3onedata



MES5400 Series

Layer 3 Managed Industrial Ethernet Switch

User Manual

Document Version: 01

Issue Date: 06/24/2025

Industrial Ethernet Communication Solution Expert **3onedata Co., Ltd.**

Copyright © 2025 3onedata Co., Ltd. All rights reserved.

No company or individual is allowed to duplicate or transmit this manual in any forms without written permission issued by 3onedata Co., Ltd.

Trademark Statement

3onedata, 3onedata and 3One data are the registered trademarks owned by 3onedata Co., Ltd. And other trademarks mentioned in this manual belong to their corresponding companies.

Notice

Purchased product, service or features should be constrained by 3onedata commercial contracts and clauses. The whole or part product, service or features described in this document may beyond purchasing or using range. 3onedata won't make any statement or warranty for this document content unless any other appointment exists.

Due to product version upgrading or other reason, this document content will be upgraded periodically. Unless other appointment exists, this document is only for usage guide, all statement, information, and suggestion in this document won't constitute any warranty.

3onedata



3onedata Co., Ltd.

Headquarter address:	3/B, Zone 1, Baiwangxin High Technology Industrial park, Nanshan District, Shenzhen, 518108 China
Technology support:	tech-support@3onedata.com
Service hotline:	+86 -880-4496
E-mail:	sales@3onedata.com
Fax:	+86 -0755-26703485
Website:	http://www.3onedata.com

Preface

This Switch User Manual has introduced:

- Product features
- Product network management configuration
- Overview of related principles of network management


Note

The reference model for the screenshot in this manual is 24 Gigabit copper slots + 6 10Gigabit SFP+. In addition to the differences in the supported power supply and port number and type, the interface functions and operation of other models in this series are similar.

Audience

This manual applies to the following engineers:

- Network administrators responsible for network configuration and maintenance
- On-site technical support and maintenance personnel
- Network engineer

Port Convention

The port number in this manual is only an example, and does not represent the actual port with this number on the device. In actual use, the port number existing on the device shall prevail.

Text Format Convention

Format	Description
" "	Words with “” represent the interface words. Such as: “Port No.”.
>	Multi-level path is separated by ">". Such as opening the local

Copyright © 3onedata Co., Ltd.

Format	Description
	connection path description: Open "Control Panel> Network Connection> Local Area Connection".
Light Blue Font	It represents the words clicked to achieve hyperlink. The font color is as follows: 'Light Blue'.
About this chapter	The section 'about this chapter' provides links to various sections of this chapter, as well as links to the Principles/Operations Section of this chapter.

Icon Convention

Format	Description
 Notice	Remind the announcements in the operation, improper operation may result in data loss or equipment damage.
 Warning	Pay attention to the notes on the mark, improper operation may cause personal injury.
 Note	Conduct necessary supplements and explanations for the description of operation content.
 Key	Configuration, operation, or tips for device usage.
 Tips	Pay attention to the operation or information to ensure success device configuration or normal working.

Button Operation Convention

Format	Description
	There is a logout button in the upper right corner of the webpage. After clicking it, the webpage returns to the login page.
	There is a port button in the upper right corner of the webpage. Click or press F2 to view the port status, and press F2 or Esc to close the port status page.
	There is a restart button in the upper right corner of the webpage. After clicking, a restart confirmation box pops up. After confirmation, the device will restart.
	There is a Save button in the upper right corner of the webpage. Click it to save the current device configuration. After setting the device, the save icon will flash to remind the

Copyright © 3onedata Co., Ltd.

Format	Description
	user to save the configuration, so as to avoid losing unsaved configuration information due to restart and other operations.
Add	Click the Add button to add a line of configuration. Note that repeated configuration may result in data overwrite.
Delete	Check the line to be deleted, and then click the Delete button to delete the configuration.
Config	Check the line to be configured, and then click the configure button to enter the configuration page.
	Click the function status button to switch the function status,  means on and  means off.
Apply	Click the Set button to submit the current configuration.
Clear	Click the “Clear” button to clear the information of current page.
Refresh	Click the Refresh button to refresh the information of current page.

Revision Record

Version No.	Revision Date	Revision Note
01	06/24/2025	Product release

Copyright © 3onedata Co., Ltd.

