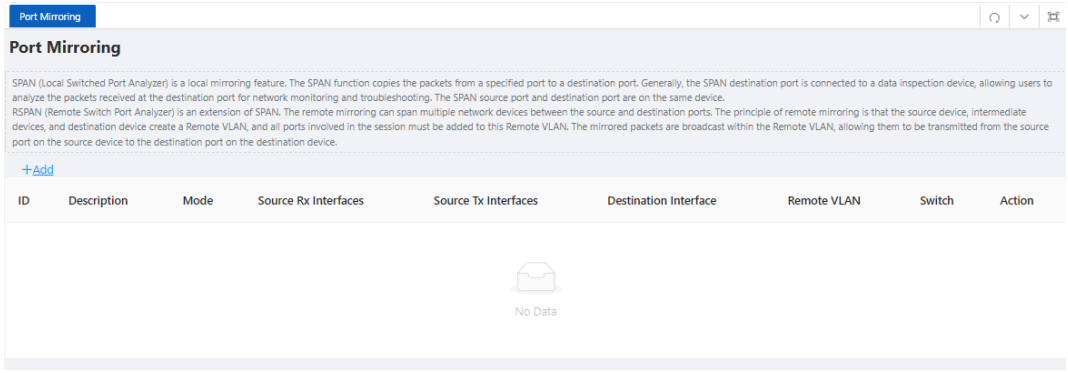
SPAN/RSPAN does not affect the packet exchange of the source port but only copies all the input and output packets of the source port to the destination one. When the mirror traffic of the source port surpasses the bandwidth of the destination one, for instance, the 100Mbps destination port monitors the traffic of the 1000Mbps source port which may cause the message to be discarded.

SPAN/RSPAN based on session management in where the user can configure the source port and the destination one. In one session, there can only be one destination port, while multiple source ports can be configured simultaneously.

Create a Mirroring Group

1. Select **Configuration** > **Port** > **Port Mirroring** in the navigation area to enter the Port Mirroring page as shown in *Figure 3-23*.

Figure 3-23 Port mirror page



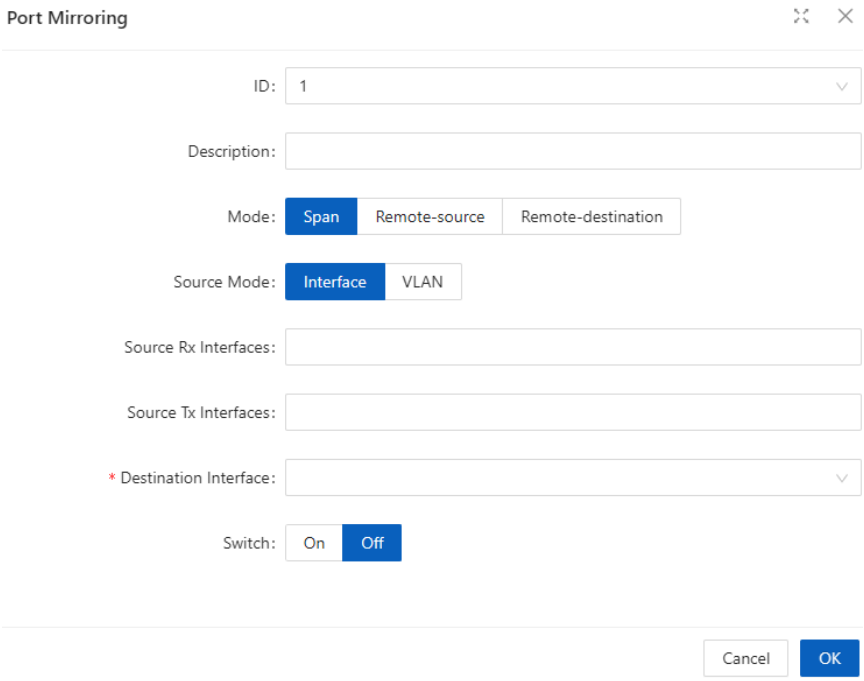
2. Click the +**Add** button for the corresponding ID to enter the Port Mirroring Configuration modal as shown in *Figure 3-24* and the specific parameters are described in *Table 3-10*.

Table 3-10 Configuration items of creating a mirroring group

Item	Description
ID	ID of the mirroring group to be created
Description	The mirror group descriptors that have created
Mode	The mode of mirror group, default to local mirror
Source Rx Interfaces	Select the mirror source Rx port, allowing multiple source Rx ports to exist simultaneously
Source Tx Interfaces	Select the mirror source tx port, allowing multiple source ts ports to exist simultaneously

Source VLAN	Create/delete SPAN source VLAN which supports range mode. Source VLAN can only support one session and it can't coexist with source port
Destination Interfaces	Select the mirroring destination port, and only one destination port is allowed for each session
Switch	Whether the destination port of SPAN is involved in the exchange
Remote VLAN	Create/delete RSPAN source VLAN which supports range mode. Source VLAN can only support one session and it can't coexist with source port

Figure 3-24 Port mirroring page



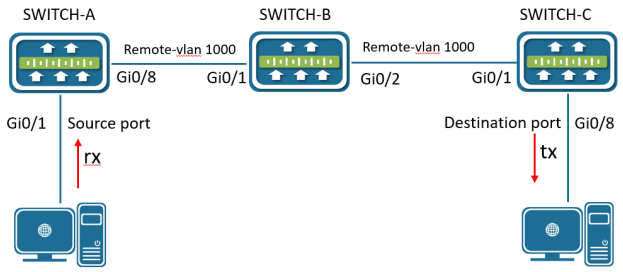
3. Fill in the parameters according to the requirements, and click the **OK** button to complete the configuration.

4. Click **Save** in the auxiliary area.

A Configuration Example

Case requirement: Using port gigabitEthernet0/8 of remote device SWITCH-C to monitor the Rx message of the port gigabitEthernet0/1 in local device SWITCH-A and the Remote VLAN is 1000, in the meantime, the intermediate device supports VLAN 1000 message broadcast. The name of this monitoring session is set to TRAFFIC_MONITOR_REMOTE. Such network is shown in below *Figure 3-25*.

Figure 3-25 Network topology

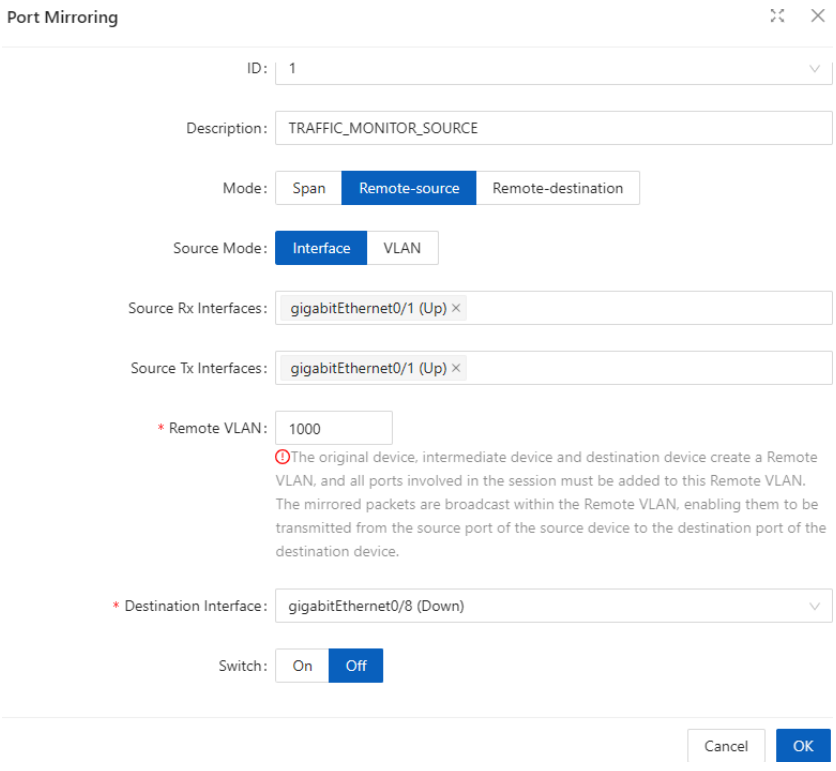


Switch A Configuration:

Step 1: Select **Configuration** > **Port** > **Port Mirroring** in the navigation area to enter the Port Mirroring page.

Step 2: Click the **Edit** button corresponding to session 1, fill in the parameters as *Figure 3-26*, then click **OK**.

Figure 3-26 Port mirroring configuration page in Switch A



Step 3: Click **Save** button in the auxiliary area.

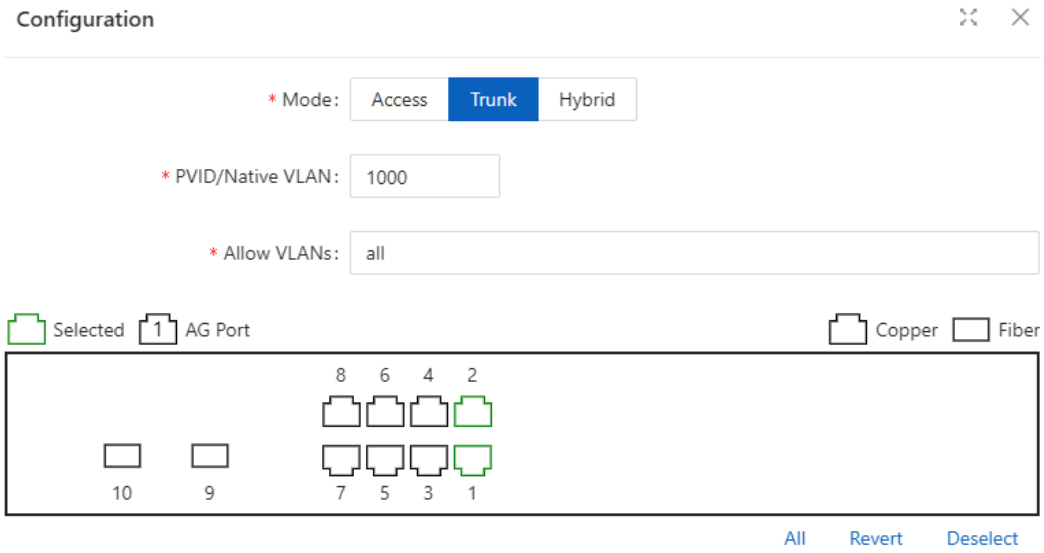
Switch B Configuration:

Step 1: Select **Configuration** > **VLAN** in the navigation area to enter the VLAN Configuration page.

Step 2: Click the **+Add** button under VLAN Configuration to configure gigabitEthernet0/1 and gigabitEthernet0/2 as trunk port whose VLAN is 1000, as shown in *Figure 3-27*.

Step 3: Click **Save** button in the auxiliary area.

Figure 3-27 VLAN configuration page in Switch B



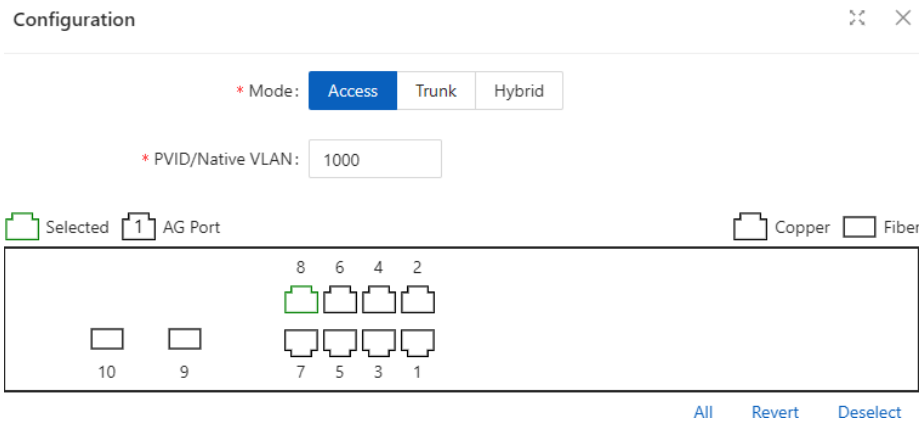
Switch C Configuration:

Step 1: Select **Configuration** > **VLAN** in the navigation area to enter the VLAN Configuration page.

Step 2: Click the **+Add** button under VLAN Configuration to create VLAN 1000.

Step 3: As shown in *Figure 3-28*, configure the gigabitEthernet0/8 as the access port and the port VLAN as 1000.

Figure 3-28 VLAN configuration page in Switch C

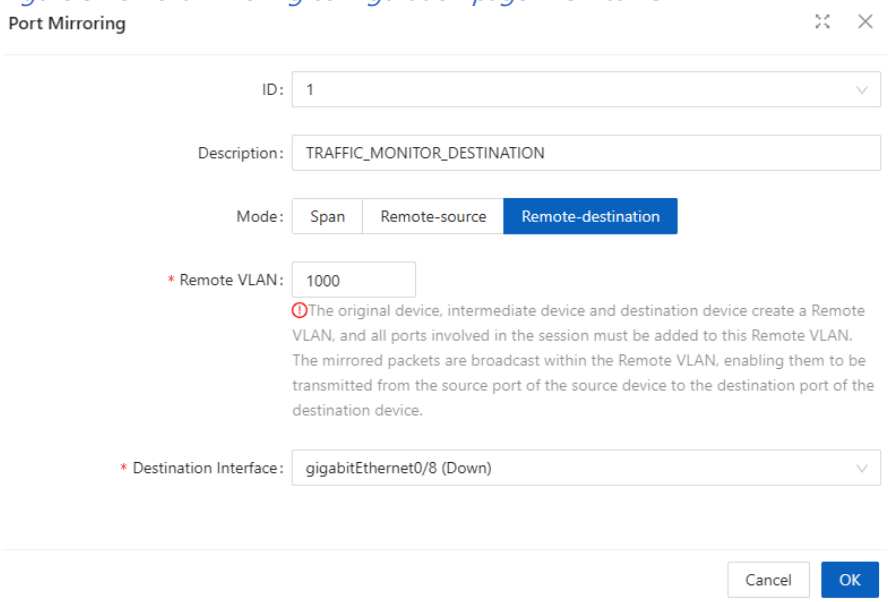


Step 4: Select **Configuration** > **Port** > **Port Mirroring** in the navigation area to enter the Port Mirroring page.

Step 5: Click the **Edit** button corresponding to session 1, fill in the parameters as *Figure 3-29*, then click **OK**.

Step 6: Click **Save** button in the auxiliary area.

Figure 3-29 Port mirroring configuration page in Switch C



3.2.4 Port Aggregation

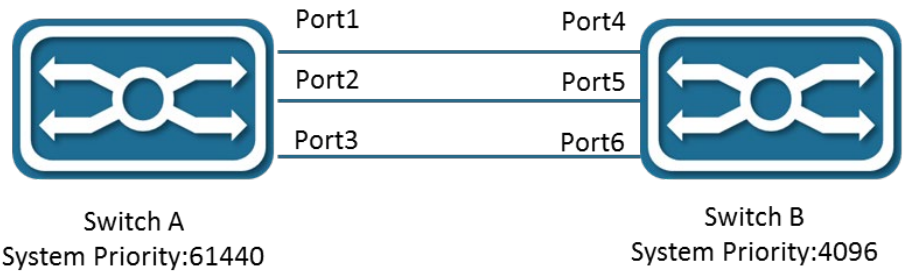
3.2.4.1 Overview

Link Aggregation

Ethernet link aggregation, most often simply called link aggregation, aggregates multiple physical Ethernet links into one logical link to increase link bandwidth beyond the limits of any one single link. This logical link is called an aggregate link. It allows for link redundancy because the member physical links dynamically back up one another.

As shown in *Figure 3-30*, Switch A and Switch B are connected with three physical Ethernet links. These physical Ethernet links are aggregated into an aggregate link, Link aggregation 1. The bandwidth of this aggregate link can be as high as the total bandwidth of these three physical Ethernet links.

Figure 3-30 Port isolate page



LACP

The IEEE 802.3ad Link Aggregation Control Protocol (LACP) enables dynamic aggregation of physical links. It uses link aggregation control protocol data units (LACPDUs) for exchanging aggregation information between LACP enabled devices.

There are two link aggregation modes: dynamic and static. Dynamic link aggregation uses LACP while static link aggregation does not. A link aggregation group operating in static mode is called a static link aggregation group, while a link aggregation group operating in dynamic mode is called a dynamic link aggregation group.

3.2.4.2 Configure an Aggregation Group

Configuration Procedure:

1. Select **Configuration** > **Port** > **Port Aggregation** in the navigation area to enter the Link Aggregation page as shown in *Figure 3-31*. The description of the link aggregation is described in *Table 3-11*.

Figure 3-31 Global configuration page

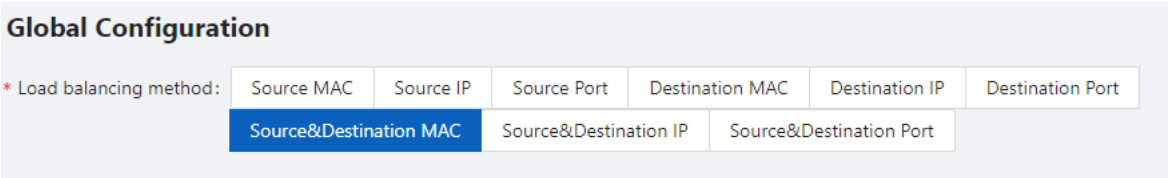


Table 3-11 Description of global configuration items

Item	Description	
Load balancing method	Dst-mac	Equalize according to the destination MAC address
	Src-mac	Equalize according to the source MAC address

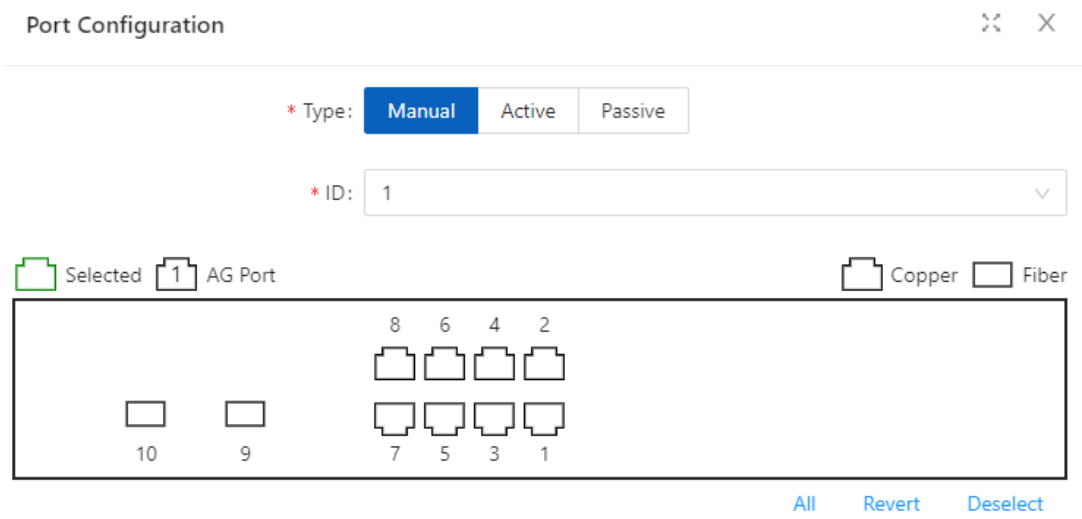
	Src-dst-mac	Equalize according to the destination MAC address and source MAC address
	Dst-ip	Equalize according to the destination IP address
	Srt-ip	Equalize according to the source IP address
	Src-dst-ip	Equalize according to the destination IP address and source IP address
	Dst-port	Equalize according to the L4 TCP/UDP destination port number
	Src-port	Equalize according to the L4 TCP/UDP source port number
	Src-dst-port	Equalize according to the L4 TCP/UDP destination port number and source port number

2. In the Aggregate Ports Configure page, click **+Add** button to enter Port Configuration page, as shown in *Figure 3-32*. The description of the link aggregation is described in *Table 3-12*.

Table 3-12 Description of aggregation member

Item		Description	
Port Configuration	ID	The ID of the Aggregation Member	
	Type	Manual	Manual mode
		Active	In this mode, the ports send LACP packets at regular intervals to the partner ports
		Passive	In this mode, the ports do not send LACP packets until the partner port sends LACP packets After receiving the LACP packets from the partner port, the ports send LACP packets to the partner port

Figure 3-32 Aggregation port configuration page



Select the type of aggregation, text the ID box, select the port in the port panel, click OK button to complete the configuration.

After the configuration is completed, the aggregation port created is displayed on the Aggregation Port page, as shown in *Figure 3-33*. The description of Aggregation Port is described in *Table 3-13*.

Figure 3-33 Aggregation port page

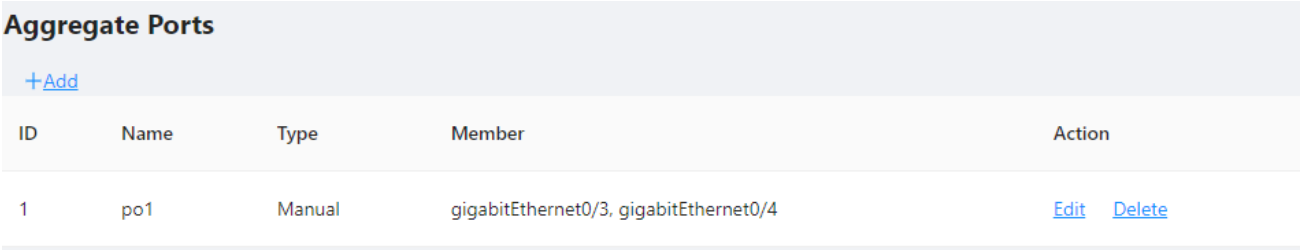


Table 3-13 Description of aggregation port

Item		Description
Aggregation Port	ID	The ID of the Aggregation Port
	Name	The name of the Aggregation Port
	Type	The mode of the Aggregation Port
	Member	The member ports of the Aggregation Port

3.2.5 Port Violation

During the use of the device, active or passive violations may occur on the switch port, such as port security violations, port flapping violations, port loop detection violations, etc. The port violation module is used to configure the recovery enablement and recovery time of the violating port, and displays the port's violation behavior.

Configuration Procedure:

Select **Configuration** > **Port** > **Port Violation** in the navigation bar to enter the Port Violation Global Configuration interface, check the service that needs to be violated, turn on the automatic recovery button and configure the recovery time, click the **Apply** button to complete the configuration, such as *Figure 3-34* is shown, and the global configuration parameters are shown in *Table 3-14*.

Figure 3-34 Global configuration page

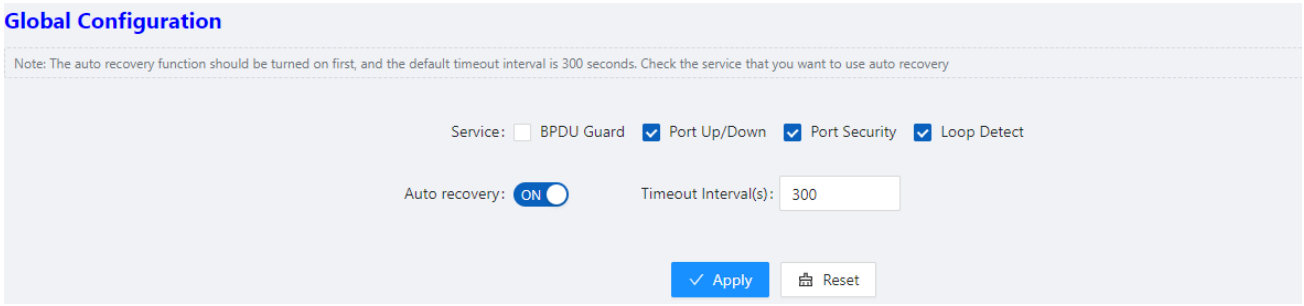
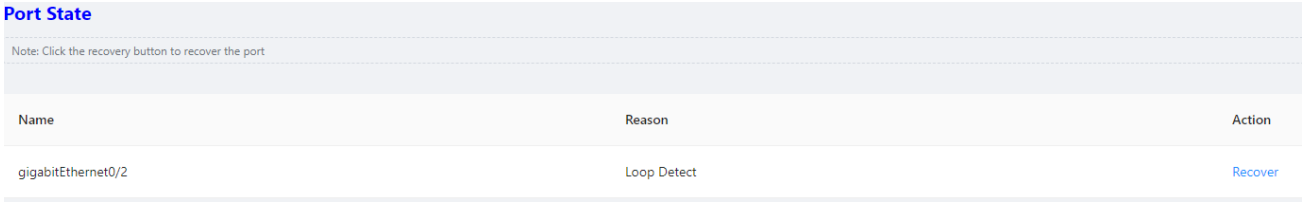


Table 3-14 Description of global configuration

Item		Description
Service	BPDU Guard	Violations caused by port BPDU protection
	Port Up/Down	Violations caused by frequent port Up/Down
	Port Security	Violations caused by illegal port security
	Loop Detect	Violations caused by a loop in the device downstream of the port
Auto recovery		Enable/disable automatic recovery of violating ports
Timeout interval		Configure the recovery time of the violating port, in seconds

When you need to manually restore the violating port, select the port that needs to be restored and click the **Reset** button to restore the port function.

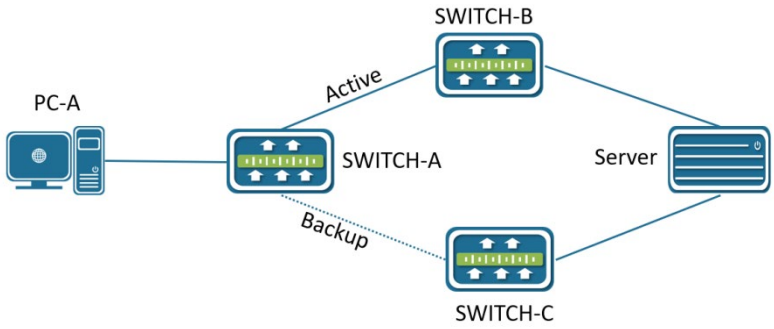
Figure 3-35 Port state



3.2.6 Port BackupLink

The full name of BLG is Backup-link Group, which refers to a redundant link group. By establishing a redundant mechanism for primary and backup links, the reliability of the deployment plan is enhanced. The following figure illustrates a typical scenario of the BLG function.

Figure 3-36 Topology showing



The business traffic between PC-A and Server is forwarded through the Active primary path when the link between SWITCH-A and SWITCH-B is normal. When the link between SWITCH-A and SWITCH-B becomes abnormal, the traffic will automatically switch to the Backup path for forwarding.

A backupLink group has two ports, namely Active (primary port) and Backup (backup port). The port forwarding rules are as follows:

- When both the primary and backup ports are in the linkdown state, the entire backup link is interrupted and data cannot be forwarded normally.
- When one port is linkup and the other is linkdown, the linkup port forwards data.
- When both ports are in the linkup state, only one port participates in data forwarding at the same time. Which port participates in data forwarding is determined by whether the backup Link group is in the preemption mode.

Preemption mode:

- No-preempt mode: The data forwarding will only be switched to another port when the current forwarding port goes linkdown state. It has nothing to do with the Active/Backup role configured for the ports.
- Preemption mode: When the Active port is in a linkup state, it will actively take over the data forwarding, and the Backup port will automatically exit the data forwarding and return to the backup role.

Preemption delay:

In the preemption mode, when the Active port recovers from a failure and reverts to a linkup state (i.e., the trigger time for preemption action), the device will delay for a set period of time before executing the preemption forwarding action of the Active port to avoid packet loss and oscillation caused by frequent link disconnections.

NOTE:

- Do not support configuring BLG on the aggregated member ports.
- Do not support configuring the BLG simultaneously with ERPS, port security, and port LoopDetect and so on Loop Detect the same port.
- Recommend to disable the RSTP on the port where BLG is configured if the RSTP is globally enabled on the device.

Configure BLG:

Select **Configuration > Port > Port BackupLink** in the navigation bar to enter the Port BackupLink Configuration page. Click **+Add** button to enter the configuration modal as shown in *Figure 3-37* and the relevant parameter descriptions as shown in *Table 3-15*.

Figure 3-37 Port backupLink configuration page

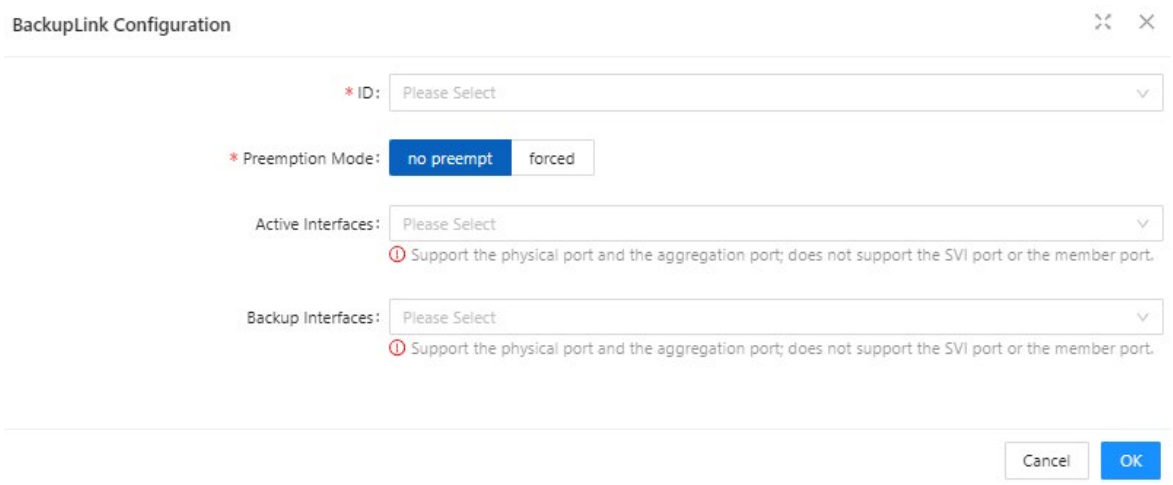
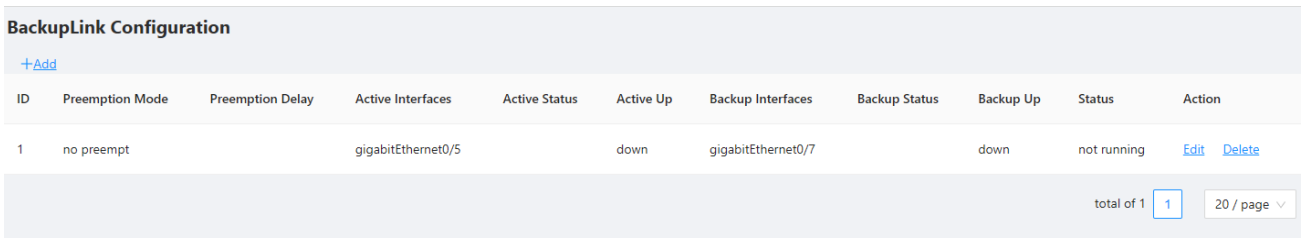


Table 3-15 Port backupLink parameters' description

Item	Description
ID	Configure the backupLink group ID for the port, with the value ranging from <1-8>. Up to 8 backupLink groups can be supported.
Preemption Mode	Configure the port's preemption mode. No preempt by default.
Preemption Delay	Configure the preemption delay for the port. This setting is only effective in the preemption mode and the parameter is optional. By default, the active port immediately takes over upon recovery from a failure. The VALUE is set to <1-60>, with the unit being seconds.
Active Interfaces	Configure the active port of the backupLink group.
Backup Interfaces	Configure the backup port of the backupLink group.

Click **OK** button to finish the operation and the Port BackupLink page displays the backupLink group which is successfully created, as shown in *Figure 3-38*.

Figure 3-38 The backupLink port status



3.3 Spanning Tree

3.3.1 Overview

Spanning Tree Protocol (STP) is a Layer-2 management protocol. It cannot only selectively block redundant links to eliminate Layer-2 loops but also can back up links.

Like many protocols, STP is continuously updated from Rapid Spanning Tree Protocol (RSTP) to Multiple Spanning Tree Protocol (MSTP) as the network develops.

For the Layer-2 Ethernet, only one active link can exist between two local area networks (LANs). Otherwise, a broadcast storm will occur. To enhance the reliability of a LAN, it is necessary to establish a redundant link and keep some paths in backup state. If the network is faulty and a link fails, you must switch the redundant link to the active state. STP can automatically activate the redundant link without any manual operations. STP enables devices on a LAN to:

- Discover and start the best tree topology on the LAN.
- Troubleshoot a fault and automatically update the network topology so that the possible best tree topology is always selected.

The LAN topology is automatically calculated based on a set of bridge parameters configured by the administrator. The best topology tree can be obtained by properly configuring these parameters.

RSTP is completely compatible with 802.1D STP. Like traditional STP, RSTP provides loop-free and redundancy services. It is characterized by rapid speed. If all bridges in a LAN support RSTP and are properly configured by the administrator, it takes less than 1 second (about 50 seconds if traditional STP is used) to re-generate a topology tree after the network topology changes.

STP and RSTP have the following defects:

- STP migration is slow. Even on point-to-point links or edge ports, it still takes two times of the forward delay for ports to switch to the forwarding state.
- RSTP can rapidly converge but has the same defect with STP: Since all VLANs in a LAN share the same spanning tree, packets of all VLANs are forwarded along this spanning tree.

Therefore, redundant links cannot be blocked according to specific VLANs and data traffic cannot be balanced among VLANs.

- MSTP, defined by the IEEE in 802.1s, resolves defects of STP and RSTP. It cannot only rapidly converge but also can enable traffic of different VLANs to be forwarded along respective paths, thereby providing a better load balancing mechanism for redundant links.

In general, STP/RSTP works based on ports while MSTP works based on instances. An instance is a set of multiple VLANs. Binding multiple VLANs to one instance can reduce the communication overhead and resource utilization.

3.3.2 Configure Spanning Tree

Global Configuration of the Spanning Tree

Select **Configuration** > **Spanning Tree** in the navigation area to enter the Global Configuration section, as shown in *Figure 3-39*. *Table 3-16* describes the Spanning Tree Global Configuration items.

Figure 3-39 Spanning tree global configuration

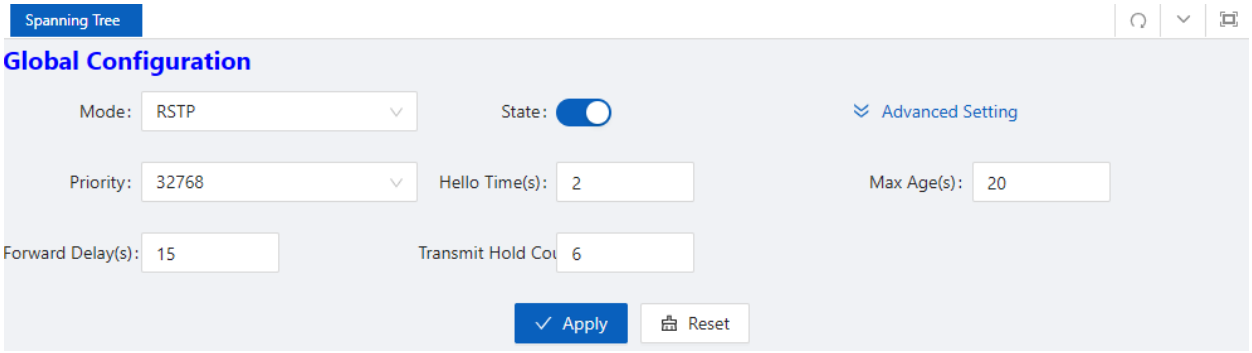


Table 3-16 Spanning tree global configuration items

Item		Description
Global Configuration	Mode	Set the working mode of STP, including STP, RSTP, and MSTP. STP: In STP mode, each port of the device sends STP BPDUs. RSTP: In RSTP mode, each port of the device will send out RSTP BPDUs. When it is connected to the device running STP, the port will automatically migrate to STP mode.

		MSTP: In MSTP mode, each port of the device sends MSTP BPDUs. When it is connected to the device running STP, the port is automatically migrated to work in STP mode.
	State	Enable STP.
	Hello Time(s)	Hello timer interval.
	Priority	Bridge priority.
	Forward Delay(s)	Set the delay time before an interface change to forwarding.
	Transmit Hold Count	Maximum number of BPDUs sent by the bridge per second.
	Max Age(s)	Set the maximum duration that messages are saved in the device.

Configure the Instance

Select **Configuration** > **Spanning Tree** in the navigation area to enter the Instance Configuration part, as shown in *Figure 3-40*. *Table 3-17* describes the instance configuration items.

Figure 3-40 Spanning tree instance configuration

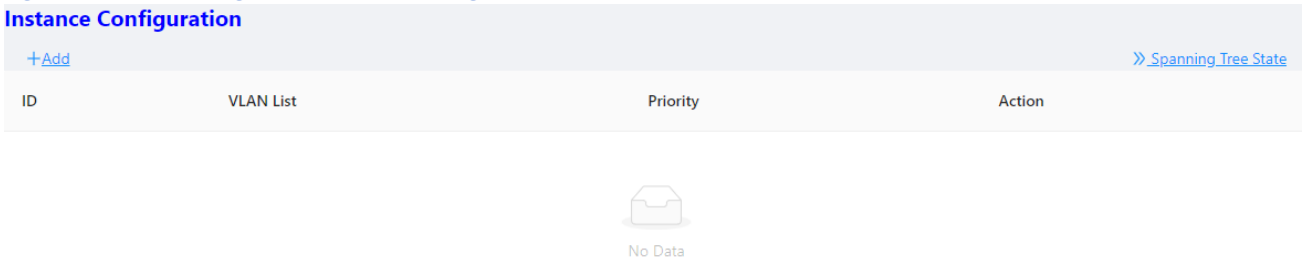


Table 3-17 Spanning tree instance items

Item		Description
Instance Configuration	ID	Instance ID
	VLAN List	Instance associated VLAN list
	Priority	Bridge priority in this instance
	Action	Click to delete this entry

Configure the Ports

Select **Configuration** > **Spanning Tree** in the navigation area to enter the Port Configuration page, as shown in *Figure 3-41*. *Table 3-18* describes the port configuration items.

Figure 3-41 Spanning tree port configuration

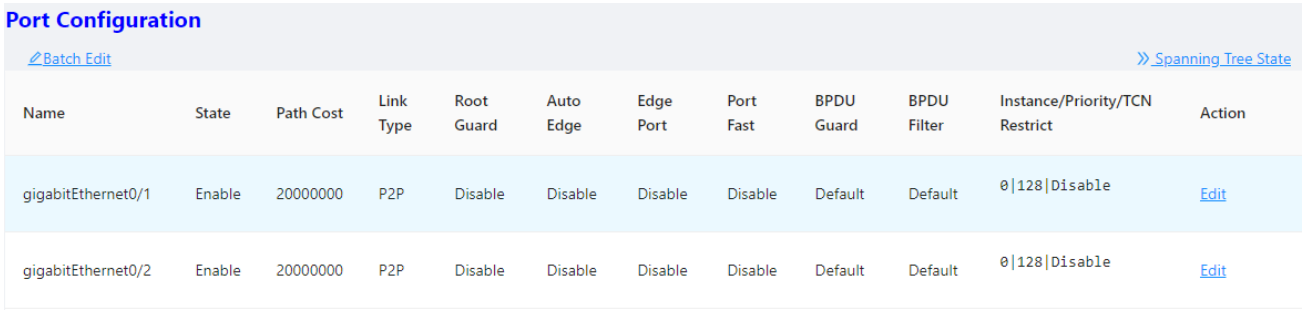


Table 3-18 Spanning tree port configuration items

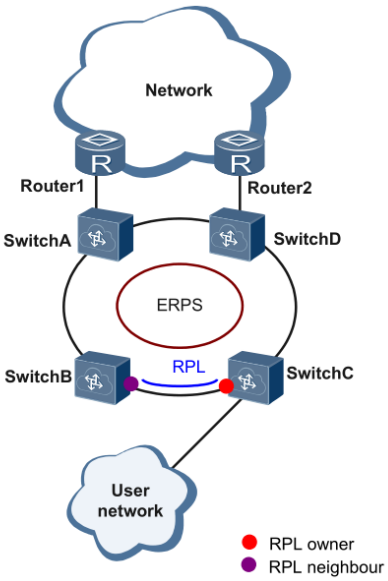
Item		Description
Port Configuration	Name	Interface name.
	State	STP status.
	Path Cost	Configure interface path cost.
	Link Type	Configure interface link type.
	Root Guard	Configure the interface to enable root protection.
	Auto Edge	Configure the interface to automatically recognize the function of the edge port.
	Edge Port	Configure the interface as an edge port.
	Port Fast	Configure the interface as a fast port.
	BPDU Filter	Configure the interface to enable BPDU filtering.
	BPDU Guard	Configure the interface to enable BPDU protection.
	Instance/Priority/TCN restrict	Configure the instance, Priority, and TCN restrict.

3.4 ERPS

3.4.1 Overview

The ITU-T G.8032 ERPS feature implements protection switching mechanisms for the Ethernet layer ring topology. This feature uses the G.8032 Ethernet Ring Protection (ERP) protocol, defined in ITU-T G.8032, to provide protection for Ethernet traffic in a ring topology, while ensuring that no loops are within the ring at the Ethernet layer. The loops are prevented by blocking traffic on either a predetermined link or a failed link.

Figure 3-42 Network topology



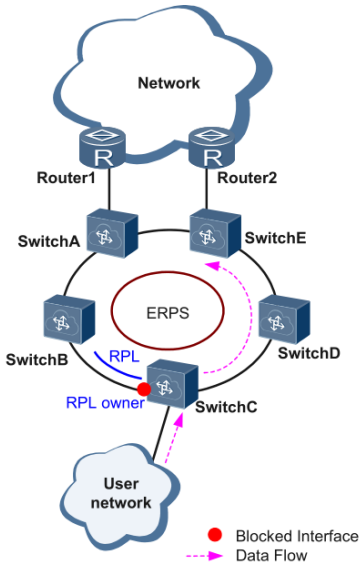
Initial State

As the following figure, the devices on the ring have been configured, and all the link status is up. The RPL owner interface will be blocked by ERPS protocol to prevent loops. If a RPL neighbor interface is configured, it will also be blocked. Other interfaces are under the forwarding state, can forward the traffic.

Link Failure

When there is a link failure between Switch D and Switch E, the two interfaces on the link will be blocked by ERPS protocol, the RPL owner interface will be forwarded.

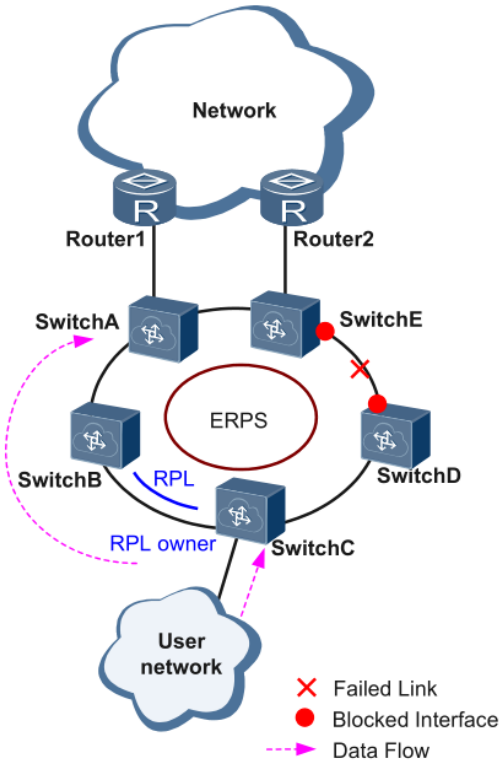
Figure 3-43 Link failure



Link Restores

When the failure link is restored. When the ERPS ring is configured to revertive mode, the RPL owner interface will be blocked by ERPS protocol, the restored link will be configured to forwarding state to forward traffic.

Figure 3-44 Link restores



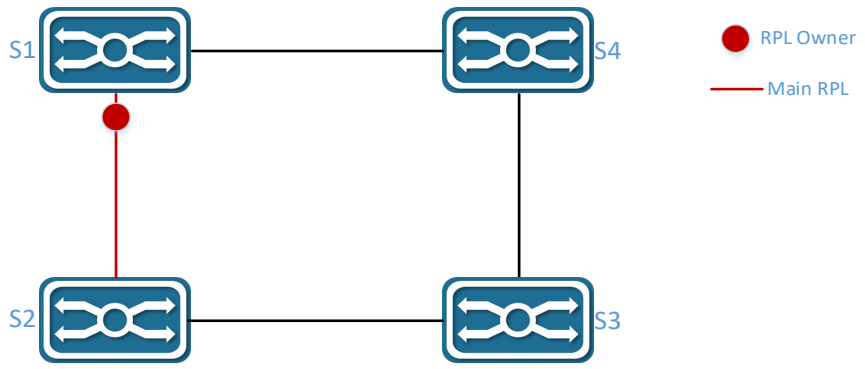
Single-Ring:

Only one ring in a network topology needs to be protected.

In *Figure 3-45*, the network topology has only one ring, only one ring protection link (RPL) owner node, and only one RPL. All nodes must belong to the same ring automatic protection switching (R-APS) virtual local area network (VLAN).

- All devices in the ring network must support ERPS.
- The links between devices in the ring network must be directly connected, and there must be no intermediate devices.

Figure 3-45 ERPS single ring



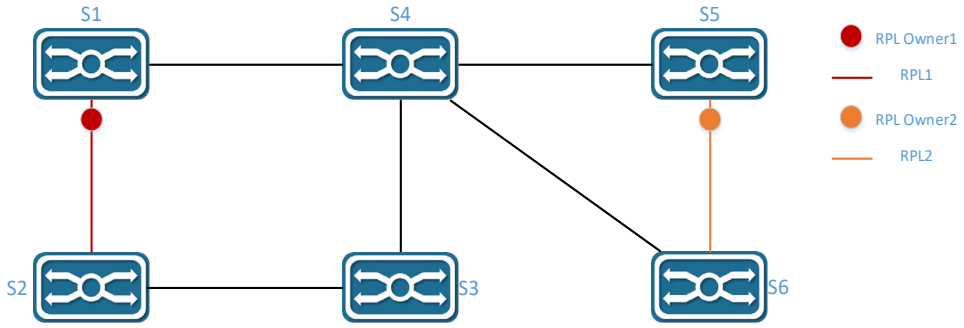
Tangent Rings:

The two rings in a network topology that share one device need to be protected.

In *Figure 3-46*, the two rings in the network topology share one device. Each ring has only one PRL owner node and only one RPL. The two rings belong to different R-APS VLANs.

- All devices in the ring network need to support ERPS.
- The links between devices in the ring network must be directly connected, and there must be no intermediate devices.

Figure 3-46 ERPS tangent rings



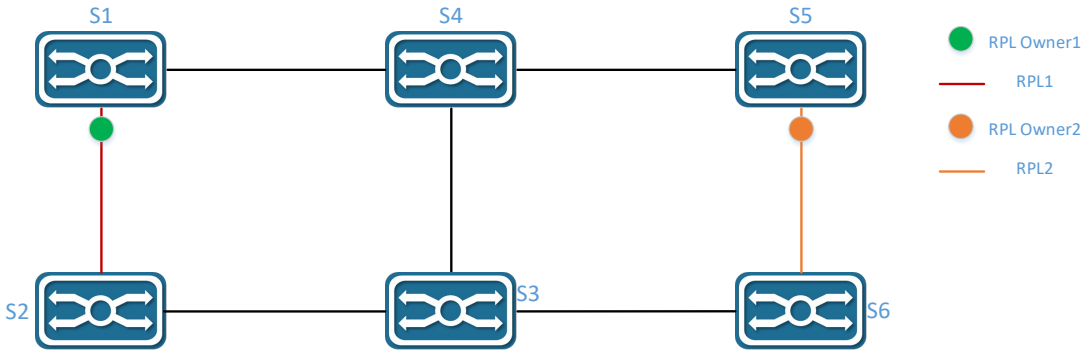
Intersecting Rings:

Two or more rings in a network topology share one link. (Each link between intersecting nodes must be a direct link without any intermediate node.)

In *Figure 3-47*, four rings exist in the network topology. Each ring has only one PRL owner node and only one RPL. The four rings belong to different R-APS VLANs.

- All devices in the ring network need to support ERPS.
- The links between devices in the ring network must be directly connected, and there must be no intermediate devices.

Figure 3-47 ERPS intersecting rings



3.4.2 Configure the ERPS

Ring Configuration

Select **Configuration** > **ERPS** > **Ring Configuration** in the navigation area to enter the ERPS Ring Configuration page as shown in *Figure 3-48*, The description of the ERPS ring configuration is described in *Table 3-19*.

Figure 3-48 ERPS ring configuration

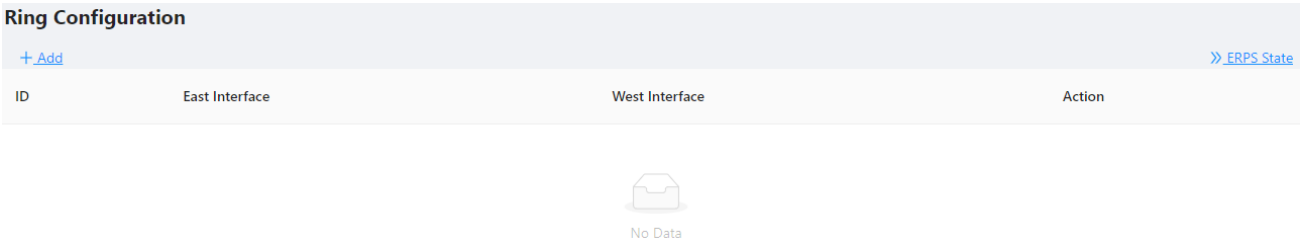


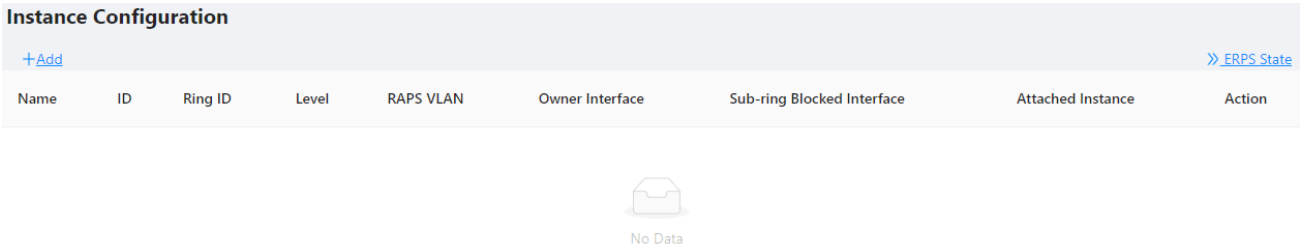
Table 3-19 Ring configuration description

Item	Description
Ring ID	Can be any number. The ring number of each ERPS ring must be unique.
East Interface	The east interface of the ERPS ring
West Interface	The west interface of the ERPS ring
Action	Delete ERPS Ring

ERPS Instance Configuration

Select **Configuration** > **ERPS** > **Instance Configuration** to enter the ERPS Instance Configuration page, as shown in *Figure 3-49*.