Contents

PREFACE 1
CONTENTS I
1 LOGIN TO THE WEB INTERFACE 1
1.1 SYSTEM REQUIREMENTS FOR WEB BROWSING 1
1.2 SET THE IP ADDRESS OF PC 1
1.3 LOGIN TO THE WEB CONFIGURATION INTERFACE 2
2 SYSTEM INFORMATION 4
3 LOGIN CONFIGURATION 6
3.1 IP ADDRESS 6
3.1.1 IPv4 6
3.1.2 IPv6 7
3.2 USER 8
3.3 PROTOCOL AUTHORIZATION 9
4 PORT CONFIGURATION 11
4.1 PORT SETTINGS 11
4.2 LINK AGGREGATION 13
4.2.1 Link Aggregation 13
4.2.2 Aggregation Protection 16
4.3 PORT SPEED LIMIT 17
4.4 STORM CONTROL 18
4.5 PORT MIRRORING 20
4.6 PORT ISOLATION 21
4.7 PORT STATISTICS 22
4.7.1 Port Statistics-Overview 22
4.7.2 Port Statistics-Port 23
5 LAYER 2 CONFIGURATION 24
5.1 VLAN 24
5.1.1 VLAN Configuration 24
5.1.2 Access Configuration 25
5.1.3 Trunk Configuration 27
5.1.4 Hybrid Configuration 28
5.2 MAC 29
5.2.1 Global Configuration 30
5.2.2 Static Unicast MAC 31

Copyright © 3onedata Co., Ltd.

5.2.3 Static Multicast MAC 32
5.2.4 MAC Information 32
5.2.5 MAC Learning 34
5.3 SPANNING TREE 35
5.3.1 Global Configuration 36
5.3.2 Instance Configuration 38
5.3.3 Port Configuration 39
5.3.4 Port Instance Configuration 41
5.4 RING 43
5.4.1 Global Configuration 44
5.4.2 Ring Information 49
5.5 HSR/PRP 50
5.5.1 Global Configuration 51
5.5.2 Instance Configuration 51
5.5.3 Interlink Port Configuration 54
5.6 MRP 56
5.7 GMRP 57
5.7.1 Global Configuration 57
5.7.2 Port Configuration 58
5.8 ERPS 61
5.8.1 Timer Configuration 61
5.8.2 Ring Configuration 63
5.8.3 Instance Configuration 64
5.9 IGMP SNOOPING 66
5.9.1 Global Configuration 66
5.9.2 Interface Configuration 68
5.9.3 MRoute Interface Config 70
5.9.4 Mroute Interface Info 70
5.10 IPV6 MLD-SNOOPING 71
5.10.1 Global Configuration 71
5.10.2 Interface Configuration 73
5.10.3 Mroute Interface Config 74
5.10.4 Routing Port Information 75
5.11 LINK FLAP PROTECTION 76
5.11.1 Global Configuration 76
5.11.2 Port Configuration 77
5.12 PORT LOOPBACK DETECTION 79
5.13 IPDT 80
5.14 IPV6DT 81
5.15 SMART-LINK 82
5.15.1 Global Configuration 83
5.15.2 Interface Configuration 85
6 IP NETWORK CONFIGURATION 87

Copyright © 3onedata Co., Ltd.

6.1 INTERFACE 87
6.1.1 Layer 3 Interface 87
6.1.2 Loopback Interface 88
6.2 ARP 89
6.2.1 ARP Information 90
6.2.2 Static ARP 91
6.2.3 ARP Parameter Configuration 91
6.3 NAT 92
7 UNICAST ROUTING 95
7.1 IPV4 95
7.1.1 IPv4 Routing Table 95
7.1.2 IPv4 Static Route 96
7.2 IPV6 97
7.2.1 IPv6 Routing Table 97
7.2.2 IPv6 Static Route 98
7.3 RIP 99
7.3.1 Global Configuration 99
7.3.2 Network Configuration 102
7.3.3 Interface Configuration 102
7.4 RIPNG 103
7.4.1 Global Configuration 104
7.4.2 Interface Configuration 106
7.5 OSPF 107
7.5.1 Global Configuration 107
7.5.2 Network Configuration 109
7.5.3 Interface Configuration 109
7.6 OSPFV3 111
7.6.1 Global Configuration 111
7.6.2 Interface Configuration 112
7.7 ISIS 114
7.7.1 Global Configuration 114
7.7.2 Interface Configuration 115
7.8 VRRP 117
7.9 IPV6 VRRP 119
8 MULTICAST ROUTING 121
8.1 MULTICAST ROUTING 121
8.1.1 Multicast Routing Switch 121
8.1.2 Multicast Routing Information 122
8.2 IPV6 MULTICAST ROUTING 123
8.2.1 Multicast Routing Switch 123
8.2.2 Multicast Routing Information 123
8.3 IGMP SNOOPING 124
8.3.1 Interface Configuration 124

Copyright © 3onedata Co., Ltd.

8.3.2 SSM-Map Configuration 126
8.3.3 Multicast Group Information 128
8.4 IPv6 MLD 128
8.4.1 Interface Configuration 129
8.4.2 SSM-Map configuration 130
8.4.3 Multicast Group Information 131
8.5 PIM-SM 132
8.5.1 Global Configuration 133
8.5.2 Static RP Configuration 135
8.5.3 C-RP Configuration of Interface 135
8.5.4 Interface Configuration 136
8.6 PIM-DM 137
8.7 IPv6-PIM-SM 139
8.7.1 Global Configuration 139
8.7.2 Static RP Configuration 141
8.7.3 C-RP Configuration of Interface 142
8.7.4 Interface Configuration 142
8.8 Enable IPv6 PIM-DM 144
9 NETWORK MANAGEMENT 146
9.1 ACL 146
9.1.1 ACL effective period configuration 146
9.1.2 IP Configuration 150
9.1.3 MAC Configuration 153
9.1.4 ACL Port Configuration 155
9.2 SNMP 156
9.2.1 SNMP Switch 157
9.2.2 View 157
9.2.3 Community 158
9.2.4 SNMP Group 159
9.2.5 V3 User 160
9.2.6 Trap Alarm 163
9.3 RMON 164
9.3.1 Event 165
9.3.2 Statistical 166
9.3.3 History 167
9.3.4 Alarm 168
9.4 LLDP 169
9.4.1 Global Configuration 170
9.4.2 Port Configuration 171
9.4.3 Neighbor Information 172
9.5 DHCP 173
9.5.1 DHCP Switch 173
9.5.2 Server-Address Pool Configuration 174

Copyright © 3onedata Co., Ltd.

9.5.3 Server-MAC Binding 175
9.5.4 Server-Port Binding 176
9.5.5 Server-Client List 176
9.5.6 Relay 177
9.6 DHCP-SNOOPING 178
9.6.1 Global Configuration 179
9.6.2 VLAN Enable Configuration 180
9.6.3 Binding Configuration 181
9.6.4 Port Configuration 181
9.7 MODBUS TCP 183
9.8 IEC61850-MMS 191
9.8.1 Global Configuration 191
9.8.2 Export ICD Model File 192
9.8.3 Configure CSD File 193
9.9 QOS 194
9.9.1 Global Configuration 195
9.9.2 CoS Mapping 196
9.9.3 DSCP Mapping 197
9.9.4 Class-map 198
9.9.5 Policy-map 200
9.9.6 Port Configuration 201
10 TSN MANAGEMENT 203
10.1 PTP 203
10.1.1 Clock Configuration 203
10.1.2 Port Configuration 206
10.1.3 Master Clock Information 208
10.1.4 PTP Time 209
11 SYSTEM MAINTENANCE 211
11.1 NETWORK DIAGNOSIS 211
11.1.1 Ping 211
11.1.2 Traceroute 212
11.1.3 Network Cable Diagnosis 212
11.1.4 SFP Digital Diagnosis 213
11.2 TIME 214
11.2.1 NTP Configuration 214
11.2.2 Time Configuration 215
11.3 ALARM 216
11.3.1 Alarm Trigger 216
11.3.2 Alarm Reception 223
11.4 CONFIGURATION FILE MANAGEMENT 226
11.4.1 Current configuration 226
11.4.2 Configuration File Update 227
11.4.3 Restore Factory Settings 228

Copyright © 3onedata Co., Ltd.

11.5 UPGRADE 228
11.6 LOG INFORMATION 229
11.6.1 Log Information 229
11.6.2 Operation Log 231
11.6.3 Syslog Server 232
12 FAQ 234
12.1 LOGIN PROBLEM 234
12.2 CONFIGURATION PROBLEM 234
12.3 INDICATOR PROBLEM 235
13 MAINTENANCE AND SERVICE 237
13.1 INTERNET SERVICE 237
13.2 SERVICE HOTLINE 237
13.3 PRODUCT REPAIR OR REPLACEMENT 237

Copyright © 3onedata Co., Ltd.

1 Login to the WEB Interface

1.1 System Requirements for WEB Browsing

Using this device, the system should meet the following conditions.

Hardware and Software	System Requirements
CPU	Above Pentium 586
Memory	Above 128MB
Resolution	Above 1024x768
Color	256 colors or above
Browser	Above Internet Explorer 9.0
Operating system	Windows 7/8/10 or above

1.2 Set the IP Address of PC

The default management IP address of the device is as follows:

IP Settings	Default Value
IP address	192.168.1.254
Subnet mask	255.255.255.0

When configuring a device through the Web:

- Before conducting remote configuration, please confirm the route between computer and device is reachable.
- Before making a local configuration, make sure that the IP address of the computer and the serial server are on the same subnet.

Note:
While configuring the device for the first time, if it's the local configuration mode, first confirm the network segment of current PC is 1.

Copyright © 3onedata Co., Ltd.