Figure 3-49 ERPS Instance Configuration

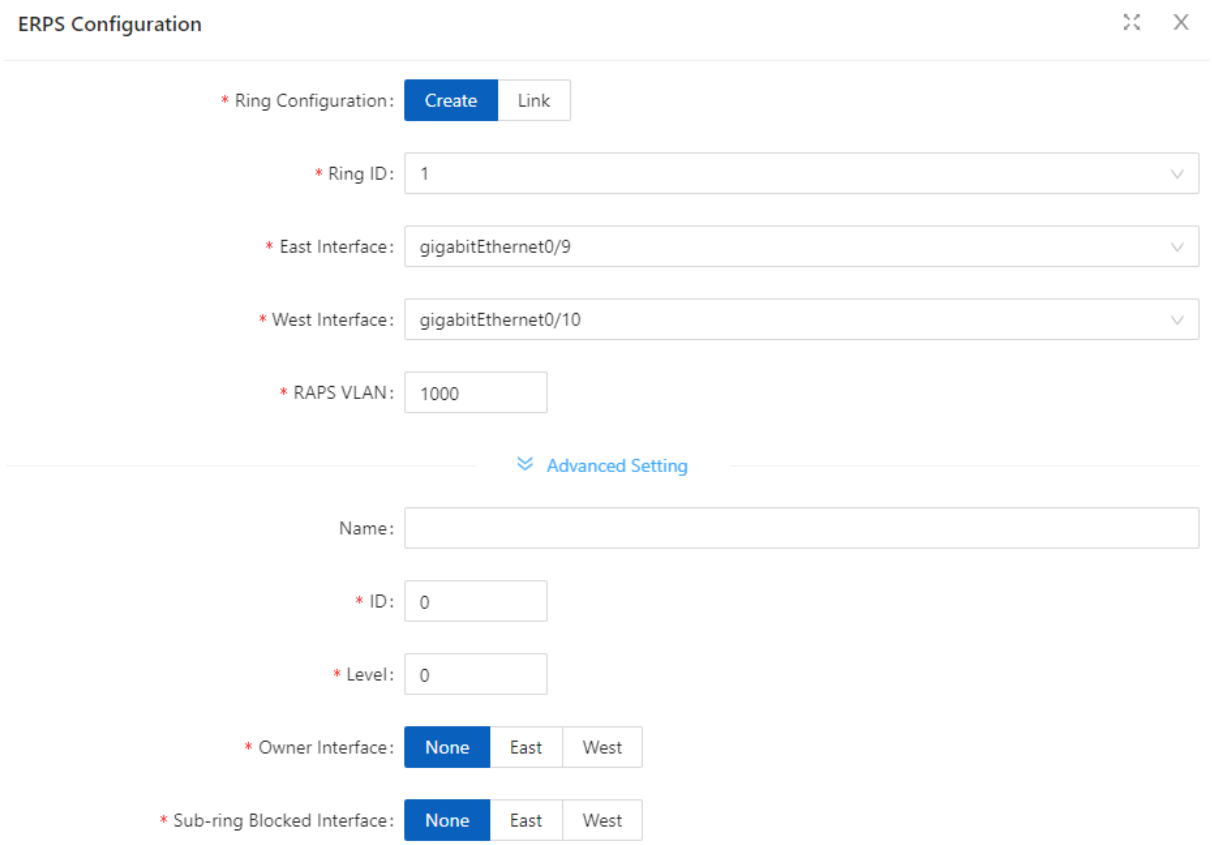


Click **+Add** button below Instance Configuration to create an ERPS instance, as shown in *Figure 3-50*. The description of the ERPS Instance Configuration Summary is described in *Table 3-20*.

Table 3-20 Description of the ERPS instance configuration

Item	Description
Ring Configuration	Create a new one or Link to a ERPS ring which has been created.
Ring ID	The associated ring ID must be the ring that has been created.
East Interface	The east interface of the ERPS ring.
West Interface	The west interface of the ERPS ring.
RAPS VLAN	Each switch in the same ring must be configured with the same RAPS management VLAN for transmitting ERPS protocol packets. The RAPS management VLAN can be a virtual VLAN and needs to be distinguished from the data VLAN. * It does not need to be created in 6&8 series switch, as it is created by default.
Owner interface	ERPS Owner interface can select either the east interface or the west interface as the Owner node. Each ERPS ring has one and only one interface configured as an RPL owner interface that controls the ports that need to be blocked.
Sub-ring Block Interface	The sub-ring 's blocked interface, one sub-ring has only one blocking port. You can choose east or west. This parameter needs to be configured only for the tangent ring. The sub-rings of the two devices with tangent to the ring must be configured with the sub-ring blocking port.
Attached Instance	It only needs to be set when the sub-ring blocking port needs to be configured, and is set to the ring ID that is tangent to the current sub-ring.

Figure 3-50 ERPS instance configuration



View ERPS State

Click **ERPS State** button to enter the ERPS State page, as shown in *Figure 3-51*. The description of the ERPS State summary is described in *Table 3-21*.

Figure 3-51 ERPS state

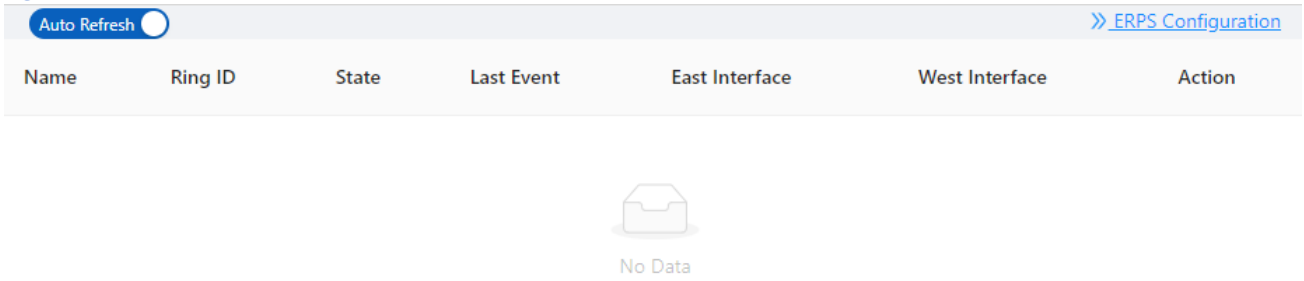


Table 3-21 ERPS state description

Item	Description
Name	The name of the ERPS ring
Ring ID	The number of the ERPS ring
State	ERPS ring status, include: Idle:

	Stable state when all non-RPL links are available. In this state, the owner node blocks the RPL port and periodically sends NR-RB packets. The neighbor node blocks the RPL port. All nodes enter the idle state after the owner node enters the idle state Pending: Transient state between the previous states Protection: State when a non-RPL link is faulty. In this state, the RPL link is unblocked to forward traffic. All nodes enter the protection state after a node enters the protection state
Last Event	Recent state event RAPS-NR: remote failure recovery RAPS-NR-RB: remote switchback RAPS-SF: remote fault LOCAL-SF: local fault LOCAL-CLEAR-SF: local failure recovery WTR-EXP: local switchback
East Interface	The east interface of the ERPS ring
West Interface	The west interface of the ERPS ring
Action	When the faulty link is restored, you can choose to manually revert immediately, otherwise the system will automatically revert after 5 minutes

3.5 PoE Management

3.5.1 PoE Overview

Power over Ethernet (PoE) means that power sourcing equipment (PSE) supplies power to powered devices (PDs) from Ethernet interfaces through twisted pair cables.

3.5.2 PoE Configuration

NOTE:

- Before configure PoE, make sure that the PoE power supply and PSE are operating normally; otherwise, you cannot configure PoE or the configured PoE function does not take effect.
- For switches with external power supply, the input voltage range is 44-57 V. In order to obtain a more stable power supply, it is recommended that the power supply voltage of AT equipment be greater than 50V, and that of BT equipment be greater than 53V.

1. Select **Configuration** > **PoE** in the navigation area to enter the PoE Management page as shown in *Figure 3-52*, the *Table 3-22* describes the items of PoE global configuration.

2. Type the Power supply and Power reserved boxes, and click **Apply** button.

Figure 3-52 PoE global configuration

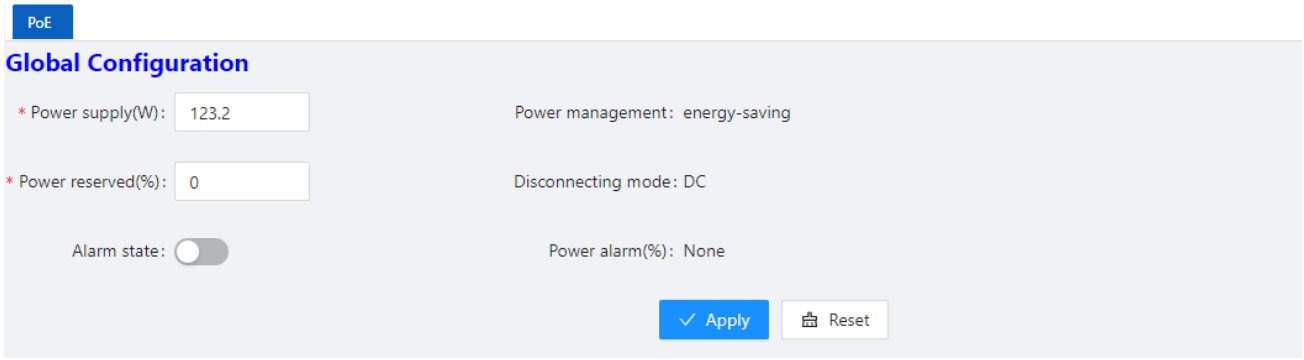


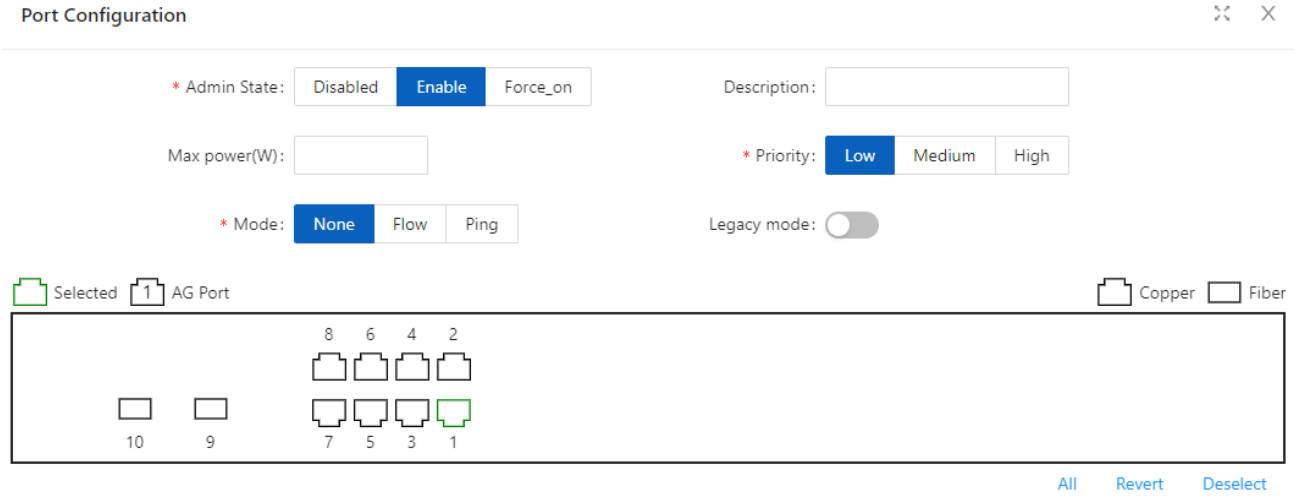
Table 3-22 Descriptions of PoE global configuration

Item	Description
Power supply (w)	By default, the default power provided by the device is 15.4W port number, for example, the maximum power provided by an 8-port device is 123.2W • For devices with external power supply, please fill in this parameter according to the actual configured power supply • For devices with built-in power supply, please refer to the description of PoE power in the product manual for this parameter
Power reserved (%)	Reserved power set against power fluctuations • For devices with external power supply, it is recommended to fill in the power consumption of the main board

	• For devices with built-in power supply, this parameter can be set 0 by default
Power management	Display the mode of power management is energy-saving. In this mode, the power requested and allocated to the port is based on the actual port's (real time) power consumption
Disconnect mode	Display the mode of disconnection is DC disconnect
Alarm state	Turn on/off the log alarm when the power is insufficient
Power alarm (%)	Alarm power limit setting, when the PoE power consumption exceeds this value, the system will automatically output a log alarm

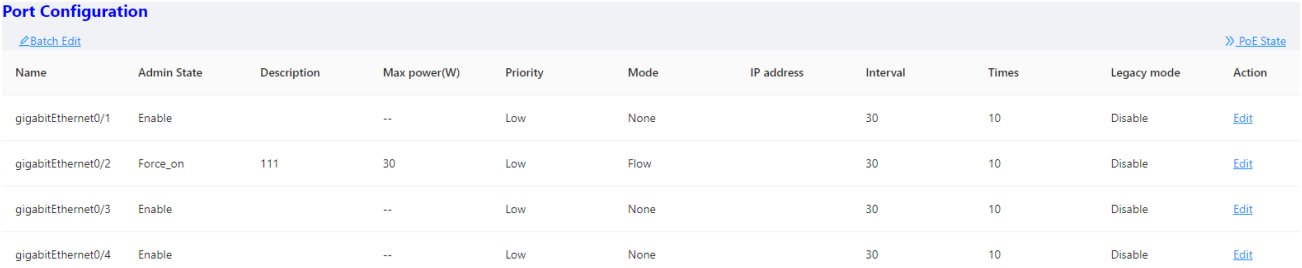
3. Click **Batch Edit** below Port Configuration to enter **PoE Port Configuration** page, Select the port to be configured, as shown in *Figure 3-53*.

Figure 3-53 PoE configuration page



4. Click the **OK** to complete the operation, and then the page will return to the PoE Interface Configuration page, as shown in *Figure 3-54*. the *Table 3-23* describes the items of the PoE interface configuration.

Figure 3-54 PoE configuration page



5. Click the **Save** in the navigation area to save the configuration.

Table 3-23 The items of the PoE interface configuration

Item	Description
Name	Indication panel port number.
Admin State	Enable/disable PoE for the PoE Interface. Disable: Disable the PoE power supply of the port. Enable: Enable the Po E power supply of the port. Force_on: Forcibly turn on the PoE power supply of the port. This function is implemented by skipping the PD valid detection and PD classification detection, and directly supply power to the PD load. In this mode, the default maximum load power is 15w, if you need to power the device above 15w, the maximum power parameter needs to be configured at the same time.
Description	Description of PoE port.
Max Power (W)	Configure the maximum power for this port. For AF/AT ports, the maximum port power range is 1-30. For BT ports, the port maximum power range is 1-90. In default mode, the port will perform power management according to PD class.
Priority	Configuring the port's priority. Users can configure the interface power supply priority of the PoE switch. The priority from high to low is: high, medium, and low. When the overall power of the PoE switch is insufficient, the ports with lower priority will be powered off first. The port priorities of the same priority are arranged in the order of the port number, and the priority of the port with the smaller port number is higher. For example, the priority of port 0/1 is higher than ports 0/2 and 0/3. Newly inserted ports will not affect the power supply of PDs that are already powered which has the same priority. Newly inserted ports which have higher priority will preempt low- priority ports.
Mode	None: Disable the PD alive detection function. Flow: Enable the PD alive detection function in Flow mode. This function is realized by monitoring the port counter, if the port packets counter does not change, it is judged that

	the PD device connected to the port is in abnormal state, and then turn off the power supply for a few seconds and then turn on. Ping: Enable the PD alive detection function in Ping mode. This function is realized by continuously pinging the PD load, if a period of time the ping packet fails during the interval, it is judged that the PD device connected to the port is in abnormal state, and the power supply is turned off for a few seconds and then turned on again. It is recommended to use the switch **diagnostics network tool → ping** to test whether the ping packet of the PD device can be used before enabling this function.
IP address	Ping mode, the IP address of the PD load requires that the switch and the PD load be in the same network segment.
Interval	The detection time interval.
Times	The detection times PD start up time must be less than the interval * times, otherwise the PD load will always be in the power- off and start -up state.
Legacy mode	ON/OFF, the default is OFF. OFF: Only standard PD devices are supported, the detection resistance is between 19k-26.5k, and the detection capacitance is less than 150nF. ON: Support non-standard PD devices, and can supply power to some PD devices whose detection resistance and capacitance values exceed the standard values.

3.6 Security

3.6.1 Port Security

3.6.1.1 Overview

The Port Security function restricts the number of valid MAC addresses on the port to limit the access of illegal users to the port. The illegal MAC packets will be directly discarded.

The legal MAC can be generated statically or dynamically. The static legal MAC is generated through user command line configuration; the dynamic legal MAC is dynamically generated through the MAC address learning function.

When the number of secure addresses on the port has reached the configured value of the maximum number of secure addresses, the new MAC access port will be recognized as an illegal MAC and a violation event will be generated. The user can configure the actions to be taken when the violation event occurs, respectively restrict or shutdown the port.

Restrict: Prohibit illegal MAC data from passing, and generate alarm log prompt information. Illegal MAC will prohibit access to the port within the MAC address aging time. It can be restored through shutdown and no shutdown ports.

Shutdown: The port is forced to be down, and the port recovery time can be configured. The port will automatically recover when the time is up; it can also be recovered by the shutdown, no shutdown command.

If you want to convert a dynamic security user to a static security user, you can enable the sticky function on the port. When the sticky function is enabled on the port, the dynamic users learned on the port will exist as static users. If the configuration is saved, the device will still exist after restarting the device.

NOTE:

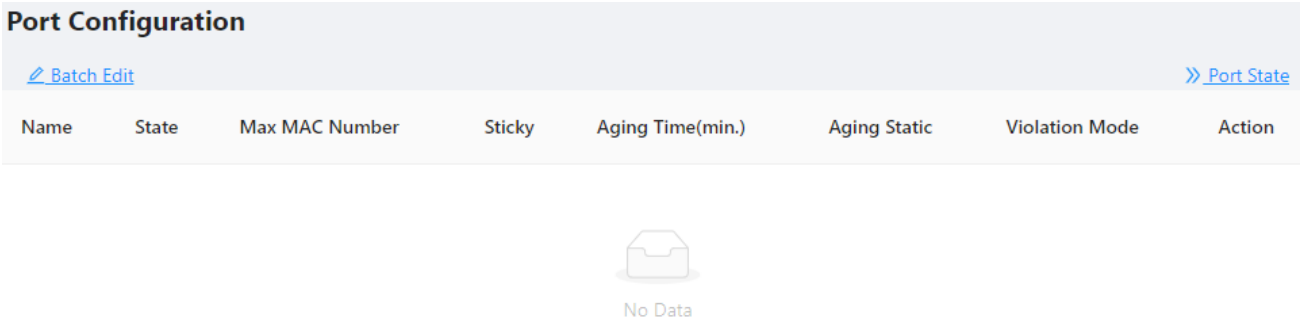
- Only support L2 port configuration port security, such as ordinary physical port, aggregation port.
- Only support port security configuration in access mode.
- Do not support aggregation port member ports to configure port security functions.
- Do not support SPAN destination port configuration port security function.
- Do not support configuring port security functions on ports that have been configured with static MAC addresses.

3.6.1.2 Configure Port Security

Port Configuration

Select **Configuration > Security > Port security** in the navigation area to enter the Port Security page as shown in *Figure 3-55*.

Figure 3-55 Port security statistic page



Click the **Batch Edit** button below Port Configuration to enter the Port Configuration page, as shown in *Figure 3-56*. The items of the port configuration are described in *Table 3-24*.

Figure 3-56 Port security configuration page

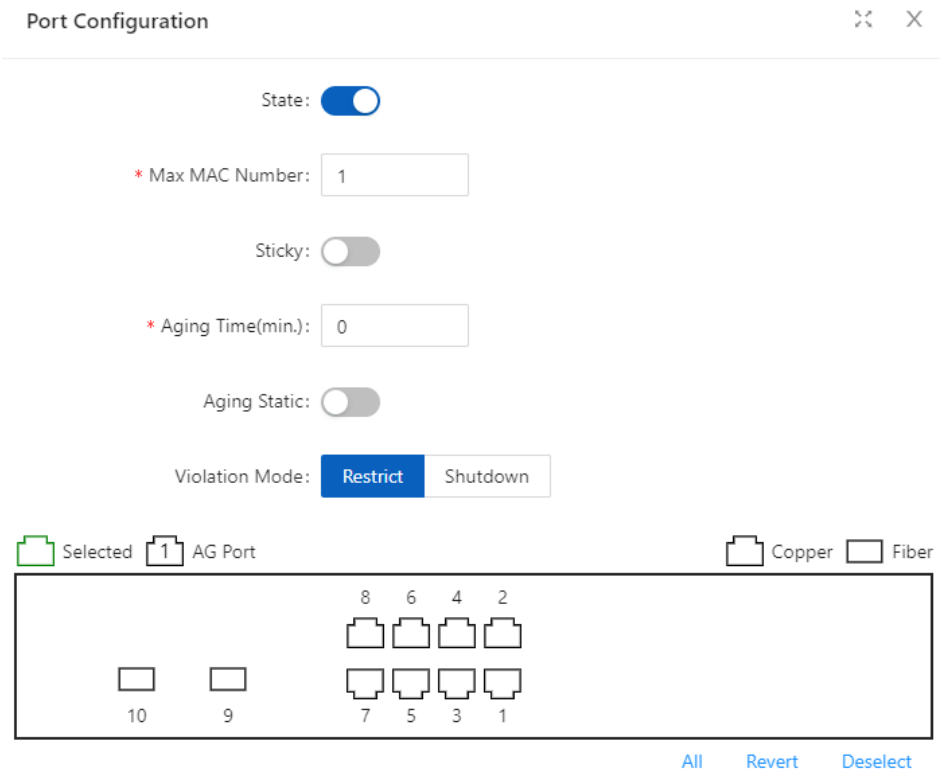


Table 3-24 The items of the port security configuration

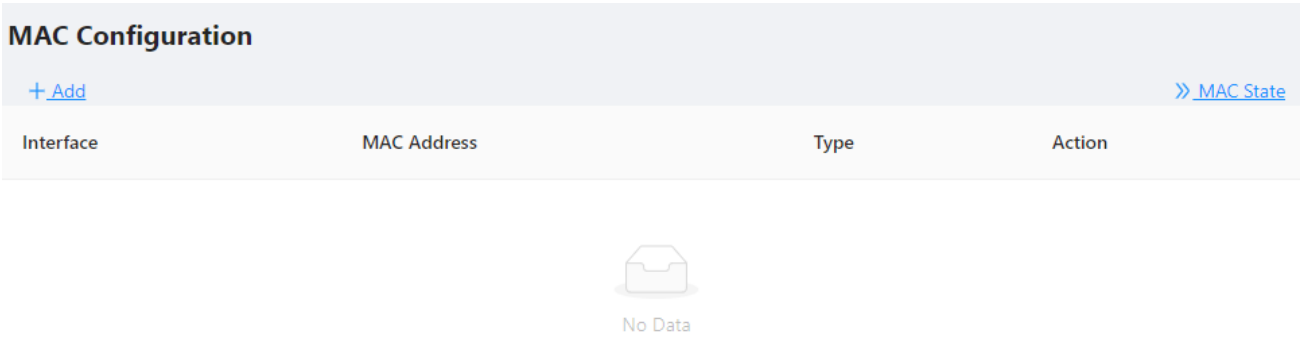
Item		Description
Port Configuration	State	Enable/disable port Security of the interface.

	Max MAC Number	Configure the maximum number of secure MAC addresses for the port, the default maximum number of secure addresses is 1, the range is <1-1024>.
	Sticky	Turn on/off the Sticky function.
	Aging Time(min.)	Configure the security address aging time, in minutes. The default aging time is 0, which means that the aging function is turned off. Aging time range <0-1440>. The default aging function only takes effect for dynamic and sticky security addresses.
	Aging Static	Enable the static security address aging function.
	Violation Mode	Configure port security violation handling, default violation mode is Restrict. Restrict: Prohibit illegal user data from passing, and log prompt. Shutdown: shutdown interface, and resume passing after errdisable recovery time.

MAC Configuration

Select **Configuration** > **Security** > **MAC Configuration** in the navigation area to enter the MAC Configuration page as shown in *Figure 3-57*.

Figure 3-57 MAC configuration summary



Click **+Add** to enter the MAC Configuration page as shown in *Figure 3-58*. The items of the mac configuration are described in *Table 3-25*.

Figure 3-58 MAC configuration page

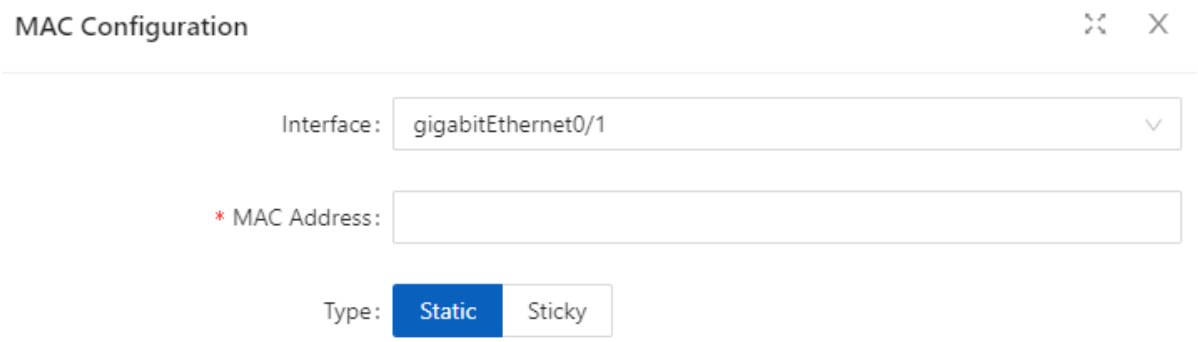


Table 3-25 The items of the MAC configuration

Item		Description
MAC Configuration	Interface	Select the interface to be configured.
	MAC Address	Configure a static security address, the format of the security address: XXXX.XXXX. XXXX. The security address cannot be a broadcast or multicast Address.
	Type	Configure the MAC address as dynamic or static.

3.6.2 IP Source Guard

3.6.2.1 Overview

IP Source Guard:

The IP Source Guard binding function allows IP packets conforming to the IP+MAC binding to pass through the port, and non-conforming packets are directly discarded, thereby achieving the purpose of preventing IP/MAC spoofing attacks.

The binding entries of IP Source Guard mainly come from two sources: user static configuration and dynamic acquisition in the IP DHCP snooping environment.

User static configuration: mainly for host users whose IP addresses are statically configured in the local area network.

IP DHCP snooping dynamic acquisition: mainly respond to the host users who dynamically acquire the IP address through DHCP in the local area network.

IP/MAC spoofing attack: Illegal MAC users send IP packets with legal source IP to realize the legalization of access identity.

ARP Check:

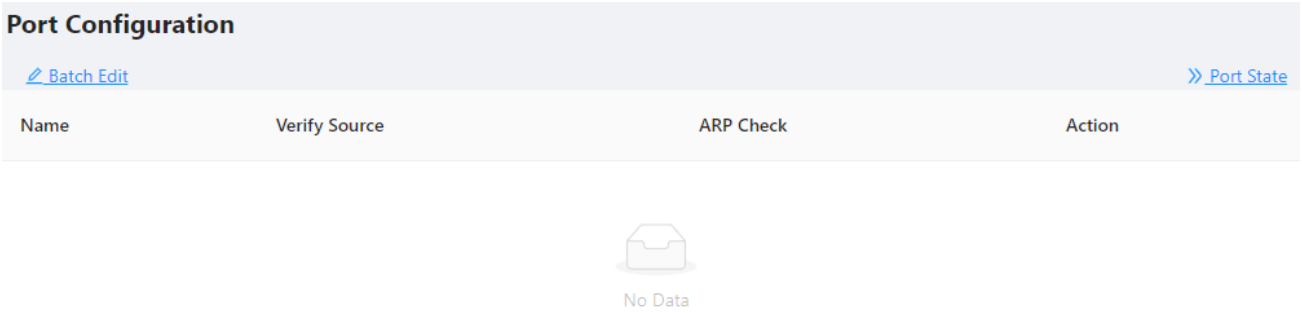
The ARP check (ARP packet check) function filters all ARP packets under the port and discards all illegal ARP packets, which can effectively prevent ARP spoofing in the network and improve the stability of the network.

In the device that supports the ARP check function, the ARP check function can generate corresponding ARP filtering information based on the legal user information (IP+MAC) generated by the security application modules such as IP Source Guard, so as to realize the illegal ARP packets filtering in the network.

3.6.2.2 Configure IP Source Guard

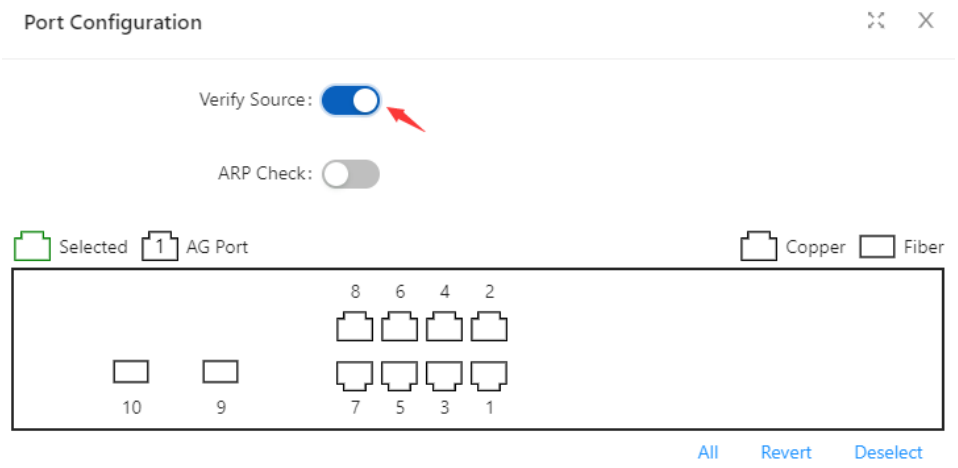
1. Select **Configuration** > **Security** > **IP Source Guard** in the navigation area to enter the IP Source Guard Summary page as shown in *Figure 3-59*.

Figure 3-59 IP source guard summary



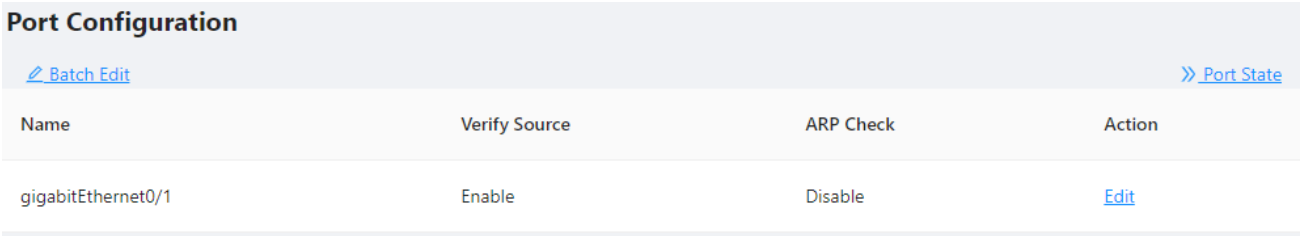
2. Click **Batch Edit** button below Port Configuration in the current page, select the interface to be configured in the port panel, click **Verify Source** button, as shown in *Figure 3-60*.

Figure 3-60 IP source guard port configuration



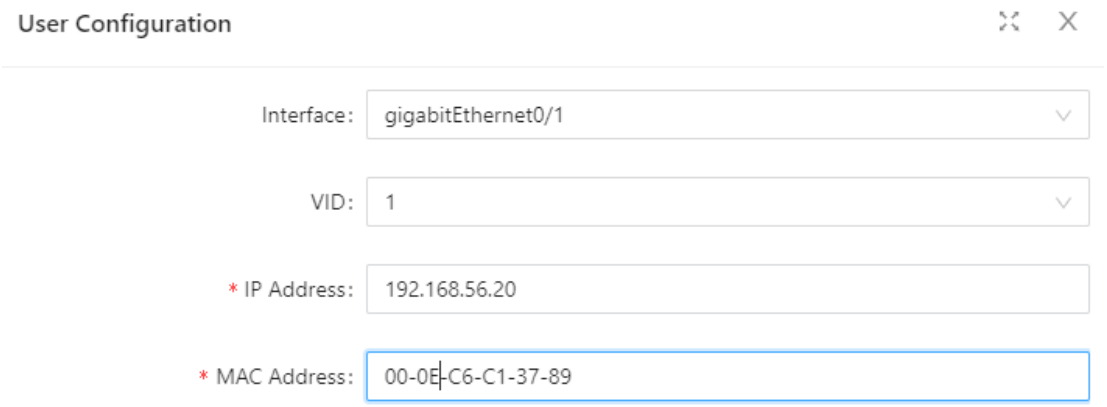
3. Click **OK** button, the rules created were displayed in summary page as shown in *Figure 3-61*.

Figure 3-61 Port configuration



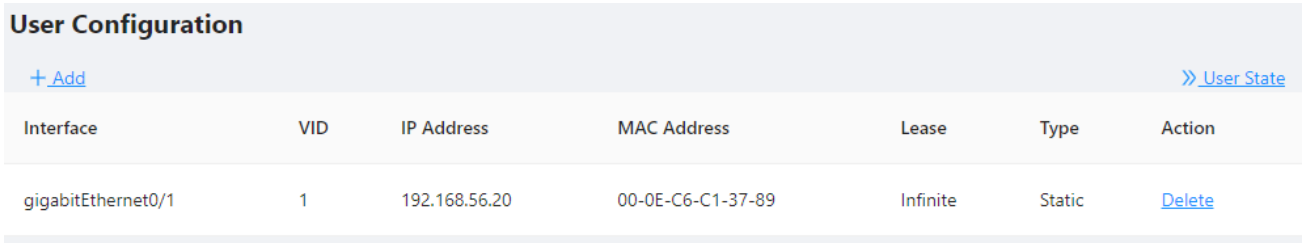
4. Click **+Add** button below User Configuration in current page, to enter the User Configuration page, Select the port in the interface box, text VID, IP Address, MAC Address, as shown in *Figure 3-62*.

Figure 3-62 IP source guard user configuration



5. Click **OK** button, the rules created were displayed in summary page as shown in *Figure 3-63*.

Figure 3-63 IP source guard rules summary

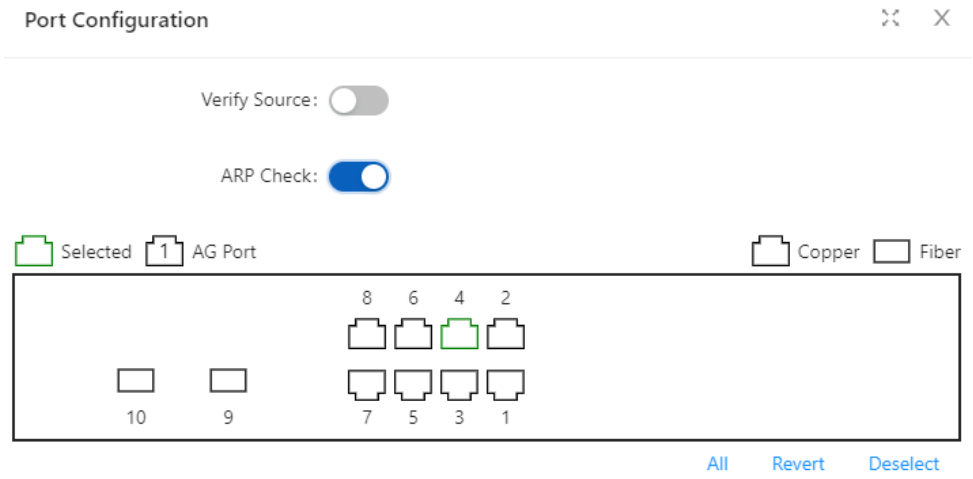


3.6.2.3 Configure ARP Check

1. Select **Configuration** > **Security** > **IP Source Guard** in the navigation area to enter the IP Source Guard Summary page as shown in *Figure 3-59*.

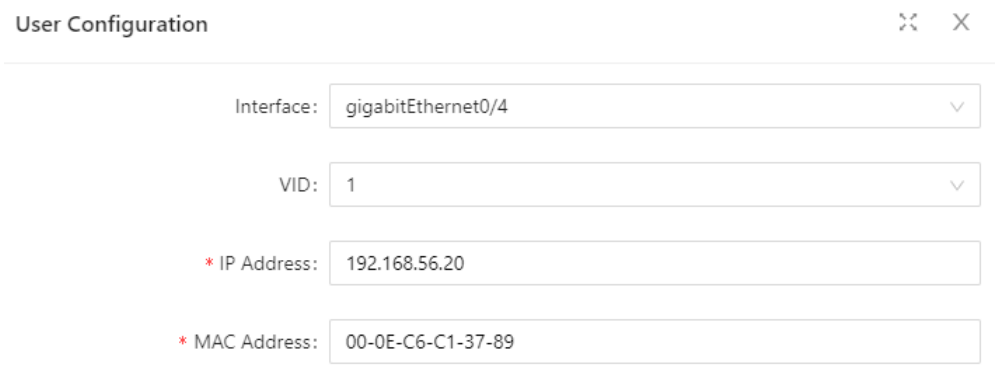
2. Click **Batch Edit** button below Port Configuration in the current page, select the interface to be configured in the port panel, click **ARP Check** button, as shown in *Figure 3-64*.

Figure 3-64 IP source guard ARP check



3. Click **+Add** button below User Configuration in current page, to enter the User Configuration page, as shown in *Figure 3-65*.

Figure 3-65 IP source guard user configuration



4. Click **OK** button, the rules created were displayed in summary page as shown in *Figure 3-66*.

Figure 3-66 ARP check rules

User Configuration

+ Add » User State

Interface	VID	IP Address	MAC Address	Lease	Type	Action
gigabitEthernet0/4	1	192.168.56.20	00-0E-C6-C1-37-89	Infinite	Static	Delete

3.6.3 Dot1X

3.6.3.1 Overview

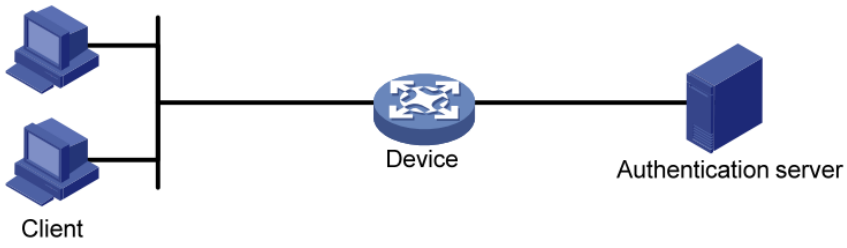
The 802.1X (Dot1X) protocol was proposed by the IEEE 802 LAN/WAN committee for security of wireless LANs (WLAN). It has been widely used on Ethernet as a common port access control mechanism.

As a port-based access control protocol, 802.1X authenticates and controls accessing devices at the port level. A device connected to an 802.1X-enabled port of an access control device can access the resources on the LAN only after passing authentication.

Architecture of 802.1X

802.1X operates in the typical client/server model and defines three entities: Client, Device, and Server, as shown in below.

Figure 3-67 802.1X



- Client is an entity seeking access to the LAN. It resides at one end of a LAN segment and is authenticated by Device at the other end of the LAN segment. Client is usually a user-end device such as a PC. 802.1X authentication is triggered when an 802.1X-capable client

program is launched on Client. The client program must support Extensible Authentication Protocol over LAN (EAPOL).

- Device, residing at the other end of the LAN segment, authenticates connected clients. Device is usually an 802.1X-enabled network device and provides access ports (physical or logical) for clients to access the LAN.
- Server is the entity that provides authentication services to Device. Server, normally running RADIUS (Remote Authentication Dial-in User Service), serves to perform authentication, authorization, and accounting services for users.

Authentication Modes of 802.1x

The 802.1X authentication system employs the Extensible Authentication Protocol (EAP) to exchange authentication information between the client, device, and authentication server. Client Device Server

- Between the client and the device, EAP protocol packets are encapsulated using EAPOL to be transferred on the LAN.
- Between the device and the RADIUS server, EAP protocol packets can be exchanged in two modes: EAP relay and EAP termination. In EAP relay mode, EAP packets are encapsulated in EAP over RADIUS (EAPOR) packets on the device, and then relayed by device to the RADIUS server. In EAP termination mode, EAP packets are terminated at the device, converted to RADIUS packets either with the Password Authentication Protocol (PAP) or Challenge Handshake Authentication Protocol (CHAP) attribute, and then transferred to the RADIUS server.

Basic Concepts of 802.1x

These basic concepts are involved in 802.1X: controlled port/uncontrolled port, authorized state/unauthorized state, and control direction.

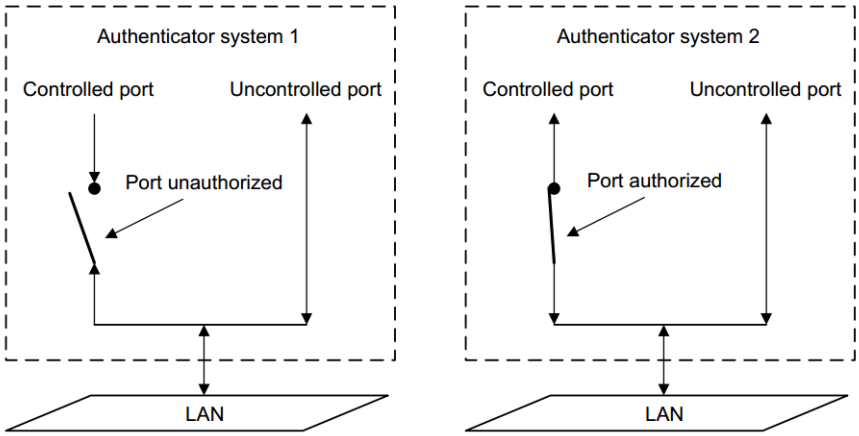
Controlled Port and Uncontrolled Port

A device provides ports for clients to access the LAN. Each port can be regarded as a unity of two logical ports: a controlled port and an uncontrolled port. Any packets arriving at the port are visible to both logical ports.

- The uncontrolled port is always open in both the inbound and outbound directions to allow EAPOL protocol packets to pass, guaranteeing that the client can always send and receive authentication packets.
- The controlled port is open to allow data traffic to pass only when it is in the authorized state.

Authorized State and Unauthorized State

Figure 3-68 Authorized/unauthorized state of a controlled port



A controlled port can be in either authorized state or unauthorized state, which depends on the authentication result, as shown in *Figure 3-68*.

You can control the port authorization status of a port by setting port authorization mode to one of the following:

- Force-Authorized: Places the port in authorized state, allowing users of the port to access the network without authentication.
- Force-Unauthorized: Places the port in unauthorized state, denying any access requests from users of the port.
- Auto: Places the port in the unauthorized state initially to allow only EAPOL packets to pass, and turns the port into the authorized state to allow access to the network after the users pass authentication. This is the most common choice.

Control Direction

In the unauthorized state, the controlled port can be set to deny traffic to and from the client or just the traffic from the client.

802.1X Authentication Triggering

802.1X authentication can be initiated by either a client or the device.

Unsolicited Triggering of A Client

A client can initiate authentication unsolicitedly by sending an EAPOL-Start packet to the device. The destination address of the packet is 01-80-C2-00-00-03, the multicast address specified by the IEEE 802.1X protocol.

Some devices in the network may not support multicast packets with the above destination address, and unable to receive authentication requests of clients as a result. To solve this problem, the device also supports EAPOL-Start packets using a broadcast MAC address as the destination address.

Unsolicited Triggering of the Device

The device can trigger authentication by sending EAP-Request/Identity packets to unauthenticated clients periodically (every 30 seconds by default). This method can be used to authenticate clients that cannot send EAPOL-Start packets unsolicitedly to trigger authentication, for example, a client running the 802.1X client application provided by Windows XP.

Authentication Process of 802.1x

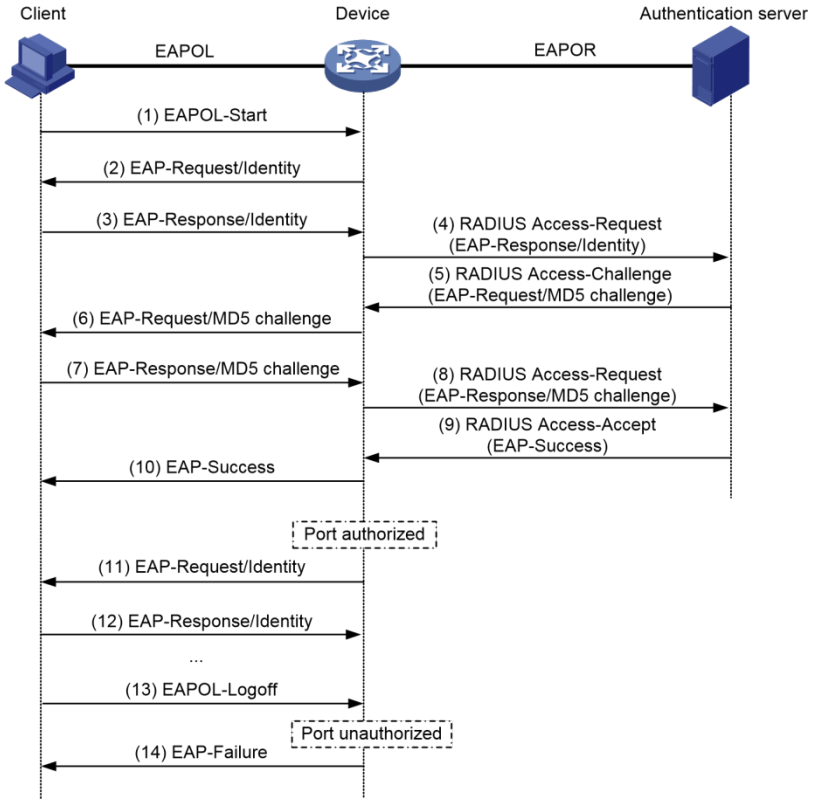
An 802.1X device communicates with a remote RADIUS server in two modes: EAP relay and EAP termination. The following describes the 802.1X authentication procedure in the two modes, which is triggered by the client in the examples.

EAP Relay

EAP relay is defined in IEEE 802.1X. In this mode, EAP packets are carried in an upper layer protocol, such as RADIUS, so that they can go through complex networks and reach the authentication server. Generally, relaying EAP requires that the RADIUS server support the EAP attributes of EAP-

Message and Message-Authenticator, which are used to encapsulate EAP packets and protect RADIUS packets carrying the EAP-Message attribute respectively.

Figure 3-69 Show the message exchange procedure with EAP-MD5



1. When a user launches the 802.1X client software and enters the registered username and password, the 802.1X client software generates an EAPOL-Start frame and sends it to the device to initiate an authentication process.

2. Upon receiving the EAPOL-Start frame, the device responds with an EAP-Request/Identity packet for the username of the client.

3. When the client receives the EAP-Request/Identity packet, it encapsulates the username in an EAP-Response/Identity packet and sends the packet to the device.

4. Upon receiving the EAP-Response/Identity packet, the device relays the packet in a RADIUS Access-Request packet to the authentication server.

5. When receiving the RADIUS Access-Request packet, the RADIUS server compares the identify information against its user information table to obtain the corresponding password information.

Then, it encrypts the password information using a randomly generated challenge, and sends the challenge information through a RADIUS Access-Challenge packet to the device.

6. After receiving the RADIUS Access-Challenge packet, the device relays the contained EAP-Request/MD5 Challenge packet to the client.

7. When receiving the EAP-Request/MD5 Challenge packet, the client uses the offered challenge to encrypt the password part (this process is not reversible), creates an EAP-Response/MD5 Challenge packet, and then sends the packet to the device.

8. After receiving the EAP-Response/MD5 Challenge packet, the device relays the packet through a RADIUS Access-Request packet to the authentication server.

9. When receiving the RADIUS Access-Request packet, the RADIUS server compares the password information encapsulated in the packet with that generated by itself. If the two are identical, the authentication server considers the user valid and sends to the device a RADIUS Access-Accept packet.

10. Upon receiving the RADIUS Access-Accept packet, the device opens the port to grant the access request of the client. After the client gets online, the device periodically sends handshake requests to the client to check whether the client is still online. By default, if two consecutive handshake attempts end up with failure, the device concludes that the client has gone offline and performs the necessary operations, guaranteeing that the device always knows when a client goes offline.

11. The client can also send an EAPOL-Logoff frame to the device to go offline unsolicitedly. In this case, the device changes the status of the port from authorized to unauthorized and sends an EAP-Failure packet to the client.

3.6.3.2 Configure Dot1X

Select **Security** > **Dot1x**> **Configuration** from the navigation area. The system automatically displays the 802.1X Global Configuration and Port Configuration, as shown in *Figure 3-70* and *Figure*

3-71. *Table 3-26* and *Table 3-27* separately describe the global configuration and port configuration items.

Figure 3-70 802.1X global configuration

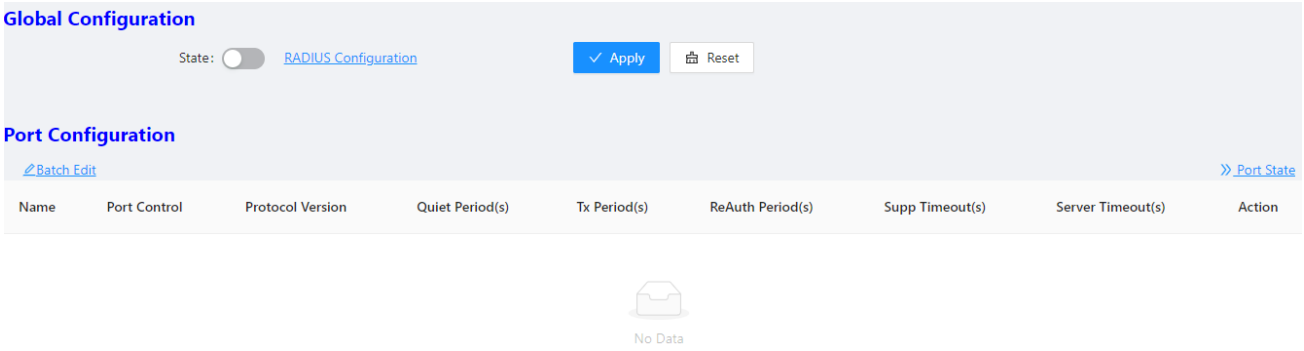


Table 3-26 The 802.1X configuration items

Item		Description
Global Configuration	State	Enables the 802.1X feature on your switch.
	RADIUS Configuration	Click to jump to the RADIUS configuration interface.