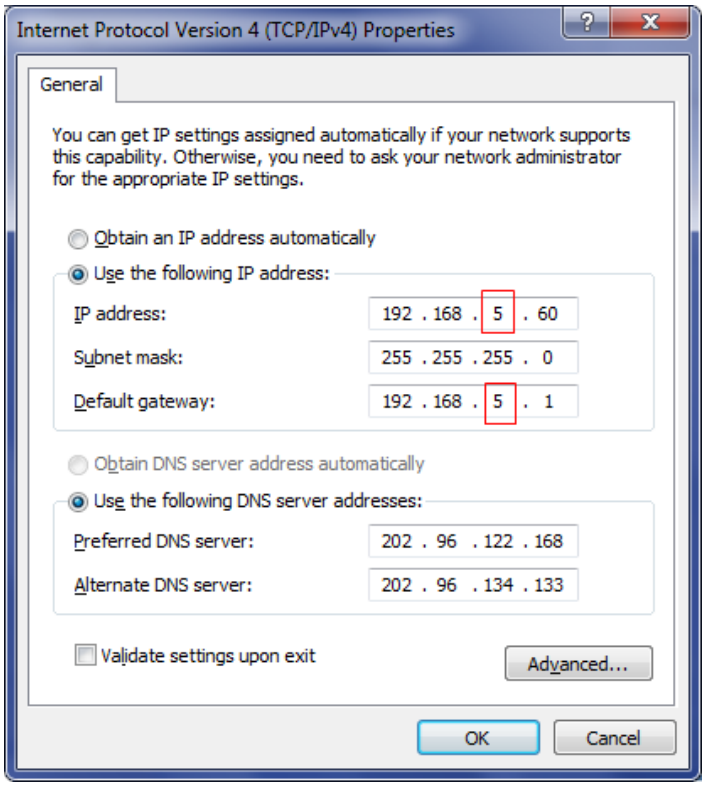
Eg: Assume that the IP address of the current PC is 192.168.5.60, change the network segment "5" of the IP address to "1".

Operation Steps

Amendment steps are as follows:

Step 1 Open "Control Panel> Network Connection> Local Area Connection> Properties> Internet Protocol Version 4 (TCP / IPv4)> Properties".

Step 2 Change the "5" selected by the red frame in the figure to "1".



Step 3 Click "OK", modification is successful.

Step 4 End.

1.3 Login to the WEB Configuration Interface

Operation Steps

Log in to the WEB configuration interface as follows:

Step 1 Run the computer browser.

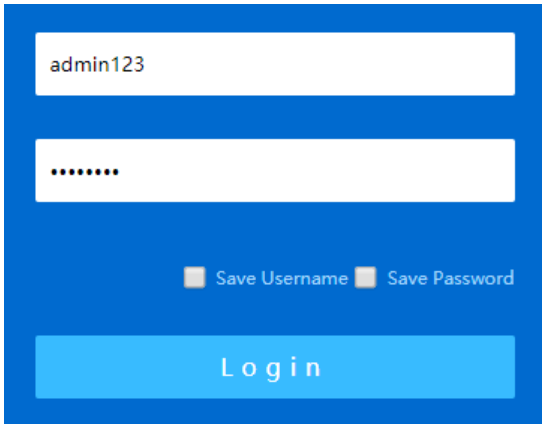
Step 2 Enter the address of the device "http://192.168.1.254" in the address bar of the browser.

Step 3 Click the “Enter” key.

Step 4 Pop-up dialog box as shown below, enter the user name and password in the login

Copyright © 3onedata Co., Ltd.

window.



Note:

- The default username and password are “admin123”; please strictly distinguish capital and small letter while entering.
- Default user account has the administrator privileges.
- When the user has not operated the Web network management configuration page for a long time, the system will log out and return to the Web login page after timeout; By default, the timeout of Web page login is 15 minutes.
- When the number of consecutive password login errors of a user reaches the limit (default is 5 times), the user will be restricted from logging in for the following time (default is 10 minutes).

Step 5 Click "Login".

Step 6 End.

After login successfully, user can configure relative parameters and information of WEB interface according to demands.

Copyright © 3onedata Co., Ltd.

2 System Information

Function Description

View port status such as port type and connection status.

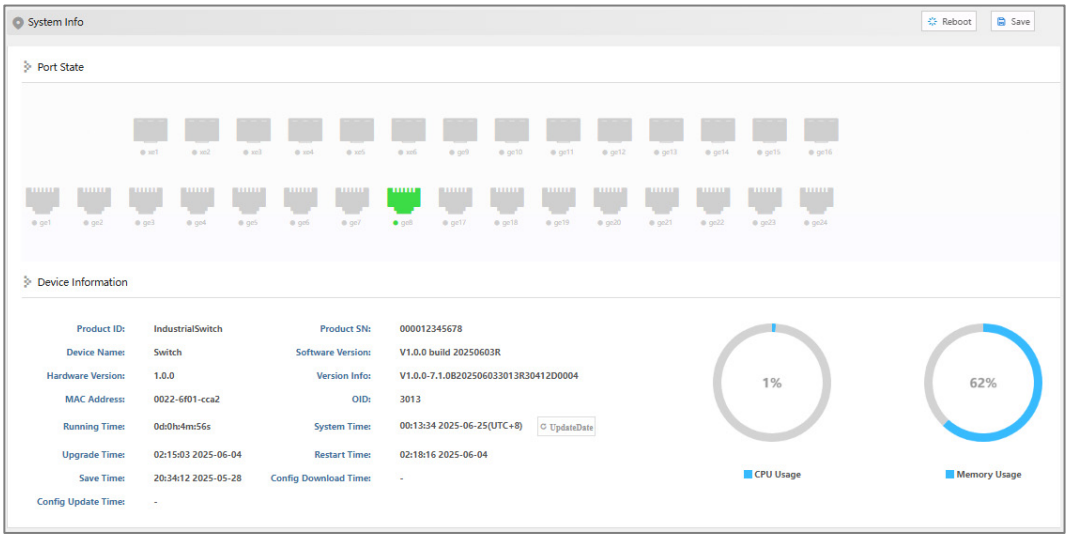
Check device information such as product model, software and hardware version, etc.

Operation Path

Open in the navigation bar: “System Information”.

Interface Description

System information interface is as follows:



The main element configuration description of System Info interface:

Interface Element	Description
Port State	Display port icon and port connection status of the device: • Fiber port icon, highlighting indicates that the port is connected.

Copyright © 3onedata Co., Ltd.

Interface Element	Description
	• Fiber port icon, grayed out indicates that the port is not connected or disabled.
Device Information	Basic information of software, hardware, and operation of the device. • Product ID • Device Name • Hardware Version • MAC Address • Running Time • Upgrade Time • Save Time • Config Update Time • Product SN • Software Version • Version Info • OID • System Time • Restart Time • Save Time • Config Download Time • CPU Usage • Memory Usage

Copyright © 3onedata Co., Ltd.

3 Login Configuration

3.1 IP Address

3.1.1 IPv4

Function Description

Configure the IPv4 address of the vlanif1 interface.

Operation Path

Open in order: "Login > IP Address > IPV4".

Interface Description

The IPV4 interface is as follows:



Main elements configuration descriptions of IPV4 interface:

Interface Element	Description
IP	The IPv4 address and subnet mask of the vlanif1 interface of the device. The default IP is 192.168.1.254/24. Note: After modifying the IP of the device, re-enter the corresponding IP address to access the WEB interface.

Copyright © 3onedata Co., Ltd.

3.1.2 IPv6

Function Description

Add or delete IPv6 address of vlanif1 interface.

An IPv6 address is 128 bits long and is written as eight groups of four hexadecimal digits (base 16 digits represented by the numbers 0-9 and the letters A-F). Each group is separated by a colon (:). For the convenience of writing, IPv6 also provides a compression format. The specific compression rules are:

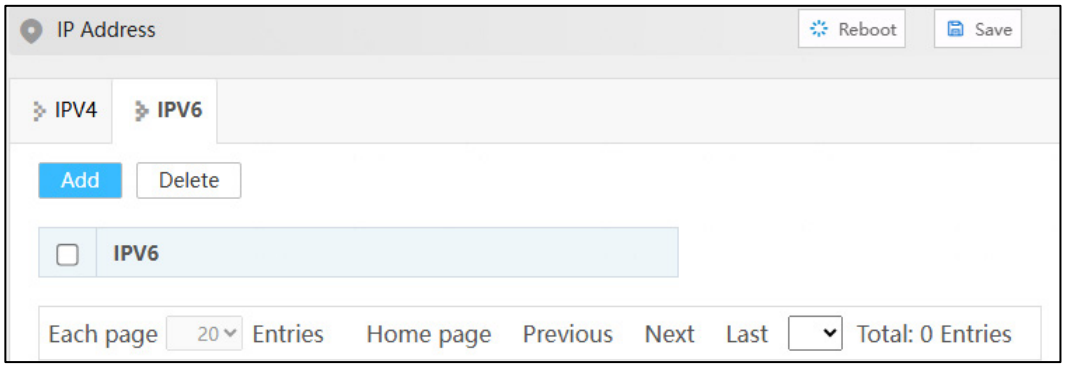
- The leading "0" in each group can be omitted.
- The address contains two or more consecutive groups of 0s, which can be replaced by double colons "::".

Operation Path

Open in order: "Login > IP Address > IPV6".

Interface Description

The IPV6 interface is as follows:



Main elements configuration descriptions of IPV6 interface:

Interface Element	Description
IPV6	IPv6 address and prefix length of vlanif1 interface of device.

Copyright © 3onedata Co., Ltd.