Figure 3-71 802.1X port configuration

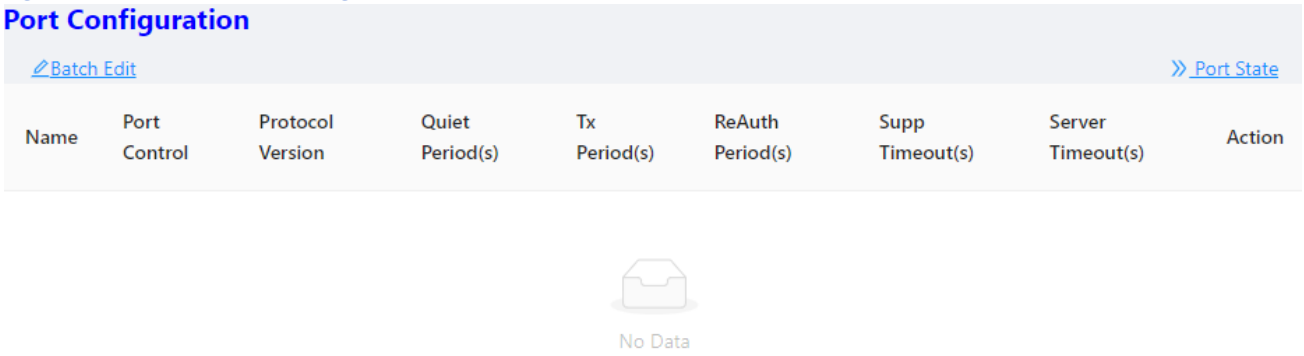


Table 3-27 The 802.1X port configuration items

Item		Description
Port Configuration	Name	Physical interface name.
	Port Control	Port control mode.
	Protocol Version	Eapol protocol version, default version 2.
	Quiet Period(s)	Sets the number of seconds that the switch remains in the quiet-period following a failed authentication exchange with the client. The range is 0 to 65,535 seconds; the default is 60.

		When the switch cannot authenticate the client, the switch remains idle for a set period, and then tries again. The idle time is determined by the quiet-period value.
	Tx Period(s)	Sets the number of seconds that the switch waits for a response to an EAP-request/identity frame from the client before re-transmitting the request. The range is 1 to 65,535 seconds; the default is 30.
	ReAuth Enabled	Enables periodic re-authentication of the client.
	ReAuth Period(s)	Specifies the number of seconds between re-authentication attempts or have the switch use a RADIUS-provided session timeout. The range is 1 to 65,535; the default is 3600 seconds. This command affects the behavior of the switch only if periodic re-authentication is enabled.
	Supp Timeout(s)	Sets the number of seconds that the switch waits for a response to an EAP-Request/MD5 Challenge frame from the client before re-transmitting the request. The range is 1 to 65,535 seconds; the default is 30.
	Server Timeout(s)	Sets the number of seconds that the switch waits for a response to a RADIUS Access-Request packet from the server. The range is 1 to 65,535 seconds; the default is 30.

3.6.4 MAC Auth

3.6.4.1 Overview

Authentication of MAC addresses is supported using a RADIUS server that contains a database of all valid users.

When the MAC Auth option is enabled on any interface, all source MAC addresses from any incoming frame are sent for authentication. If the username and password of the source address are configured in the RADIUS server, then authentication succeeds, otherwise it fails. When authentication succeeds, the source MAC is added to the forwarding table with forwarding

enabled. In the case of failure, the source MAC either is added to the forwarding table as discarded or is added to a restricted VLAN.

NOTE:

- If the configured static MAC is the same as the silent MAC, the MAC silent function after the MAC address authentication fails will be invalid.

3.6.4.2 Configure MAC Authentication

Displaying MAC Authentication Summary

Select **Configuration > Security > MAC Authentication** from the navigation area. The system automatically displays the MAC Authentication summary, as shown in *Figure 3-72*. *Table 3-28* describes the MAC Authentication Summary items.

Figure 3-72 The MAC authentication summary

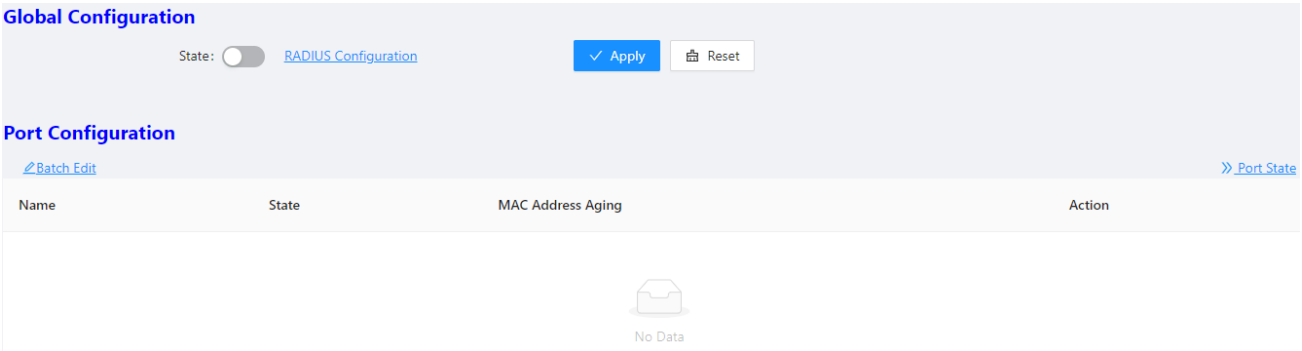


Table 3-28 The MAC authentication summary items

Item		Description
Global Configuration	State	Enables the 802.1X feature on your switch
	RADIUS Configuration	Click to jump to the RADIUS configuration interface
Port Configuration	Name	Physical interface name
	State	Display the state of MAC Auth
	MAC Address Aging	Display the state of MAC Address Aging
	Action	Click to Edit the rule

Configuring MAC Authentication

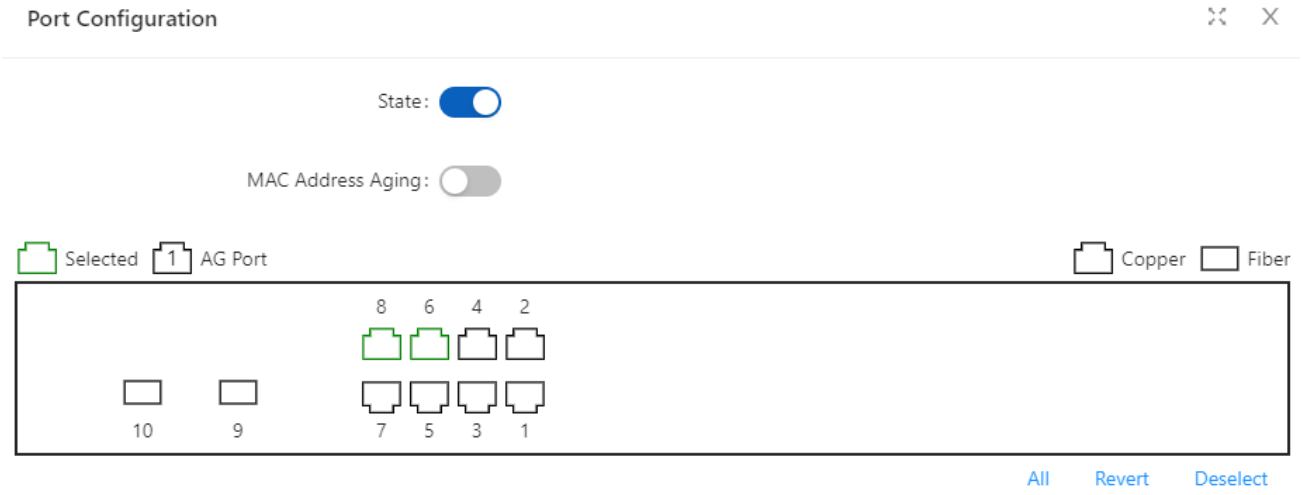
Enable MAC Auth

Select **Configuration** > **Security** > **MAC Authentication** from the navigation area. Click **State** button in Global Configuration, click **Apply** button to enable the MAC Auth function.

Configuring Port

Click **Batch Edit** button below Port Configuration to enter the Port Configuration page, as shown in *Figure 3-73*. Click **State** button, select the port to be configured in port panel, click **OK** button.

Figure 3-73 MAC authentication port configuration



3.6.5 RADIUS

3.6.5.1 Overview

Remote Authentication Dial-In User Service (RADIUS) is protocol for implementing Authentication, Authorization, and Accounting (AAA).

RADIUS is a distributed information interaction protocol using the client/server model. RADIUS can protect networks against unauthorized access and is often used in network environments where both high security and remote user access are required. RADIUS uses UDP, and its packet format and message transfer mechanism are based on UDP. It uses UDP port 1812 for authentication and 1813 for accounting.

RADIUS was originally designed for dial-in user access. With the diversification of access methods, RADIUS has been extended to support more access methods, for example, Ethernet access and

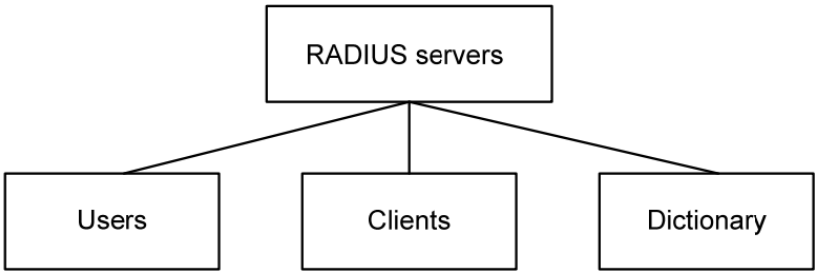
ADSL access. It uses authentication and authorization in providing access services and uses accounting to collect and record usage information of network resources.

Client/server Model

- Client: The RADIUS client runs on the NASs located throughout the network. It passes user information to designated RADIUS servers and acts on the responses (for example, rejects or accepts user access requests).
- Server: The RADIUS server runs on the computer or workstation at the network center and maintains information related to user authentication and network service access. It listens to connection requests, authenticates users, and returns the processing results (for example, rejecting or accepting the user access request) to the clients.

  In general, the RADIUS server maintains three databases: Users, Clients, and Dictionary, as shown in *Figure 3-74*.

Figure 3-74 RADIUS server components



- Users: Stores user information such as the usernames, passwords, applied protocols, and IP addresses.
- Clients: Stores information about RADIUS clients, such as the shared keys and IP addresses.
- Dictionary: Stores information about the meanings of RADIUS protocol attributes and their values.

Security and Authentication Mechanisms

Information exchanged between a RADIUS client and the RADIUS server is authenticated with a shared key, which is never transmitted over the network. This enhances the information exchange

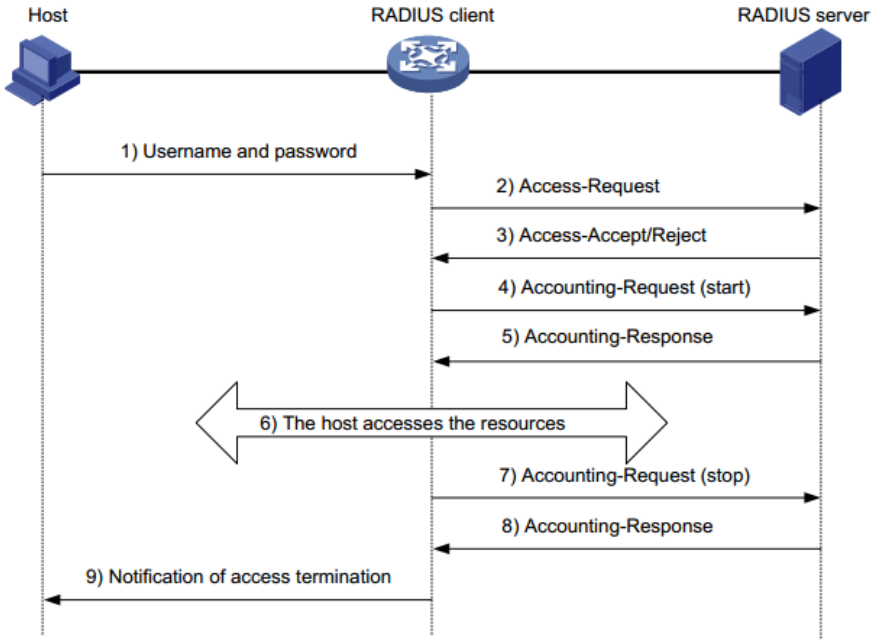
Figure 3-74 security. In addition, to prevent user passwords from being intercepted on insecure networks, RADIUS encrypts passwords before transmitting them.

A RADIUS server supports multiple user authentication methods, for example, the Password Authentication Protocol (PAP) and Challenge Handshake Authentication Protocol (CHAP) of the Point-to-Point Protocol (PPP). Moreover, a RADIUS server can act as the client of another AAA server to provide authentication proxy services.

Basic Message Exchange Process of RADIUS

Figure 3-75 illustrates the interaction of the host, the RADIUS client, and the RADIUS server.

Figure 3-75 Basic message exchange process of RADIUS



The following is how RADIUS operates:

1. The host initiates a connection request carrying the username and password to the RADIUS client.

2. Having received the username and password, the RADIUS client sends an authentication request (Access-Request) to the RADIUS server, with the user password encrypted by using the Message-Digest 5 (MD5) algorithm and the shared key.

3. The RADIUS server authenticates the username and password. If the authentication succeeds, it sends back an Access-Accept message containing the user ‘s authorization information. If the authentication fails, it returns an Access-Reject message.

4. The RADIUS client permits or denies the user according to the returned authentication result. If it permits the user, it sends a start-accounting request (Accounting-Request) to the RADIUS server.

5. The RADIUS server returns a start-accounting response (Accounting-Response) and starts accounting.

6. The user accesses the network resources.

7. The host requests the RADIUS client to tear down the connection and the RADIUS client sends a stop-accounting request (Accounting-Request) to the RADIUS server.

8. The RADIUS server returns a stop-accounting response (Accounting-Response) and stops accounting for the user.

9. The user stops access to network resources

NOTE:

- Do not support RADIUS accounting function.

3.6.5.2 Configure RADIUS

RADIUS Global Configuration

Select **Configuration > Security > RADIUS** from the navigation area. The system automatically displays the RADIUS Global Configuration, as shown in *Figure 3-76*. *Table 3-29* describes the RADIUS global configuration items.

Figure 3-76 The RADIUS global configuration

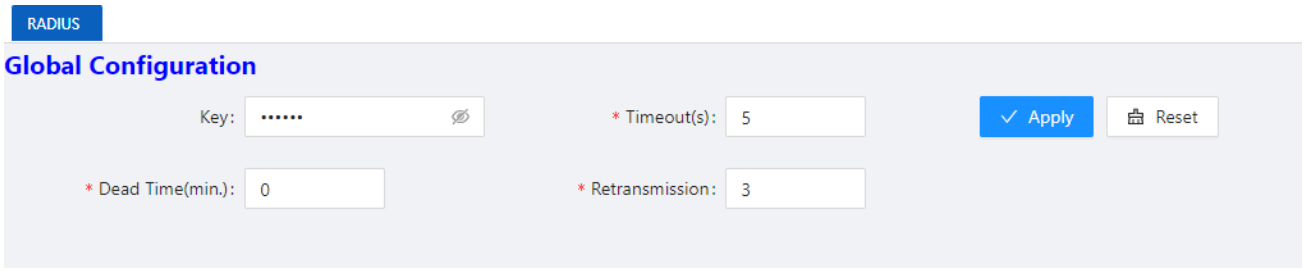


Table 3-29 The RADIUS global configuration items

Item		Description
Global Configuration	Key	Global default password configuration; configurable, unreadable; optional configuration
	Timeout	Global server timeout; optional configuration
	Retransmission	Global server re-transmissions; optional configuration
	Dead Time	Server death duration; optional configuration; default 0, indicating that the server will be revived immediately after death

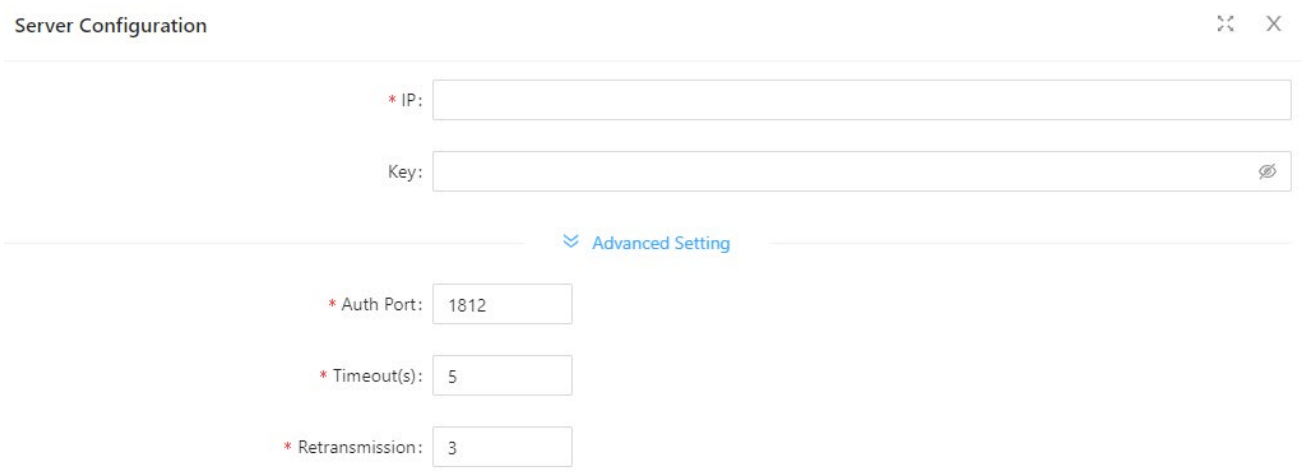
RADIU Server Configuration

Click **+Add** button below Server Configuration in current page to enter the Configuration page, as shown in *Figure 3-77*. *Table 3-30* describes the RADIUS Server Configuration items.

Table 3-30 The RADIUS server configuration items

Item	Description
IP	Server IP address
Auth Port	Server authentication port number; default 1812
Key	Server key; global configuration when not configured
Timeout	Server timeout; default 5s
Retransmission	Server re-transmission times, default 3 times

Figure 3-77 The RADIUS server configuration



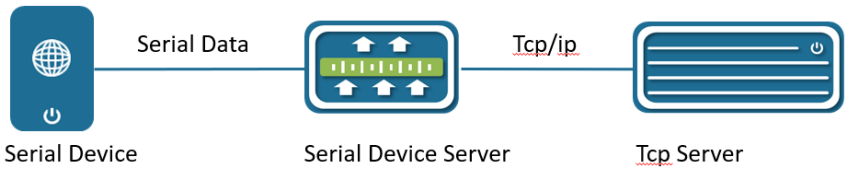
3.7 Control

3.7.1 Serial Servers

3.7.1.1 Overview

The serial device server is used to connect serial devices to the Ethernet. The serial device server supports bidirectional conversion and transmission of network data and serial data. Serial device server work in tcp-client mode, as shown in *Figure 3-78*.

Figure 3-78 Serial device server work in tcp-client mode

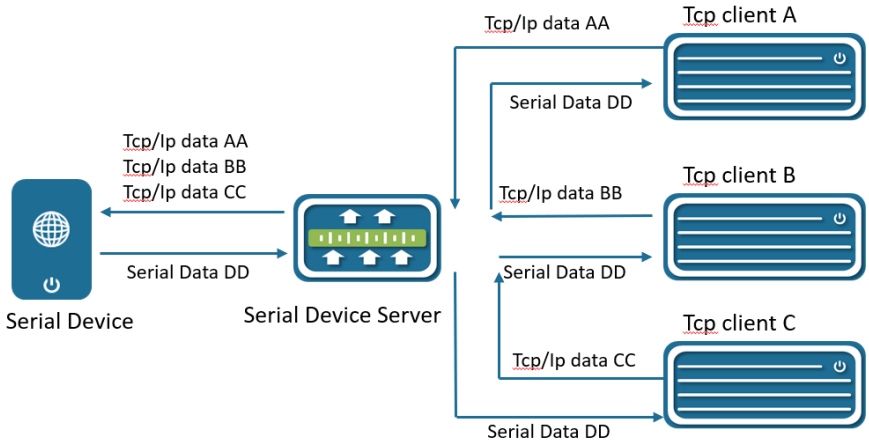


Serial device server in tcp-client mode provides client connections for TCP network servers. it actively initiates a connection and connects to the server to realize the interaction between serial device and TCP server. The TCP/IP and serial data are transparently transmitted in both directions. The serial device server supports to establish multiple TCP Clients to connect to different TCP Server. Serial device server work in tcp-server mode, as show in *Figure 3-79*.

In TCP Server mode, the module monitors the local port, accepts and establishes a connection for data communication when a connection request is sent. Used for communication with TCP clients

within a local area network. It is suitable for scenarios where there is no server in the LAN and there are multiple computers or mobile phones requesting data from the module.

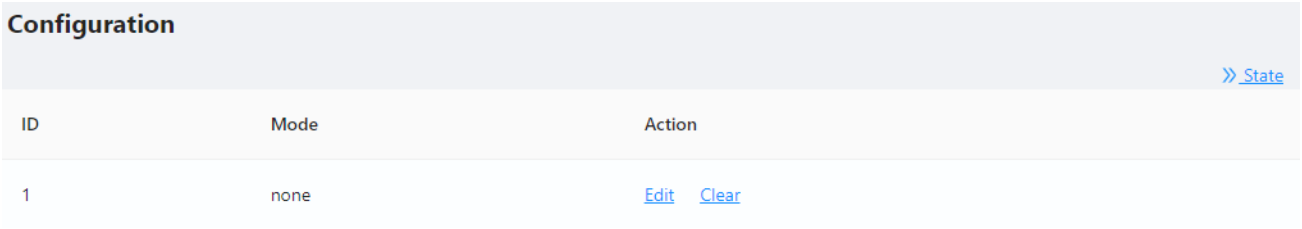
Figure 3-79 Serial device server work in tcp-server mode



3.7.1.2 Configure Serial Server

Select **Configuration** > **Control** > **Serial Server** from the navigation area. The system automatically displays the Serial Server Configuration page, as shown in *Figure 3-80.*

Figure 3-80 Serial server configuration summary



Click **Edit** button to enter Serial Server Configuration page, as shown in *Figure 3-81*. *Table 3-31* describes the serial server configuration items.

Figure 3-81 Serial server configuration

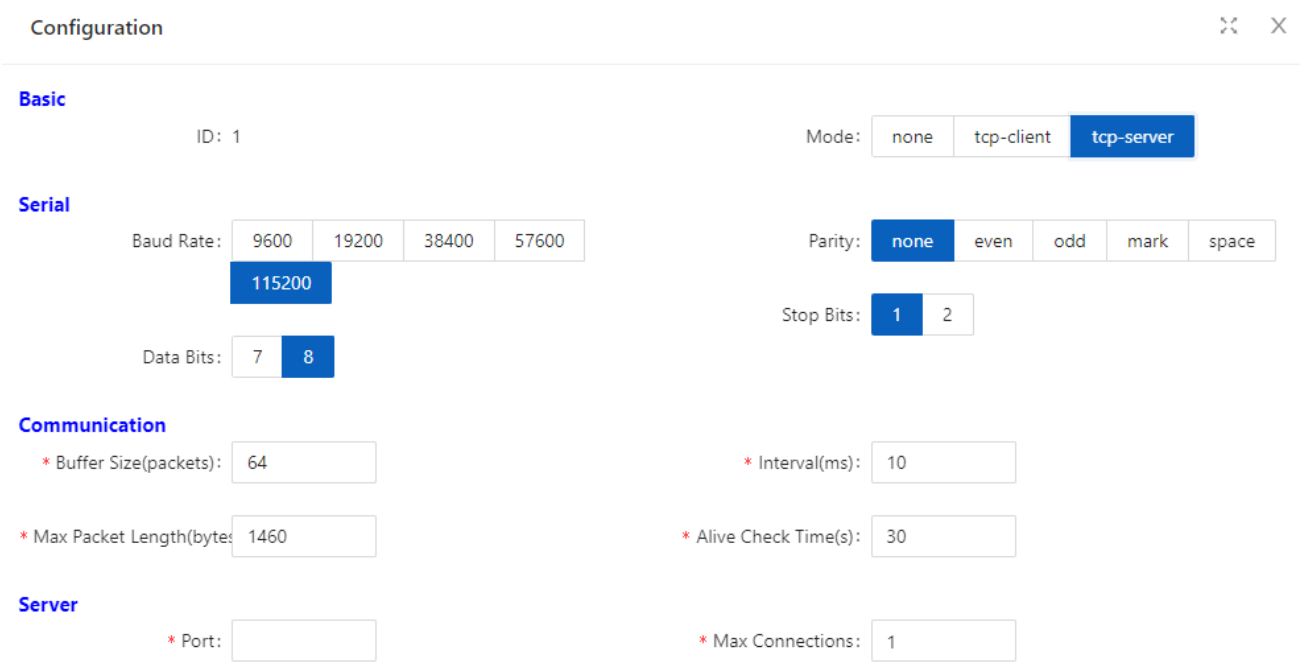


Table 3-31 Serial server configuration items

Item		Description
Basic	ID	Serial port number
Mode	None	Shut down the serial port server
	tcp-client	Configure the working mode to tcp-client
	tcp-server	Configure the working mode to tcp-server
Serial	Baud Rate	The baud rate of the serial port is configured, and there are five kinds of options: 9600, 19200, 38400, 57600, and 115200
	Data Bits	The data bits of the serial port are configured, and there are two kinds of options: 7 and 8
	Parity	There are five types of configuration checksum methods: none, even, odd, mark, and space
	Stop Bits	There are two options for configuring the stop bit, 1 and 2
Communication	Buffer size	Serial port data bits are transmitted at low speed, and the data is transferred from the network end to the serial port side to increase the fifo, improve the forwarding ability, the range < 0-128>, the default 64

	Max packet Length	The length of the serial port data packet, beyond the LEGGTH value, the packet is forwarded to the network end, the range <0-1460>, the default is 1460
	Interval	If the interval between the bytes before and after the serial port data exceeds MILLISECONDS, the post-byte data is recognized as the new message header byte The range < 1-1000 >, the default is 10ms
	Alive check time	Configure the serial port server to keep alive, during which there is no data interaction, then active detection is initiated
Client	Remote IP	Configure the remote connection IP address
	Remote port	Configure the port number for the remote connection, ranging from < 1-65535>
	Local port	For optional configurations, the default system is automatically assigned
Server	Port	Configure the tcp-server port number, which < range from 1-65535>
	Max connections	The maximum number of connections in tcp-server mode, ranging from 1 to 65535 >

3.7.2 Relay Warning

3.7.2.1 Overview

Relay Warning function helps network administrators effectively manage unexpected network situations by providing a digital input DI and a digital output DO (Relay) for external alarm devices on the panel. Digital input DI can be used to detect and record the status of external equipment such as access control intrusion detector. Digital output DO can be used for device port link interruption, abnormal system temperature, abnormal PoE status, and abnormal power supply to issue an alarm.

The device's digital input DI can be activated by external sensors sensing physical changes including certain physical changes in intrusion detection or monitoring area, with the DI parameter description shown in *Table 3-29*.

Table 3-32 DI description items

Type	Trigger Condition	Description
DI input	Low level	Low level input trigger alarm with the voltage limit"-30V-3V"
	High level	High level input trigger alarm with the voltage limit "12V-30V"

The device can detect in real time through the digital input DI and trigger some internal event processing of the device. *Table 3-30* describes the configuration items.

Table 3-33 internal event processing items

Trigger Condition	Event Type	Description
DI input: low level←→high level	Port event	Port shutdown and then up
		Port shutdown
	Port PoE event	Port PoE is powered off and then powered on
		Port PoE is powered off
	DO output event	Relay is normally open
		Relay is normally closed
		Relay is in alternating normally open and normally closed cycles

The main function of the digital output DO is to allow switch automatic, manual or remote control of the software application to trigger external devices, and the working status of the DO is shown in *Table 3-31*.

Table 3-34 DO status description

Type	Mode	Description
Relay output	Normally open	The default mode is normally closed and becomes normally open after the alarm is triggered
	Normally closed	The default mode is normally open and becomes normally closed after the alarm is triggered

	Pulse	By default, the output is in normally open state, and after the alarm is triggered, it becomes in the status of alternating normally open and normally closed cycles with a default period of 2s, and a 50% duty cycle

The switch can not only manually configure the output status, but associate the equipment internal events to trigger the relay output alarm. The parameters of internal events are shown in *Table 3-32*.

Table 3-35 Trigger relay alarm output configuration items

Event	Action	
Ambient temperature	When the ambient temperature exceeds the configured limit, the relay output alarm is triggered	**prompt** This function requires an external related sensor
Ambient humidity	When the ambient humidity exceeds the configured limit, the relay output alarm is triggered	
System temperature	When the system temperature exceeds the configured limit, the relay output alarm is triggered	
PoE power consumption	When the system PoE power consumption exceeds the configured percentage limit, the relay output alarm is triggered	
PoE voltage	When the PoE chip voltage exceeds the configured limit, the relay output alarm is triggered	
PoE temperature	When the PoE chip temperature exceeds the configured limit, the relay output alarm is triggered	
PoE port power supply change	When the PoE port power supply is powered off or on, the relay alarm output is triggered	
Port link status change	When the port link changes from up to down or from down to up, the relay alarm output is triggered	

3.7.2.2 Relay Warning Configuration

Select **Configuration > Relay Warning** in the navigation area to enter the Relay Warning Configuration page. This page contains three parts: Global Configuration, Trigger Relay Alarm, Digital Input Configuration.

Global Configuration

Select **Configuration** > **Relay Warning** > **Global Configuration** in the navigation area to enter the Relay Warning Global Configuration page. The Global Configuration page is shown in *Figure 3-82*, and the specific parameters are shown in *Table 3-36*.

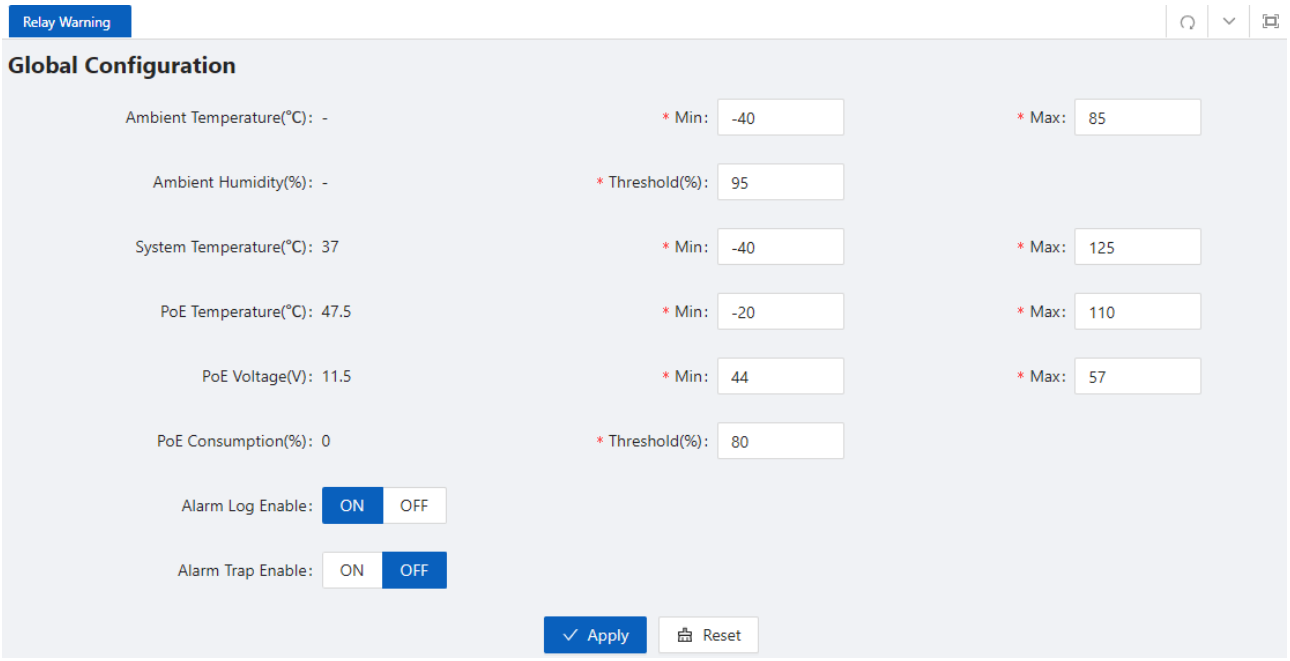
Table 3-36 The description of global configuration items

Item	Description
Ambient Temperature (℃)	Min: the alarm minimum limit. When the ambient temperature is lower than the minimum, an alarm is triggered. Max: the alarm maximum limit. When the ambient temperature is higher than the maximum, an alarm is triggered. The default minimum is -40℃, and the default maximum is 85℃; the minimum difference between the Min and Max is 5℃。 When the ambient temperature is higher than the maximum limit, an alarm is triggered. When the temperature drops to 2℃ below the maximum limit, a prompt is given to return to normal. When the ambient temperature is lower than the minimum limit, an alarm is triggered. When the temperature rises to 2℃ higher than the minimum limit, a prompt is given to return to normal.
Ambient Humidity (%)	Threshold (%): ambient humidity alarm value, and the default value is 95%. When the ambient humidity is higher than the alarm value, an alarm is triggered. When the humidity drops to 2% below the alarm value, a prompt is given to return to normal.
System Temperature (℃)	Min: the alarm minimum limit. When the system temperature is lower than the minimum, an alarm will be triggered.

	Max: the alarm maximum limit. When the system temperature is higher than the maximum, an alarm will be triggered. The default minimum is -40℃ and the default maximum is 125℃; the minimum difference value between the Min and Max is 5℃。 When the system temperature is higher than the maximum, an alarm is triggered. When the temperature drops to 2℃ below the maximum, a prompt is given to return to normal. When the system temperature is lower than the minimum, an alarm is triggered. When the temperature rises to 2℃ higher than the minimum, a prompt is given to return to normal.
PoE Temperature（℃）	Min: the alarm minimum limit. When the PoE temperature is lower than the minimum, an alarm will be triggered. Max: the alarm maximum limit. When the PoE temperature is higher than the maximum, an alarm will be triggered. The default minimum is -20℃ and the default maximum is 125℃; the minimum difference value between the Min and Max is 5℃。 When the PoE temperature is higher than the maximum, an alarm is triggered. When the temperature drops to 2℃ below the maximum, a prompt is given to return to normal. When the PoE temperature is lower than the minimum, an alarm is triggered. When the temperature rises to 2℃ higher than the minimum, a prompt is given to return to normal.
PoE Voltage(V)	Min: the alarm minimum limit. When the PoE voltage is lower than the minimum, an alarm will be triggered. Max: the alarm maximum limit. When the PoE voltage is higher than the maximum, an alarm will be triggered. The default minimum is 44V and the default maximum is 57V; the minimum difference value between the Min and Max is 5V. When the PoE voltage is higher than the maximum, an alarm is triggered. When the voltage drops to 1V below the maximum, a prompt is given to return to normal.

	When the PoE voltage is lower than the minimum, an alarm is triggered. When the voltage rises to 1V higher than the minimum, a prompt is given to return to normal.
PoE Consumption (%)	Threshold (%): PoE power consumption alarm value, and the default value is 80% which means that when the PoE power consumption reaches to 80% of the total power, an alarm is triggered. When the PoE power consumption is higher than the alarm value, an alarm is triggered. When the power consumption drops to 2% below the alarm value, a prompt is given to restore to normal.
Alarm Log Enable	Enable/disable alarm log. Enable by default.
Alarm Trap Enable	Enable/disable alarm trap. Disable by default.

Figure 3-82 Relay warning global configuration page



Trigger Relay Alarm

Select **Configuration** > **Relay Warning** > **Trigger Relay Alarm** in the navigation area to enter the Trigger Relay Alarm Configuration page as shown in *Figure 3-83*, the alarm port action configuration is shown in *Figure 3-84*, and the alarm PoE action configuration is shown in *Figure 3-85*. The configuration parameters are shown in *Table 3-37*.

Figure 3-83 Trigger relay alarm configuration

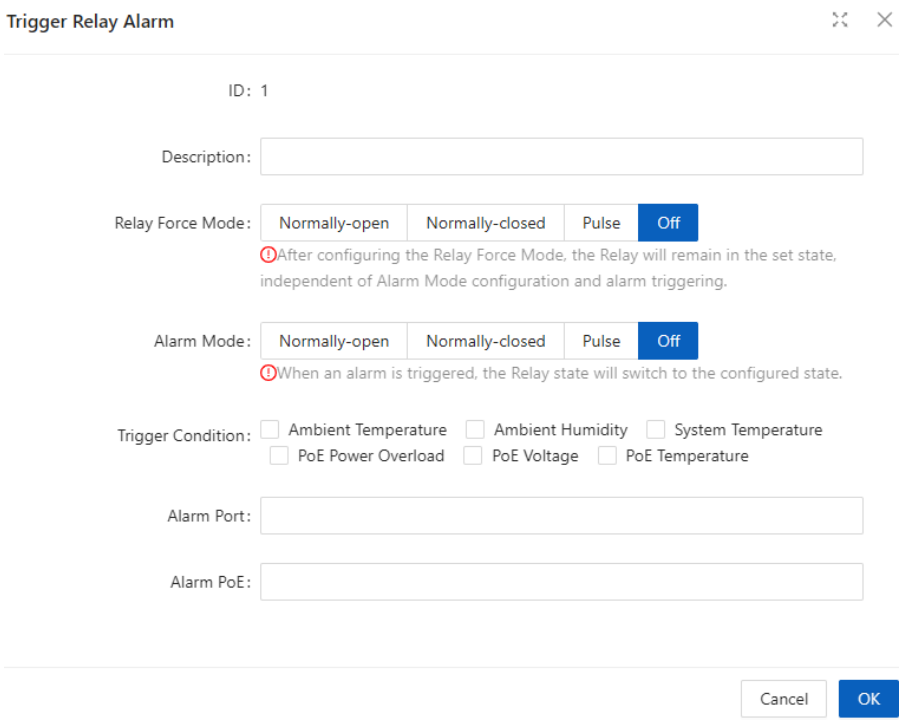


Figure 3-84 Alarm port action configuration

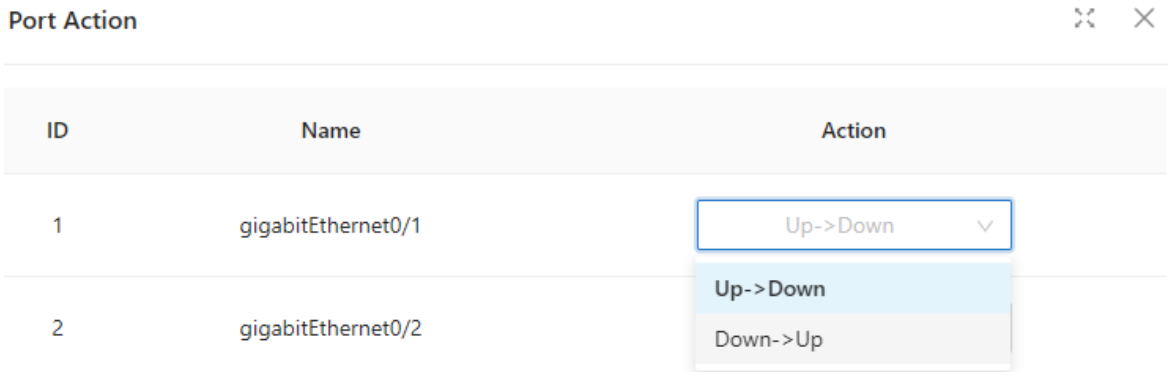


Figure 3-85 Alarm PoE port action configuration

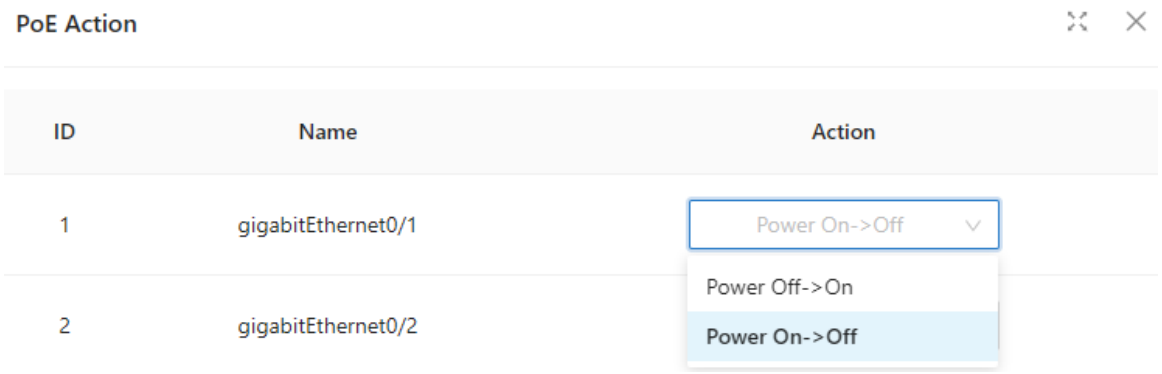


Table 3-37 The description items of trigger relay alarm

Item	Description
Alarm port action	**Up->Down**: port shutdown

	Down->Up: port link is down and then up
Alarm PoE action	**Power On->Off**: port PoE is powered off
	Power Off->On: port PoE is powered off and then powered on
ID	Relay output index parameters
Description	Relay output descriptors, up to 64 characters
Relay Force Mode	**Normally-open**: when configuration takes effect, the relay output is normally open **Normally-closed**: when configuration takes effect, the relay output is normally closed **Pulse**: when configuration takes effect, the relay output pulse level with 2s cycle and 50% duty cycle **Off**: function is off The default mode is Off. After configuring the Relay Force Mode, the relay will remain in the set state, independent of Alarm Mode configuration
Alarm Mode	**Normally-open**: when configuration takes effect, the relay output changes from normally closed to normally open after the alarm is triggered **Normally-closed**: when configuration takes effect, the relay output changes from normally open to normally closed after the alarm is triggered **Pulse**: when configuration takes effect, the relay output changes from normally open to pulse level with 2s cycle and 50% duty cycle after the alarm is triggered **Off**: function is off Off by default
Period(s)	The cycle of the relay from normally open to normally closed in pulse level status
Closed Time(s)	The closed time of relay in pulse level status
Trigger Condition	**Ambient Temperature**: ambient temperature exceeding the configuration limit will trigger the relay output alarm **Ambient Humidity**: ambient humidity exceeding the configuration limit will trigger the relay output alarm **System Temperature**: system temperature exceeding the configuration limit will trigger the relay output alarm

	PoE Power Overload: PoE power load exceeding the configuration limit will trigger the relay output alarm **PoE Voltage**: PoE chip voltage exceeding the configuration limit will trigger the relay output alarm **PoE Temperature**: PoE chip temperature exceeding the configuration limit will trigger the relay output alarm
Alarm Port	The port link changing from up to down or from down to up will trigger the relay output alarm
Alarm PoE	The port PoE changing from being powered on to being powered off or from being powered off to being powered on will trigger the relay output alarm

3.7.2.3 DI Configuration

Select **Configuration** > **Relay Warning** > **Digital Input Configuration** in the navigation area to enter the Digital Input Configuration page as shown in *Figure 3-86*, the Trigger Port Action page as shown in *Figure 3-87*, the Trigger PoE Action page as shown in *Figure 3-88*, and the description of the DI parameters as shown in *Table 3-38*.

Figure 3-86 DI configuration page

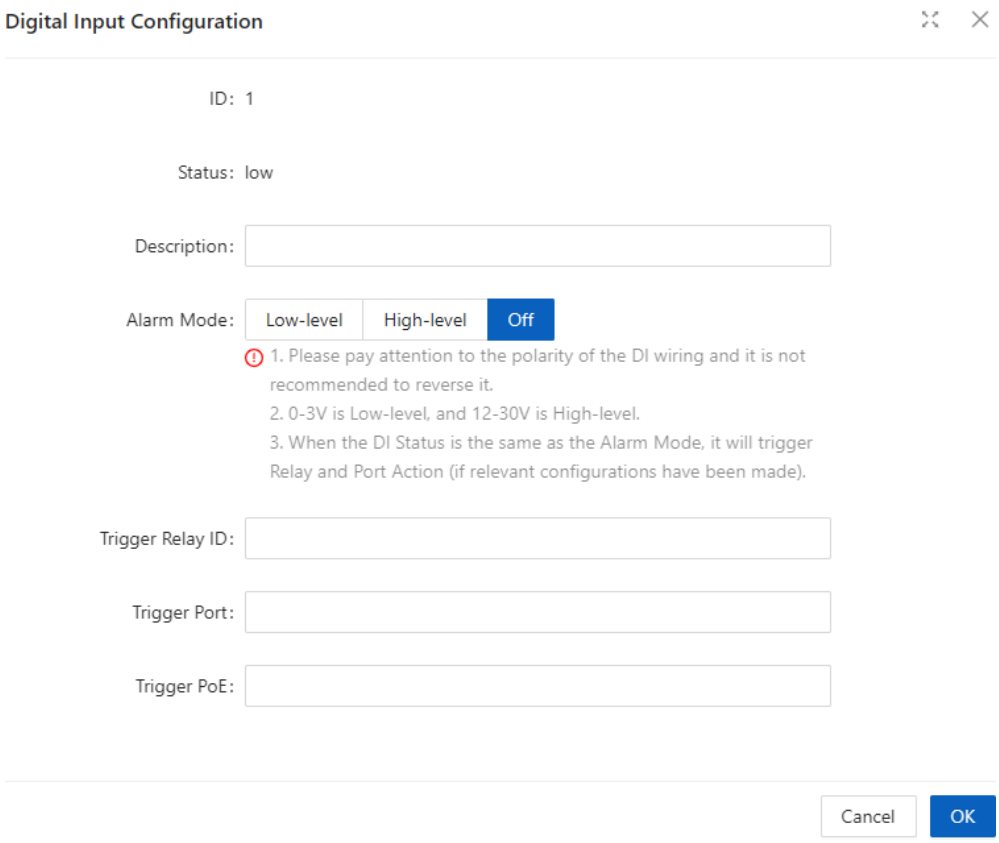


Figure 3-87 Trigger port action configuration

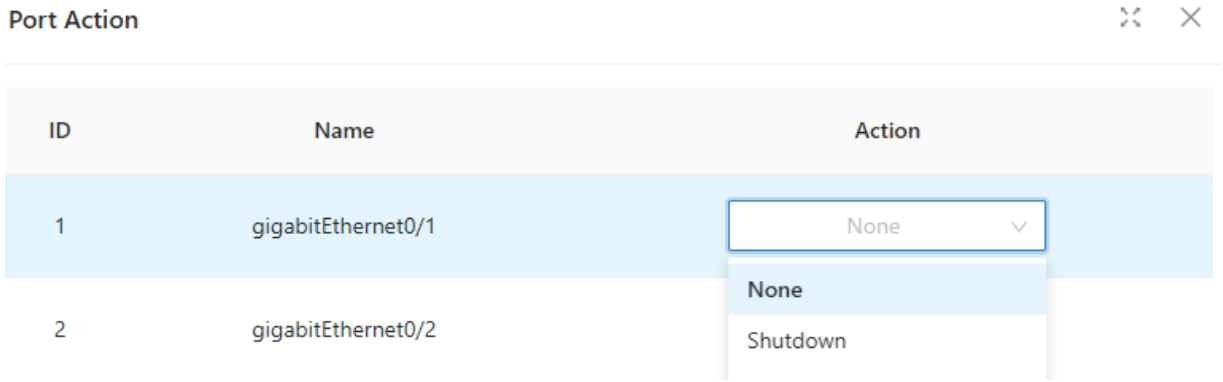


Figure 3-88 Trigger PoE action configuration

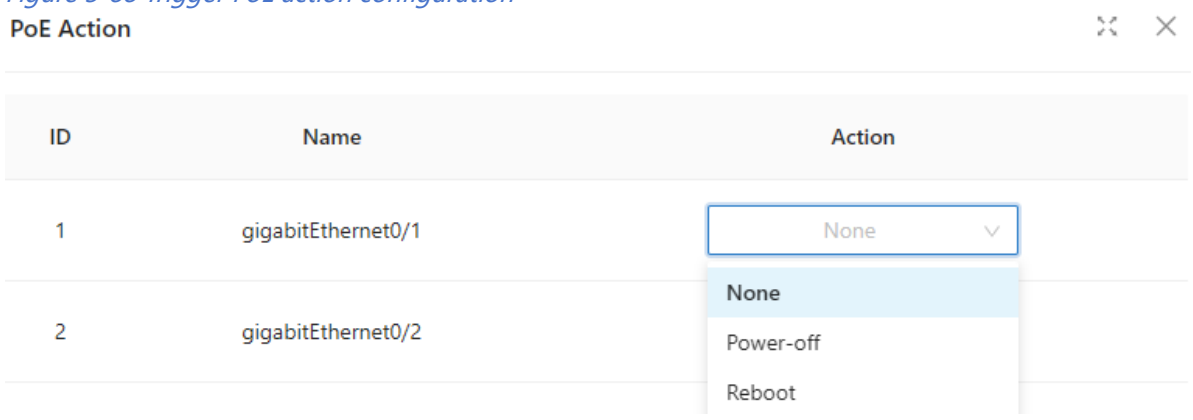


Table 3-38 The description of DI configuration parameters

Item	Description
Trigger Port Action	**None**: none action
	Shutdown: port shutdown, and if the DI alarm restore, no shutdown again
	Reboot: for the link-up port, down forcibly, and up again automatically
Trigger PoE Action	**None**: none action
	Power-off: power off the port PoE, and if the DI alarm restore, power on again
	Reboot: for the power-on port PoE, power off forcibly, and power on again automatically
ID	The DI input index parameter
Description	The DI input description, up to 64 characters
Alarm Mode	**Low-level**: low level trigger **High-level**: high level trigger **Off**: function is off Off by default
Trigger Relay ID	The relay index parameter associated with the DI input
Trigger Port	The trigger port associated with the DI input
Trigger PoE	The port PoE associated with the DI input

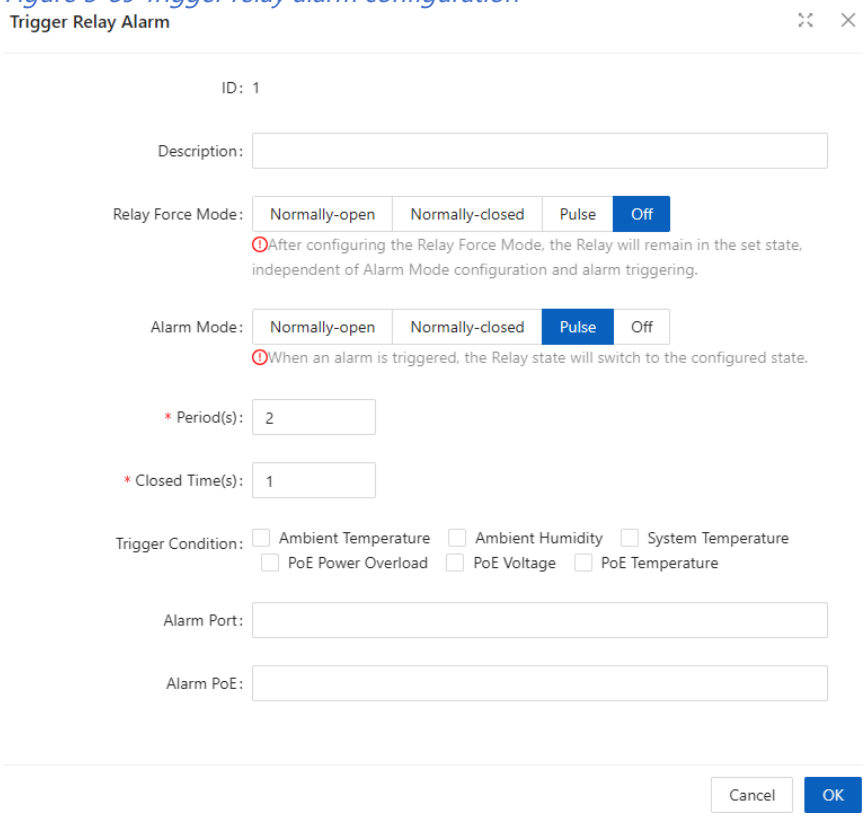
3.7.2.4 The Configuration Example

DI input connects the access control relay, the access control is closed by default, the DI input is low level and when access control is open, the DI input is high level. Relay output is connected to the external alarm LED, and when detect the access control is open, the LED is required to flashing. The switch detects the DI input alarm, prints the log locally, and sends the log to the log server.

Step 1: Select **Configuration** > **Relay Warning** in the navigation bar to enter the Relay Warning Configuration page.

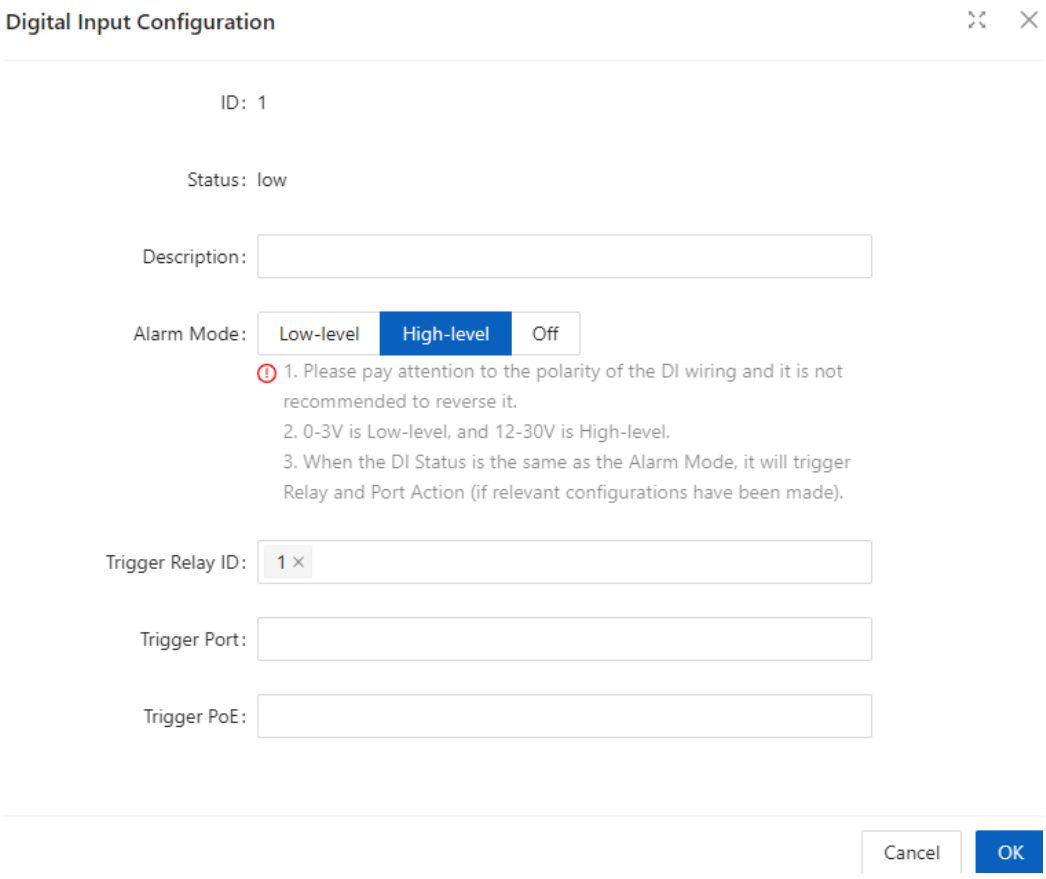
Step 2: Select Relay 1 in Trigger Relay Alarm and click the **Edit** button to enter the configuration page, fill in the parameter as shown in *Figure 3-89*, and then click **OK** button to complete.

Figure 3-89 Trigger relay alarm configuration



Step 3: Select DI 1 in Digital Input Configuration and click the **Edit** button to enter the configuration page, fill in the parameter as shown in *Figure 3-90*, and then click **OK** button.

Figure 3-90 Digital input configuration



Step 4: Click the **Save** button in the auxiliary area.

3.8 LoopDetect

3.8.1 Overview

LOOP-DETECT is an Ethernet loop detection protocol, which is used to quickly detect loop faults on downlink interfaces. If a fault is found, LOOP-DETECT will notify the user to manually close or automatically close the relevant port according to the fault handling method configured by the user, so as to avoid affecting the normal data exchange.

Enable control: Enable control is divided into global enable control and port enable control. When the global enable control is enabled and the loop detection is enabled on the port, the port supports the loop detection function.

Loop action: When a loop fault is detected on the port, the user will be notified to manually handle the loop fault by default, and the automatic closing of the port can also be configured. When the

port is automatically shut down, the port can recover from the fault by waiting for timeout, shutdown/no shutdown port, recovery command, or restarting the device.

Specify VLAN: By default, the port VLAN attribute is ignored; if you need to detect whether a loop fault occurs in a specific VLAN domain, you can configure the specified VLAN on the port, and only detect Whether there is a loop data path in this VLAN domain.

The device supports loop fault alarm and loop fault recovery message traps to the SNMP server, which is disabled by default.

3.8.2 Configure LoopDetect

LoopDetect Configuration

1. Select **Configuration** > **LoopDetect** in the navigation area to enter the LoopDetect page. This page contains two parts: Global Configuration and Port Configuration.

2. Turn on the loop detection switch in the global configuration page, configure the detection interval, turn on the Trap switch (optional), and click the **Apply** button to complete the configuration, as shown in *Figure 3-91*, the *Table 3-39* describes the items of PoE global configuration.

Figure 3-91 LoopDetect global configuration

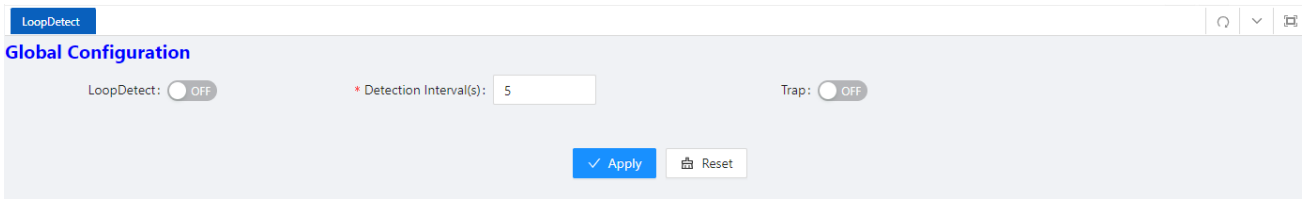


Table 3-39 Loop detection global configuration items

Item	Description
Loop detection	Turn on/off the loop detection function. The default is to turn off globally and the port
Detection interval	Configure loop detection interval, range 5-300 seconds, default 5 seconds
Trap	Enable/disable loop fault trap alarm

3. Click the **Batch Edit** button under Port Configuration or the **Edit** button behind the port that needs to be configured to enter the loop detection port configuration interface, configure the management status, violation handling method, VLAN domain detection, and select the required.

The port that enables this function is shown in *Figure 3-92*, and the parameter description is shown in *Table 3-40*.

Figure 3-92 LoopDetect port configuration

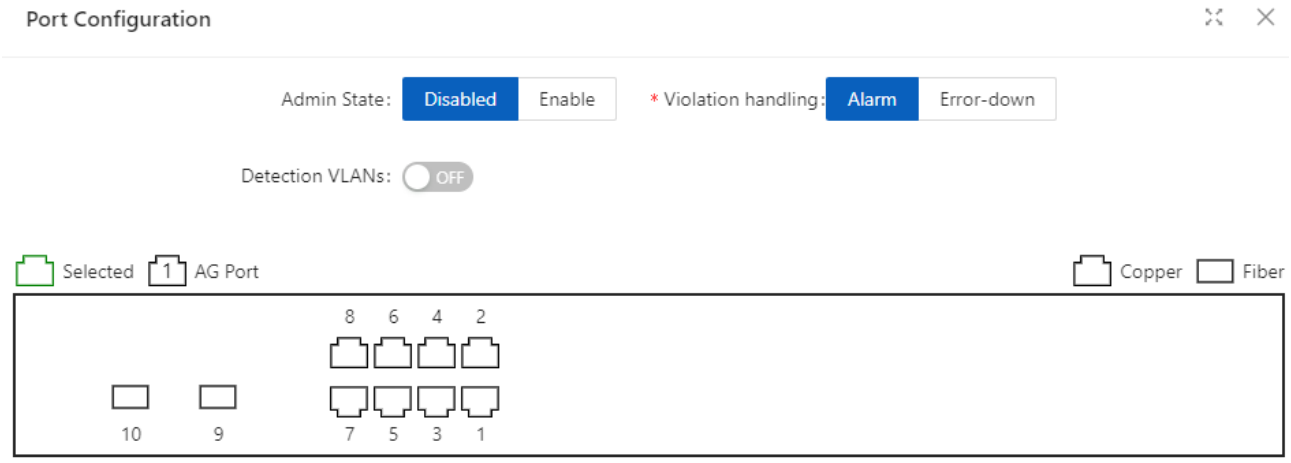


Table 3-40 Loop detection port configuration items

Item	Description
Admin State	Enable: Enable the loop detection function of the port Disabled: Turn off the loop detection function of the port
Violation handling	Alarm: Trap alarm when a loop occurs Error-down: When a loop occurs, shut down the loop port
Detection VLANs	Detect whether a data path loop occurs within the specified VLAN domain

3.9 DNS

3.9.1 Overview

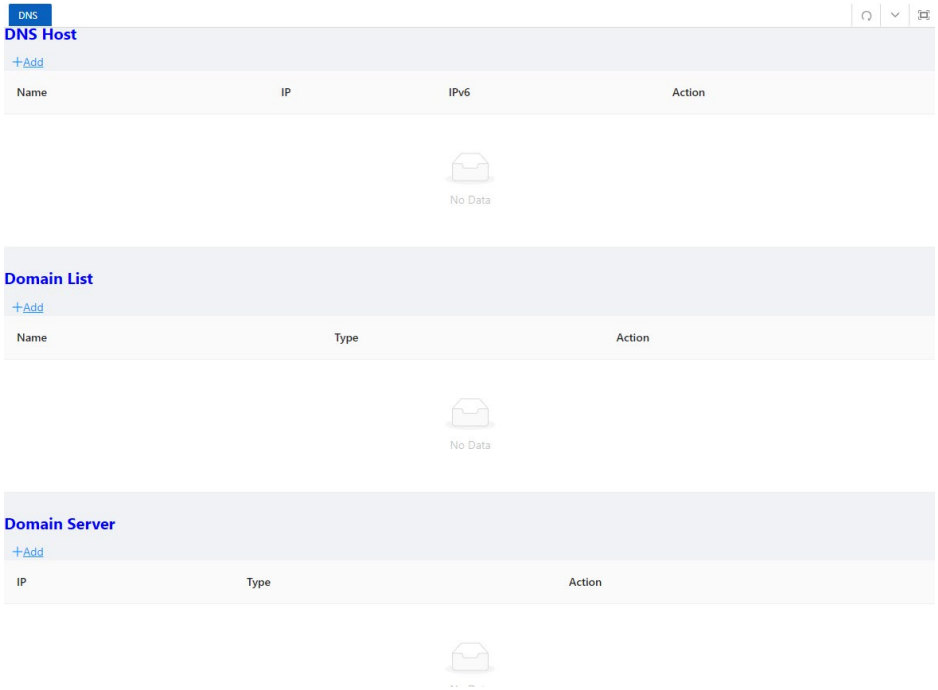
The Domain Name System (DNS) is a crucial and widely used system in a network environment with a TCP/IP architecture. DNS primarily provides a translation and query mechanism between IP addresses and host names to convert less memorable IP address into easily memorable domain names. The process of converting a host name to its corresponding IP address is known as domain name resolution (or host name resolution). Initially, static domain name resolution can be attempted when resolving a domain name; if this fails, dynamic domain name resolution can be used. Commonly used domain names can be added to a static domain name resolution table to

enhance the resolution efficiency. Both the TCP and UDP ports for DNS are 53, and UDP is typically used.

3.9.2 Configure DNS

Select **Configuration** > **DNS** in the navigation area to enter the DNS page which contains three parts, as shown in *Figure 3-93*.

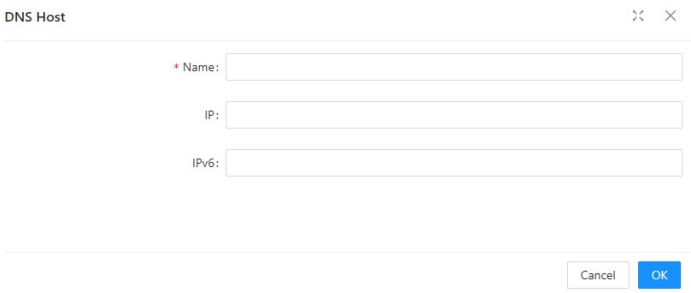
Figure 3-93 DNS configuration



3.9.2.1 Configure Static Domain

Click the **+Add** button under the DNS Host to enter the DNS Host page, as shown in *Figure 3-94*.

Figure 3-94 DNS host configuration



Fill in the parameters as required, and click the **OK** button to complete the configuration.

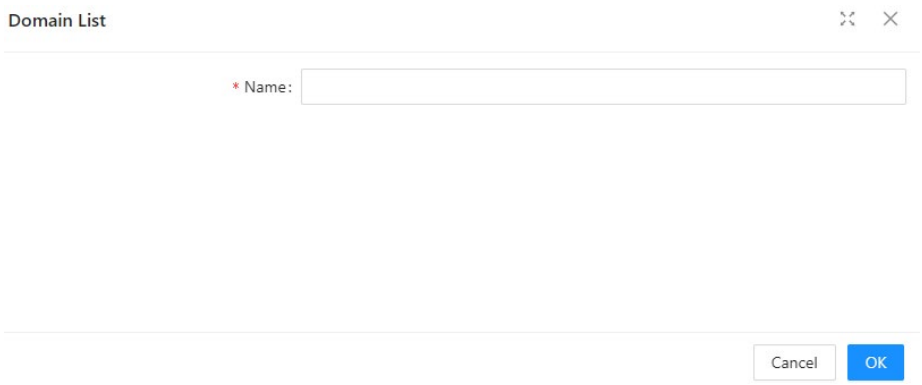
NOTE:

- A switch can have up to 100 static DNS items configured.

3.9.2.2 Configure Dynamic Domain

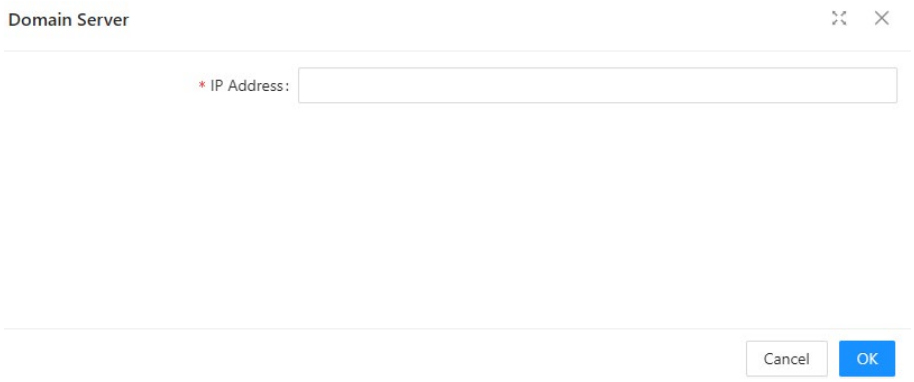
Click the **+Add** button under the Domain List to enter the Domain List Configuration page, as shown in *Figure 3-95*.

Figure 3-95 Domain list configuration



Click the **+Add** button under the Domain Server to enter the Domain Server Configuration page, as shown in *Figure 3-96*.

Figure 3-96 Domain server configuration



Fill in the parameters as required, and click the **OK** button to complete the configuration.

NOTE:

- A switch can be configured with up to 6 domain name suffixes.
- When the user enters a host name that does not contain a fully qualified domain name (FQDN), the system will attempt to resolve the DNS by appending these domain name suffixes to the host name in turn.

3.9.3 A Configuration Example

Case requirement: SWITCH can access the Server with IP address 2.2.2.106 through the domain name www.test.com.

1. Select **Configuration** > **DNS** in the navigation area to enter the DNS page.

2. Click the +**Add** button under DNS Host to enter the configuration page, fill in the parameters according to the requirements, as shown in *Figure 3-97*.

3. Click **OK** button to complete the configuration.

4. Click **Save** button in the auxiliary area.

Figure 3-97 Static domain name configuration

3.10 Time Range

3.10.1 Overview

Time Range (Time Control Service) is a refined time management tool provided by the device. Its core function is to create custom time periods and reference them in ACL and PoE services to achieve the effect of "triggering/ending business strategies on time". For example, it can block network access or turn on power supply at a scheduled time.

Time Range supports two methods to define time periods: absolute time range and periodic time range.

Absolute time range:

- It represents a time range with a specified start time and end time. For example, from 00:00 on January 1st, 2000 to 23:59 on January 3rd, 2000.
- When using an absolute time range, it will check whether the current system time is within the absolute time range when a business that references the Time Range enables a certain function. If it is not, the function will not take effect.

Period time range:

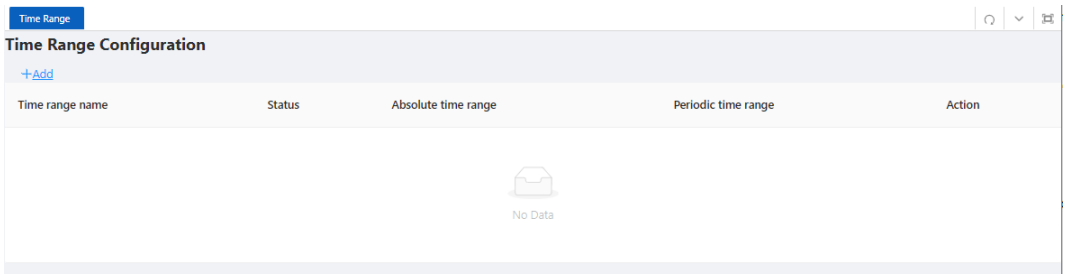
- It represents a periodic time range. For example, "from 8:00 every Monday to 17:00 every Friday".
- When using the periodic time range, it will judge whether the current system time is within the periodic time when the business that references Time Range enables a certain function. If not, the function will not take effect.

Currently, Time Range can be directly associated with services that require time triggering, such as ACL and PoE, to achieve the linked control of "time + business".

3.10.2 Configure Time Range

Select **Configuration** > **Time Range** in the navigation bar to enter the Time Range Configuration page, as shown in *Figure 3-98*.

Figure 3-98 Time range configuration page



Click the **Add** button to enter the detail configuration page, as shown in *Figure 3-99*, *Table 3-41* describes the configuration items.

Figure 3-99 Time range detail configuration page

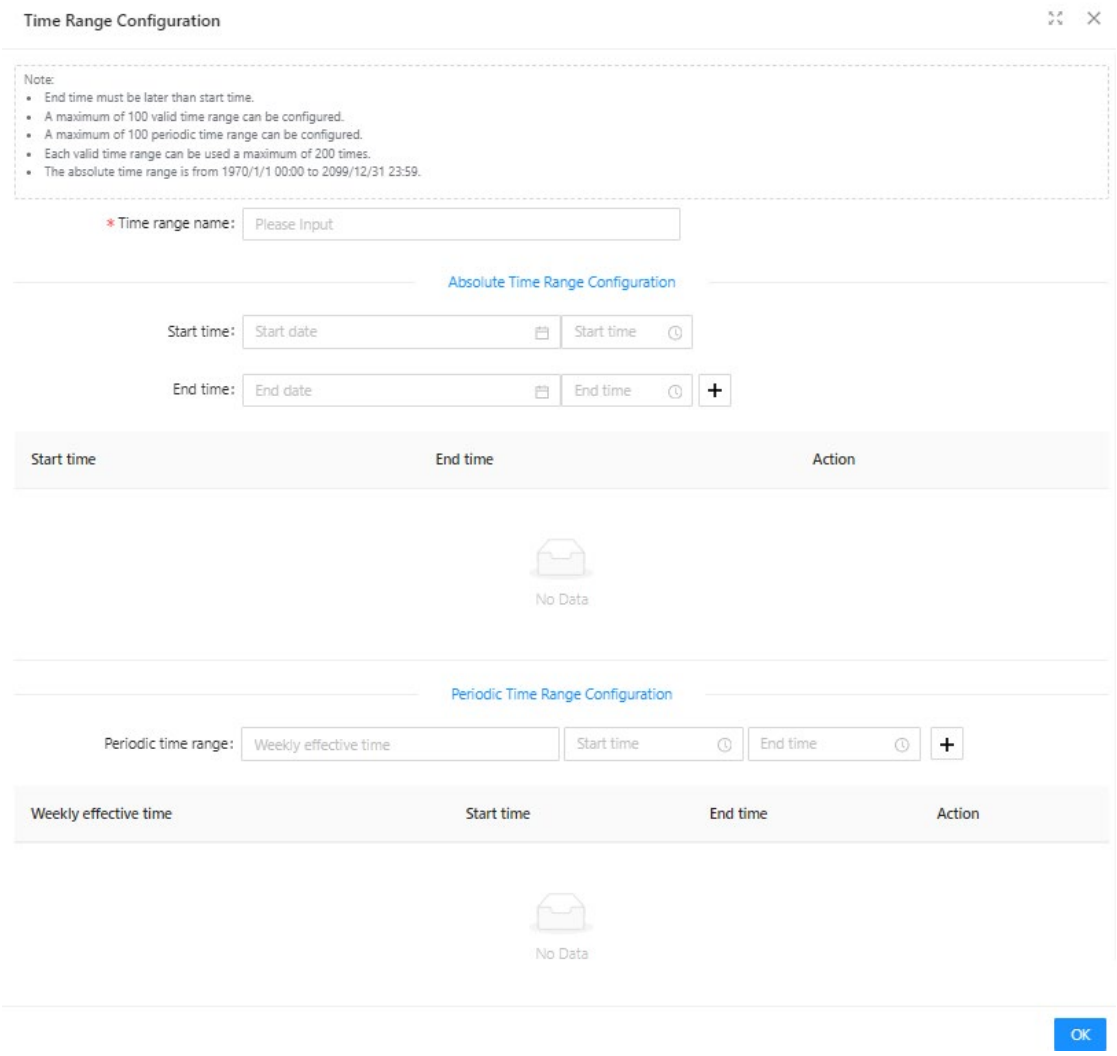


Table 3-41 Time range parameter's description

Item		Description
Time range name		It supports a maximum of 32 bytes.
Absolute Time Range Configuration	Start time	Configure the start time. Setting it to 00:00 represents the start of a day.
	End time	Configure the end time. Setting it to 00:00 represents the end of a day.
Periodic Time Range Configuration		Day-of-week: support the following combinations: Daily: Every day (Monday to Sunday). Weekdays: Monday to Friday. Weekend: Saturday、Sunday. Monday – Sunday: can choose any combination of several day.

	A time-range can supports up to 100 time period range and the end time must be later than the start time. Configuring 00:00 for the start time indicates the start of a day while configuring 00:00 for the end time indicates the end of a day.

NOTE:

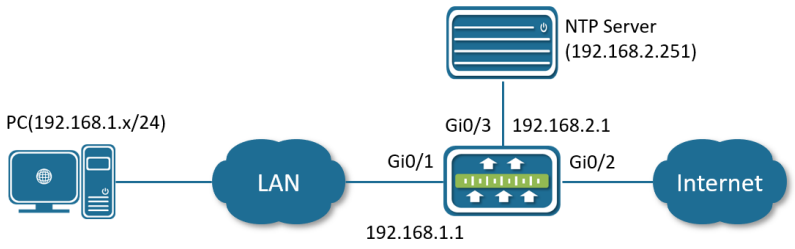
- When the absolute time range and the periodic time range are configured separately for time-range, the valid time of the time-range is the set time range; when both are configured, the valid time is the intersection of the two.
- When time-range is configured as empty, the default time-range takes effect.
- A single time-range can be referenced up to 200 times. Each reference by an ACL rule and each reference by PoE count as one.

3.10.3 The Configuration Example

Case requirement:

Traffic control will be implemented in the dormitory. From Monday to Friday, internet access will be blocked from 8:00 to 18:00. Internet access is allowed at other times. This can be achieved by coordinating ACL with Time Range. The dormitory network segment is 192.168.1.1/24.

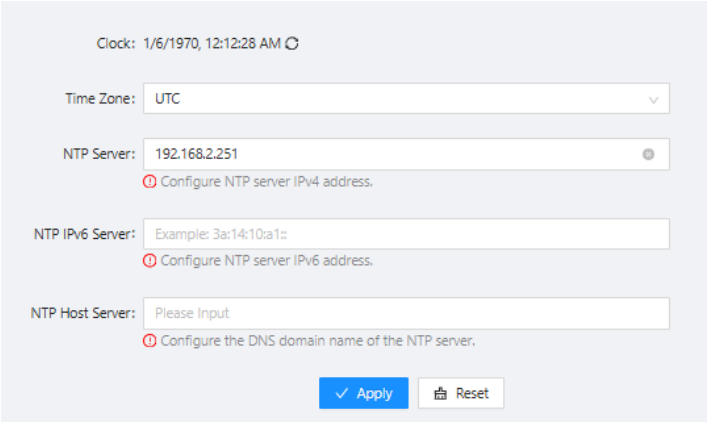
Figure 3-100 Case topology



Configuration steps:

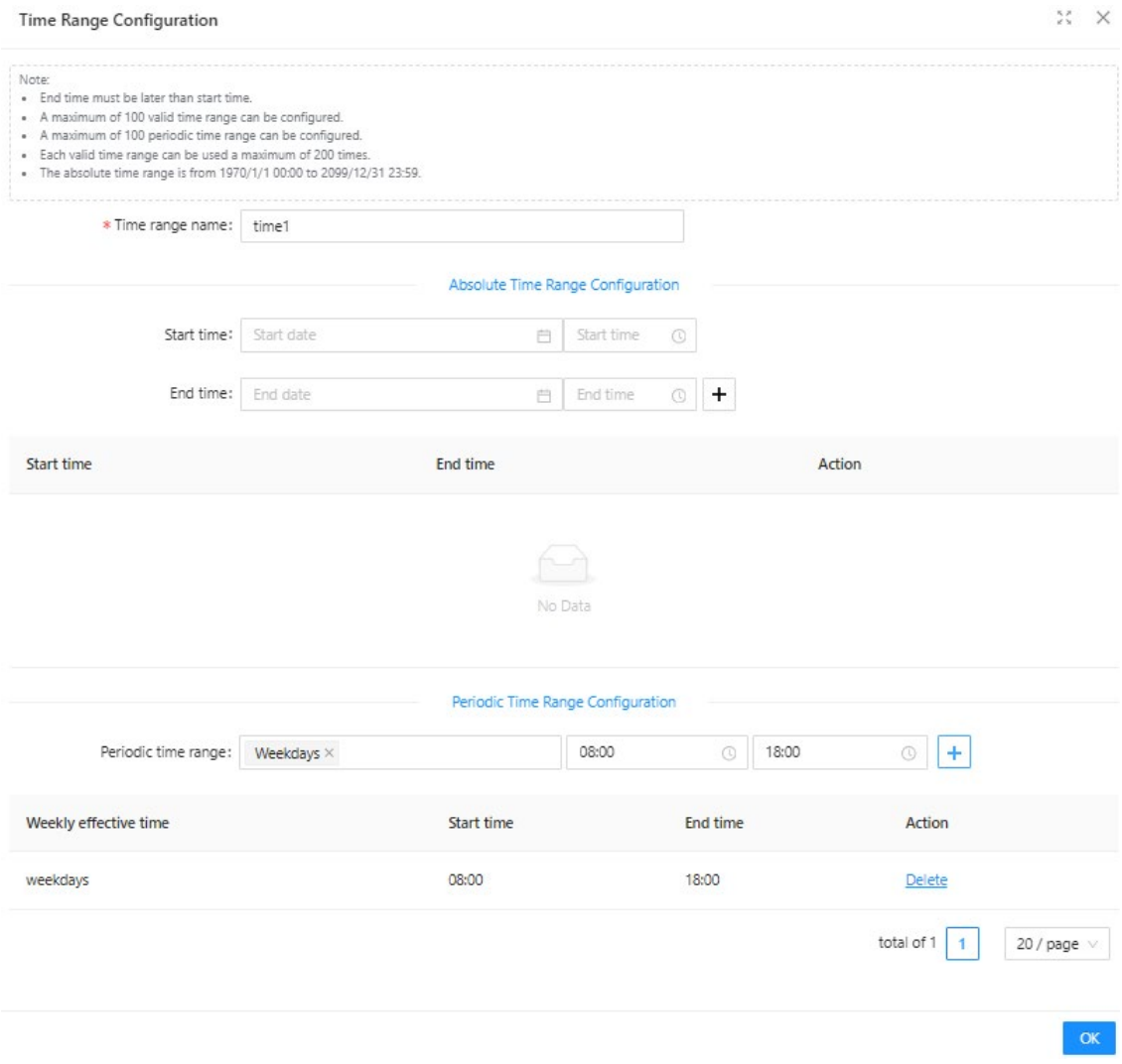
Step 1: Configure the NTP server for the device. Select **Maintenance > Time Management** in the navigation bar as shown in *Figure 3-101.* Fill in the relevant parameters and click **Apply** to complete the configuration.

Figure 3-101 Time management configuration page



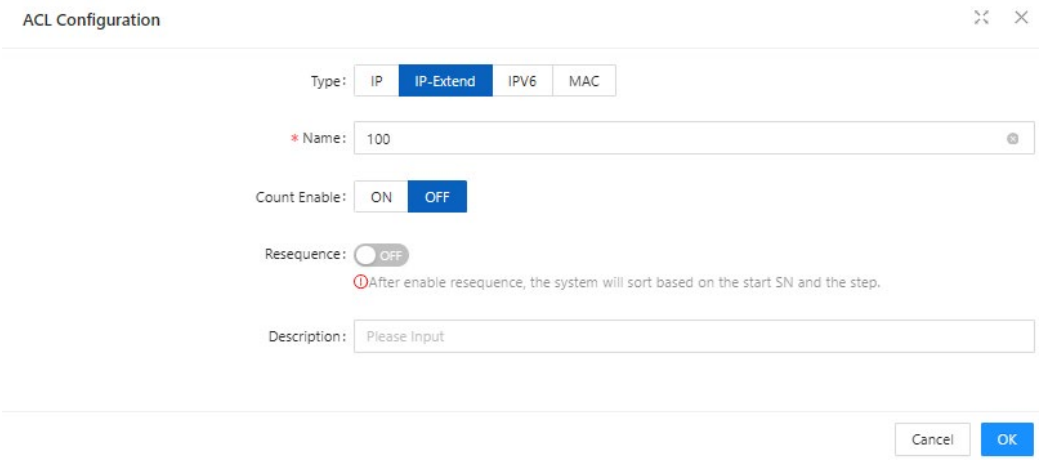
Step 2: Select **Configuration > Time Range** in the navigation bar to enter the Time Range page. Click **+Add** under the title, as shown in *Figure 3-102,* complete the relevant parameters as showing and finally click **OK** to finish the configuration.

Figure 3-102 Time range configuration page



Step 3: Select **Advanced > Security > ACL Configuration** in the navigation bar to enter the ACL Configuration page. Click **+Add ACL** under the title to enter ACL Configuration modal, as shown in *Figure 3-103*, complete the relevant parameters as figure and finally click **OK** to add the ACL.

Figure 3-103 ACL adding page



Step 4: Select **Advanced > Security > ACL Configuration > ACE Configuration** in the navigation bar to enter the ACE Configuration page. Select the "100" ACL to enter ACE Configuration modal, input the relevant parameters as shown in *Figure 3-104*, *Figure 3-105* and then click **OK** to add two ACE rules, as shown in *Figure 3-106* .

Figure 3-104 ACE configuration page

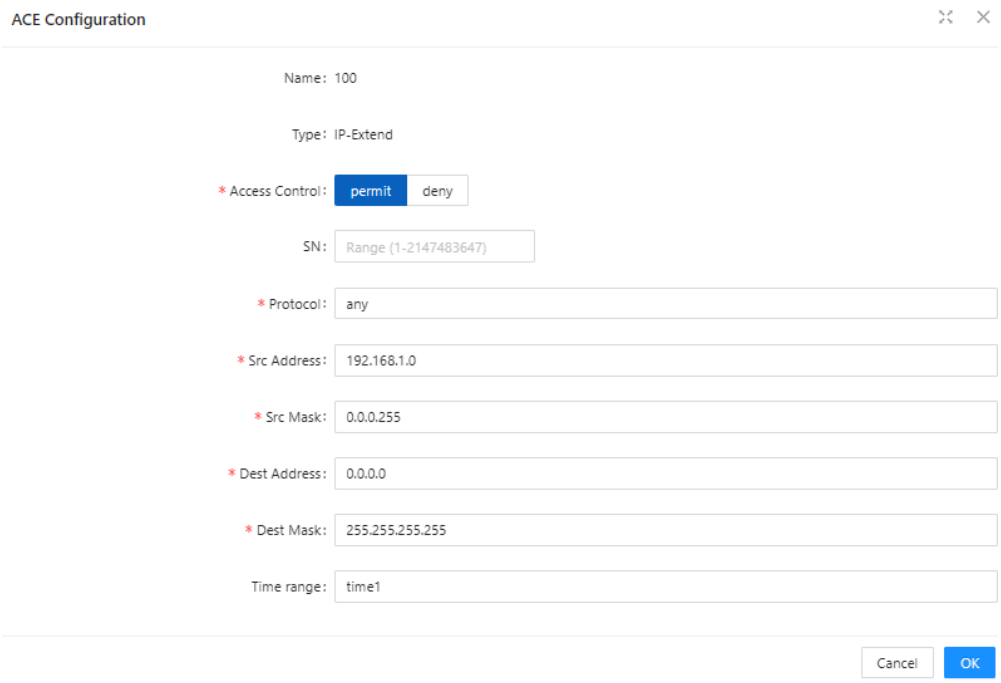


Figure 3-105 ACE configuration page

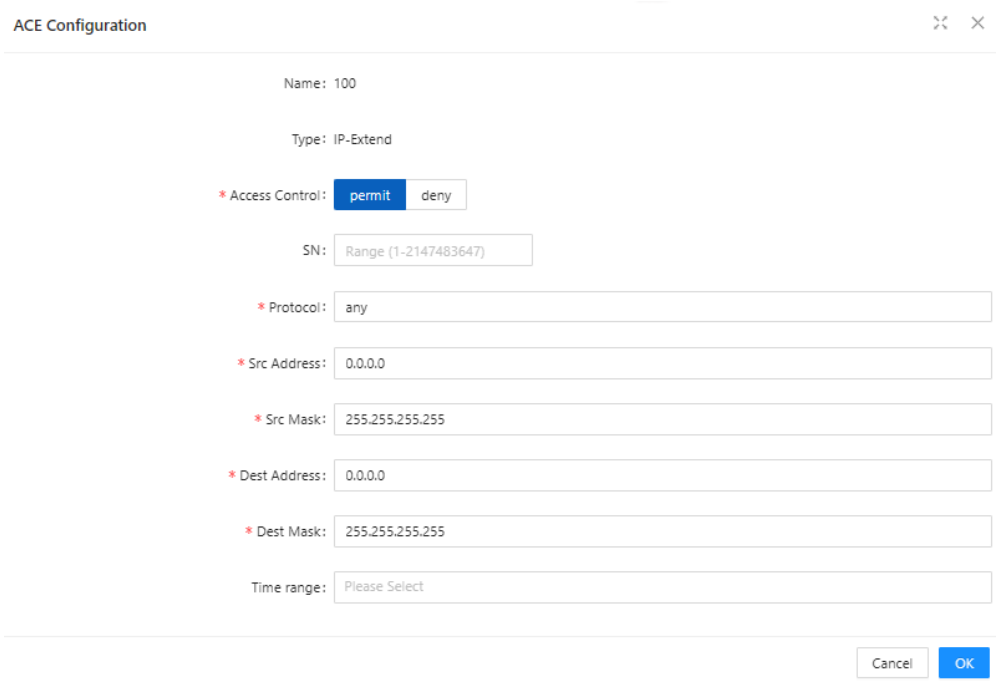
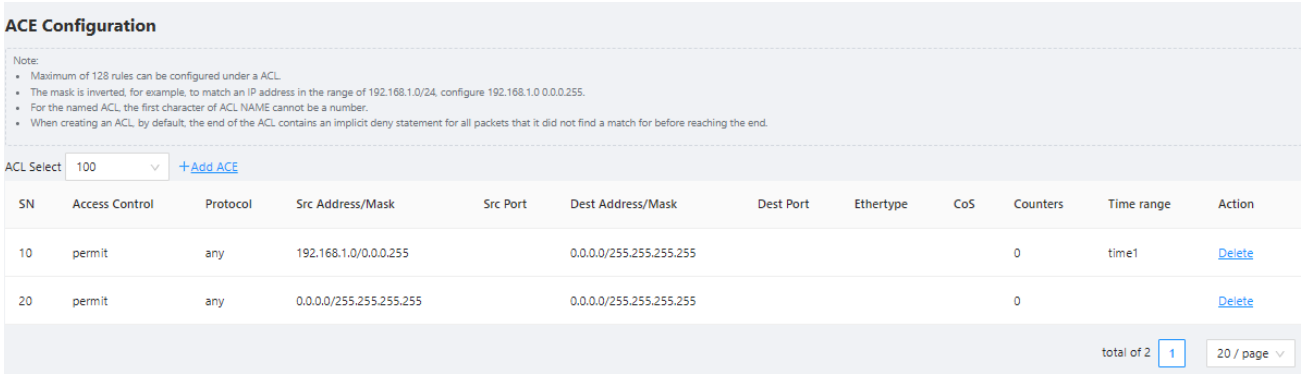
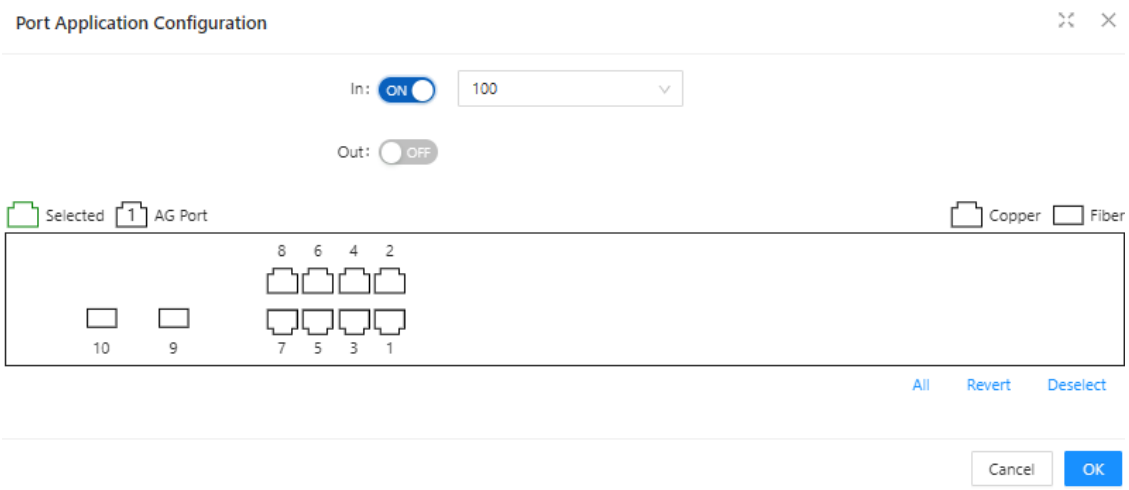


Figure 3-106 ACE state page



Step 5: Select **Advanced > Security > ACL Configuration > Port Application Configuration** in the navigation bar to enter the port configuration page. Click **Batch Edit** to enter Port Application Configuration modal, input the relevant parameters as shown in *Figure 3-107* and click **OK** to finish such configuration.

Figure 3-107 Port application configuration page



Step 6: Click **Save** button in the navigation bar to save configuration.

4. Advance

4.1 LLDP

4.1.1 Overview

In a heterogeneous network, a standard configuration exchange platform ensures that different types of network devices from different vendors can discover one another and exchange configuration.

The Link Layer Discovery Protocol (LLDP) is specified in IEEE 802.1AB. The protocol operates on the data link layer to exchange device information between directly connected devices. With LLDP, a device sends local device information as TLV (type, length, and value) triplets in LLDP Data Units (LLDPDUs) to the directly connected devices. Local device information includes its system capabilities, management IP address, device ID, port ID, and so on. The device stores the device information in LLDPDUs from the LLDP neighbors in a standard MIB. LLDP enables a network management system to quickly detect and identify Layer 2 network topology changes.

NOTE:

- TLV for PoE-related sections is not supported.

4.1.2 Configure LLDP

LLDP Global Configuration

Select **Advance** > **Layer2** > **LLDP Configuration** in the navigation area to enter the Global Configuration page, as shown in *Figure 4-1*. *Table 4-1* describes the Global Configuration items.

1. Click enable button behind **Status**.
2. Type the boxes behind of the **System Name** and **Description**.
3. Click **Apply** button to enable LLDP Configuration.

Figure 4-1 LLDP global configuration

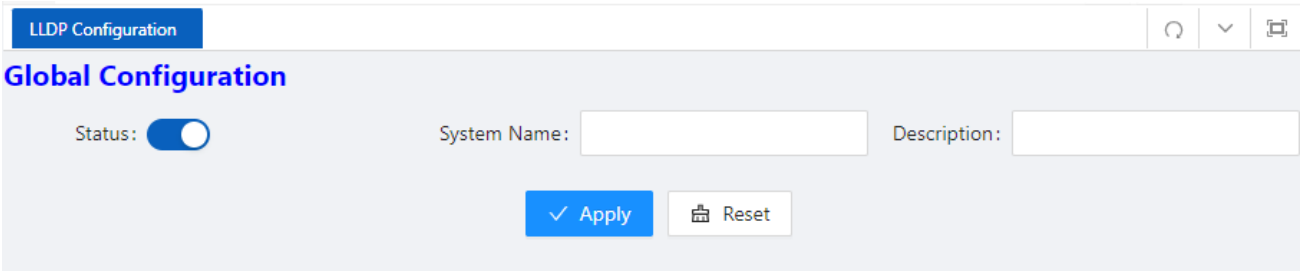


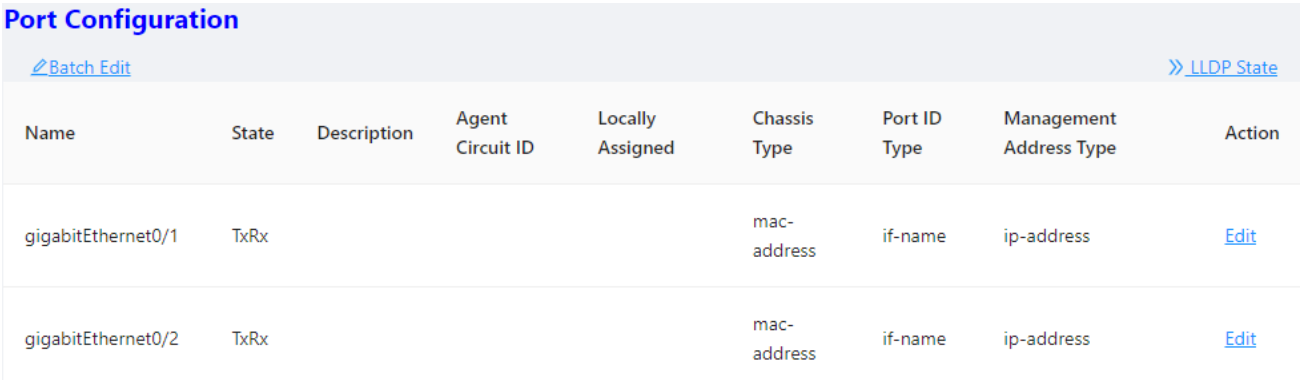
Table 4-1 LLDP global configuration items

Item	Description
Status	Disable: global disable Enable: global enable
System Name	The name of the device, can be empty
Description	Description of the system, can be empty
Apply	Click to enable

4.1.2.1 LLDP Port Setting

1. The LLDP Port Configuration page appears after global configuration is enabled, as shown in *Figure 4-2*.

Figure 4-2 LLDP port configuration status



2. Click **Batch Edit** button below Port Configuration or **Edit** button correspond of the port to enter the page for configuring ports, as shown in *Figure 4-3*. *Table 4-2* describes the configuration items of configuring ports.

Figure 4-3 LLDP port status

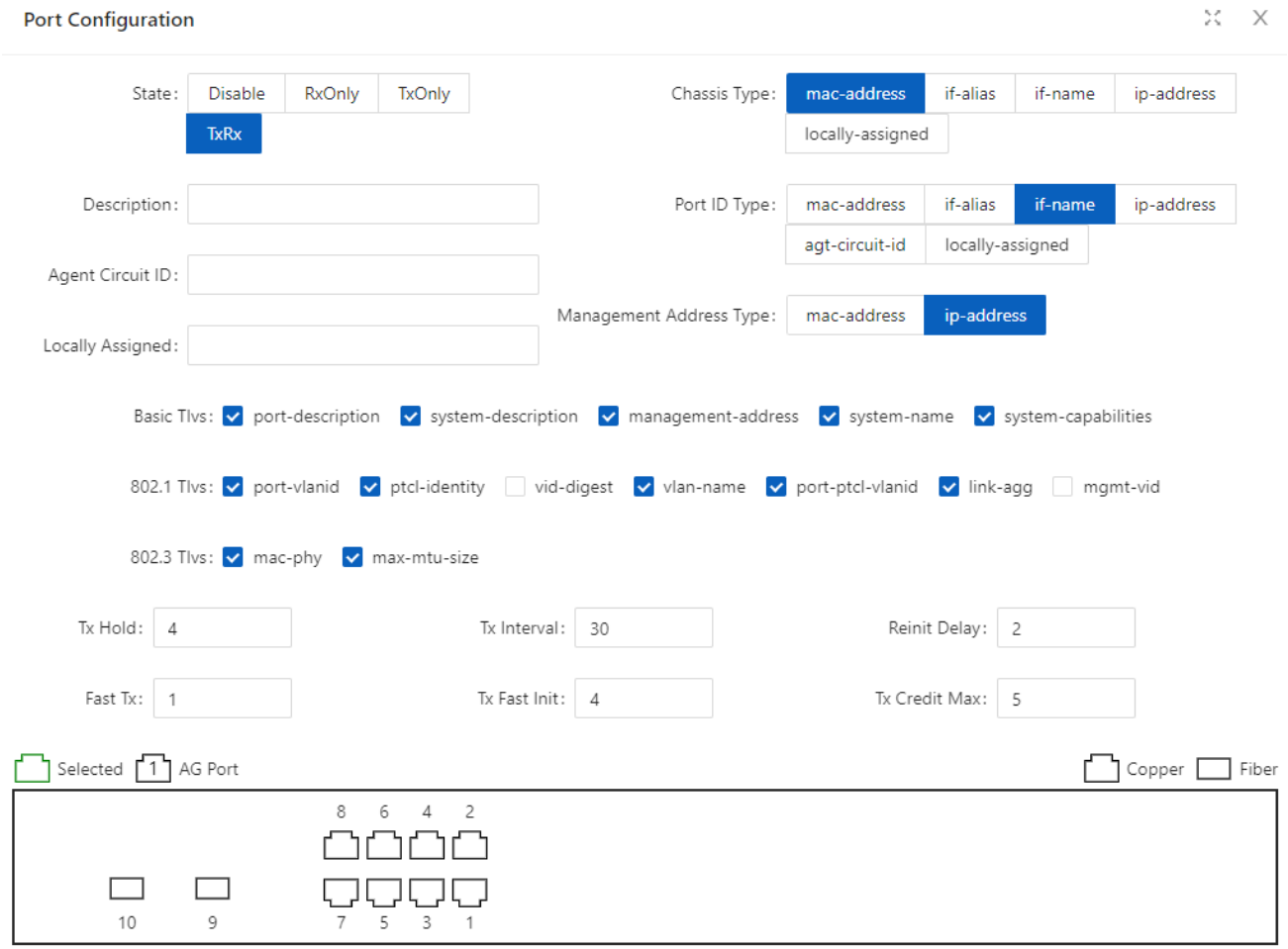


Table 4-2 LLDP port configuration items

Item	Description
Description	Description of the currently configured LLDP port
Agent Circuit ID	Agent circuit identification. Can be used as a value for port-id-tlv
Locally Assigned	Locally Assigned
Admin Status	Disabled: No LLDP packets are sent/receive on the interface TxOnly: LLDP packets are sent on the interface RxOnly: LLDP packets are received on the interface TxRx: LLDP packets are sent/receive on the interface
Chassis Subtype	Mac-address: indicates the MAC address If-alias: Indicates the interface alias If-name: indicates the interface name IP-address: Indicates the IP address Locally-assigned: indicates local configuration

Port ID Subtype	Mac-address: indicates the MAC address If-alias: Indicates the interface alias If-name: indicates the interface name IP-address: Indicates the IP address Agt -circuit-id: Indicates the agt-circuit-id Locally-assigned: indicates locally-assigned value
Management Address Subtype	Mac-address: Device MAC address IP-address: Device IP address
Basic Tlvs	port-description: port descriptor system-description: system descriptor management-address: management address system-name: system name system-capabilities: system capabilities
802.1 Tlvs	port-vlanid: port's vlanid ptcl -identity: protocol id vid-digest: vid digest vlan-name: vlan name port-ptcl - vlanid: port protocol vlanid link- agg mgmt -vid: Link Aggregation Management vid
802.3 Tlvs	mac-phy: The rate and duplex status supported by the port, whether it supports port rate auto-negotiation, whether the auto-negotiation function is enabled, and the current rate and duplex status max - mtu -size: maximum mtu value
Tx hold	Transmission hold, the default value txFastInit is 4, used for packet TTL calculation; TTL= msgTxInterval * msgTxHold + 1
Tx interval	Transfer intervals, default is 30 s; admin can change this value to any value between5and 300
Reinit delay	Indicates the amount of delay between when adminStatus becomes ' disabled' and when re-initialization is attempted. The default value of reinitDelay is 2 s

Fast tx	Defines the time interval for the timer interval between two transfers within a fast transfer period (ie txFast is not zero). The default value for msgFastTx is 1; administrators can change this value to any value between 1 and 3600
Tx fast init	This variable is used as the initial value of the txFast variable. This value determines the number of LLDPDUs transmitted during the fast transmission period
Tx credit max	Configure the maximum value of txCredit. The default value is 5. Administrators can change this value to any value in the range 1 to 10

4.1.2.2 View LLDP State

In the current page, click the **LLDP State** button on the right to enter the LLDP State page, as shown in *Figure 4-4*, and the specific parameters are described as described in *Table 4-3*.