3.2 User

Function Description

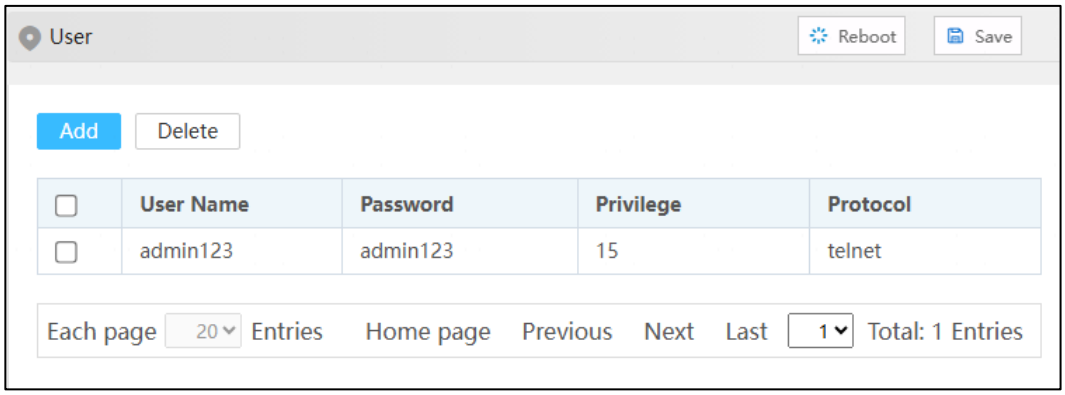
To add and delete user, user needs to enter username and password to access the device, the initial username and password are: admin123.

Operation Path

Open in order: "Login > User".

Interface Description

User interface is as follows:



The main element configuration description of user interface:

Interface Element	Description
User Name	Identification of the visitor. Note: • User name supports 1-16 valid characters, consisting of uppercase letters, lowercase letters, numbers, or special characters (! @ _-). • User name does not support sensitive characters such as root, daemon, bin, sys, sync, mail, proxy, www-data, backup, operator, haldaemon, dbus, ftp, nobody, sshd, default, etc.
Password	Password used by the visitor. Note: • Password supports 8-16 valid characters, consisting of combination of two or more of uppercase letters, lowercase letters, numbers, special characters (~! @ # $% _-.). • The password is valid for 90 days by default, and the password needs to be revised after it expires.
Privilege	The visitor's privilege is 0-15, and it supports 16 priorities in 4 categories. • 0: visit level; You can only view the system information,

Copyright © 3onedata Co., Ltd.

Interface Element	Description
	IP address and log information of the device, and conduct network diagnosis (Ping, Traceroute). • 1: view level; The configuration information of the device can be viewed, but the configuration of the device cannot be modified. • 2: configuration level; User can view the configuration information of the device and configure some functional parameters of the device, but cannot manage the device. • 3-15: manage level, user has all privileges of the device, including downloading, uploading, rebooting, modifying device information and other other operations. Notice: • Users can view, delete, or add other users whose priority does not exceed their own. • If the added user name already exists, the original user information will be overwritten.
Protocol	Provide Telnet protocol for users, with the following options: • Telnet • SSH

3.3 Protocol Authorization

Function Description

Configure device TELNET service and SSH service.

The CLI interface of the device can be accessed through TELNET protocol and SSH2.0 protocol. TELNET transmission process uses TCP protocol for plaintext transmission, and SSH (Secure Shell) protocol provides secure remote login, ensuring the safe transmission of data.

Operation Path

Open in order: "Login > Protocol Authorization".

Interface Description

Protocol authorization interface is as below:

Copyright © 3onedata Co., Ltd.



Configuration description of main elements of the protocol authorization interface:

Interface Element	Description
Telnet Enable Switch	TELNET service enable switch button, which is enabled by default.
SSH Enable Switch	SSH service enable switch button, which is disabled by default.

Copyright © 3onedata Co., Ltd.

4 Port Configuration

4.1 Port Settings

Function Description

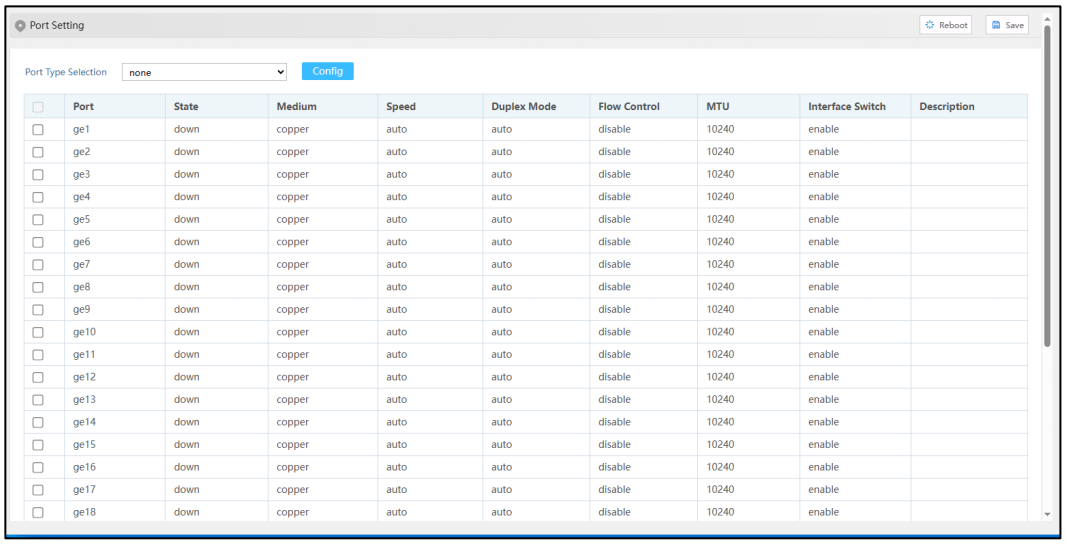
Set port parameters individually or in batches.