Figure 4-4 LLDP port statistics

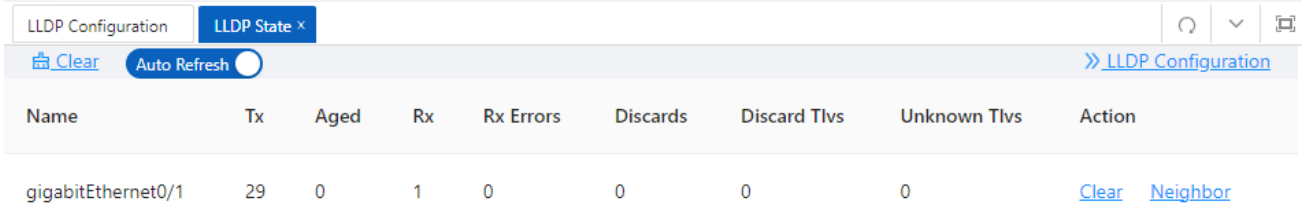


Table 4-3 LLDP port configuration items

Item	Description
Name	Description of the currently configured LLDP port
Tx	The number of packets sent on the interface
Aged	The number of packets aged on the interface
Rx	The number of packets received on the interface
Rx Errors	The number of error packets received on the interface
Discards	The number of packets discarded on the interface
Discard Tlvs	The number of Tlv packets of discarded on the interface
Unknown Tlvs	The number of unknown Tlvs packets on the interface
CLEAR	Clear counters on the current interface

4.1.2.3 View Neighbor Information

On the current LLDP State page, click the **Neighbor** button of the corresponding port to enter the Neighbor Information view interface.

Figure 4-5 LLDP neighbor information

4.2 IGMP Snooping

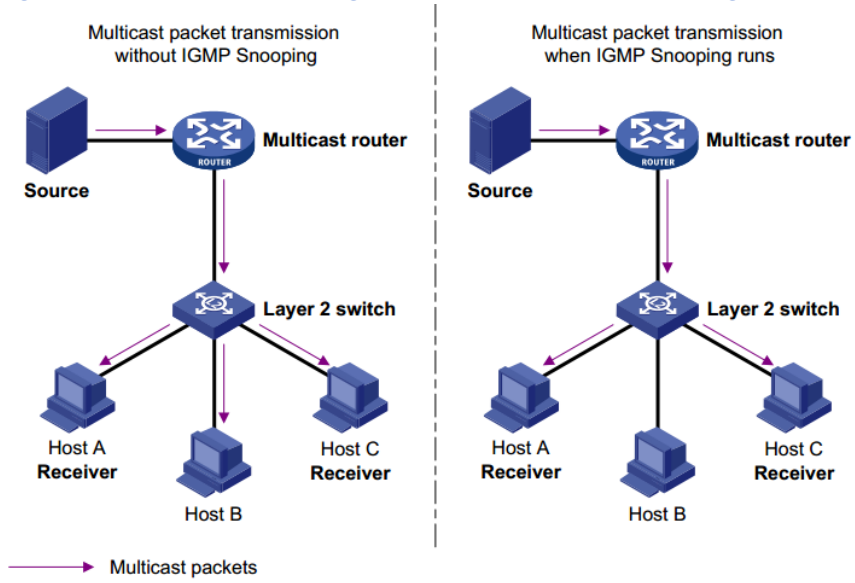
Internet Group Management Protocol Snooping (IGMP Snooping) is a multicast constraining mechanism that runs on Layer 2 devices to manage and control multicast groups.

4.2.1 Principle of IGMP Snooping

By analyzing received IGMP messages, a Layer 2 device running IGMP snooping establishes mappings between ports and multicast MAC addresses and forwards multicast data based on these mappings. As shown in *Figure 4-6*, when IGMP snooping is not running on the switch,

multicast packets are flooded to all devices at Layer 2. However, when IGMP snooping is running on the switch, multicast packets for known multicast groups are multicast to the receivers, rather than broadcast to all hosts, at Layer 2.

Figure 4-6 Multicast forwarding before and after IGMP snooping runs



4.2.2 Configure the IGMP Snooping

4.2.2.1 Global Configuration

Select **Advance** > **Layer2** > **IGMP Snooping Configuration** in the navigation area to enter the Global Configuration page, as shown in *Figure 4-7*. *Table 4-4* describes the IGMP snooping configuration items.

Figure 4-7 IGMP global configuration

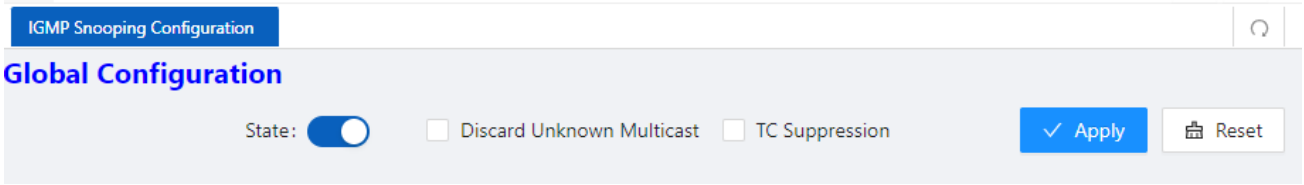


Table 4-4 IGMP snooping summary items

Item		Description
	State	Disabled: global disable Enabled: global enable

Global Configuration	Discard Unknown Multicast	If this option is enabled, unknown multicast traffic will be dropped by switch
	TC Suppression	If this option is enabled, topology change event will be ignored by switch

4.2.2.2 IGMP M-router Interface Configuration

1. Select **Advance** > **Layer2** > **IGMP Snooping Configuration** in the navigation area to enter the IGMP M-router Interface section as shown in *Figure 4-8*. *Table 4-5* describes the IGMP M-router Interface configuration items.

Figure 4-8 IGMP M-router interface

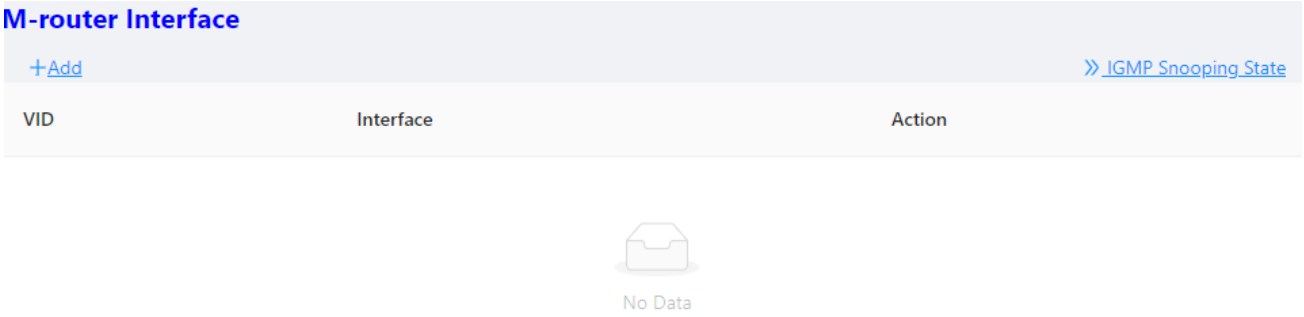


Table 4-5 GMP M-router interface items

Item		Description
IGMP M-router Interface	VID	VLAN ID
	Interface	Interface Name
	Delete	Click to delete this entry

2. Click the **+Add** button to create an IGMP M-router Interface, as shown in *Figure 4-9*. Configure VID and Interface, then click **OK**.

Figure 4-9 Creating IGMP M-router interface

4.2.2.3 IGMP Static Group Configuration

1. Select **Advance** > **Layer2** > **IGMP Snooping Configuration** in the navigation area to enter the IGMP Static Group section as shown in *Figure 4-10*. *Table 4-6* describes the IGMP static group configuration items.

Figure 4-10 IGMP static group

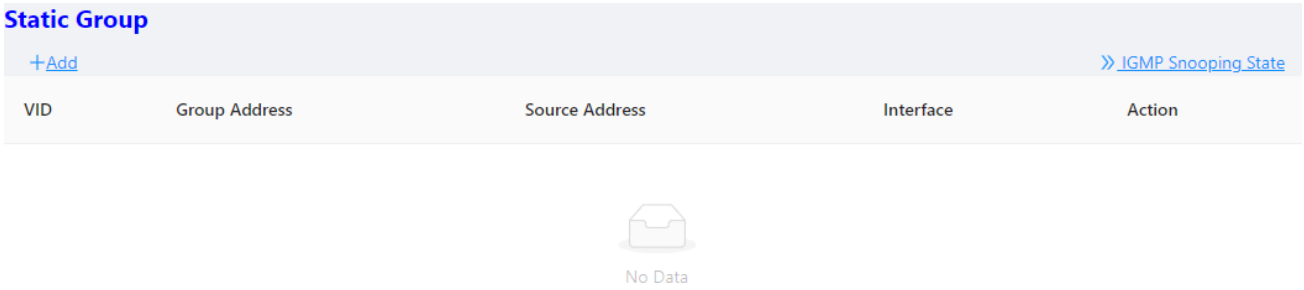


Table 4-6 IGMP static group items

Item		Description
IGMP Static Group	VID	VLAN ID
	Group Address	Group IP address
	Source Address	Source IP address
	Interface	Interface name
	Delete	Click to delete this entry

2. Click the **+Add** button to create an IGMP static group, as shown in *Figure 4-11*. Configure "VID", "Group Address", "Source Address" and "Interface", then click **OK**.

Figure 4-11 Creating IGMP static group

4.3 MAC Management

4.3.1 Overview

A device maintains a MAC address table for frame forwarding. Each entry in this table indicates the MAC address of a connected device, to which interface this device is connected and to which VLAN the interface belongs. A MAC address table consists of two types of entries: static and dynamic. Static entries are manually configured and never age out. Dynamic entries can be manually configured or dynamically learned and will age out.

Your device learns a MAC address after it receives a frame from a port, port A for example, as it executes the following steps.

1. Checks the frame for the source MAC address (MAC-SOURCE for example).

2. Looks up the MAC address table for an entry corresponding to the MAC address and do the following:

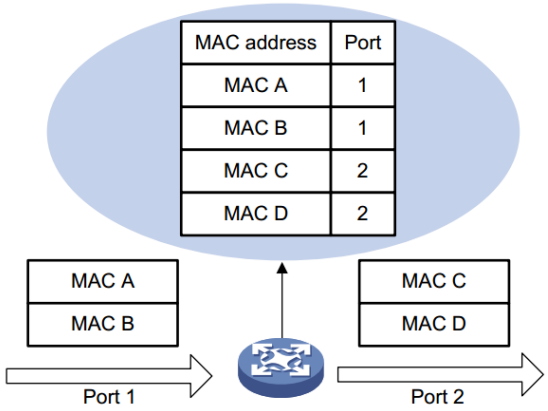
- If an entry is found for the MAC address, updates the entry.
- If no entry containing the MAC address is found, adds an entry that contains the MAC address and the receiving port (port A) to the MAC address table.

3. After the MAC address (MAC-SOURCE) is learned, if the device receives a frame destined for MAC-SOURCE, the device looks up the MAC address table and then forwards the frame from port A.

When forwarding a frame, the device adopts the following forwarding modes based on the MAC address table:

- Unicast mode: If an entry matching the destination MAC address exists, the device forwards the frame directly from the sending port recorded in the entry.
- Broadcast mode: If the device receives a frame with the destination address being all FS, or no entry matches the destination MAC address, the device broadcasts the frame to all the ports except the receiving port.

Figure 4-12 MAC address table of the device



4.3.2 Configure MAC Addresses

MAC addresses configuration includes the configuring and displaying of static MAC address, Filter MAC Address, and the setting of MAC address entry aging time.

Global Configuration

1. Select **Advance** > **Layer2** > **MAC Configuration** in the navigation area to enter the MAC Global Configuration page shown in *Figure 4-13*. *Table 4-7* describes the MAC configuration items.

Figure 4-13 MAC global configuration

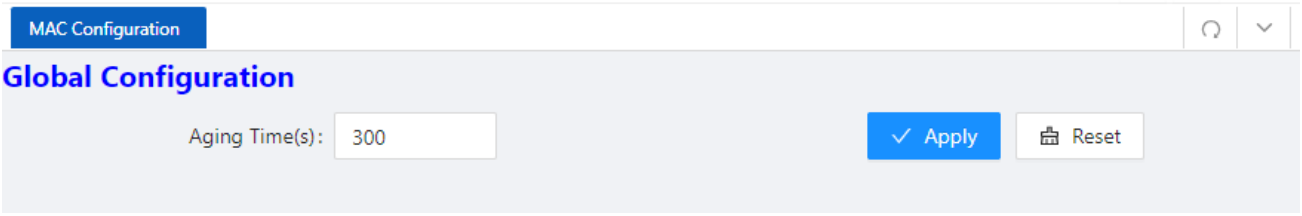


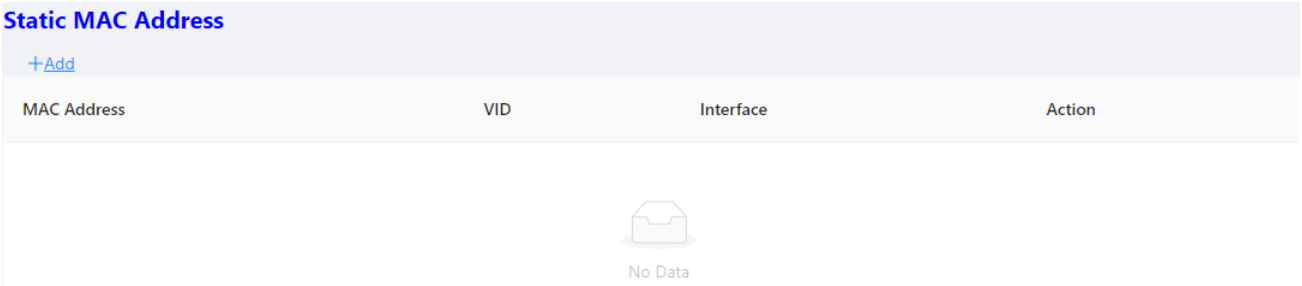
Table 4-7 MAC global configuration items

Item		Description
Global configuration	Aging time	Set the aging time for the MAC address, the default value is 300 seconds.
	Apply	Click to apply configuration.
	Reset	Click to reset configuration.

Configuring Static MAC Address

1. Select **Advance** > **Layer2** > **MAC Configuration** in the navigation area to enter the Static MAC Address Configuration page shown in *Figure 4-14* .

Figure 4-14 MAC static address page



2. Click **+Add** to enter the page for creating static MAC address, as shown in *Figure 4-15*. *Table 4-8* shows the detailed configuration for creating a static MAC address.

3. Type in **MAC address** box, for example '00eb.fc00.8877', select the **VID** in the VLAN drop down list, select the **Interface** in the Interface drop list.

4. Click **OK** to end the operation.

Figure 4-15 Creating static MAC address

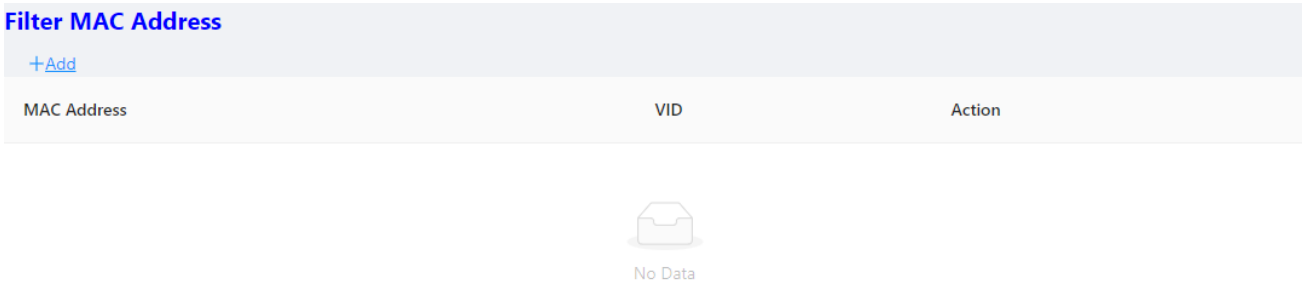
Table 4-8 Static MAC address items

Item		Description
Static Mac Address	MAC Address	Set the MAC address to be added.
	VID	Sets the ID of the VLAN to which the MAC address belongs.
	Interface	Sets the port to which the MAC address belongs.

Configuring Filter MAC Address

1. Select **Advance** > **Layer2** > **MAC Configuration** from the navigation area. The system automatically displays the Filter MAC Address page, as shown in *Figure 4-16*.

Figure 4-16 MAC static address page



2. Click **+Add** to enter the page for creating filter MAC address, as shown in *Figure 4-17*. *Table 4-9* shows the detailed configuration for creating a filter MAC address.

3. Type in "MAC address", for example "00eb.fc00.8877", select the "VID"in the VLAN drop down list.

4. Click **OK** to end the operation.

Figure 4-17 Creating filter MAC address

Table 4-9 Filter MAC address items

Item		Description
Static Mac Address	MAC Address	Set the MAC address to be filtered.
	VID	Sets the ID of the VLAN to which the MAC address belongs.

4.4 DHCP Snooping

4.4.1 Overview

DHCP (Dynamic Host Configuration Protocol) snooping is a security feature that acts like a firewall between untrusted hosts and trusted DHCP servers. When DHCP snooping is enabled on a VLAN, the system examines DHCP messages sent from untrusted hosts associated with the VLAN and extracts their IP addresses and lease information. This information is used to build and maintain the DHCP snooping database.

DHCP snooping is enabled on a per-VLAN basis. By default, the feature is inactive on all VLANs. You can enable the feature on a single VLAN or a range of VLANs.

Trusted Sources

The DHCP snooping feature determines whether traffic sources are trusted or untrusted. DHCP snooping acts as a guardian of network security by keeping track of valid IP addresses assigned to downstream network devices by a trusted DHCP server. The default trust state of all interfaces is untrusted.

DHCP Snooping Limit Rate

Configure the number of DHCP packets per second that an interface can receive, to reduce or eliminate the impact of DHCP packet attack from this interface.

MAC Address Verification

With DHCP snooping MAC address verification enabled, DHCP snooping verifies that the source MAC address and the client hardware address match in DHCP packets that are received on untrusted ports. The source MAC address is a Layer 2 field associated with the packet, and the client hardware address is a Layer 3 field in the DHCP packet.

Option-82 Insertion

DHCP Option82 option is also called DHCP relay agent information option, one of many DHCP options. The Option82 option is a DHCP option proposed to enhance the security of the DHCP server and improve the IP address allocation strategy. The addition and stripping of options are implemented by the relay component.

DHCP Database

The DHCP snooping feature dynamically builds and maintains the database using information extracted from intercepted DHCP messages. The database contains an entry for each untrusted host with a leased IP address if the host is associated with a VLAN that has DHCP snooping enabled. The database does not contain entries for hosts connected through trusted interfaces.

When the IP verify source function is enabled on the interface, database entries act as valid users on the interface.

4.4.2 Configure DHCP Snooping

Configuring DHCP Snooping Globally

1. Select **Advance** > **Layer2** > **DHCP Snooping** from the navigation tree to enter the DHCP Snooping Configuration page, as shown in *Figure 4-18*. *Table 4-10* describes the configuration items of configuring DHCP globally.

Figure 4-18 DHCP snooping global configuration

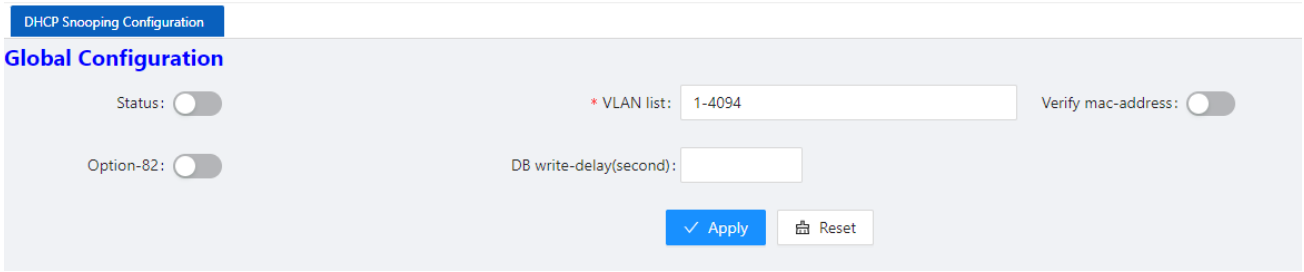


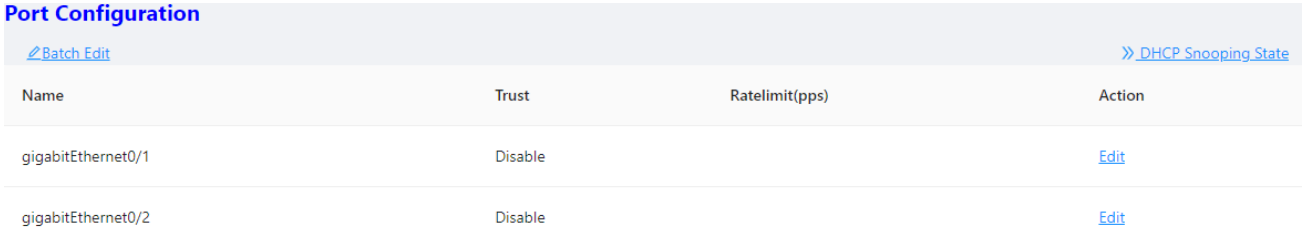
Table 4-10 The description of DHCP snooping global configuration

Item	Description
Status	Enable/Disable the DHCP Snooping globally
VLAN	Enable/Disable the DHCP Snooping on the VLANs
Verify mac-address	Verify the source MAC address and the client hardware address is matched in DHCP packets
option-82	Enable/Disable option-82 insertion
DB write-delay(s)	Configure the interval time database writing to flash

Configuring DHCP Snooping Ports

1. Select **Advance** > **Layer2** > **DHCP Snooping** from the navigation tree, as shown in *Figure 4-19*.

Figure 4-19 DHCP snooping interface configuration status



2. Click **Batch Edit** button below Port Configuration or **Edit** button correspond of the port to enter the page for configuring ports.

3. Check the ports to be configured, click **Edit** to enter the Interface Configuration page as shown in *Figure 4-20*. *Table 4-11* describes the configuration items of DHCP snooping interface configuration.

Figure 4-20 DHCP snooping global configuration

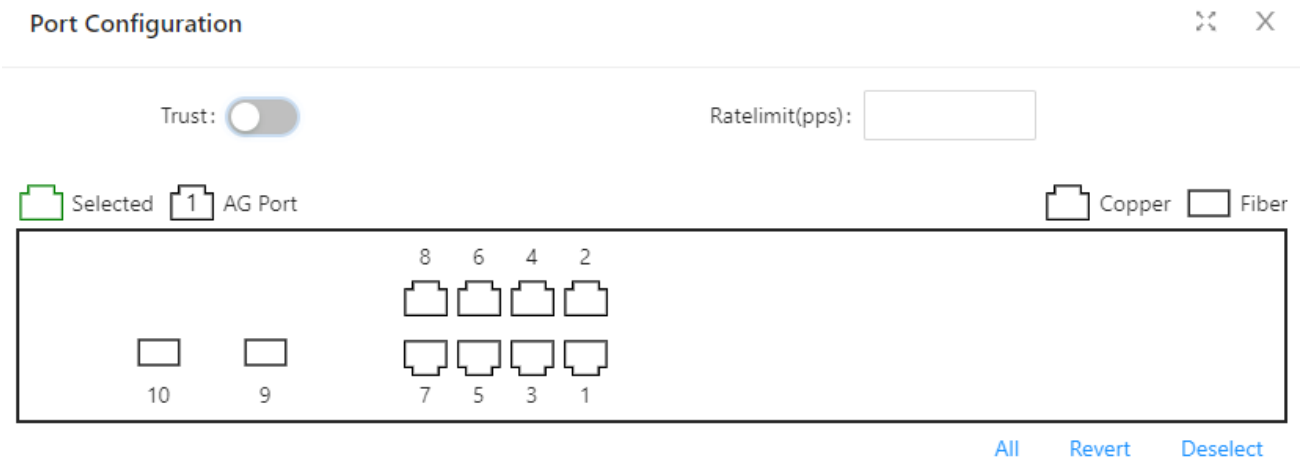


Table 4-11 The description of DHCP snooping interface configuration

Item	Description
Trust	Determines whether traffic sources are trusted or untrusted
Ratelimit(pps)	Configure the number of DHCP packets per second that an interface can receive

NOTE:

- Due to hardware limitations, for DHCP rate limit, when the limit value is not 0, the software rate limit is used, and when the limit value is 0, the hardware rate limit is used. Software rate limit will consume CPU resources.

View DHCP Snooping State

1. Click the **DHCP Snooping state** button in the current page to enter the DHCP Snooping State page, as shown in *Figure 4-21*. *Table 4-12* describes the configuration items of configuring DHCP snooping database.

Figure 4-21 DHCP snooping database

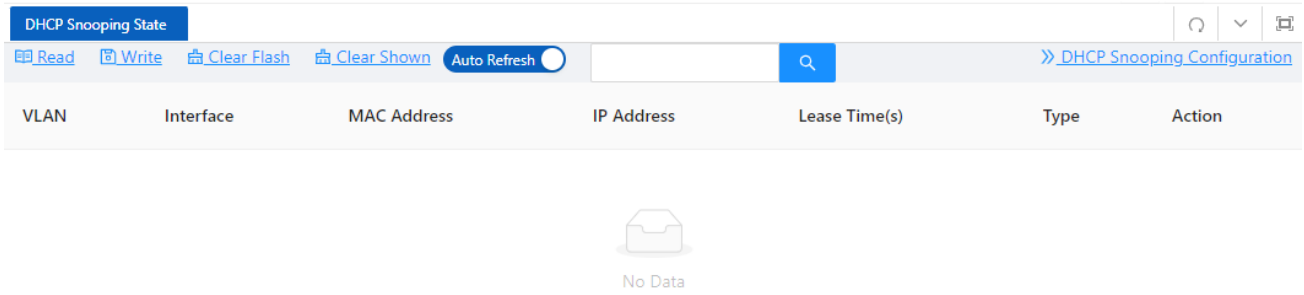


Table 4-12 The description of DHCP snooping database

Item	Description
Search	Search database entries by fuzzy match the input strings
WRITE	Write database entries to flash
READ	Read database entries from flash
CLEAR	Clear database entries, you can narrow the scope by selecting keywords

4.5 QinQ

4.5.1 Overview

Introduction to QinQ

QinQ stands for 802.1Q in 802.1Q. QinQ is a flexible, easy-to-implement Layer 2 VPN technology based on IEEE 802.1Q. QinQ enables the edge device on a service provider network to insert an outer VLAN tag in the Ethernet frames from customer networks, so that the Ethernet frames travel across the service provider network (public network) with double VLAN tags. QinQ enables a service provider to use a single SVLAN to serve customers who have multiple CVLANs.

Background and Benefits

The IEEE 802.1Q VLAN tag uses 12 bits for VLAN IDs. A device supports a maximum of 4094 VLANs. This is far from enough for isolating users in actual networks, especially in metropolitan area networks (MANs).

By tagging tagged frames, QinQ expands the available VLAN space from 4094 to 4094 × 4094. QinQ delivers the following benefits:

- Releases the stress on the SVLAN resource.

• Enables customers to plan their CVLANs without conflicting with SVLANs.

• Provides an easy-to-implement Layer 2 VPN solution for small-sized MANs or intranets.

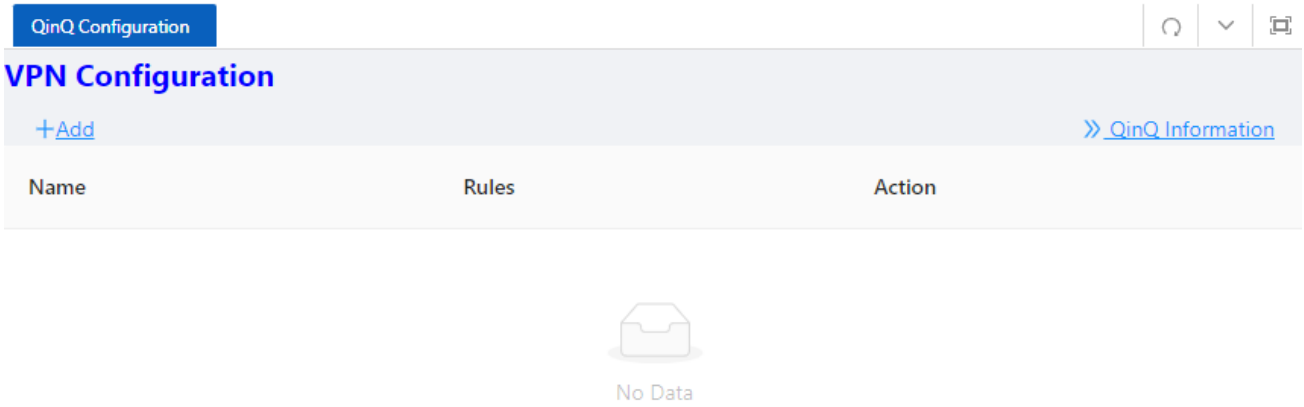
• Allows the customers to keep their VLAN assignment schemes unchanged when the service provider upgrades the service provider network.

4.5.2 QinQ Configuration

VPN Configuration

1. Select **Advance** > **Layer2** > **QinQ Configuration** in the navigation area. The system automatically enters the page as shown in *Figure 4-22*.

Figure 4-22 VPN configuration summary



2. Click **+Add** button below VPN Configuration to enter the VPN Rule Creating page, as shown in *Figure 4-23*, *Table 4-13* describes the items of configuring a QinQ rule.

Figure 4-23 VPN configuration

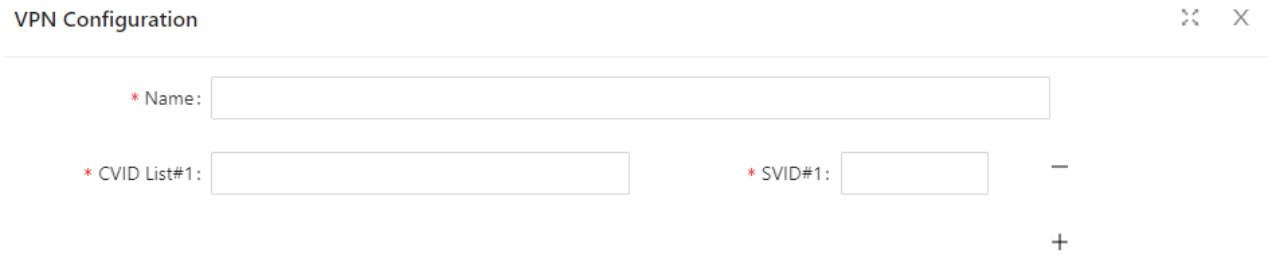


Table 4-13 VPN configuration description

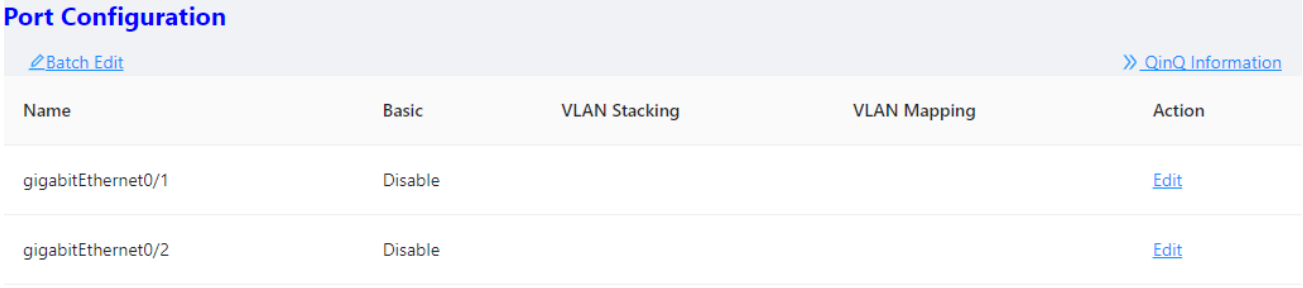
Item	Description
Name	The name of the VLAN VPN rule
CVID	The ID of the customer VLAN

SVID	The ID of the service provider VLAN

Port Configuration

1. Select **Advance** > **Layer2** > **QinQ Configuration** in the navigation area. The system automatically enters the page as shown in *Figure 4-24*.

Figure 4-24 Port configuration summary



2. Click **Batch Edit** button below Port Configuration or **Edit** button correspond of the port to enter the "QinQ Port Configuration" page, as shown in *Figure 4-25*, *Table 4-14* describes the items of configuring port.

Figure 4-25 Port configuration

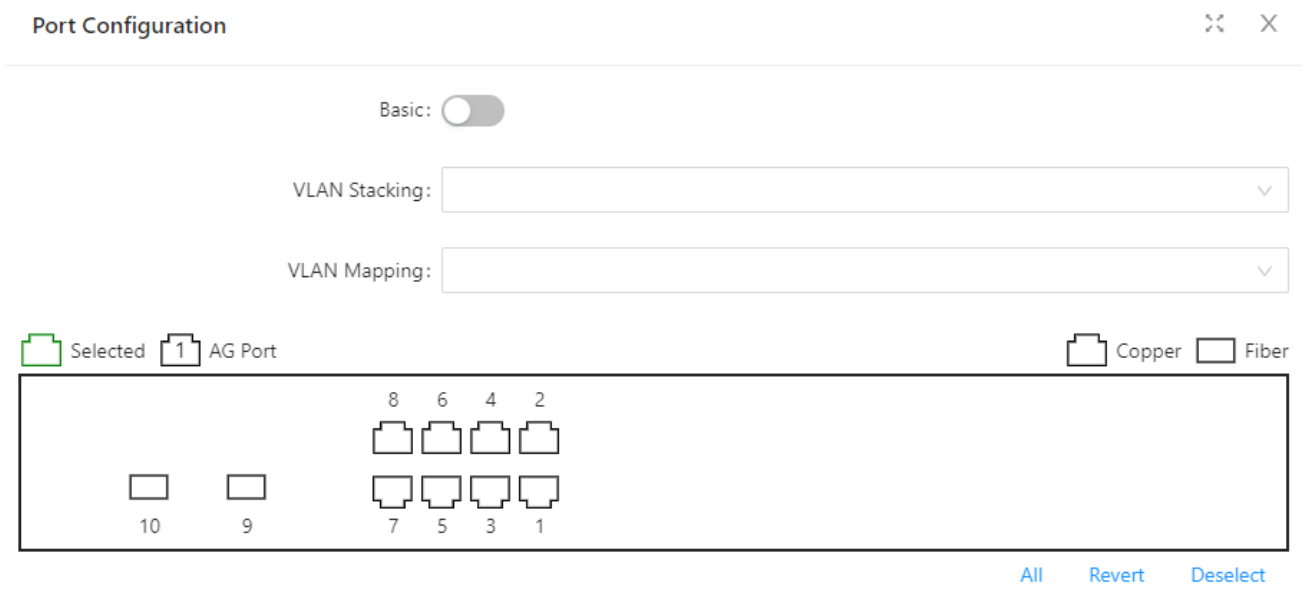


Table 4-14 The description of configuring a QinQ rule

Item	Description
Basic	Enable VLAN mapping mode
VLAN Stacking	Multi-layer tag mode
VLAN Mapping	Tag replacement mode

4.6 ACL

4.6.1 Overview

An access control list (ACL) is a set of rules (or permit or deny statements) for identifying traffic based on criteria such as source IP address, destination IP address, and port number. ACLs are essentially used for packet filtering. A packet filter drops packets that match a deny rule and permits packets that match a permit rule. ACLs are also widely used by many modules, for example, QoS and IP routing, for traffic identification.

4.6.2 Configure ACLs

NOTE:

- A maximum of 128 rules can be configured under a single ACL ID; due to hardware resource limitations, please refer to the specific product specification document for the maximum number of application rules supported by a single device.
- When an ACL has been applied to a port, if you need to add and delete rules, you must first cancel to apply them from the port.

Configuring a Rule for an IP ACL

1. Select **Advance** > **Security** > **ACL Configuration** in the navigation area.

2. Click the **+Add ACL** button to enter the Rule Configuration page and choose the ACL type IP for a basic ACL as shown in *Figure 4-26*. *Table 4-15* describes the configuration items of configuring an IP ACL.

Figure 4-26 Configuring a basic IP ACL

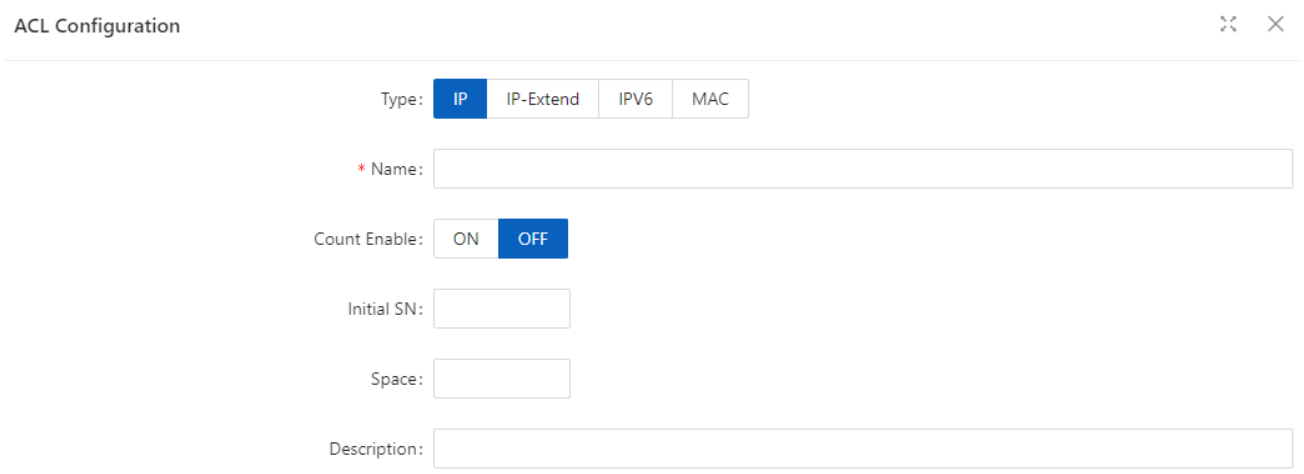


Table 4-15 The description of the basic IP ACL

Item		Description
ACL Type	IP	Standard IP ACL can match the source IP field in IPv4 packets
	IP-Extend	the protocol number, source IP address, destination IP address, Layer 4 port number, etc. of IPv4 packets
	IPV6	IPv6 ACL can match IPv6 packet source IP address, destination IP address, protocol number, etc.
	MAC	MAC ACL, which can match destination MAC address, source MAC address, Etype and other fields
Name		Standard IP valid number range: <1-99> | <1300-1999> Extended IP valid number range: <100-199> | <2000-2699> MAC ACL valid number range: <200-699> IPv6 ACL only supports string naming. All ACLs support string naming The string length range is <1-64>
Count Enable		Enable the counting function. When a packet hits the ACL, the count value is increased by 1
Initial SN		Starting value of rule entry sequence number, default value: 10, range <1-2147483647>
Space		Increment the serial number, default value: 10, range <1-2147483647>
Description		Define the ACL description information

3. Configure a rule for an IP ACL, and click **OK**.

4. Select IP rule in the box below ACE Configuration and click **+Add ACE** button to enter ACE Configuration page as shown in *Figure 4-27*. *Table 4-16* describes the configuration items of configuring an IP ACE configuration.

Figure 4-27 IP type ACE configuration interface

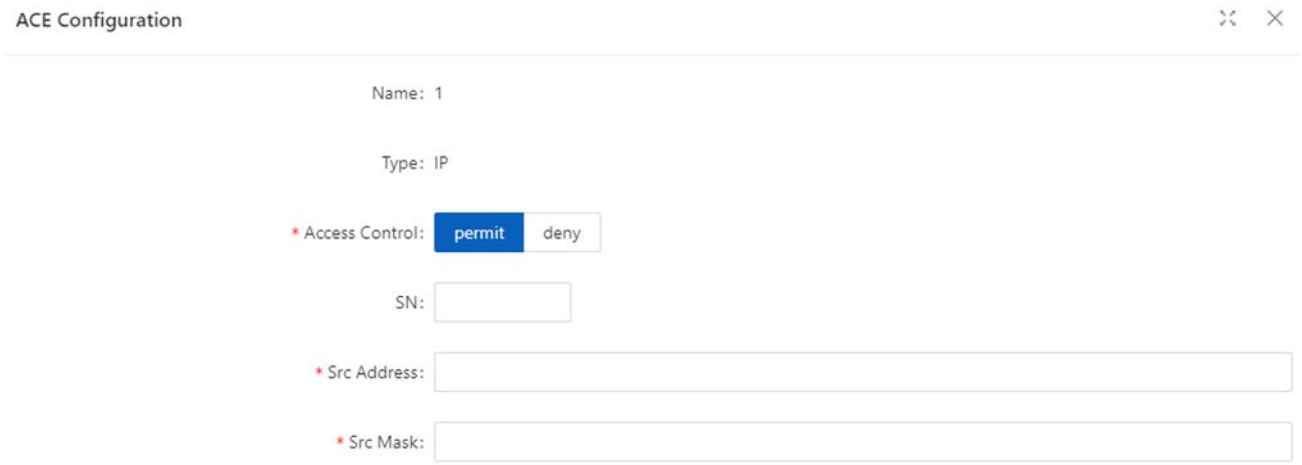


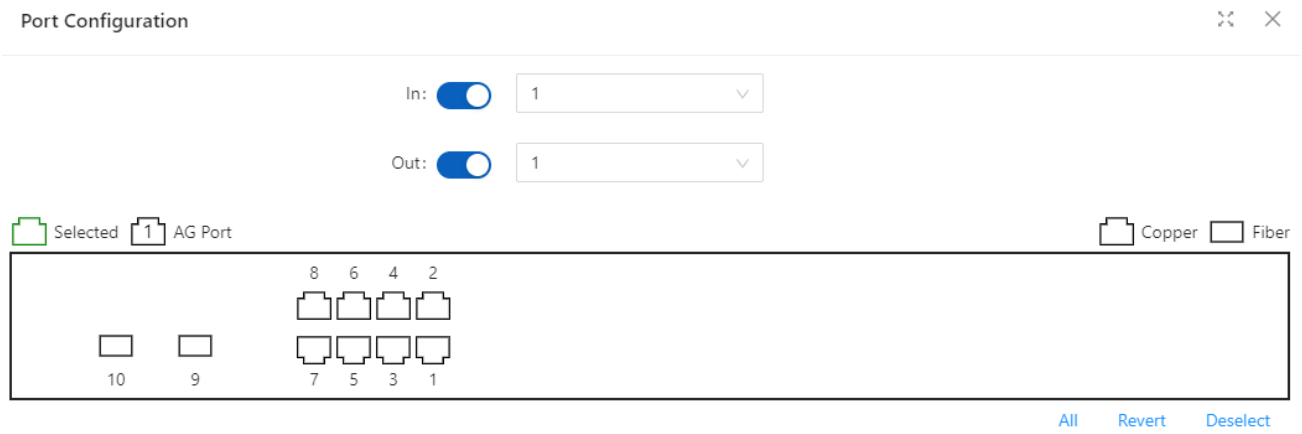
Table 4-16 The description of the IP type ACL

Item		Description
Access Control	permit	Release the packets that match this rule
	deny	Discard packets matching this rule
SN		Rule entry sequence number
Src Address		Source IP address, such as 192.168.64.1
Src Mask		The IP mask is inverted. If it matches the first 24 digits of the IP address, the mask is 255.255.255.0. Here it needs to be configured as 00.00.00.255

5. Configure ACE and click **OK**.

4. Click **Batch Edit** below Port Configuration to enter the ACL Port Configuration page, select the ACL rules of the corresponding port, as shown in *Figure 4-28*, and click **OK**.

Figure 4-28 Apply the ACL rule to the port



Configuring a Rule for an IP-Extend ACL

1. Select **Advance** > **Security** > **ACL Configuration** in the navigation area.

2. Click the **+Add ACL** button to enter the Rule Configuration page and choose the ACL type **IP-Extend** for a basic ACL as shown in *Figure 4-26*.

3. Configure a rule for an IP ACL, and click **OK**.

4. Select ACK rules in the box below ACE Configuration and click **+Add ACE** button to enter ACE Configuration page as shown in *Figure 4-29*. *Table 4-17* describes the configuration items of configuring an IP ACE configuration.

Figure 4-29 IP-Extend type ACE configuration interface

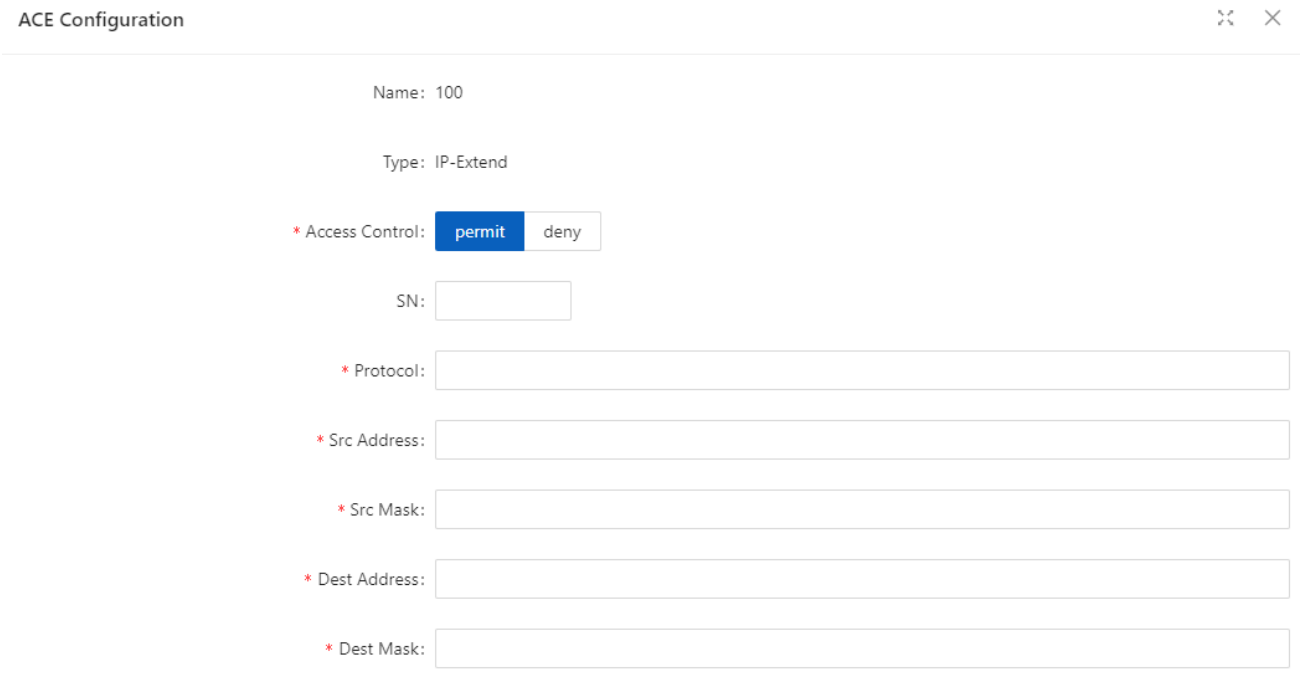


Table 4-17 The description of the IP-Extend ACL

Item		Description
Access Control	permit	Release the packets that match this rule
	deny	Discard packets matching this rule
SN		Rule entry sequence number
Protocol		Supports common protocol message options, including TCP, UDP, VRRP, IGMP, GRE, IPCOMP, OSFP, PIM, RSVP, etc. Supports all IP v4 packets IPv4 messages of customized protocol
Src Address		Source IP address, such as 192.168.64.1
Src Mask		The IP mask is inverted. If it matches the first 24 digits of the IP address, the mask is 255.255.255.0. Here it needs to be configured as 00.00.00.255
Dest Address		Destination IP address, such as 192.168.64.100
Dest Mask		Homology mask

5. Configure ACE and click **OK**.

6. Click **Batch Edit** below "Port Configuration" to enter the "ACL Port Configuration"page, select the ACL rules of the corresponding port, and click **OK**.

Configuring a Rule for an IPV6 ACL

1. Select **Advance** > **Security** > **ACL Configuration** in the navigation area.

2. Click the **+Add ACL** button to enter the rule configuration page and choose the ACL type **IPV6** for a basic ACL as shown in *Figure 4-26*.

3. Configure a rule for an IP ACL, and click **OK**.

4. Select ACL rules in the box below ACE Configuration and click **+Add ACE** button to enter ACE Configuration page as shown in *Figure 4-30*. *Table 4-18* describes the configuration items of configuring an IP ACE configuration.

Figure 4-30 IPV6 type ACE configuration interface

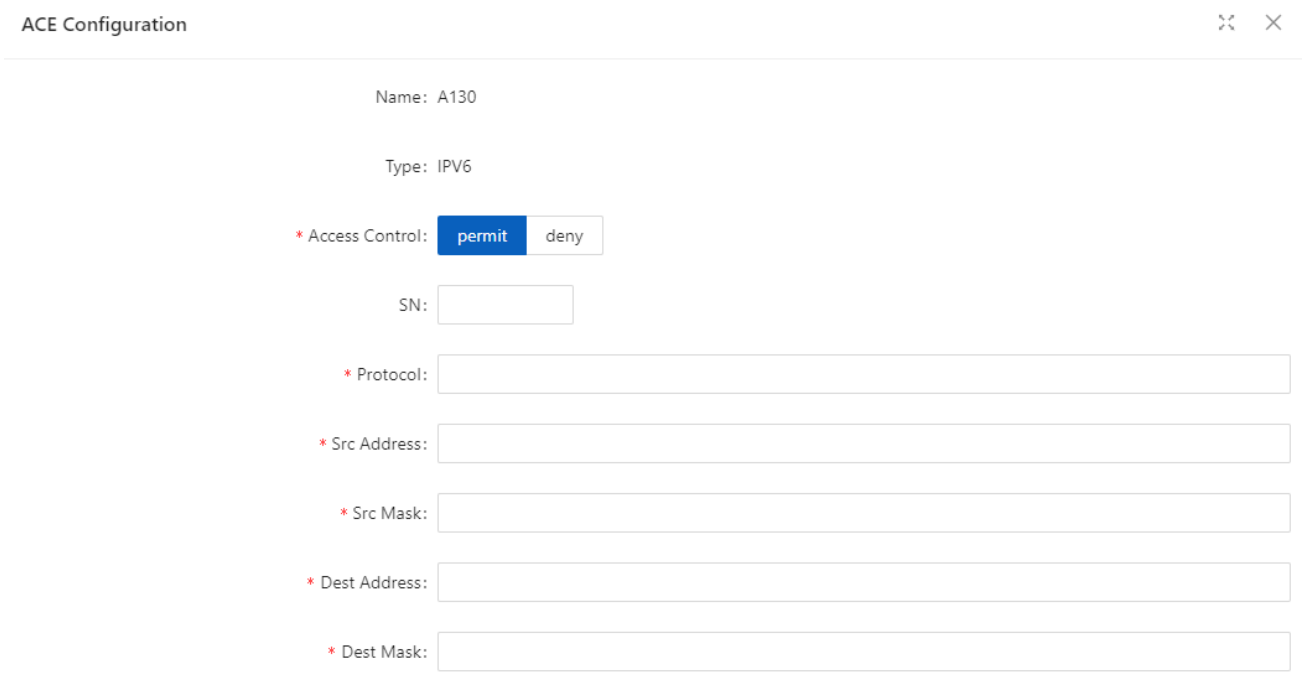


Table 4-18 The description of the IPV6 ACL

Item		Description
Access Control	permit	Release the packets that match this rule
	deny	Discard packets matching this rule
SN		Rule entry sequence number
Protocol		Supports common protocol message options, including TCP, UDP, ICMP, etc. Supports all IP v 6 packets Support IPv6 messages of customized protocol
Src Address		Source MAC address, such as 00.d0.f8.22.33.40
Src Mask		The MAC address mask is inverted. If it matches the first 24 digits of the MAC address, the mask is ffff.ff00.0000. Here it needs to be configured as 0000.00ff.ffff
Dest Address		Destination MAC address, such as 00.d0.f8.22.33.41
Dest Mask		Homology mask

5. Configure ACE and click **OK**.

6. Click **Batch Edit** below Port Configuration to enter the ACL Port Configuration page, select the ACL rules of the corresponding port, and click **OK**.

Configuring a Rule for an MAC ACL

1. Select **Advance** > **Security** > **ACL Configuration** in the navigation area.

2. Click the **+Add ACL** button to enter the Rule Configuration page and choose the ACL type **IPV6** for a basic ACL as shown in *Figure 4-26*.

3. Configure a rule for an IP ACL, and click **OK**.

4. Select ACK rules in the box below ACE Configuration and click **+Add ACE** button to enter ACE Configuration page as shown in *Figure 4-31*. *Table 4-19* describes the configuration items of configuring an IP ACE configuration.

Figure 4-31 Apply the ACL rule to the port

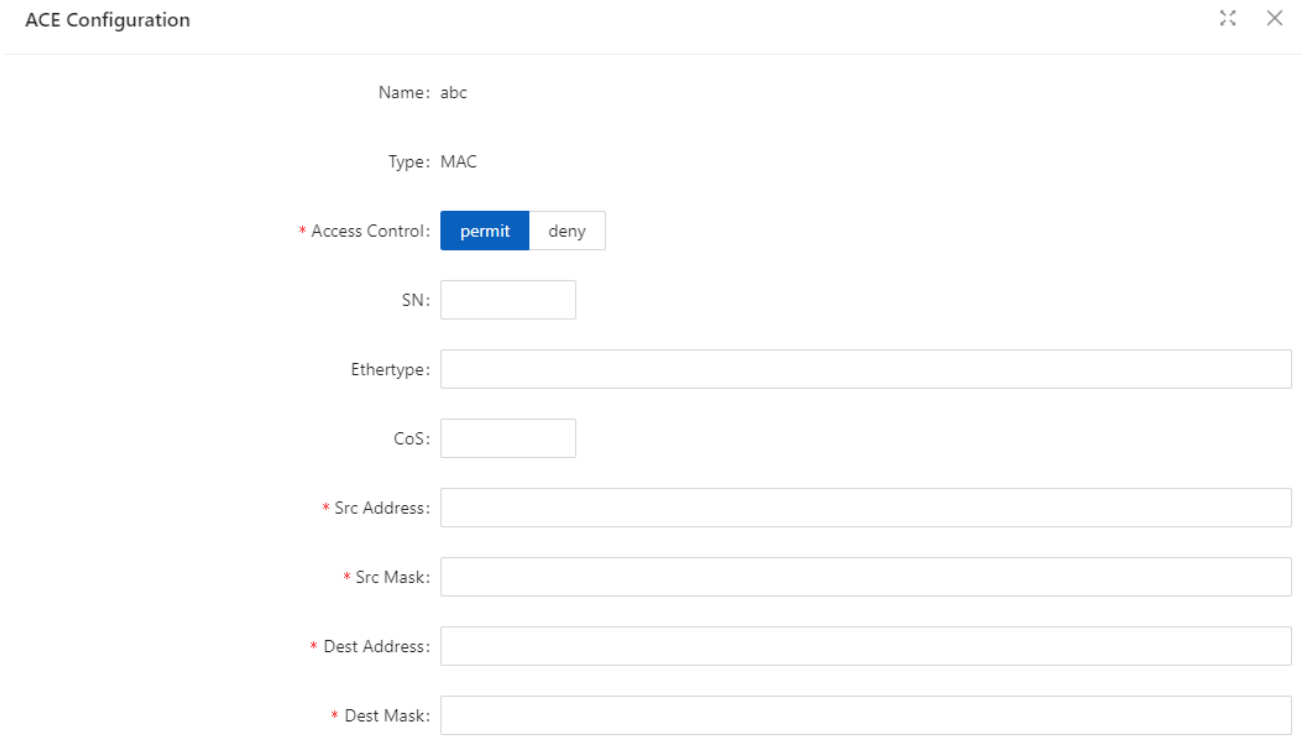


Table 4-19 The description of the MAC ACL

Item		Description
Access Control	permit	Release the packets that match this rule
	deny	Discard packets matching this rule
SN		Rule entry sequence number
Ethertype		Ethernet protocol type, range (0x05DD-0xFFFF)
CoS		CoS value of the message, range (0-7)
Src Address		Source MAC address, such as 00.d0.f 8.22.33.40

Src Mask	The MAC address mask is inverted. If it matches the first 24 digits of the MAC address, the mask is ffff.ff00.0000. Here it needs to be configured as 0000.00ff.ffff
Dest Address	Destination MAC address, such as 00.d0.f 8.22.33.41
Dest Mask	homology mask

5. Configure ACE and click **OK**.

6. Click **Batch Edit** below Port Configuration to enter the ACL Port Configuration page, select the ACL rules of the corresponding port, and click **OK**.

4.7 QoS

4.7.1 Overview

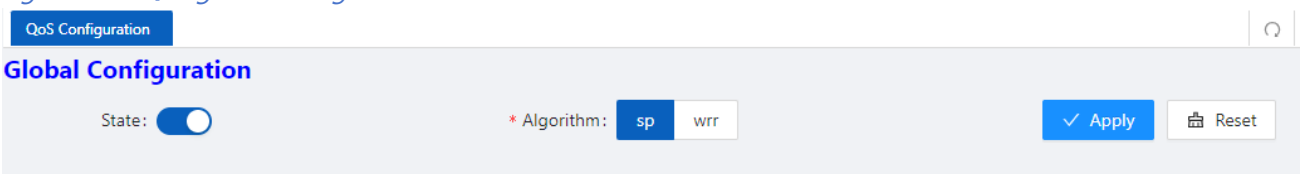
Quality of Service (QoS) reflects the ability of a network to meet customer needs. In an internet, QoS evaluates the ability of the network to forward packets of different services. The evaluation can be based on different criteria because the network may provide various services. Generally, QoS performance is measured with respect to bandwidth, delay, jitter, and packet loss ratio during packet forwarding process.

4.7.2 Configure QoS

Enable QoS

1. Select **Advance** > **Security** > **QoS Configuration** in the navigation area to enter the QoS Global Configuration page, as shown in *Figure 4-32*. *Table 4-20* describes the QoS summary items.

Figure 4-32 QoS global configuration



2. Click State button, choose Algorithm, **click** Apply to enable QoS.

Table 4-20 Descriptions of QoS summary

Item	Description

QoS Configuration	State		Enable QoS, all QoS functions do not support configuration before enabling
	Algorithm	Sp	Absolute priority scheduling, the queue ID is large, the priority is high, and the low-priority queue is processed after the high -priority queue is processed.
		Wrr	robin scheduling algorithm schedules each queue in turn according to the queue weight, from the largest to the smallest queue ID.

QoS Mapping

1. In current page, click **Queue** button below QoS Mapping to enter Queue Configuration page, as shown in *Figure 4-33*. *Table 4-21* describes the QoS summary items.

Figure 4-33 Queue configuration

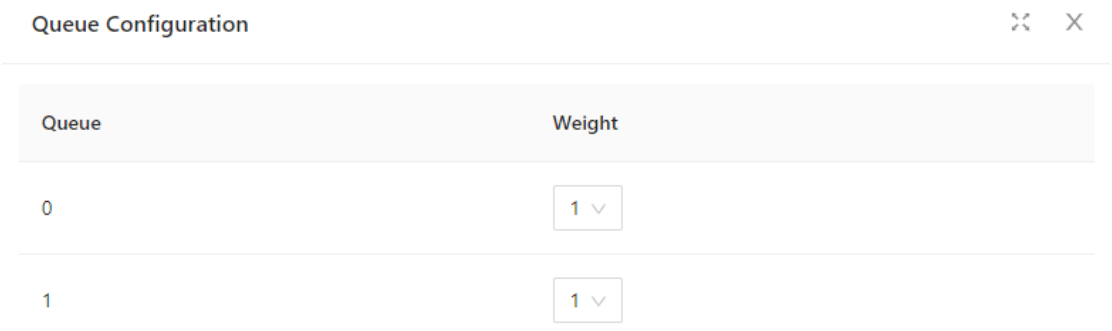


Table 4-21 Descriptions of queue configuration

Item	Description	
Queue weight	Queue	< 0, 7 >
	weight	< 0, 32>, the larger the value, the higher the weight, and the higher the probability of preferential processing of packets in this queue under the condition of channel congestion, 0 means infinity.

2. Click **CoS** button below QoS Mapping to enter CoS Configuration page, as shown in *Figure 4-34*. *Table 4-22* describes the CoS configuration items.

Figure 4-34 CoS configuration

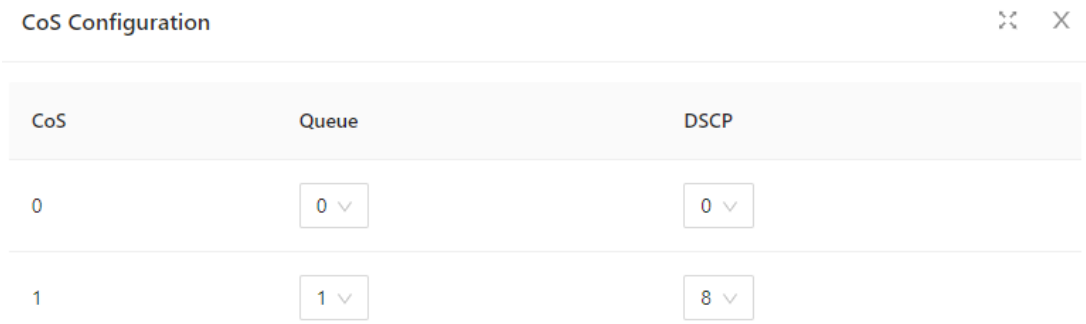


Table 4-22 Descriptions of CoS configuration

Item		Description
CoS Configuration	CoS	<0, 7>
	Queue	< 0, 7>, CoS-queue mapping relationship, based on the CoS marked on the port, modifying the packet egress queue takes effect when the port is configured as no trust, trust CoS or trust DSCP and non-IP packets.
	DSCP	CoS-dscp mapping relationship takes effect when the port is configured as no trust, trust cos or trust DSCP and is not IP packets. Modify the packet DSCP value.

3. Click **DSCP** button below QoS Mapping to enter DSCP Configuration page, as shown in *Figure 4-35*. *Table 4-23* describes the DSCP configuration items.

Figure 4-35 CoS configuration

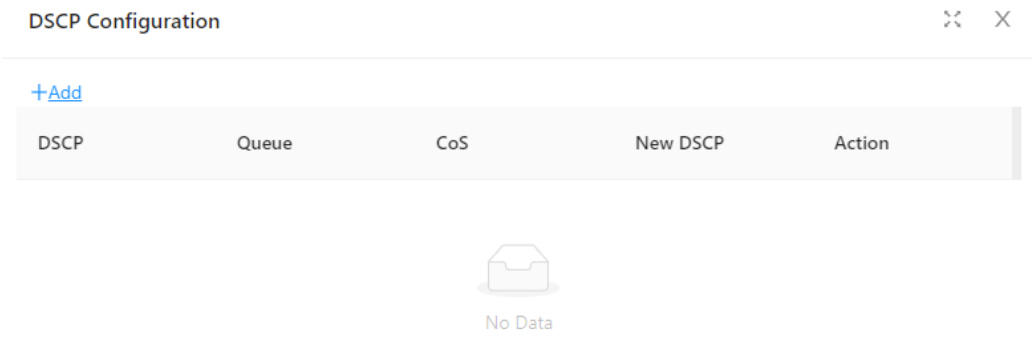


Table 4-23 Descriptions of DSCP configuration

Item		Description
DSCP Map	DSCP	<0, 63>
	Queue	< 0, 7>, dsp-queue mapping relationship, which takes effect when the port is configured as trust DSCP and IP packets, modify the packet export queue

	CoS	< 0, 7>, dscp-cos mapping relationship, which takes effect when the port is configured as trust DSCP and IP packets, modify the cos field of the packet
	New DSCP	< 0, 63 >, dscp-dscp mapping relationship, which takes effect when the port is configured as trust DSCP and IP packets, first perform dscp-dscp mapping, and then perform dscp-cos mapping

Class Setting

1. In current page, click **+Add** button below Class Setting to enter Class Setting page, as shown in *Figure 4-36*. *Table 4-24* describes the QoS summary items.

Figure 4-36 Class setting page

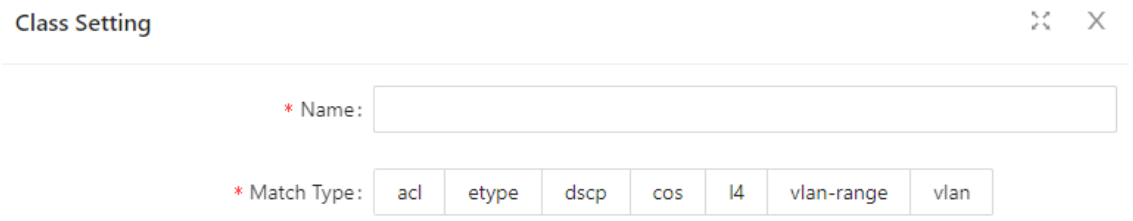


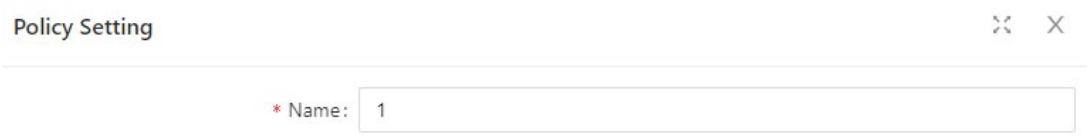
Table 4-24 Descriptions of class setting

Item		Description
Class Setting	Name	Create a category, define the category name
	Match	Define match type, support associated ACL; Support packet ETYPE, DSCP, CoS, l4port, VLAN field matching

Policy Setting

1. In current page, click **+Add Policy** button below Policy Setting to enter Policy Setting page, as shown in *Figure 4-37*. Text the box behind **Name**, click **OK** button.

Figure 4-37 Class setting page



2. Click **+Add Policy Rule** button below Policy Setting to enter Policy Rule Setting page, as shown in *Figure 4-38*. *Table 4-25* describes the QoS rule configuration items.

Figure 4-38 Rule configuration page

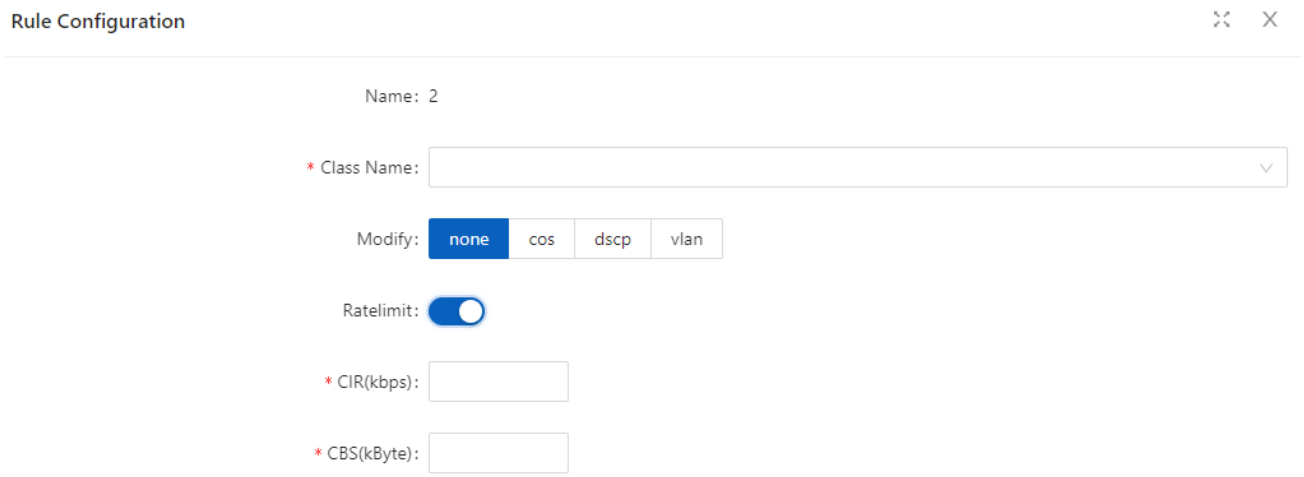


Table 4-25 Descriptions of class setting

Item		Description
Rule Configuration	Name	Rule name
	Class Name	Create a policy, define a policy name
	Modify	policy, supports modifying CoS, DSCP, VLAN and other actions
	Ratelimit	Action 2 corresponding to the strategy, speed limit
	CIR	Speed limit waterline, unit kbps
	CBS	burst capability, unit Kbyte

Port Configuration

1. In current page, click **+Batch Edit** button below Port Configuration to enter Port Configuration page, as shown in *Figure 4-39*. *Table 4-26* describes the port configuration items.

Figure 4-39 Port configuration page

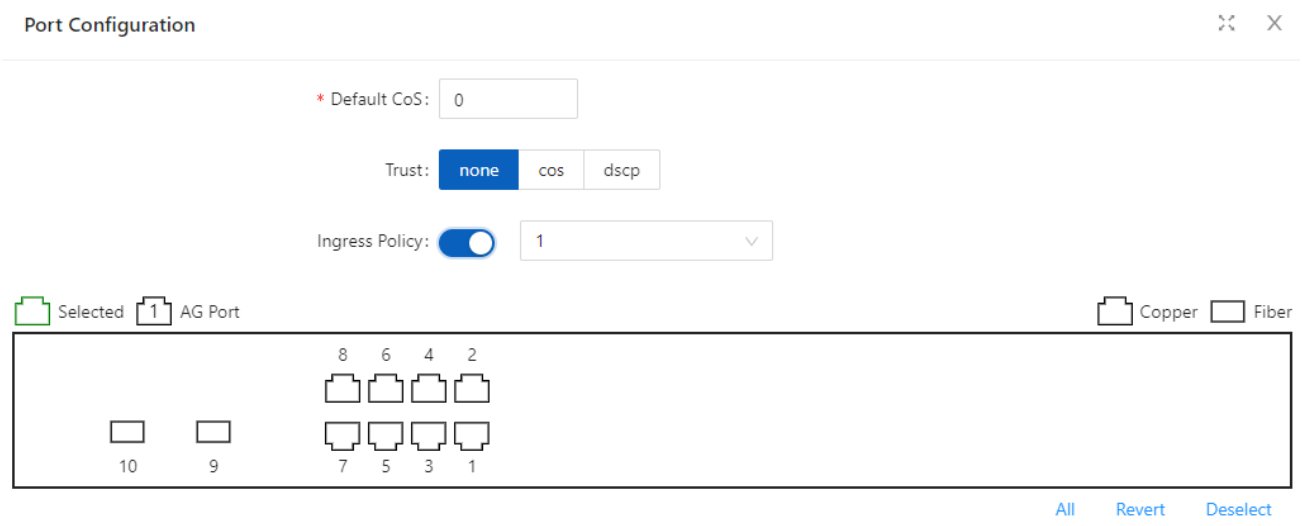


Table 4-26 Descriptions of port configuration

Item		Description
Port Configuration	Default CoS	< 0, 7>, when the configuration port is not trusted, or the configuration is trusted but the message does not meet the trust condition, the port default cos is used to mark the ingress message.
	Trust	Support untrust, trust cos, trust DSCP configuration. When in no trust mode, the entry stage modifies the cos field and DSCP field of the message according to the default cos of the port; when trust cos is configured, the same as the no trust mode for untagged messages, and for tagged messages, choose the message with its own CoS; When configuring trust DSCP, for IP packets, select the packet with DSCP, and for non-IP packets, it is the same as trust cos mode.
	Ingress Policy	Select Ingress Policy.

4.8 DoS

4.8.1 Overview

Denial of Service (DoS) attack aims to prevent the computer or network from providing normal service. There are many kinds of DoS attacks, and also many different implementation methods.

Its common trait is that the victim host or network cannot receive and process external requests in time. Here are some typical DoS attack types.

SYN Flood Message Attack:

SYN Flood attack is the most common DDOS attack on the current network, but also the most classic DoS attack. By sending a large number of attack messages with fake source addresses to the port of the network service, the target server connection queue is full, thus blocking access to other legitimate users.

ICMP Flood Message Attack:

ICMP Flood attack is a DDOS attack that sends a large number of ping packets to the target host in a short period of time and consumes the host resources. The host can't provide any other service after its resources are exhausted.

ARP Flood Message Attack:

ARP Flood attack is a DDOS attack that sends a large number of ARP request packets to the target host in a short period of time and consumes the host resources. Unable to answer other ARP requests after the host resources are exhausted.

NULL SCAN Message Attack:

NULL SCAN attack is mainly that the attacker sends TCP packets without any flag to the target host's IP, and parts of operating systems actively feedback RST messages, so that the attacker obtains the port that does not close the session. Anti-NULL SCAN attack is to discard TCP messages without any TCP flag bits, which can effectively prevent attackers from launching subsequent attacks after obtaining the closure of each port through NULL SCAN.

TCP Message with SYN and FIN:

Normally, the SYN sign (connection request sign) and the FIN sign (connection removal sign) can' t appear in one TCP message, and the RFC does not specify how the IP stack will handle such a deformed message. The attacker can take advantage of this feature to determine the type of operating system by sending TCP messages with SYN and FIN settings.

TCP Message with FIN without ACK:

Under normal circumstances, except for the first message(SYN message), all messages possess ACK signs, including the TCP connection removal message (message with FIN sign setting). However, some attackers may send TCP messages which are with FIN and without ACK to the target host so that it may cause the target host to crash.

TCP Message with SYN and Source Port Number Between 0-1023:

0-1023 is the known port number assigned by IANA and in most systems can be used only by the system (or root) process or the procedure executed by privileged users. These ports (0-1023) can't be used as the source port number for the first TCP message (already has been set the SYN sign). Start the anti-illegal TCP message attack function, the device will check according to the characteristics of non-TCP message, if illegal, then discarded.

Our company provides the above several anti-DoS attack functions.

4.8.2 Configure DoS

In the navigation area, select **Advance** > **Security** > **DoS Configuration** and enter the DoS Configuration page. This page contains four parts: Global Configuration, SYN Configuration, ICMP Configuration, and ARP Configuration.

Global Configuration

The DoS Global Configuration page is shown in *Figure 4-40* including several global anti-DoS attack configurations, and the specific parameters are shown in *Table 4-27*. Global SYN Flood, ICMP Flood and ARP Flood configure in the same way. Take the ARP Flood Configuration for example, the setting page is as *Figure 4-41*.

Figure 4-40 Global configuration page

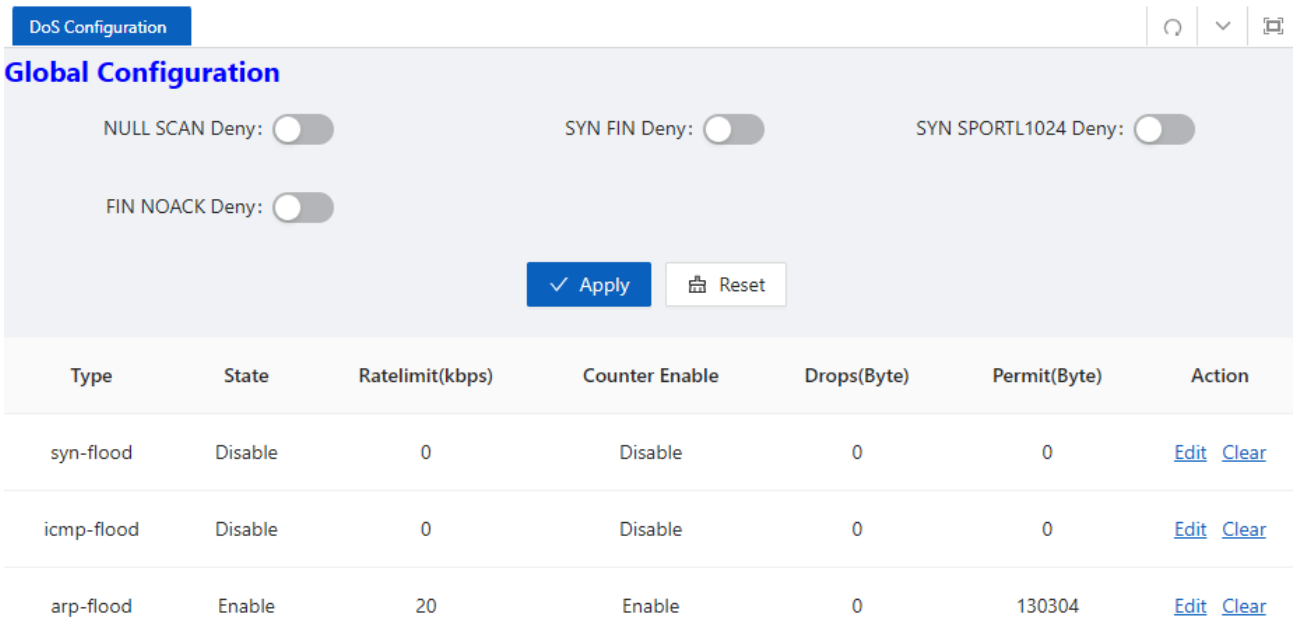


Table 4-27 Descriptions of global configuration

Item	Description
NULL SCAN Deny	Configure the global anti-NULL SCAN attack, and discard the TCP message without any flag
SYN FIN Deny	Configure global anti-SYN FIN attack, and discard TCP messages set by both SYN and FIN flag
SYN SPORT1024 Deny	Configure the global anti-SYN SPORTL1024 attack, and discard the synchronous message of the source port (0-1023) TCP after opening
FIN NOACK Deny	Configure global anti-FIN NOACK attack, and discard TCP messages with FIN set without ACK set
SYN/ICMP/ARP Flood	Configure global anti-SYN/ICMP/ARP Flood attack
SYN/ICMP/ARP Flood rate-limit	Configure the rate limit range of anti-SYN/ICMP/ARP Flood attack and if its value is 0, deny all attack messages
Counter enable	Configure the counter enable function of anti-SYN/ICMP/ARP Flood attack and if it's enabled, count the hit attack message

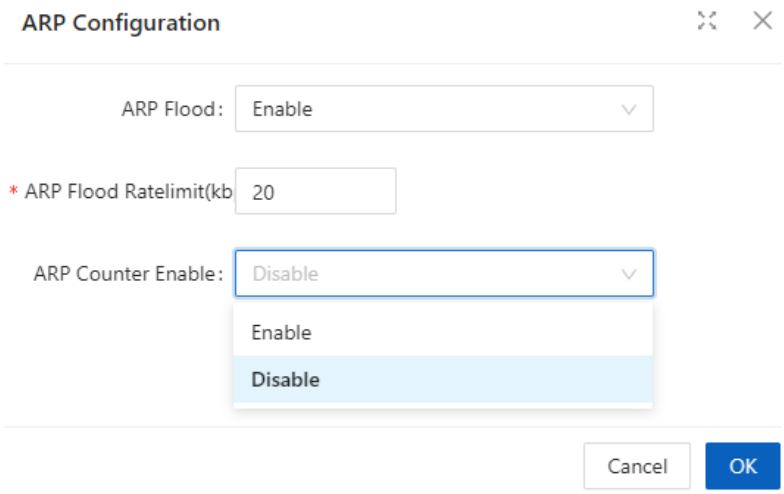
Figure 4-41 ARP configuration page

Operating Steps

1. Select **Advance** > **Security** > **DoS Configuration** in the navigation bar to enter the DoS Configuration page.

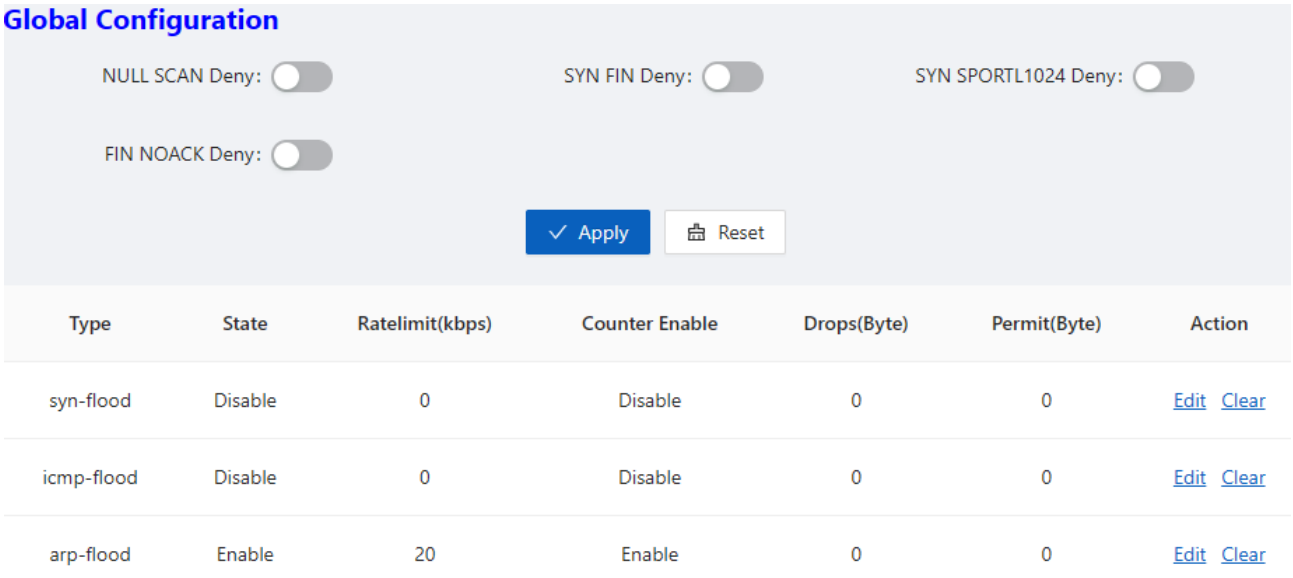
2. Click the **Edit** button in the Global Configuration table to enter the anti-DoS attack creation modal, and fill in the parameters according to requirements. Take the Global ARP Flood Configuration for instance, as shown in *Figure 4-42* and click the **OK** button to complete the configuration.

Figure 4-42 ARP Flood configuration page



After above steps, the successful DoS Global Configuration page is shown in *Figure 4-43*.

Figure 4-43 Global ARP Flood configuration page



SYN/ICMP/ARP Configuration

Port Configuration against DoS attack includes SYN Flood, ICMP Flood and ARP Flood. The configuration page is shown in *Figure 4-44~ Figure 4-46* and the parameters' descriptions is shown in *Table 4-28*.

Table 4-28 Descriptions of SYN/ ICMP/ARP configuration

Item	Description
SYN Flood	Enable SYN Flood attack
SYN Flood rate-limit	Limit the SYN message attack flow rate
ICMP Flood	Enable ICMP Flood attack
ICMP Flood rate-limit	Limit the ICMP message attack flow rate
ARP Flood	Enable ARP Flood attack
ARP Flood rate-limit	Limit the ARP message attack flow rate

Figure 4-44 SYN configuration page

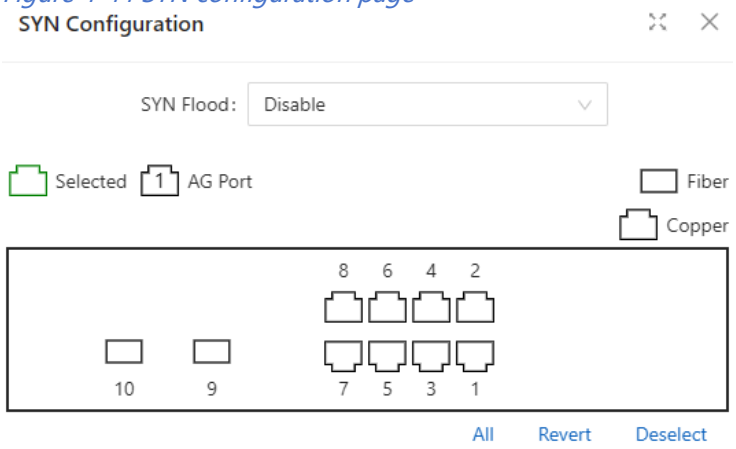


Figure 4-45 ICMP configuration page

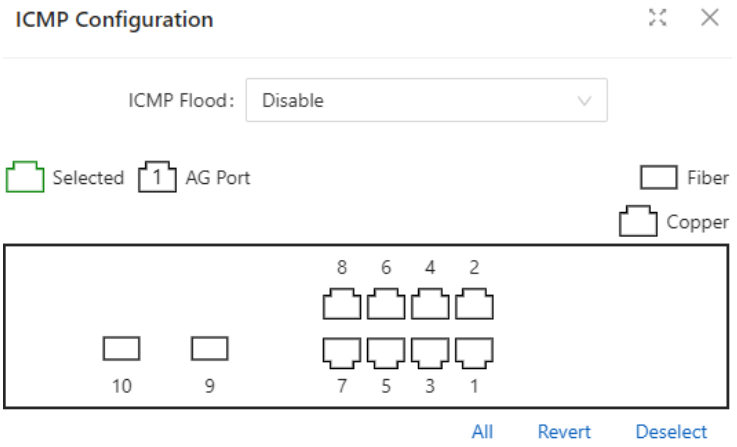
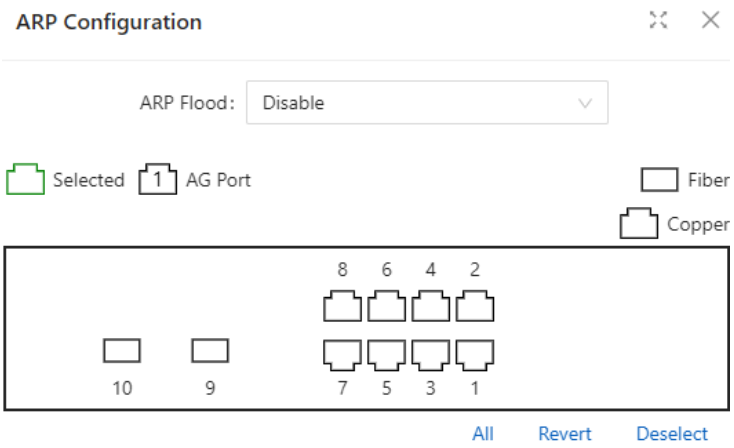


Figure 4-46 ARP configuration page

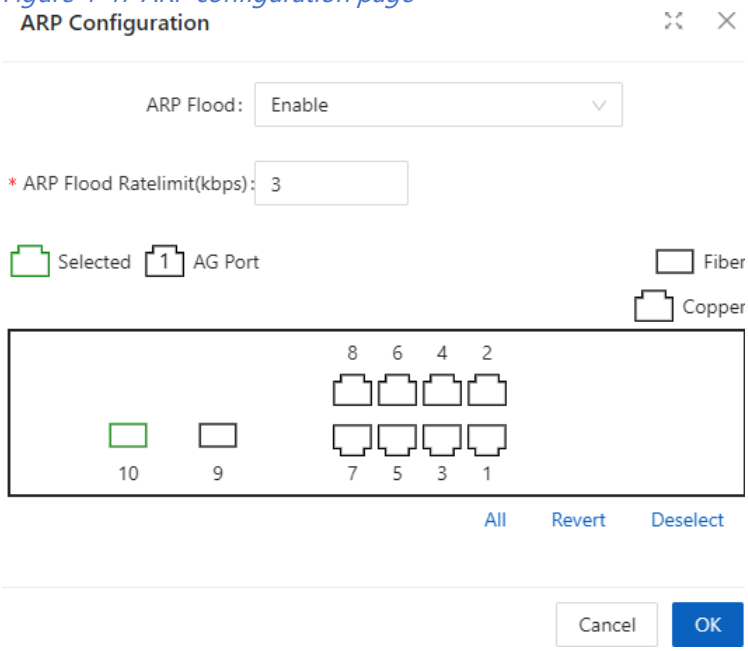


4.8.2.1 Operating Steps

1. Select **Advance** > **Security** > **DoS Configuration** in the navigation bar to enter the DoS Configuration page.

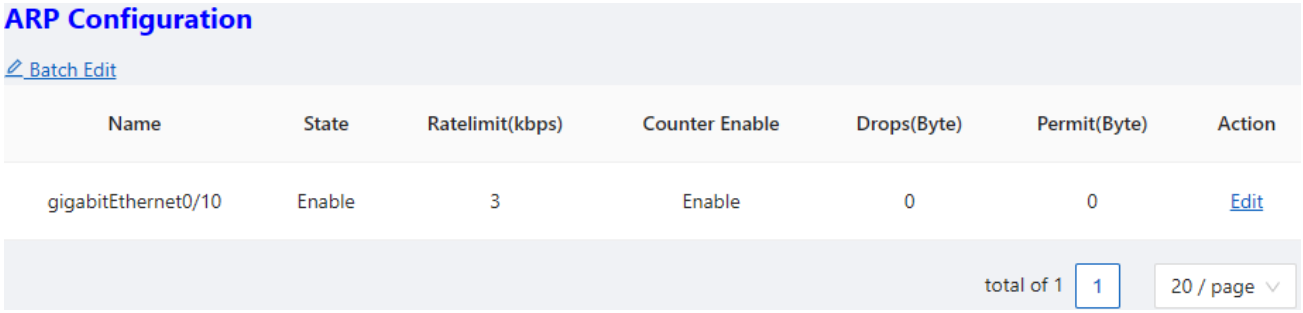
2. Click the **Batch Edit** button under SYN/ICMP/ARP Configuration to enter the creation page. Take the ARP Configuration as an example, as shown in *Figure 4-47*.

Figure 4-47 ARP configuration page



After above steps, the successful ARP Configuration page is shown in *Figure 4-48*.

Figure 4-48 ARP configuration table

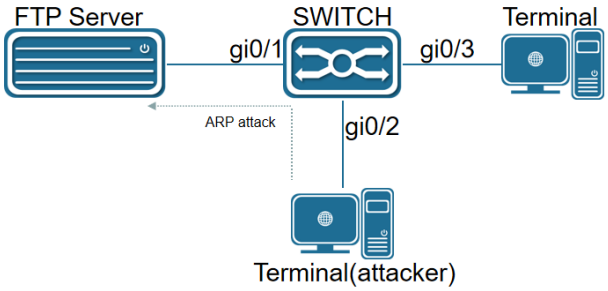


4.8.2.2 A Configuration Example

Take ARP Flood Configuration for example, the following networking requirements are shown in *Figure 4-49*.

- Port gi0/1 connects to FTP server while port gi0/2 and gi0/3 connect to terminal devices respectively.
- The connecting terminal of port gi0/2 forges a large number of IP and MAC addresses to launch ARP attacks, leaving the FTP server unable to handle normal requesting ARP messages.

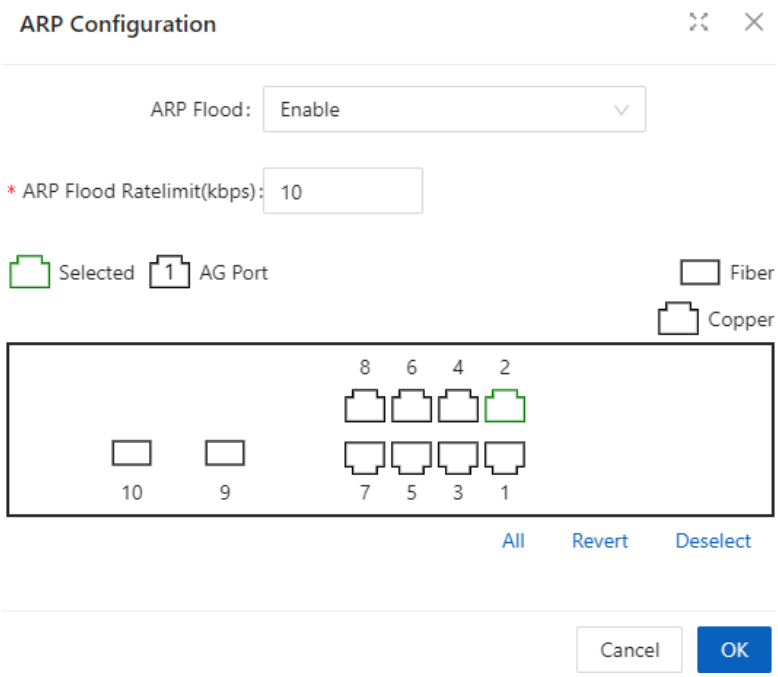
Figure 4-49 Network topology



1. Select **Advance** > **Security** > **DoS Configuration** in the navigation bar to enter the DoS Configuration page.

2. Click the **Batch Edit** button under ARP Configuration to enter the ARP Configuration modal, select GigabitEthernet0/2 in the port panel, and click **OK** to complete the configuration, as shown in *Figure 4-50*.

Figure 4-50 ARP configuration page



3. Click the **Save** button in the navigation bar to save such configuration.

4.9 Route

4.9.1 ARP/Neighbor Configuration

4.9.1.1 Overview

ARP resolves an IP address into a physical address, such as an Ethernet MAC address.

On an Ethernet LAN, a device uses ARP to get the MAC address of the target device for a packet

ARP Table

After obtaining the MAC address for the destination host, the device puts the IP-to-MAC mapping into its own ARP table. This mapping is used for forwarding packets with the same destination in the future.

An ARP table stores dynamic and static ARP entries.

Dynamic ARP Entry

ARP automatically creates and updates dynamic entries. A dynamic ARP entry is removed when its aging timer expires or the output interface goes down, and it can be overwritten by a static ARP entry.

Static ARP Entry

A static ARP entry is manually configured and maintained. It cannot get aged or be overwritten by a dynamic ARP entry.

Static ARP entries protect communication between devices, because attack packets cannot modify the IP-to-MAC mapping in a static ARP entry.

4.9.1.2 Configure ARP/Neighbor

Displaying ARP/Neighbor

1. Select **Monitor** > **ARP/Neighbor Information** in the navigation area to enter ARP/Neighbor displaying page as shown in *Figure 4-51*. *Table 4-29* describes the configuration items of ARP/Neighbor.

Figure 4-51 Port configuration page

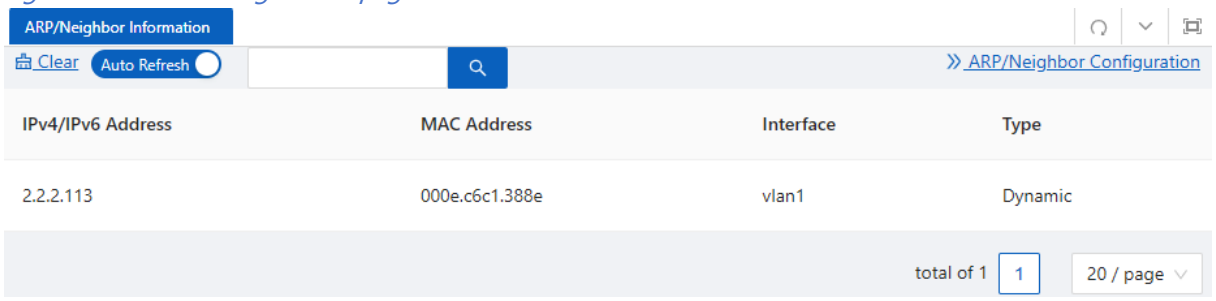


Table 4-29 Descriptions of ARP/Neighbor

Item	Description
IPv4/IPv6 Address	Terminal IP address
MAC Address	Terminal MAC address
Interface	The name of the Layer 3 interface where the terminal is located
Type	ARP/neighbor address type

Configuring ARP/Neighbor

1. Select **Advance** > **Layer3** > **ARP/Neighbor Configuration** in the navigation area to enter ARP/Neighbor Configuration page as shown in *Figure 4-52*.

2. Click **+Add** button to enter the crating page as shown in *Figure 4-53*.

3. Configure the IP address and MAC address.

4. Click **OK** button to complete the configuration.

Figure 4-52 ARP/Neighbor configuration page

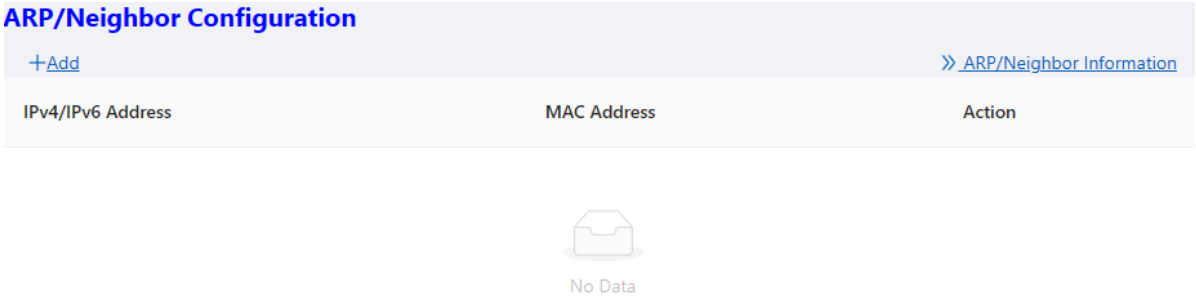
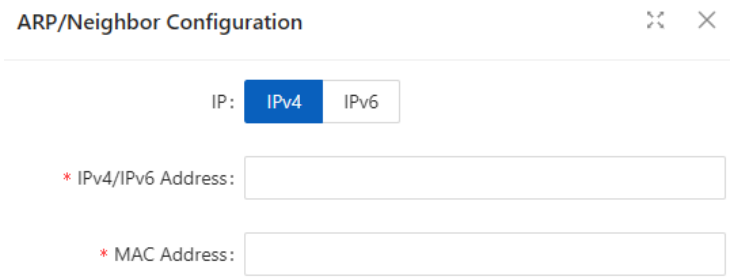


Figure 4-53 Creating a new ARP/Neighbor



4.9.2 Route

Routers are responsible for routing packets on the Internet. A router selects an appropriate route according to the destination address of a received packet and forwards the packet to the next router. The last router on the path is responsible for sending the packet to the destination host.

4.9.2.1 Routing Table

Routers forward packets through a routing table. Each entry in the table specifies which physical interface a packet should go out to reach the next hop (the next router) or the directly connected destination.

Routes in a routing table fall into three categories by origin:

- Direct routes: Routes discovered by data link protocols, also known as interface routes.
- Static routes: Routes that are manually configured.
- Dynamic routes: Routes that are discovered dynamically by routing protocols.