Operation Path

Open in order: "Port > Port Setting".

Interface Description

Port setting interface is as follows:



Main elements configuration description of port setting interface:

Interface Element	Description
Port Type Selection	Select ports of the same type in batches for configuration, and the options are as follows: • none

Copyright © 3onedata Co., Ltd.

Interface Element	Description
	• fe:100M port • ge: Gigabit port • xe: 10Gigabit port • sa: static aggregation group • po: dynamic aggregation group Note: The port type is based on the actual port of the device.
Port	The corresponding port name of the device Ethernet port.
State	Ethernet port connection status, display status as follows: • down: represent the port is disconnected; • up: represent the port is connected.
Medium	The connection types of Ethernet ports, the status is shown as follows: • fiber: fiber port medium. • copper: copper port medium.
Speed	The default is self-adaption mode, and the display status is as follows: • auto: self-adaption; • 100m: 100M; • 1g: Gigabit. • 2500m: 2.5G • 10g: 10 Gigabit.
Duplex Mode	The default is self-adaption mode, and the display status is as follows: • auto: self-adaption; • half: half-duplex • full: full duplex
Flow Control	Port flow control status, the display status is as follows: • disable • Both: Enable port data sending or receiving flow control. • send on: Enable port data sending flow control; • send off: Disables port sending data flow control. • receive on: Enable port data receiving flow control; • receive off: Disables port receiving data flow control.
MTU	The maximum Ethernet data frame length that can pass through an Ethernet port ranges from 64 to 10240.
Interface Switch	Enable or disable Ethernet port. Options are as follows: • enable

Copyright © 3onedata Co., Ltd.

Interface Element	Description
	• disable
Description	Port description information, which supports 0-32 characters and consists of uppercase letters, lowercase letters, numbers, or special characters (! @ _-).

4.2 Link Aggregation

4.2.1 Link Aggregation

Function Description

Link aggregation is the shorter form of Ethernet link aggregation; it binds multiple Ethernet physical links into a logical link, achieving the purpose of increasing the link bandwidth. At the same time, these bundled links can effectively improve the link reliability by mutual dynamic backup.

The Link Aggregation Control Protocol (LACP) protocol based on the IEEE802.3ad standard is a protocol for implementing dynamic link aggregation. Devices running this protocol exchange LACPDU (Link Aggregation Control Protocol Data Unit, Link Aggregation Control Protocol Data Unit) to exchange link aggregation related information.

Based on the enabling or disabling of LACP protocol, the link aggregation can be divided into two modes, static aggregation, and dynamic aggregation.

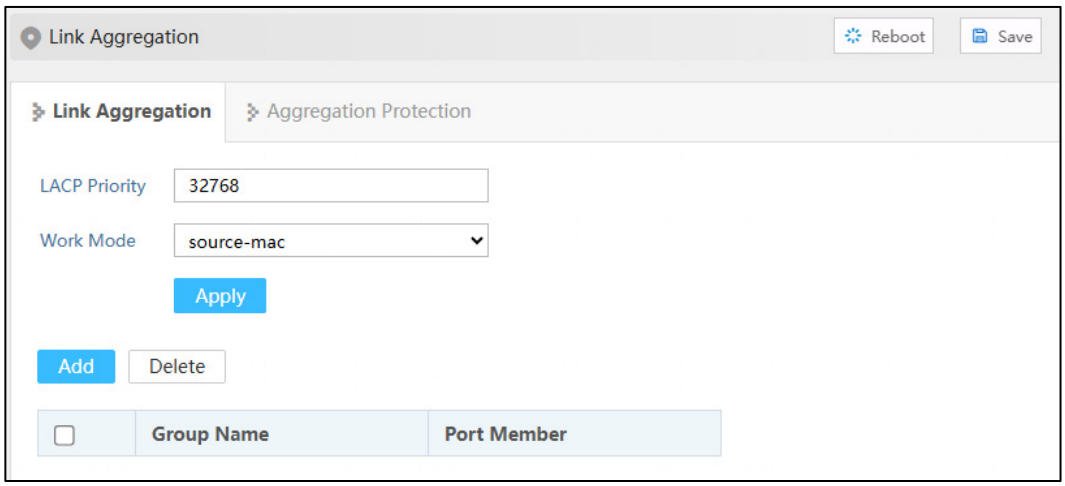
Operation Path

Open in order: "Port > Link Aggregation > Link Aggregation".