A route entry has the following items:

- Destination IP address: Destination IP address or destination network.
- Mask (IPv4)/prefix length (IPv6): Specifies, together with the destination address, the address of the destination network.
- Outbound interface: Specifies the interface through which a matching IP packet is to be forwarded.
- Next hop: Specifies the address of the next hop router on the path.
- Preference for the route: Routes to the same destination may be found by various routing protocols or manually configured, and routing protocols and static routes have different priorities configured. The route with the highest priority (the smallest value) will be selected as the optimal route.

4.9.2.2 Static Route

A static route is manually configured. If a network ‘s topology is simple, you only need to configure static routes for the network to work normally. The proper configuration and usage of static routes can improve network performance and ensure bandwidth for important network applications.

The disadvantage of using static routes is that they cannot adapt to network topology changes. If a fault or a topological change occurs in the network, some routes will be unreachable. In this case, the network administrator has to modify the static routes manually.

While configuring a static route, you can specify either the output interface or the next hop address as needed. The next hop address cannot be a local interface ‘s IP address; otherwise, the route configuration will not take effect.

Actually, it is necessary to identify next hop addresses for all route entries because the router needs to use the next hop address of a matching entry to resolve the corresponding link layer address.

4.9.2.3 Configure Static Route

Displaying Static Route

1. Select **Advance** > **Layer3** > **Static Route** in the navigation area to enter Static Route displaying page as shown in *Figure 4-54*. *Table 4-30* describes the configuration items of static route.

Figure 4-54 Creating a new static ARP

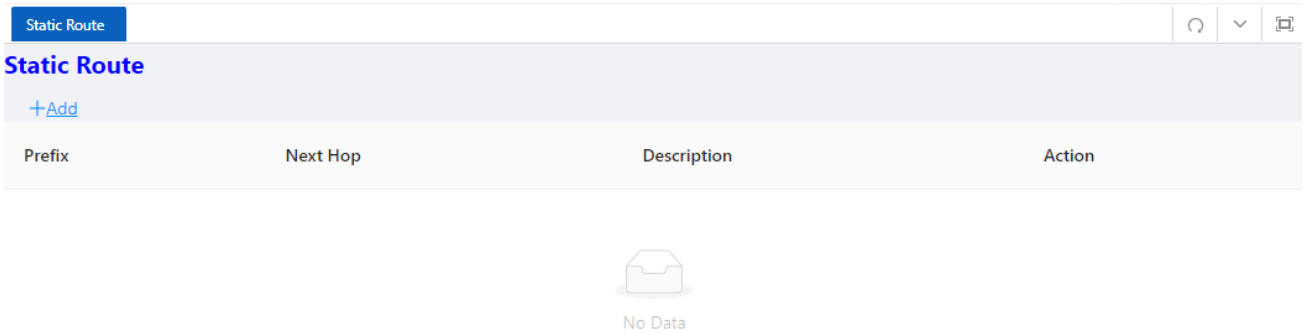


Table 4-30 Descriptions of static route

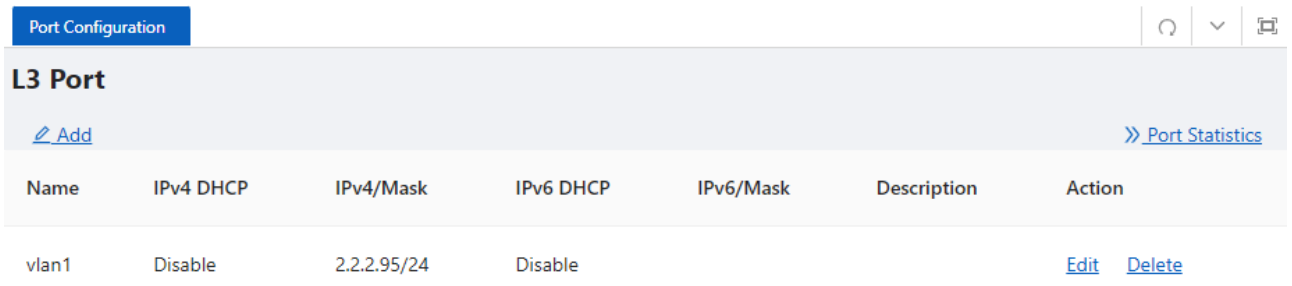
Item	Description
Route Type	IPv4 or IPv6 route
Prefix	Routing prefix address, or routing network segment; for example, common route 0.0.0.0/0 192.168.1.1, the prefix IP is 0.0.0.0
Next Hop	Next hop IP address of the route
Description	Route description information, optional configuration
Action	Delete or modify

Creating New the Static Route

1. Select **Configuration** > **VLAN** in the navigation area to create VLAN ID.

2. Select **Configuration** > **Port** > **Port Configuration** > **L3 port** in the navigation area to create L3 SVI port as shown in *Figure 4-55*.

Figure 4-55 Creating a L3 SVI port

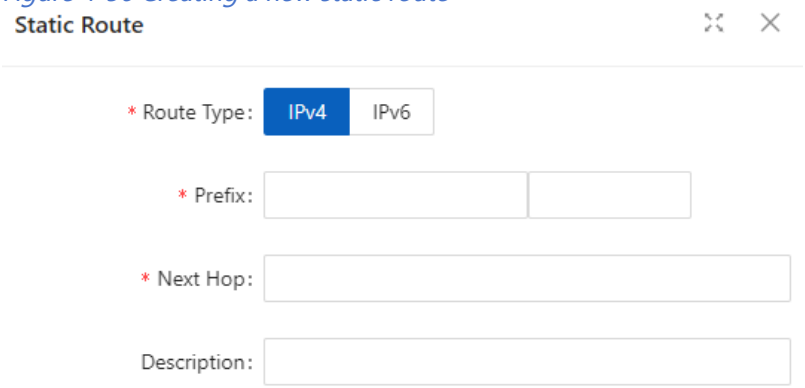


3. Select **Advance** > **Layer3** > **Static Route** in the navigation area to enter Static Route page, click **+Add** button to enter the crating page as shown in *Figure 4-56.*

4. Configure the Prefix and Next Hop.

5. Click **OK** button to complete the configuration.

Figure 4-56 Creating a new static route



NOTE:

- When adding a new SVI port, the default management IP address will be automatically deleted. Please ensure that the new SVI port can continue to be accessed.

4.10 Voice VLAN

4.10.1 Voice VLAN Overview

Voice VLAN is a VLAN that is specifically allocated for the voice data streams of users. By creating a Voice VLAN and adding the ports connected to the voice devices to this VLAN, users can concentrate the voice data transmission within the Voice VLAN. This facilitates the targeted QoS (Quality of Service) configuration for the voice streams, enhances the transmission priority of voice traffic, and ensures the quality of calls.

4.10.2 Voice Stream Recognition

To separate the voice data stream into the Voice VLAN, the following methods for identifying voice data need to be adopted:

- Identify voice data through the OUI field

The source MAC address of the voice message contains the OUI (Organization Unique Identifier) information of the voice device manufacturer. After configuring the voice VLAN OUI, compare the voice VLAN OUI with the source MAC address of the received message. This way, voice data messages can be identified and transmitted to the voice VLAN.

- Identify voice data through the VLAN tag carried in the message

If a large number of IP telephones are connected to the switch, configuring the OUI of IP telephones would be very cumbersome. On the switch, you can configure VLAN of the switch to enhance the priority of voice packets. At this time, the device will determine whether the data packet is a voice packet by checking the VLAN ID of the incoming packet at the interface. When the VLAN ID matches the voice VLAN configured by the system, it is considered to be a voice data steam.

In the case of a large number of IP telephones being connected, the configuration can be simplified.

- Identify voice device through the LLDP protocol automatically

When there are a large number of IP telephones in the network, configuring the OUI of the voice devices can be quite complicated. If the IP phone supports LLDP, when the IP phone is connected, it will actively send LLDP packets. This device can capture the LLDP protocol packets sent by the IP phone and identify the device capabilities in the protocol packets. Devices with the capability "Telephone" will be recognized as voice devices. Then, the source MAC address in the protocol message is extracted and used as the MAC address of the voice device for processing, thereby achieving the automatic identification of the voice device.

If the LLDP sends voice VLAN strategy is configured, this device can also capture the LLDP messages sent by IP phones. It will fill in the voice VLAN information in the relevant fields and send it back to the IP phones. As a result, the IP phones will obtain the voice VLAN ID of this device. If IP telephone supports sending packets with the tag, the VLAN tag will be added when

sending voice packets. When the device receives a tagged packet sent by the IP telephone, it will compare the VLAN tag with the voice VLAN ID. If they are the same, it will recognize this packet as a voice data packet.

Currently, do not support automatically identifying the voice device through LLDP protocol.

4.10.3 Work Mode

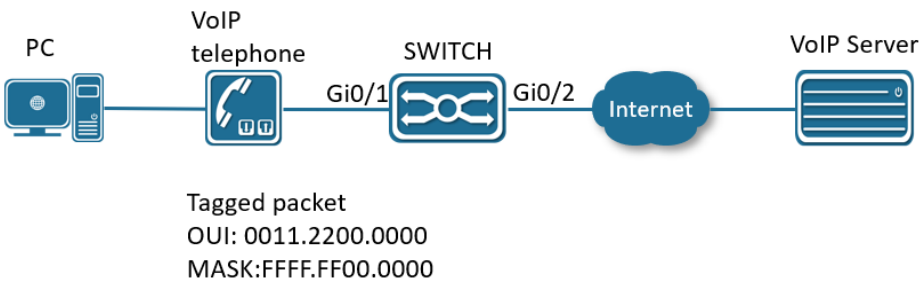
4.10.3.1 Work Mode Based on OUI

The voice data is identified through the OUI field, as long as the OUI of the message matches the MAC address specified for voice VLAN successfully, the CoS and DSCP fields of the packet will be modified. The voice VLAN based on OUI has two working modes: automatic and manual. The main difference lies in the way the port joins the voice VLAN.

Automatic Mode

The most common connection method is that a PC is connected in series with an IP phone to the port of the switching equipment. At this time, the port needs to simultaneously transmit voice data and ordinary business data. When transmitting voice data, the port automatically joins the voice VLAN.

Figure 4-57 Voice VLAN automatic mode



Working process of automatic mode of voice VLAN:

Initial state: Port gi0/1 is a trunk/hybrid port and has been removed from the Voice VLAN.

Port joining VLAN: Identify the source MAC address of the received packet, compare it with the voice OUI address. If the OUI matches successfully, it is identified as a voice packet. The device

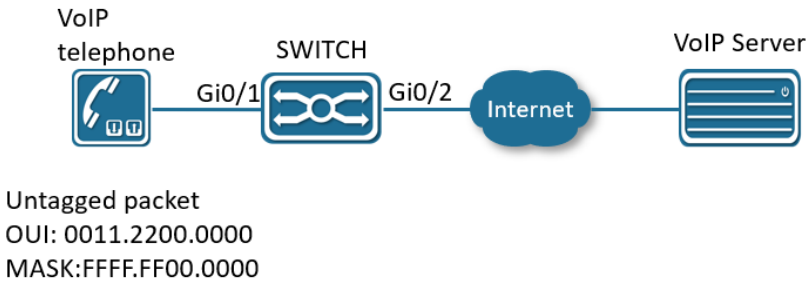
automatically adds the input port of this voice packet to the voice VLAN and transmits the voice packet within the voice VLAN.

Be removed from VLAN due to aging: Utilize the aging mechanism to maintain the ports within the voice VLAN. Once the MAC address of a voice packet ages, if the port does not receive any voice packets for a certain period of aging time, it will automatically be removed from the voice VLAN.

Manual Mode

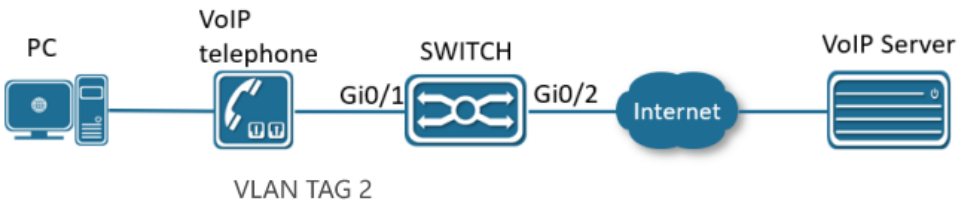
When an IP phone is connected to a port alone, since the port only needs to transmit voice packets, in this case, the manual mode can be adopted. The administrator can manually configure the port to join the voice VLAN or remove it from the voice VLAN. This networking method enables the port to be exclusively used for transmitting voice data, avoiding the interference of business data on the transmission of voice data.

Figure 4-58 Voice VLAN manual mode



4.10.3.2 Work Mode Based on VLAN

Figure 4-59 The work mode of voice VLAN based on VLAN



The implementation principle of voice VLAN based on VLAN is as follows: After receiving the packets sent by the PC and VoIP telephone, the switch will determine whether the VLAN ID of the

packet is the same as the voice VLAN ID configured on the interface. If they are the same, it will consider this data flow as a voice data flow and give it a higher priority. Untagged packets sent by the PC will be tagged with the PVID VLAN Tag. Therefore, the voice VLAN based on VLAN requires that VoIP telephones can manually specify the VLAN ID or support obtaining the voice VLAN information configured on the switch to change the VLAN ID of the packets they send.

4.10.4 Security Mode

When a port is added to the voice VLAN, the device no longer checks the source MAC address of each packet individually. In theory, all packets can be transmitted within the voice VLAN. Therefore, the device may be vulnerable to attacks from malicious packets, which could affect normal voice communication within the voice VLAN.

To better separate the user voice stream from the data stream for transmission, the voice VLAN provides a security mode function. When the security mode is enabled, the voice VLAN only allows the transmission of voice streams. The device will check the source MAC address of each packet one by one. If the source MAC address of the packet matches the OUI address of the voice VLAN, the packet is allowed to be transmitted within the voice VLAN; otherwise, it is discarded.

4.10.5 Voice VLAN Configuration

The voice VLAN page provides three modules: Global Configuration, OUI Configuration and Port Configuration.

Global Configuration

Select **Advance > Layer2 > Voice VLAN** in the navigation area to enter Voice VLAN Configuration page, as shown in *Figure 4-60*. The global parameters are shown in *Table 4-31*.

Figure 4-60 Voice VLAN global configuration

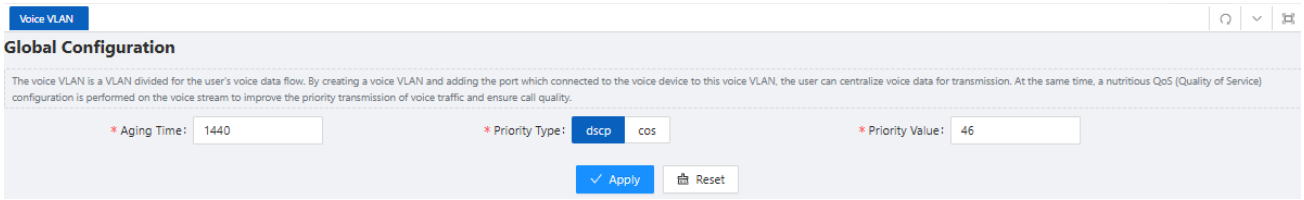


Table 4-31 Voice VLAN parameter description of global configuration

Item	Description
Aging Time	The aging time of the voice VLAN starts to be calculated from the moment when the first MAC address matching the OUI configuration enters the port. The value range is from 5 to 10000, with units of minutes. The default value is 1440. The aging time is only effective in the automatic mode and has no significance in other modes.
Priority Type	Configure the priority type of Voice VLAN. The CoS value of the voice VLAN voice stream, the range is 0 to 7, the default value is 5. After configuring the CoS value, the priority takes effect according to the CoS. The DSCP value takes effect based on the corresponding value mapped by the CoS; The DSCP value of the voice VLAN voice stream, the range is 0 to 63, the default value is 46. After configuring the DSCP value, the priority takes effect according to the DSCP. The CoS value takes effect based on the corresponding value mapped by the DSCP. Defaults to taking effect according to the DSCP value.
Priority Value	Configure the priority value for the voice VLAN. The valid range of values is 0-63.

OUI Configuration

In the navigation bar, select **Advanced > Layer 2 > Voice VLAN > OUI Configuration**. Then enter the OUI Configuration page, as shown in *Figure 4-61*. The configuration parameters are as shown in *Table 4-32*.

Figure 4-61 OUI configuration

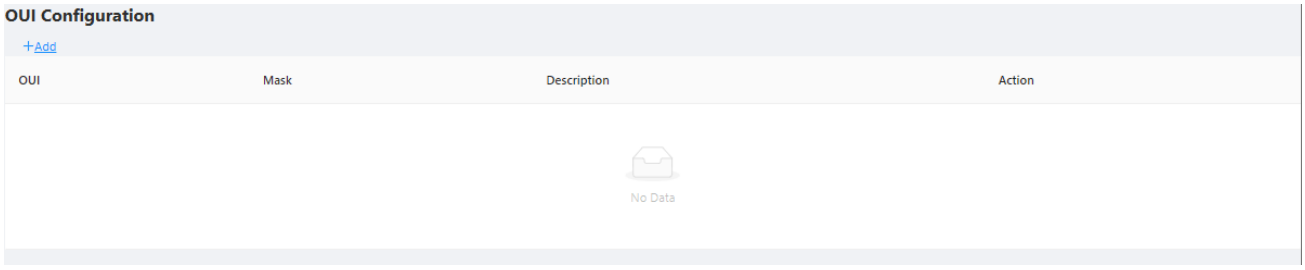


Table 4-32 The parameter description of OUI

Item	Description
OUI	Configure OUI address. OUI: format XXXX.XXXX.XXXX. The OUI address cannot be a multicast address. The configured mask must be continuous and cannot be all zeros.
Mask	OUI MASK：format XXXX.XXXX.XXXX.
Description	Descriptor configuration, the length must not exceed 64.

Port Configuration

In the navigation bar, select **Advanced > Layer 2 > Voice VLAN > Port Configuration**. Then enter the Port Configuration page, as shown in *Figure 4-62*. The configuration parameters are as shown in *Table 4-33*.

Figure 4-62 Port configuration

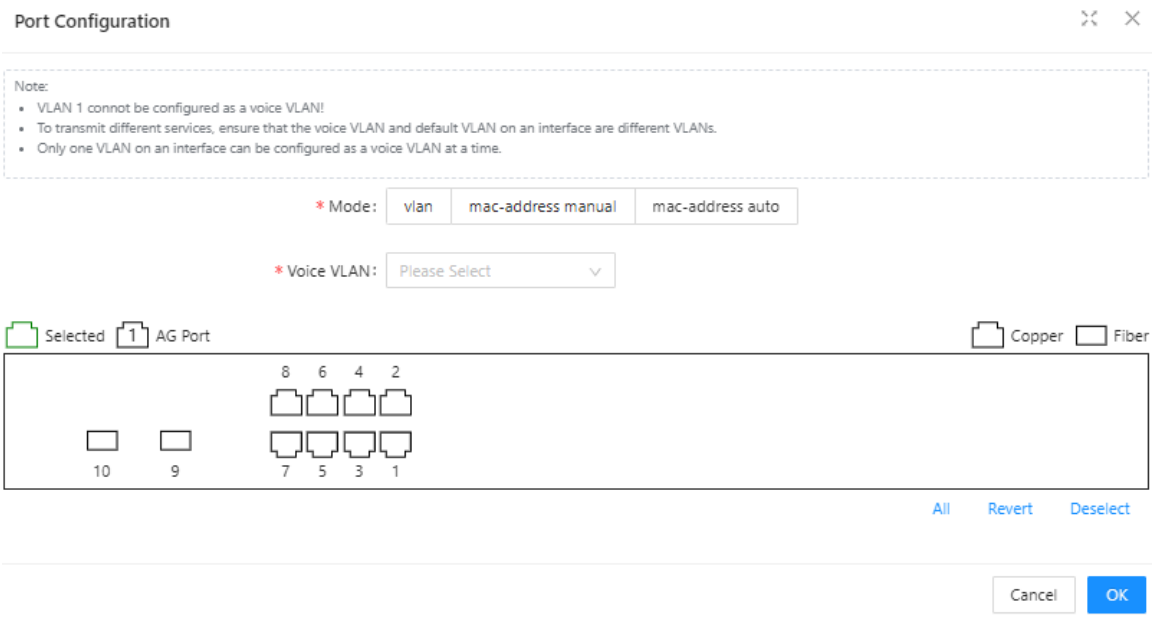


Table 4-33 The port parameter description of the voice VLAN

Item	Description
Mode	Set the voice VLAN working mode of the port. vlan: identify the voice stream based on the VLAN information in the VLAN tag of the packet. mac-address auto: automatic mode based on the OUI identification. mac-address manual: manual mode based on the OUI identification. VLAN mode of the port by default.

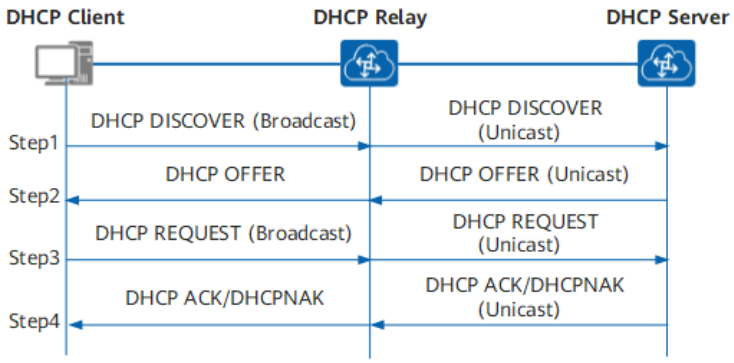
Voice VLAN	VID：the value range is from 2 to 4094. VLAN 1 cannot be set as a voice VLAN.

4.11 DHCP Relay

4.11.1 Overview

When the DHCP client and the server are not in the same network segment, the DHCP relay function is required to relay and forward the DHCP packets between the client and the server. The working process of DHCP relay is shown in the following figure.

Figure 4-63 The work process of DHCP relay



The DHCP relay function operates only on Layer 3 interfaces, and the DHCP relay must be directly connected to the network segment where the DHCP client is located.

MAC Address verification

For the DHCP messages sent by the port, if the source MAC address in the second-layer header of the message does not match the CLIENT HARDWARE ADDRESS field in the data segment, it is regarded as an illegal message.

Option-82 Option

The DHCP Option82 is also known as the DHCP Relay Agent Information Option. It is an option within the DHCP message. The Option82 was proposed to enhance the security of the DHCP server and improve the IP address allocation strategy. It is implemented by the relay component to add and strip the option.

DHCP Relay Database

DHCP Relay monitors DHCP messages and counts the user information allocated by legitimate servers.

DHCP Relay Suppression

After configuring the DHCP relay interface suppression on the specified interface, the DHCP request packets received on this interface will be blocked; while for the DHCP request packets received on other interfaces, they will be forwarded normally.

4.11.2 Configure DHCP Relay

Configuration Steps:

1. Select **Advance** > **Layer3** > **DHCP Relay** in the navigation area to enter DHCP Relay Configuration page as shown in *Figure 4-64* and the relevant parameters are as shown in *Table 4-34*.

Figure 4-64 DHCP relay global configuration

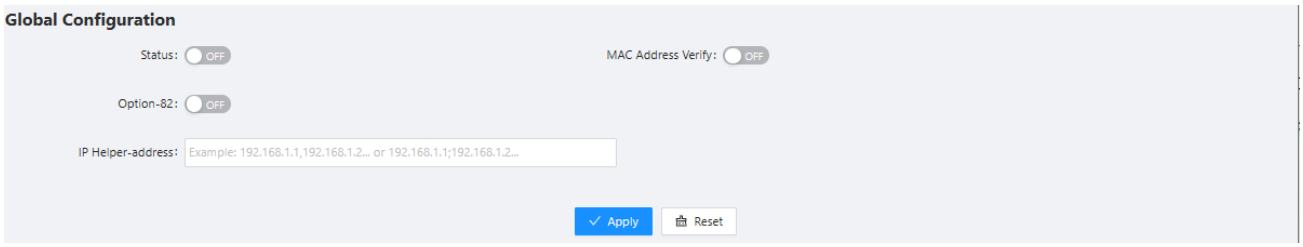


Table 4-34 The global parameter description of DHCP relay

Item	Description
Status	Enable or disable DHCP relay globally.
Option-82	Add the option-82 information in the DHCP request message, and remove the option-82 information in the response message. Off by default.
MAC Address Verify	Enable/Disable the MAC address verification function for DHCP messages.
IP Helper-address	Configure the DHCP server addresses. Up to 20 DHCP server addresses can be configured.

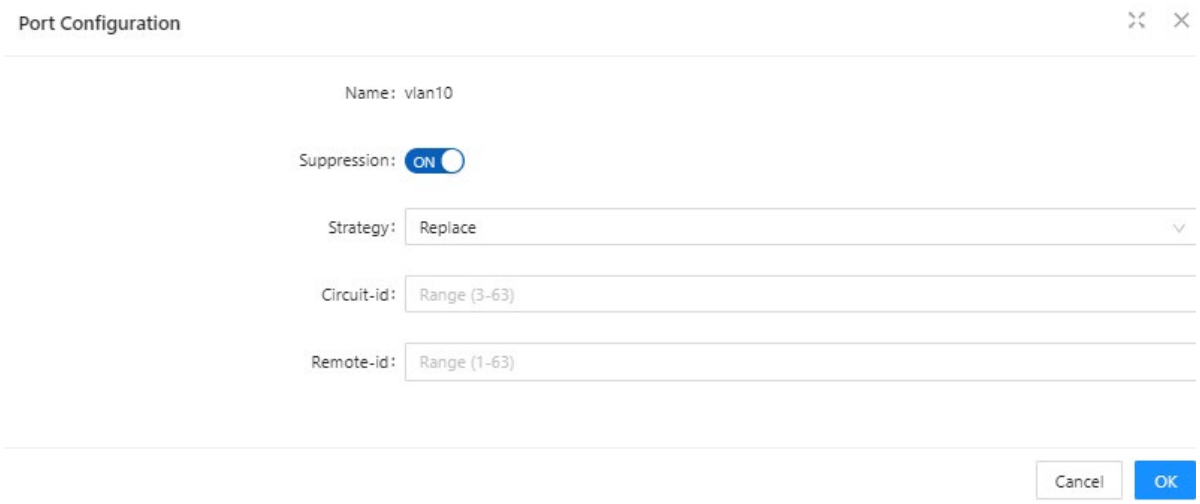
2. Select the port that needs to enable this function and select the port that needs to be edited. Click the **Edit** button or click the **Batch Edit** button below Port Configuration to enter the port

configuration interface, as shown in *Figure 4-65*. The description of port configuration parameters is as shown in *Table 4-35*.

Table 4-35 The port parameter description of DHCP relay

Item	Description
Name	Configure the name of ports.
Suppression	Configure the DHCP relay suppression to block the DHCP requests received on the interface. Only supported on layer 3 ports /SVI ports. Off by default.
Strategy	Only support configuration on the layer 3 port/SVI port. Configure the processing strategy for DHCP relay requests containing Option-82: drop: If the request packet contains Option-82, discard it. keep: If the request packet contains Option-82, keep the Option-82 in it unchanged and forward it. replace: If the request packet contains Option-82, fill in Option-82 according to the configured padding format, replace the original Option-82 in it with this option, and forward it. By default, the strategy for DHCP relay requests containing Option-82 is replace.
Circuit-id	Configure the circuit-id custom content. The effective length is 3 to 63 characters. Only supported on the layer 3 port/SVI port. The default includes VLAN and port information.
Remote-id	Configure the remote-id custom content. The effective length is 1 to 63 characters. Only supported on the layer 3 port/SVI port. The default includes the device MAC address information.

Figure 4-65 The port configuration of DHCP relay



4.12 DHCP Server

4.12.1 Overview

DHCP (Dynamic Host Configuration Protocol) is a network protocol for LAN. It operates using the UDP protocol and is widely used to dynamically allocate reusable network resources, such as IP address.

DHCP is based on the Client/Server working mode. DHCP clients obtain IP addresses and other configuration information from the DHCP server by sending request messages. When the DHCP client and the server are not on the same subnet, a DHCP Relay Agent (DHCP Relay) is required to forward DHCP requests and response messages.

4.12.1.1 Protocol Standard

RFC2132 DHCP Options and BOOTP Vendor Extensions. S. Alexander, R. Droms. March 1997. (Format: TXT, HTML) (Obsoletes RFC1533) (Updated by RFC3442, RFC3942, RFC4361, RFC4833, RFC5494) (Status: DRAFT STANDARD) (DOI: 10.17487/RFC2132)

4.12.2 Configure DHCP Server

Select **Advanced > Layer 3 > DHCP Server** in the navigation area to enter DHCP server configuration page. This page includes three modules: Global Configuration, Subnet Configuration and Host Configuration.

Global Configuration

Select **Advanced > Layer 3 > DHCP Server** in the navigation area, the DHCP Server page is as shown in *Figure 4-66* and the specific parameter is as shown in *Table 4-36*, click **Apply** button to finish configuration.

Figure 4-66 DHCP server global configuration

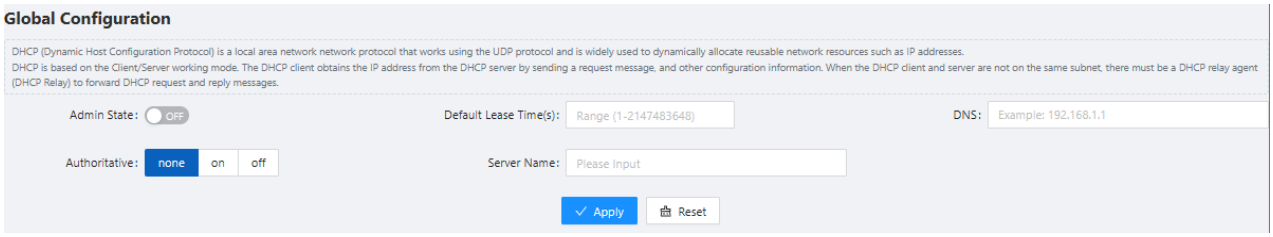


Table 4-36 The global parameter description of DHCP server

Item	Description
Admin State	Global enable/disable of DHCP server.
Default Lease Time(s)	The address lease period allocated to the DHCP client is set to the default lease time of 43200 seconds (12 hours).
DNS	Configure the DNS server address assigned to the DHCP client.
Authoritative	The sole DHCP server authorization mode for configuration authorization.
Server Name	Configure the name of the DHCP server. The maximum configuration length should not exceed 79 characters.

WARN:

- When configuring global options and there is a conflict in option values, the global parameter has a lower priority than the parameters of more precise subnet and address pools.

Subnet Configuration

On the DHCP Server page, click the **Add** button below Subnet Configuration, and you will enter the subnet configuration modal, as shown in *Figure 4-67*. The description of port configuration parameters is given in *Table 4-37*.

Figure 4-67 Subnet configuration page

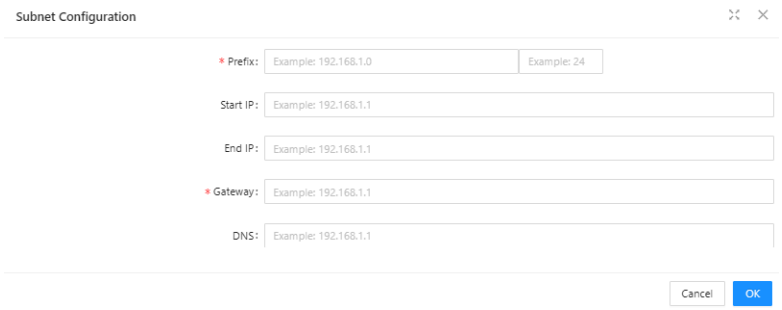


Table 4-37 The subnet parameter description of DHCP server

Item	Explanation
Prefix	Defines the prefix for configuring the subnet address range
Start IP	Defines the starting IP address for the subnet address range
End IP	Defines the ending IP address for the subnet address range
Gateway	Defines the gateway routing address for the subnet
DNS	Defines the DNS server address for the subnet

Host Configuration

On the DHCP Server page, click the **Add** button below Host Configuration, and you will enter the host configuration modal, as shown in *Figure 4-68*. The description of port configuration parameters is given in *Table 4-38*.

Figure 4-68 Host configuration page

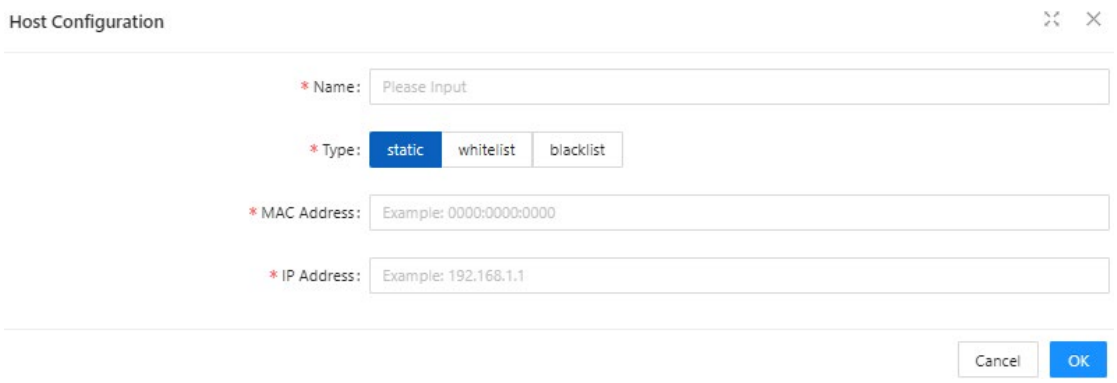


Table 4-38 The host parameter description of DHCP server

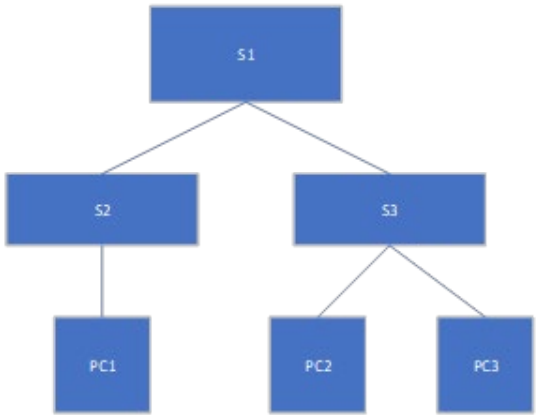
Item	Explanation
Name	Configure host address name
Type	Configure host address type
MAC Address	Configure host MAC address
IP Address	Configure host IP address

4.12.3 A Configuration Example

1. Network Requirements

Refer to the following *Figure 4-69* for the network description:

Figure 4-69 DHCP server configuration example network diagram



S1: Layer 3 switch
VLAN 100: 192.168.100.1/24 Directly connected to S2
VLAN 200: 192.168.200.1/24 directly connected to S3
S2, S3 : Layer 2 switches
PC1, PC2, and PC 3 are automatically assigned IP
Expect:
PC1 and PC2 can obtain the IPs of their respective network segments, and can ping each other.
PC3 can be assigned to the address of 192.168.200.2

2. Configuration Steps

Configure S1:

Step 1: In the navigation bar, select **Advanced > Layer 3 > DHCP Server**. Enter the DHCP Server Configuration interface. Click the **Add** button under Subnet Configuration to enter the subnet configuration interface. Add two subnet configuration items as shown in *Figure 4-70* and *Figure 4-71*. Fill in the relevant parameters and click the **OK** button to complete the configuration.

Figure 4-70 Subnet configuration 1

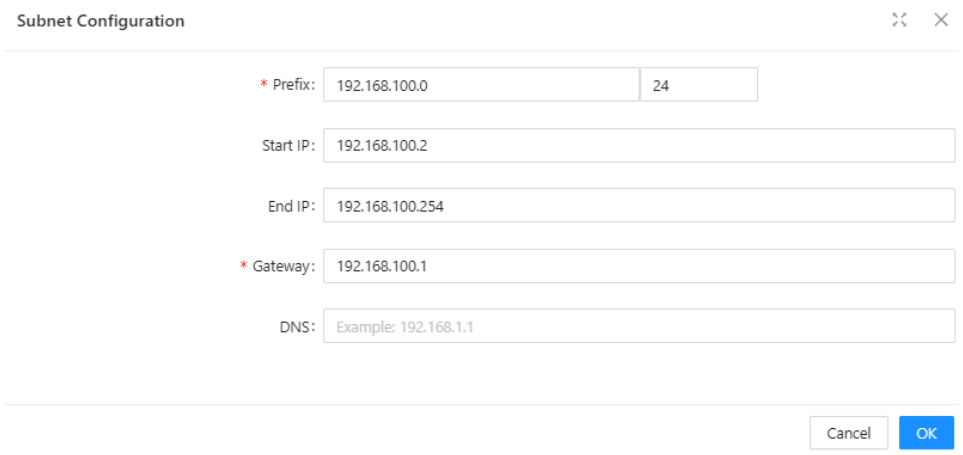
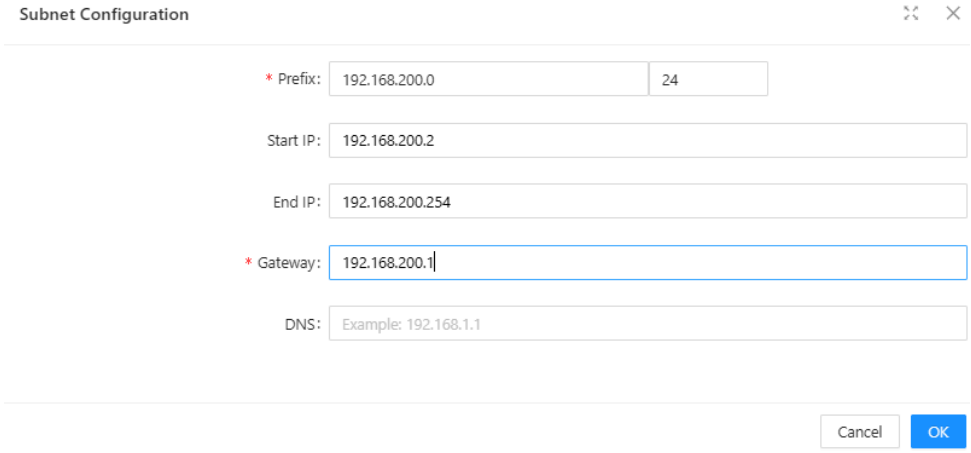
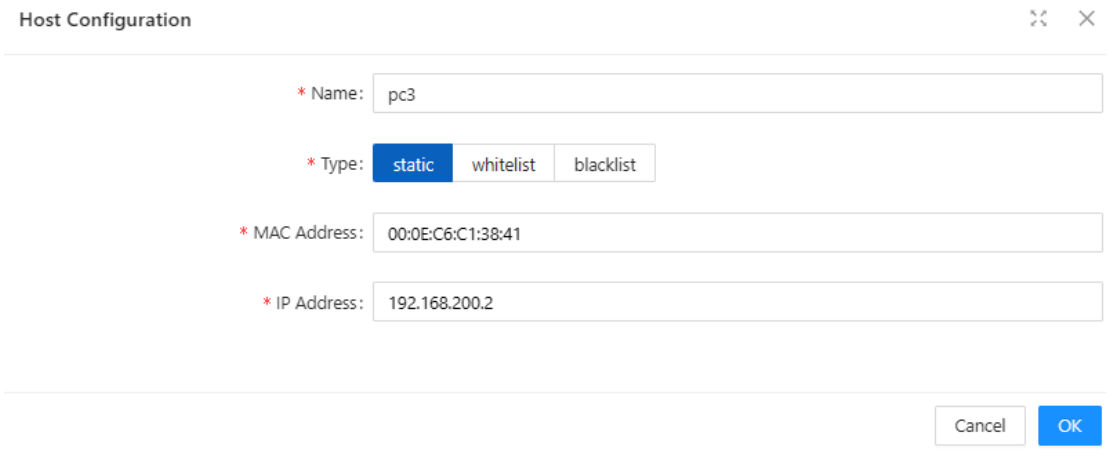


Figure 4-71 Subnet configuration 2



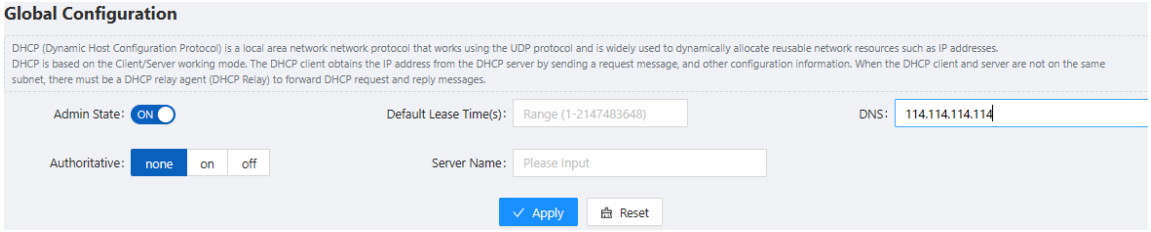
Step 2: In the navigation bar, select **Advanced > Layer 3 > DHCP Server**. This will take you to the DHCP Server Configuration interface. Click the **Add** button under Host Configuration to enter the host configuration page. Follow the steps as shown in *Figure 4-72* to fill in the relevant parameters and click the **OK** button to complete the configuration.

Figure 4-72 Host configuration page



Step 3: In the navigation bar, select **Advanced > Layer 3 > DHCP Server** to enter the DHCP Server Configuration interface. Open the Admin State in the global configuration module and configure the DNS server address. Follow the steps as shown in *Figure 4-73*, fill in the relevant parameters, and click the **Apply** button to complete the configuration.

Figure 4-73 Global configuration page



Step 4: Click the **Save** button in the auxiliary area to save the configuration.

Configure S2/S3: Transparent transmission in empty configuration.

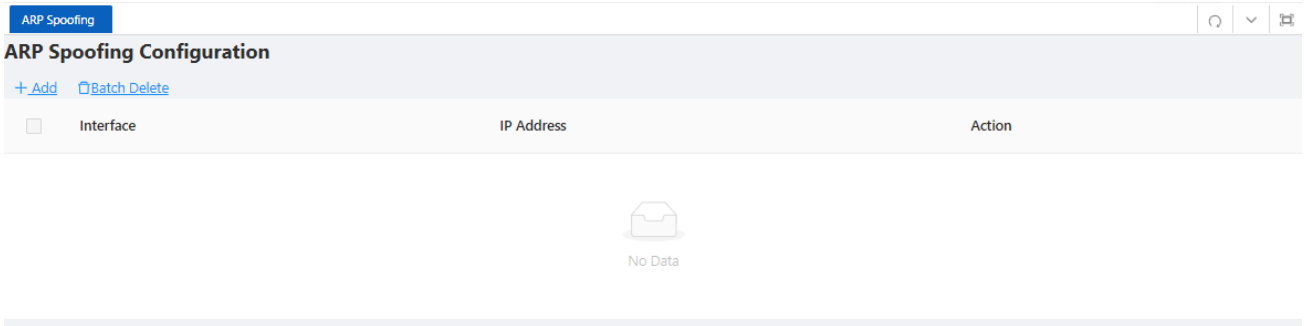
4.13 ARP Spoofing

Configuring this function on the interfaces of the device that are not connected to the gateway can prevent forged gateway attacks. After this function is configured on the port, when the port receives the ARP packet, it will check whether the source IP address of the ARP packet is the same as the IP address of the configured protected gateway. If they are the same, the packet is considered illegal and will be discarded; otherwise, the packet is considered legal and subsequent processing will continue.

ARP Spoofing Configuration Steps

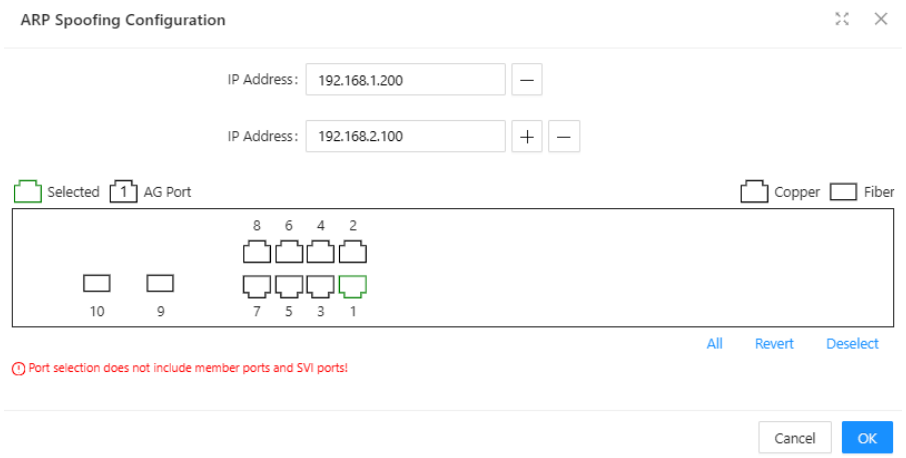
1. Select **Advanced > Security > ARP Spoofing** in the navigation area to enter ARP Spoofing page, as shown in *Figure 4-74*.

Figure 4-74 ARP spoofing configuration page



2. On the current page, click the **+ Add** button to enter the configuration interface. Fill in the parameters as shown in *Figure 4-75* and then click **OK** to complete the configuration.

Figure 4-75 ARP spoofing configuration page



3. Click **Save** button in the auxiliary area to save configuration.

5. Maintenance

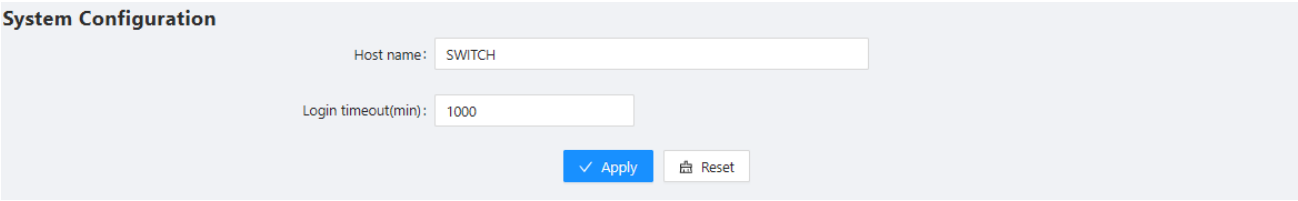
5.1 System Configuration

The system configuration module provides host name and login timeout settings, services of Telnet, SSH, HTTP, HTTPS, and management IP setting.

5.1.1 System Settings

Select **Maintenance** > **system configuration** from the navigation area to enter the System Configuration page, as shown in *Figure 5-1*. User can set the host name and device login timeout of the switch here.

Figure 5-1 Management information page



5.1.2 Services Enable

The service management module provides the following types of services: FTP, Telnet, SSH, SFTP, HTTP and HTTPS. You can enable or disable the services as needed. In this way, the performance and security of the system can be enhanced, thus secure management of the device can be achieved.

Telnet Server

The Telnet protocol is an application layer protocol that provides remote login and virtual terminal functions on the network.

SSH Server

Secure Shell (SSH) offers an approach to securely logging in to a remote device. By encryption and strong authentication, it protects devices against attacks such as IP spoofing and plain text password interception

HTTP Server

The Hypertext Transfer Protocol (HTTP) is used for transferring web page information across the Internet. It is an application-layer protocol in the TCP/IP protocol suite. You can log in to the device using the HTTP protocol with HTTP service enabled, accessing and controlling the device with Web-based network management.

HTTPS Server

The Secure HTTP (HTTPS) refers to the HTTP protocol that supports the Security Socket Layer (SSL) protocol. The SSL protocol of HTTPS enhances the security of the device in the following ways:

- Uses the SSL protocol to ensure the legal clients to access the device securely and prohibit the illegal clients;
- Encrypts the data exchanged between the HTTPS client and the device to ensure the data security and integrity, thus realizing the security management of the device;
- Defines certificate attribute-based access control policy for the device to control the access right of the client, in order to further avoid attacks from illegal clients.

Configuring Service

1. Select **Maintenance** > **System Configuration** from the navigation area to enter the System Configuration page, as shown in *Figure 5-2*.

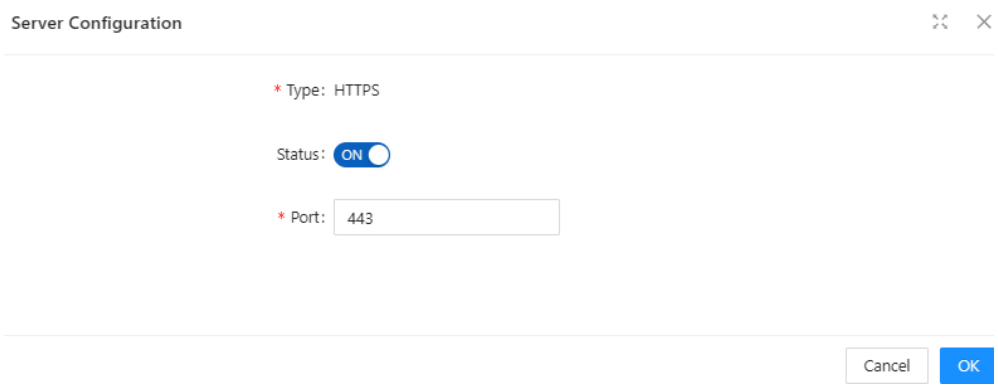
Figure 5-2 Service page

Server Configuration

Type	Status	Port	Action
SSH	Disable	22	Edit
Telnet	Enable	23	Edit
HTTPS	Enable	443	Edit
HTTP	Enable	80	Edit

2. Select the service that need to be configured, click on **Edit** to enter the service configuration interface, as shown in the figure. Fill in the required status and ports, and then click the **OK** button to complete the configuration.

Figure 5-3 Service configuration page



3. When HTTPS Server is enabled, the certificate and private key should be uploaded. If no certificate is specified, the device will use the default certificate.

5.2 Management IP

WARN:

- After modifying the IP address, you need to manually redirect the web page to the new address and then re-access the switch.

1. Select **Maintenance** > **System Configuration** from the navigation area to enter the System Configuration page, as shown in *Figure 5-4*. *Table 5-1* lists the configuration items of the management IP address.

Figure 5-4 Management information page

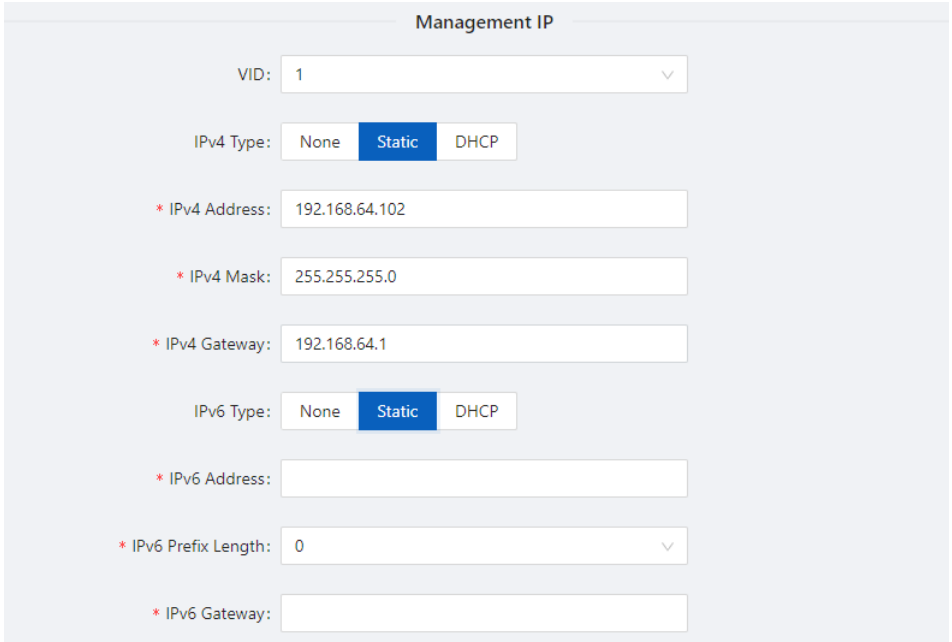


Table 5-1 Management information configuration items

Item	Description
⇋ SVI	The management IP address of the device can be automatically converted into the SVI IP address (this function button is only available for layer 3 devices).
VID	Specify the management VLAN ID. The default management VLAN is 1.
IPv4 Type	None：IPv4 management address is not used. Static：Select this option to manually specify an IPv4 address and the mask length DHCP：Select the option to get an IPv4 address through DHCP.
IPv4 Address	Specify the IPv4 management address. The default IP is 192.168.56.166.
IPv4 Mask	Specify the IPv4 management mask. The default mask is 255.255.255.0.
IPv4 Gateway	Specify the IPv4 management gateway. The default gateway is 192.168.56.1.
IPv6 Type	None：IPv6 management address is not used. Static：Select this option to manually specify an IPv6 address and the mask length. DHCP：Select the option to get an IPv6 address through DHCP.
IPv6 Address	Specify the IPv6 management address.
IPv6 Prefix Length	Specify the IPv6 management address prefix length.
IPv6 Gateway	Specify the IPv6 management gateway.

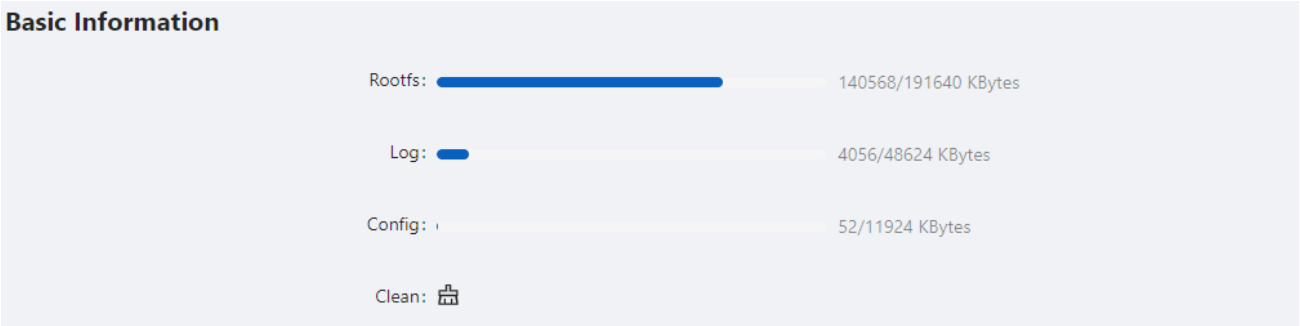
5.3 File Management

The file management module includes basic information, image management, configuration management, certificate management, and page package management functions.

5.3.1 Basic Information

Select **Maintenance** > **File Management** > **Basic Information** from the navigation area to enter the page as shown in *Figure 5-54*. In the basic information page, you can view the usage of each partition of the device, and click the **Clean** button to clear the system log.

Figure 5-5 Basic information page



5.3.2 Image Management

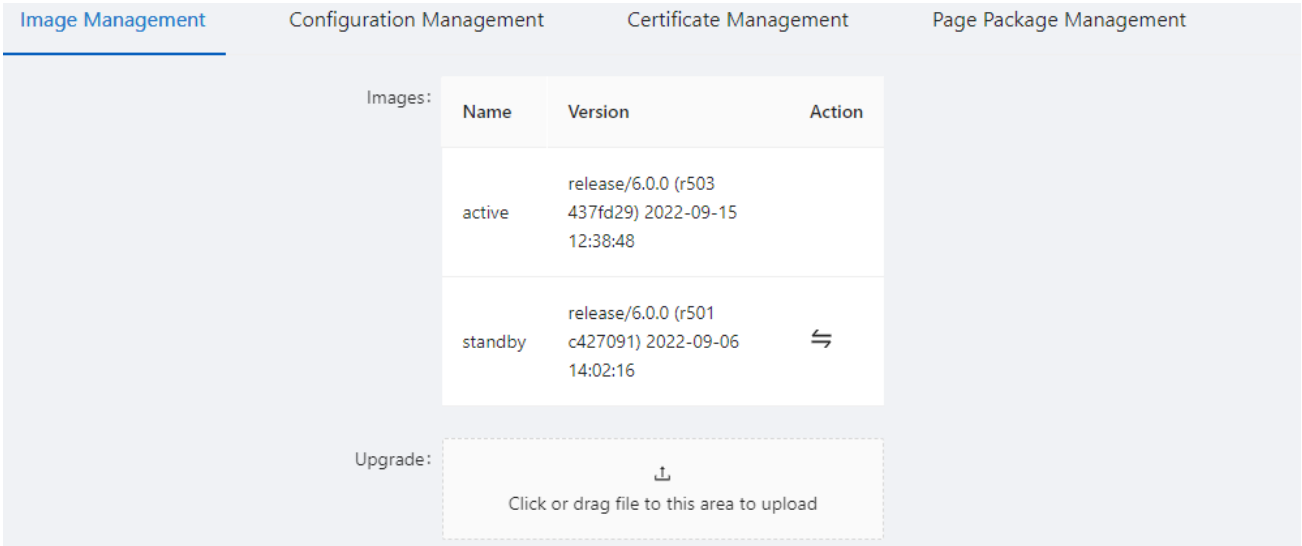
Software upgrade allows you to obtain a target application file from the current host and set the file as the main boot file or backup boot file to be used at the next reboot.

NOTE:

- A software upgrade takes some time. Do not perform any operation on the web interface during the upgrading procedure; otherwise, the upgrade operation may be interrupted.

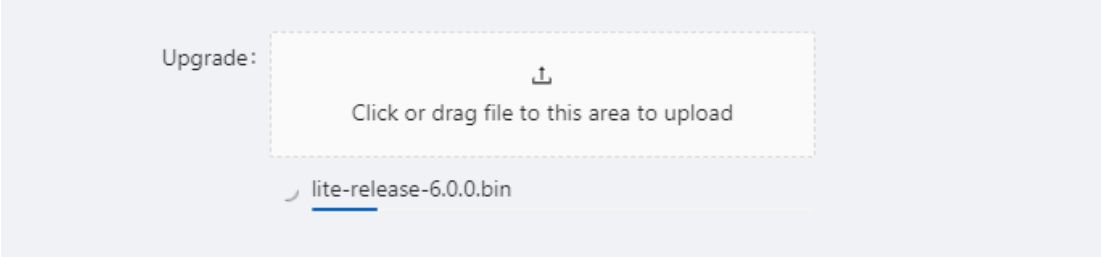
1. Select **Maintenance** > **File Management** > **Image Management** from the navigation area to enter the page as shown in *Figure 5-6*.

Figure 5-6 Image management page



2. Click **Upgrade** button, In the pop-up dialog box, select the upgrade file corresponding to the device, the upgrade file is *.bin format, and the upgrade process is shown in *Figure 5-7*. After upgrade finished, the device will be rebooted.

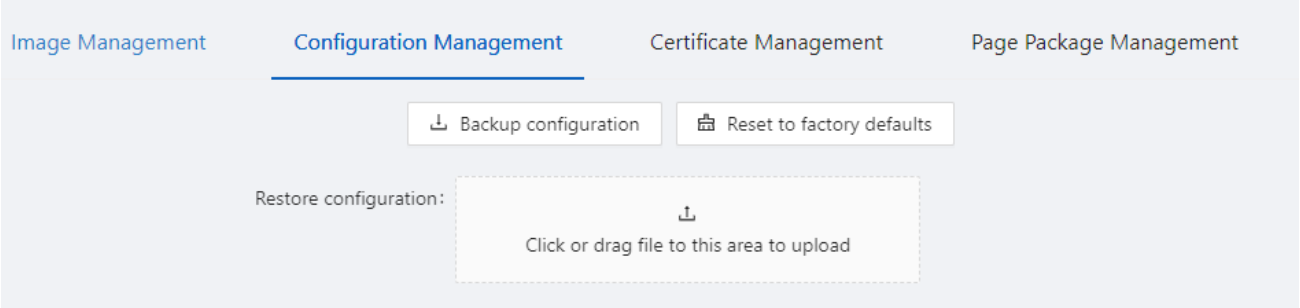
Figure 5-7 Flash new firmware image page



5.3.3 Configuration Management

Select **Maintenance** > **File Management** > **Image Management** from the navigation area to enter the page as shown in *Figure 5-8*.

Figure 5-8 Configuration file management page



Backup Configuration

Click the **Backup configuration** button, a file download dialog box appears. You can save the file locally.

Restore Configuration

After you click the **Choose File** button in this figure, the file upload dialog box appears. You can select the *.conf file to be uploaded, then the device will be reboot.

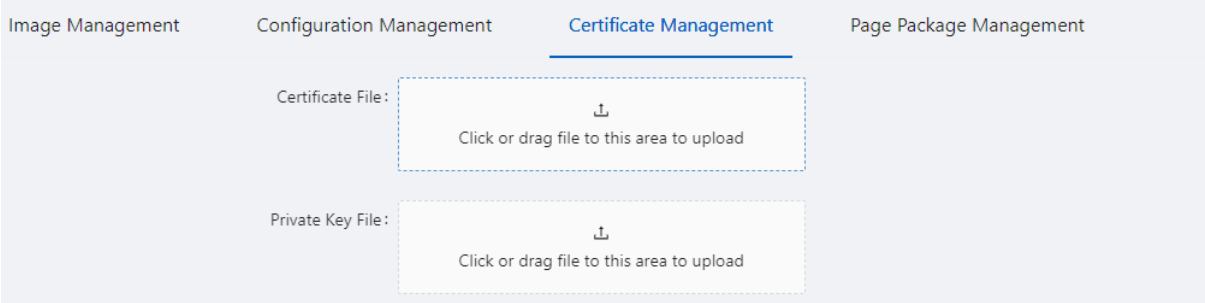
Reset to Factory Defaults

This operation restores the system to factory defaults, delete the current configuration file, and reboot the device. Click the **Reset to Factory Defaults** button to apply this operation.

5.3.4 Certificate Management

When you enable HTTPS, you need to upload the certificate and private key, as shown in *Figure 5-9*. If you do not specify a certificate, the device uses the default certificate.

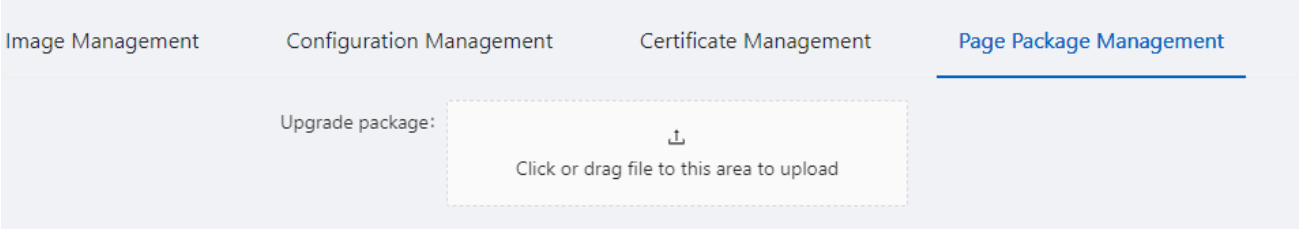
Figure 5-9 Configuration file management page



5.3.5 Page Package Management

The page package management module provides the ability to obtain the target page package file from the local host and apply the file as a device page package file, as shown in *Figure 5-10*.

Figure 5-10 Configuration file management page



5.4 User Management

⚠ WARN:

- To enhance equipment security, please change your password as soon as possible. Please make sure to keep the new password safe. Losing the password will result in being unable to log in to the device.

In the user management part, you can:

- Set the username, password.
- Create a new user.

Select **Maintenance** > **User Management** from the navigation area to enter the User Management page, as shown in *Figure 5-11*. *Table 5-2* lists the configuration items of the user management.

Figure 5-11 User management page

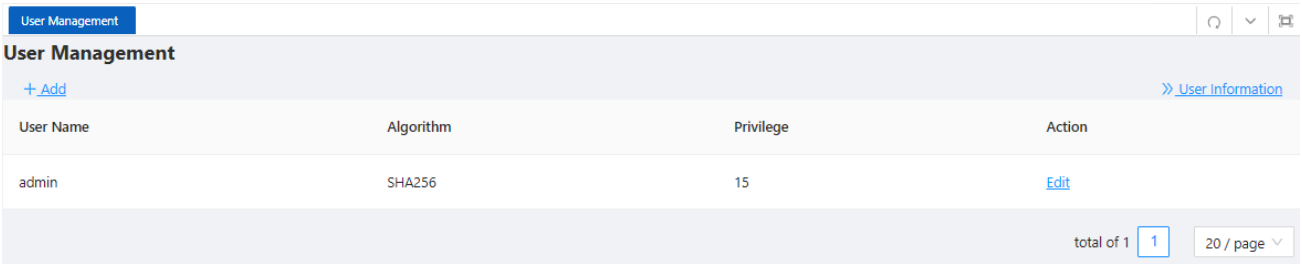


Table 5-2 Account configuration items

Item		Description
Account	User Name	Set the username
	Password	Set the password
	Algorithm	Set the user algorithm
	Privilege	Set the user privilege

5.5 Time Management

The system time module allows you to display and set the device system time on the Web interface. The device supports setting system time through manual configuration and automatic synchronization of NTP server time.

An administrator cannot keep time synchronized among all the devices within a network by changing the system clock on each device, because this is a time-consuming task and cannot guarantee clock precision.

Defined in RFC 1305, the Network Time Protocol (NTP) synchronizes timekeeping among distributed time servers and clients. NTP allows quick clock synchronization within the entire network and ensures a high clock precision so that the devices can provide diverse applications based on consistent time.

5.5.1 View the System Time

Select **Maintenance** > **Time Management** from the navigation area to enter the Time Management page, as shown in *Figure 5-12*. The current system time and clock status are displayed. *Table 5-3* shows the network time configuration items.

Figure 5-12 System time configuration page

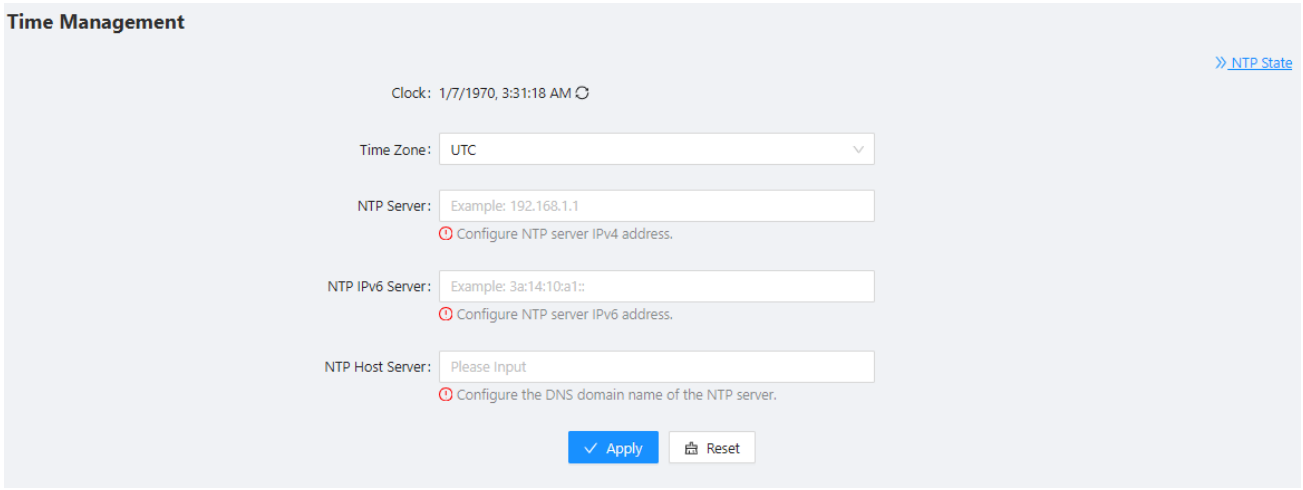


Table 5-3 System time configuration items

Item	Description
Clock	System date and time
Time Zone	Choose time zone
Enable NTP	Enable/Disable NTP
NTP Server	Set the NTP server IP address
NTP IPv6 Server	Set the NTP server IPv6 address
NTP Host Server	Set the NTP host server

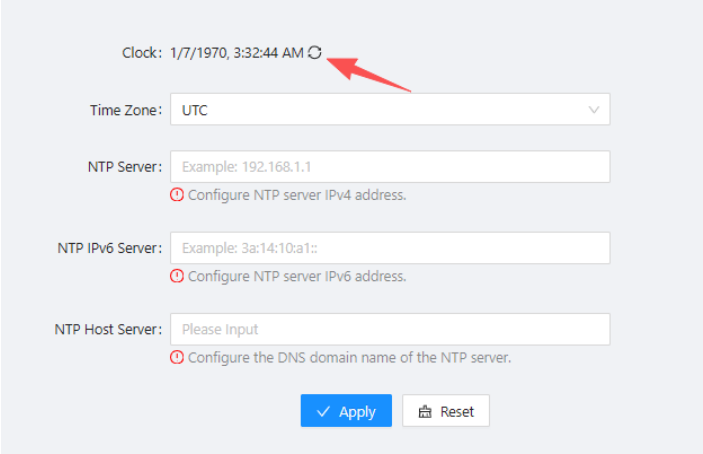
5.5.2 Configure System Time

1. Select **Maintenance** > **Time Management** from the navigation area to enter Time Management page.

2. Click synchronous button behind clock, then click **Apply** button, as shown in *Figure 5-13.* The time of the PC will be synchronized to the switch.

3. Click **Save** of the auxiliary area.

Figure 5-13 System time configuration page



5.5.3 Configure NTP Server

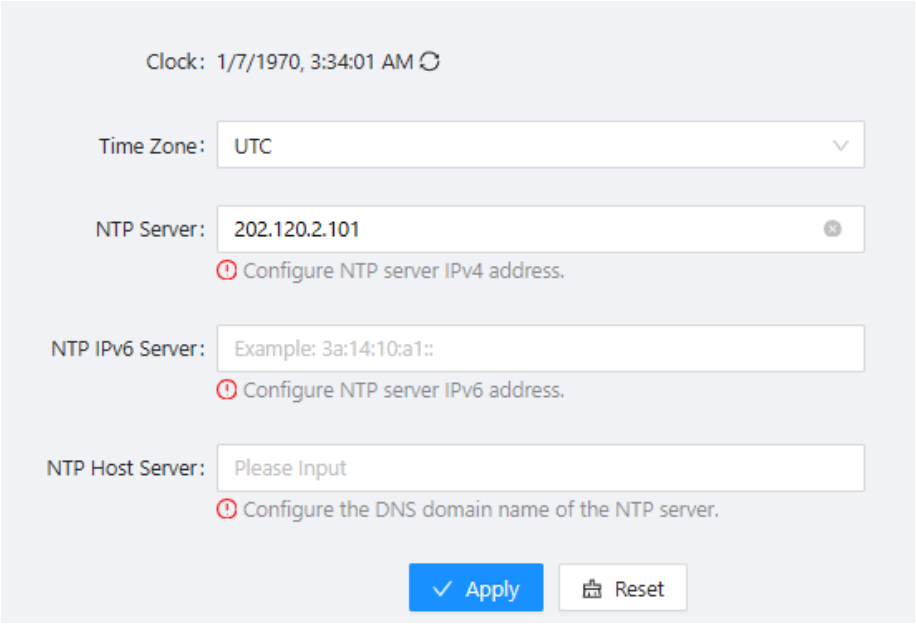
1. Select **Maintenance** > **Time Management** from the navigation area to enter Time Management page.

2. Enable NTP

3. Type **202.120.2.101** in the NTP Server IP box, as shown in *Figure 5-14*, click **Apply**.

4. Click **Save** of the auxiliary area.

Figure 5-14 NTP server time configuration page



5.6 SNMP

5.6.1 Overview

Simple Network Management Protocol (SNMP) offers the communication rules between a management device and the managed devices on the network; it defines a series of messages, methods, and syn taxes to implement the access and management from the management device to the managed devices. SNMP has the following characteristics:

- Automatic network management. SNMP enables network administrators to search and modify information, find and diagnose network problems, plan for network growth, and generate reports on network nodes.
- SNMP shields the physical differences between various devices and thus realizes automatic management of products from different manufacturers. Offering only the basic set of functions, SNMP makes the management tasks independent of both the physical features of the managed devices and the underlying networking technology. Thus, SNMP achieves effective management of devices from different manufacturers, especially in small, high-speed, and low-cost network environments.

5.6.2 SNMP Mechanism

An SNMP enabled network comprises Network Management Station (NMS) and agent.

- An NMS is a station that runs the SNMP client software. It offers a user-friendly interface, making it easier for network administrators to perform most network management tasks.
- An agent is a program on the device. It receives and handles requests sent from the NMS. Only under certain circumstances, such as interface state change, will the agent inform the NMS. NMS manages an SNMP enabled network, whereas agents are the managed network device. NMS and agents exchange management information through the SNMP protocol.

SNMP provides the following four basic operations:

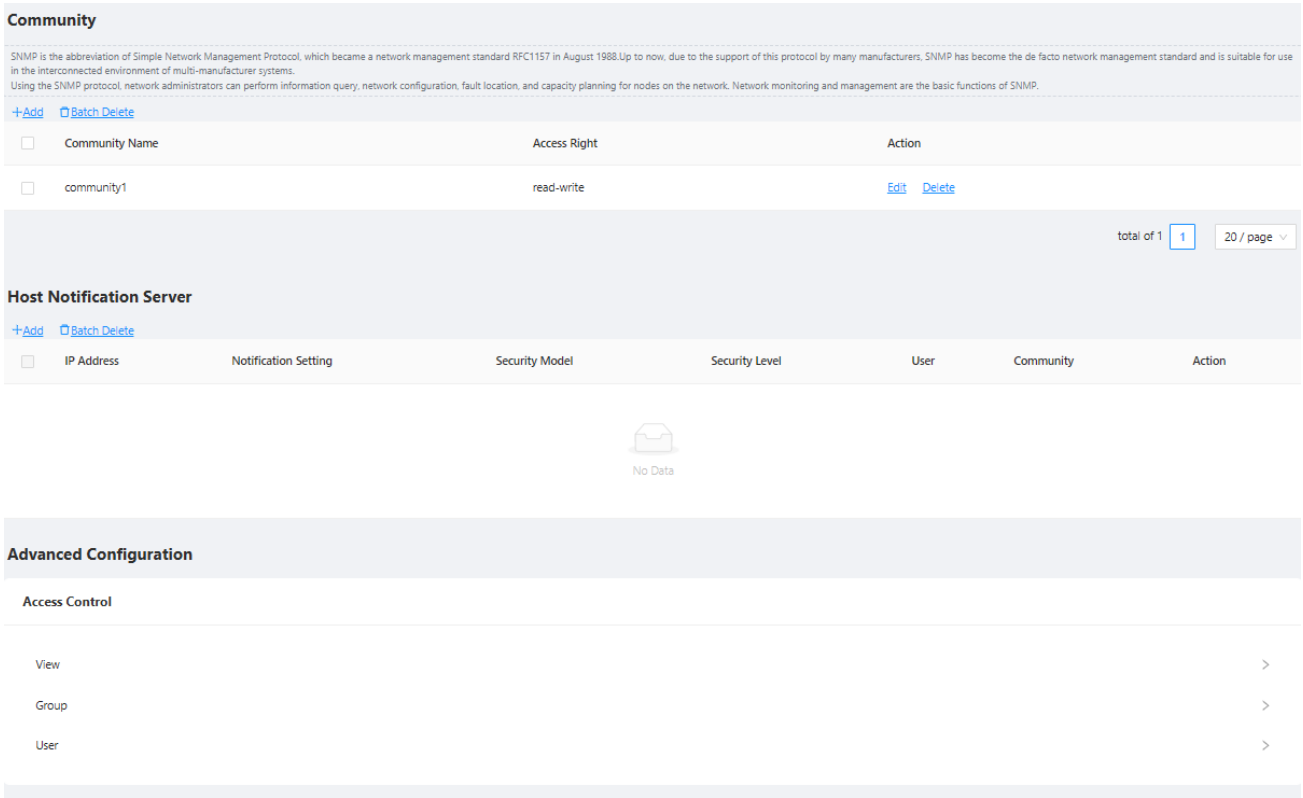
- Get operation: NMS gets the value of a certain variable of the agent through this operation.

- Set operation: NMS can reconfigure the value of one or more objects in the agent MIB (Management Information Base) by means of this operation.
- Trap operation: The agent sends traps to the NMS through this operation.
- Inform operation: The NMS sends traps to other NMSs through this operation.

5.6.3 Configure SNMP

In the navigation bar, select **Maintenance > SNMP** to enter the SNMP configuration interface. As shown in *Figure 5-15*, this interface consists of three modules: Community, Host Notification Server, and Advanced Configuration.

Figure 5-15 SNMP page

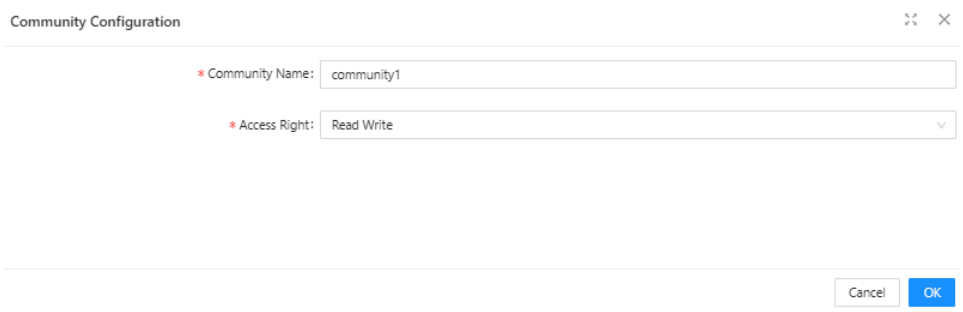


Configure Community

1. Select **Maintenance > SNMP** from the navigation area to enter the SNMP page, click the **+ Add** button under Community to enter the community configuration modal.

2. As shown in *Figure 5-16*, fill in the parameters as required and click **OK** to proceed.

Figure 5-16 Community configuration page



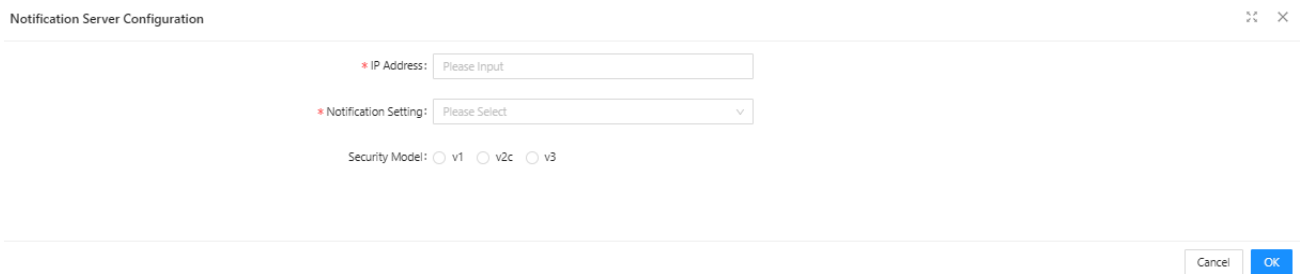
3. Click **Save** button in the auxiliary area to save.

Configure Host Notification Server

1. Select **Maintenance > SNMP** from the navigation area to enter the SNMP page, click the **+ Add** button under Host Notification Server to enter the host notification server configuration modal.

2. As shown in *Figure 5-17*, fill in the parameters as required and click **OK** to proceed.

Figure 5-17 Community configuration page

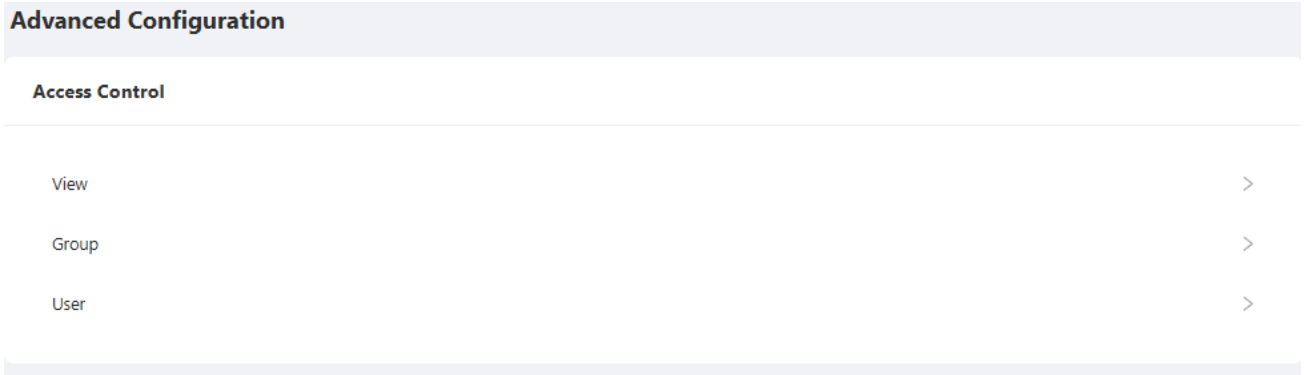


3. Click **Save** button in the auxiliary area to save.

Configure Advanced Configuration

The advanced configuration allows for the configuration of SNMP views, groups and users. Click on the item you wish to configure to enter the configuration interface, as shown in the figure:

Figure 5-18 Advanced configuration module



5.7 Syslog Server

5.7.1 Overview

During the operation of the device, various state changes such as link state UP, DOWN, etc. and also there will occur some events like abnormal handling and so on. The system log provides a serial of service that automatically generates messages in a fixed format during a status changes or an event happens, which are recorded on the device's log file. It can be displayed on the trunk port and remote login terminal, and can also be sent to 1~3 groups of log servers on the network for administrators to analyze the network conditions and locate the problems.

To facilitate administrator reading and management of log messages, these log messages can be time-stamped, and graded by the priority of log information.

5.7.2 Configure Syslog Server

Select **Maintenance** > **Syslog Server** in the navigation area to enter the Syslog Server page, as shown in *Figure 5-19*, parameter instructions as shown in *Table 5-4*.

Figure 5-19 Syslog server configuration page

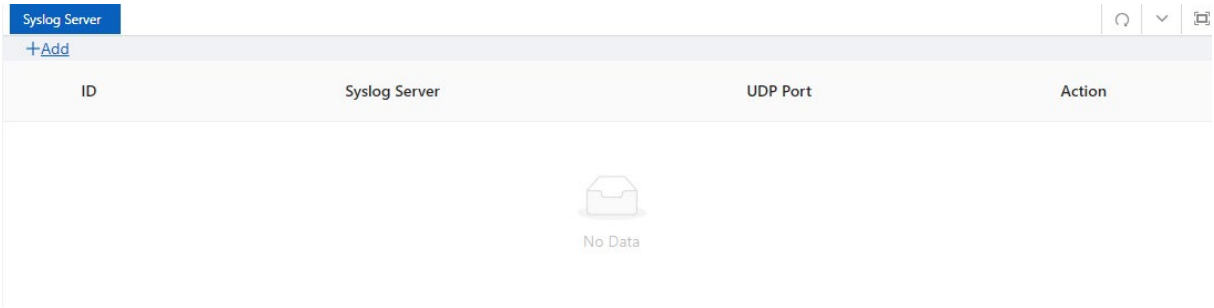


Table 5-4 Syslog server parameters

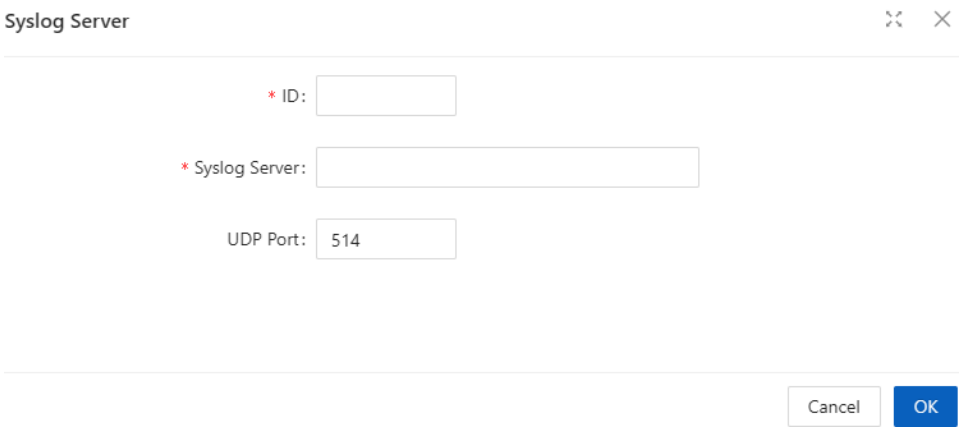
Item	Description
ID	The ID of the Syslog Server
Syslog Server	Configure the IP address of the remote server, and supports up to 3 remote server configurations
UDP port	Support remote server UDP protocol port configuration, range <1-65535>; default port number is 514 when no UDP port is configured

5.7.2.1 Operate Steps

1. Select **Maintenance** > **Syslog Server** in the navigation area to enter the Syslog Server page.

2. Click the **+Add** button under Syslog Server to enter the creation page, fill in the parameters according to the requirements, as shown in *Figure 5-20*, and click the **OK** button to complete the configuration.

Figure 5-20 Syslog server configuration page



5.7.2.2 A Configuration Example

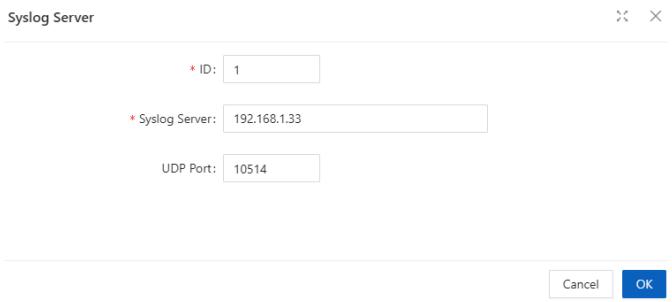
Device's syslog sends to the remote server and the device's IP is 192.168.1.240 while the remote server IP is 192.168.1.33, and the UDP port number is 10514.

1. Select **Maintenance** > **Syslog Server** in the navigation area to enter the Syslog Server page.

2. Click the **+Add** button under Syslog Server to enter the creation page, fill in the parameters according to the requirements, and click **OK** to complete the configuration, as shown in *Figure 5-21*.

3. Click the **Save** in the auxiliary area to save the configuration.

Figure 5-21 Syslog server configuration page



6. Diagnose

6.1 Network Utility

6.1.1 Overview

Ping

You can use the ping function to check whether a device with a specified address is reachable, and to examine network connectivity. A successful execution of the ping command involves the following steps:

1. The source device sends an ICMP echo request (ECHO-REQUEST) to the destination device.

2. The destination device responds by sending an ICMP echo reply (ECHO-REPLY) to the source device after receiving the ICMP echo request.

3. The source device displays related statistics after receiving the reply. Output of the ping command falls into the following:

- The ping command can be applied to the destination's host name or IP address. If the destination's host name is unknown, the prompt information is displayed.
- If the source device does not receive an ICMP echo reply within the timeout time, it displays the prompt information and the statistics during the ping operation. If the source device receives an ICMP echo reply within the timeout time, it displays the number of bytes of the echo reply, the message sequence number, Time to Live (TTL), the response time, and the statistics during the ping operation. Statistics during the ping operation include number of packets sent, number of echo reply messages received, percentage of messages not received, and the minimum, average, and maximum response time.

Traceroute

By using the traceroute command, you can display the Layer 3 devices involved in delivering a packet from source to destination. This function is useful for identification of failed node(s) in the event of network failure.

The traceroute command involves the following steps in its execution:

1. The source device sends a packet with a TTL value of 1 to the destination device.

2. The first hop (the Layer 3 device that first receives the packet) responds by sending a TTL-expired ICMP message to the source, with its IP address encapsulated. In this way, the source device can get the address of the first Layer 3 device.

3. The source device sends a packet with a TTL value of 2 to the destination device.

4. The second hop responds with a TTL-expired ICMP message, which gives the source device the address of the second Layer 3 device.

This process continues until the ultimate destination device is reached. In this way, the source device can trace the addresses of all the Layer 3 devices involved to get to the destination device. The traceroute command can be applied to the destination's host name or IP address. If the destination's host name is unknown, the prompt information is displayed

6.1.2 Diagnostic Tool Operations

Ping Operation

1. Select **Diagnosis** > **Network Utility** from the navigation tree to enter the IPv4&IPv6 Ping Configuration page.

2. Type the IPv4/IPv6 address of the destination device in the text box, as shown in *Figure 6-1*.

3. Click **PING** to execute the ping command, and you can see the result in the box below, as shown in *Figure 6-2*.

Figure 6-1 Network utility page

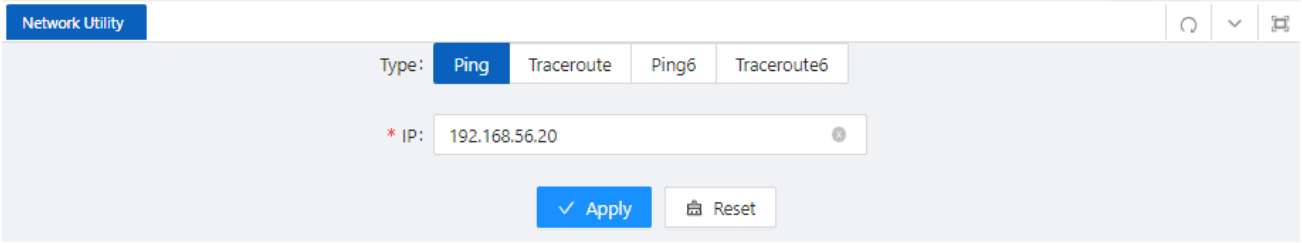


Figure 6-2 The ping result

```
Result: PING 192.168.56.20 (192.168.56.20) 56(84)
        bytes of data.
        64 bytes from 192.168.56.20: icmp_req=1
        ttl=128 time=1.04 ms
        64 bytes from 192.168.56.20: icmp_req=2
        ttl=128 time=0.859 ms
        64 bytes from 192.168.56.20: icmp_req=3
        ttl=128 time=0.986 ms
        64 bytes from 192.168.56.20: icmp_req=4
        ttl=128 time=0.892 ms
        64 bytes from 192.168.56.20: icmp_req=5
        ttl=128 time=0.821 ms

        --- 192.168.56.20 ping statistics ---
        5 packets transmitted, 5 received, 0% packet
        loss, time 4000ms
        rtt min/avg/max/mdev =
        0.821/0.920/1.046/0.091 ms
```

The Traceroute Operation

1. Select **Diagnostic** > **Network Utility** from the navigation tree.

2. Type the destination IP address in the text box, as shown in *Figure 6-3*.

3. Click **Traceroute** to execute the trace route command, and you see the result in the box below, as shown in *Figure 6-4*.

Figure 6-3 Trace route page

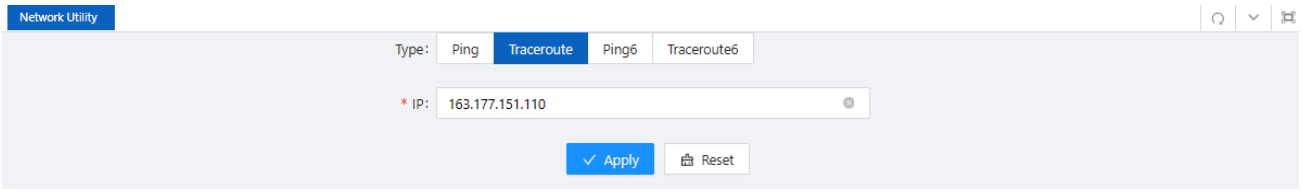


Figure 6-4 The trace route result

```
Result: traceroute to 163.177.151.110
        (163.177.151.110), 20 hops max, 60 byte
        packets
         1  192.168.1.1  0.598 ms
         2  100.69.0.1  3.784 ms
         3  218.104.224.29  3.628 ms
         4  218.104.229.66  16.026 ms
         5  218.104.229.37  24.969 ms
         6  *
         7  120.83.0.86  20.729 ms
         8  120.80.137.202  21.808 ms
```

6.2 Optical Transceiver Information

Optical fiber is commonly used for long distance data transmission. However, when link issues occur, it is very costly to troubleshoot fiber cables and fiber transceivers at remote sites. To solve this problem, Moxa industrial Ethernet switches provide digital diagnostics and monitoring (DDM) functions on SFP optical fiber links and allow users to measure optical parameters and its performance from a central site. This function can greatly facilitate the troubleshooting process for optical fiber links and reduce costs for onsite debugging.

6.2.1 Display Optical Transceiver Information

Select **Diagnosis** > **Transceiver Information** from the navigation area. The system automatically displays the optical transceiver information, as shown in *Figure 6-5*. *Table 6-1* describes the optical transceiver information items.

Figure 6-5 Optical transceiver information

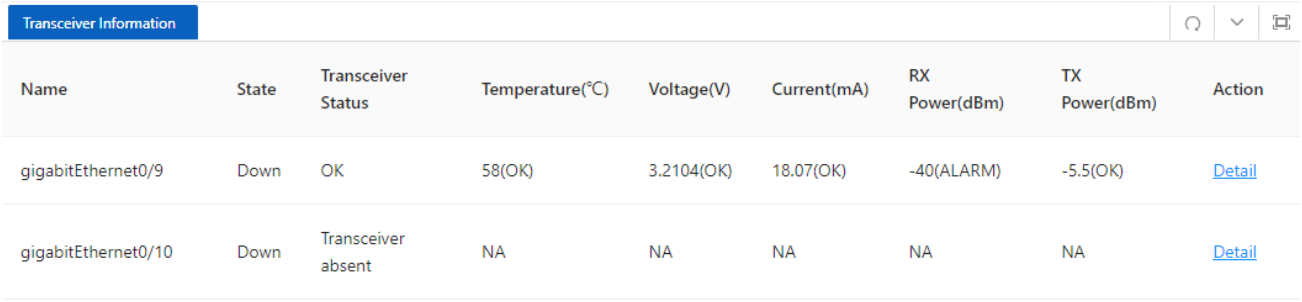


Table 6-1 Optical transceiver information items

Item	Description
Name	Switch port number that the SFP is plugged into.
State	The state of the fiber interface, up/down.
Transceiver State	The absent of the transceiver.
Temperature(degree)	SFP casing temperature
Voltage(V)	Voltage supply to the transceiver.
Current(mA)	Current consumed by transceiver.
Rx Power(dBm)	The amount of light being received from the fiber optic cable
TX Power(dBm)	The amount of light being transmitted into the fiber optic cable

Detail	Click to show the detail information of the transceiver.

6.2.2 Display Detail Information

Click **Detail** interface to enter the Transceiver Detail Information page. as shown in *Figure 6-6*.

Figure 6-6 Transceiver detail information

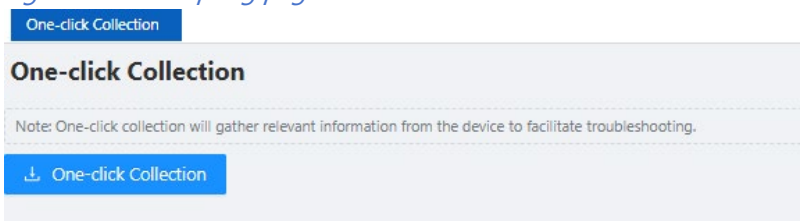
6.3 One-click Collection

Each functional module has its own running information, and generally, you need to view the output information for each module one by one. To receive as much information as possible in one operation during daily maintenance or when system failure occurs, the diagnostic information module allows you to save the running statistics of multiple functional modules to a file, and then you can locate problems faster by checking this file.

1. Select **Diagnosis** > **One-click Collection** from the navigation area to enter the page as shown in *Figure 6-7*.

2. When you click **One-click Collection** button, the system begins to generate the diagnostic information file, and after the file is generated, the File Download dialog box appears. You can save this file to the local host

Figure 6-7 Backup log page



6.4 Dying Gasp

6.4.1 Overview

The networking devices rely on a temporary back-up power supply on a capacitor, that allows for a graceful shutdown and the generation of the dying-gasp message. This temporary power supply is designed to last from 10 to 20 milliseconds to perform these tasks.

According to the definition in 802.3ah, when a device power failure event occurs, the device sends an OAM event message to its connected device. Since OAM is a point-to-point protocol, the power failure event message will not be sent to the next device that supports OAM. Continue to forward again. The device that receives a power failure event will output a power failure LOG prompt message.

In addition to the OAM alarm information, the power-off device will also send a trap message to the SNMP server.

Table 6-2 Node information

Node information	Data
Mib files	DOT3-OAM-MIB.mib
OID	1, 3, 6, 1, 2, 1, 158, 1, 6, 1, 4

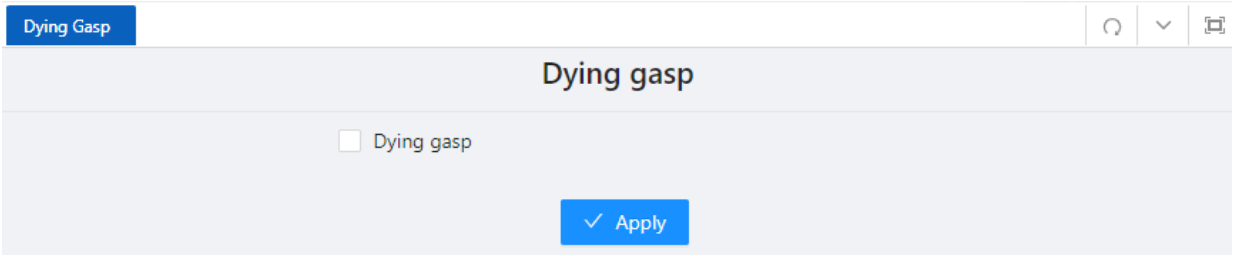
Value	DyingGaspEvent(257)

6.4.2 Configure Dying Gasp

1. Select **Diagnosis** > **Dying Gasp** from the navigation area to enter the Dying Gasp Configuration page, as shown in *Figure 6-8*.

2. Select the box of dying gasp, click **Apply** button to enable dying gasp.

Figure 6-8 Dying gasp configuration page



6.5 Cable Detect

NOTE:

Only electrical ports support this command

Performing this operation will cause the already Up port to automatically go Down and Up again.

When the line length is less than 6 meters, there is a deviation between the test results and the actual value.

Cable detection means that users can detect the current status of the cable connected to the Ethernet interface on the device, and the system will return the detection results within 5 seconds. The detection content includes whether there is a short circuit or open circuit in the cable and the length of the faulty cable.

Step 1: Select **Diagnosis** > **Cable Detect** in the navigation bar to enter the Cable Detection page, as shown in *Figure 6-9*.

Step 2: Select the interface to be tested, click the **Detect** button to start the incoming line test, and the system will return the test results within 5 seconds.

Step 3: As shown in *Figure 6-10*, view the detection results on the pop-up page.

Figure 6-9 Cable detection page

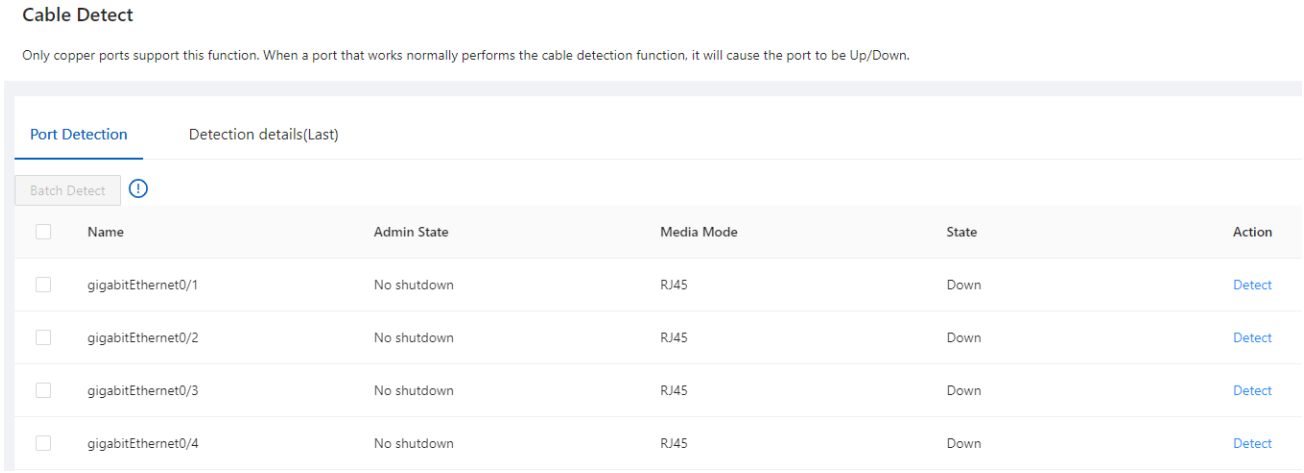


Figure 6-10 Detection results

NOTE:

Pair X length: unit meter, cable length, in case of fault, the length from the interface to the fault location

Pair X status:

OK (normal): Indicates that the line pair (PAIR) is terminated normally.

Open: Indicates that the line pair is open.

Short: Indicates a short circuit on the pair.

Unknown: Other unknown causes of failure.