Interface Description

Link Aggregation interface is as below:

Copyright © 3onedata Co., Ltd.



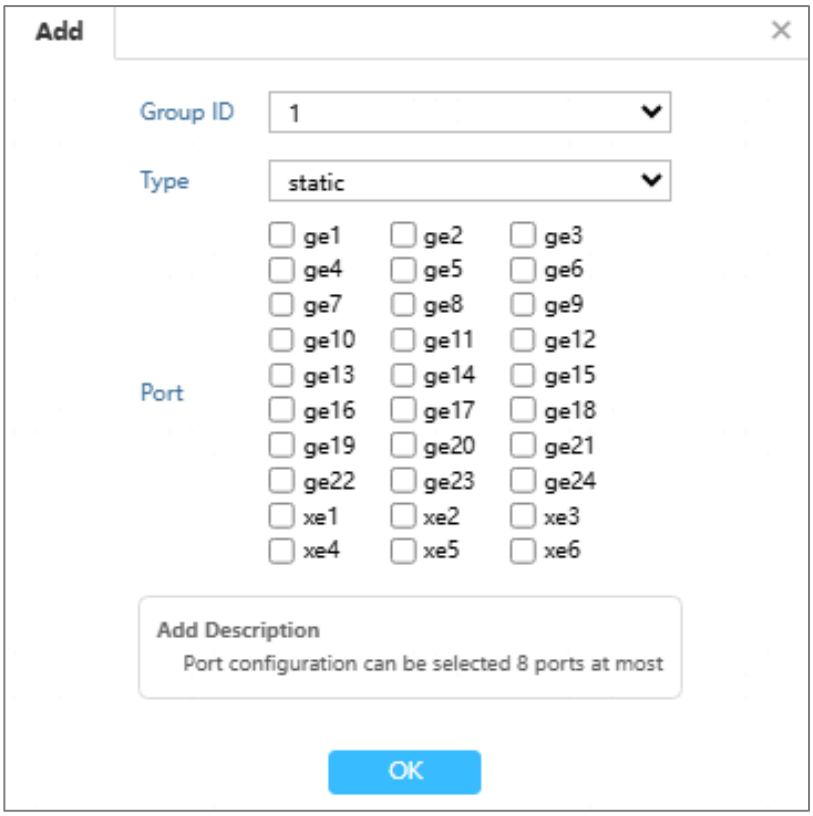
The main element configuration description of Link Aggregation interface:

Interface Element	Description
LACP Priority	Priority level setting of dynamic aggregation system, the setting range is 1-65535, defaults to 32768. Note: The lower the priority value of the system LACP is, the higher the priority is, and the activity interface of the device with high system priority is selected at both ends of the aggregation link.
Work Mode	Configure the load balancing mode of the aggregation group. The options are as follows: • source-mac: Load balance mode based on source MAC • destination-mac: Load balance mode based on destination MAC • source-dest-ip: Load balance mode based on source and destination IP • source-dest-mac: Load balance mode based on source and destination MAC • source-dest-port: The load balancing mode is based on the source and destination TCP/UDP ports.
Group Name	Group type and ID, sa is a static aggregation group, po is a dynamic aggregation group, and the aggregation group ID supports up to 12 groups. Each group can configure up to 8 ports to join aggregation.
Port Member	Port member in the link aggregation group.

Interface Description: Add

The Link Aggregation-Add interface is as follows:

Copyright © 3onedata Co., Ltd.



The main elements configuration description of Link Aggregation-Add interface:

Interface Element	Description
Group ID	The ID number of the aggregation group, which can support up to 12 groups.
Type	Type of aggregation group: • static: static aggregation • dynamic: dynamic aggregation
Aggregation Mode	Dynamic Aggregation Group Mode: • active: active mode, in which the port actively initiates the aggregation negotiation process. • passive: the mode in which the port passively receives the aggregate negotiation process. Note: Under dynamic type, display this configuration.
Port	Port members in this aggregation group. Each group can configure up to 8 ports to join the aggregation.

Copyright © 3onedata Co., Ltd.

4.2.2 Aggregation Protection

Function Description

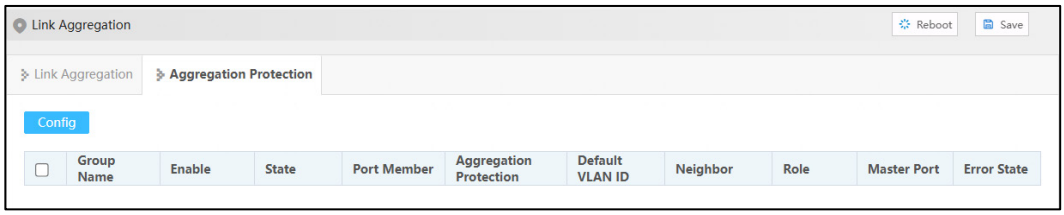
Configure static aggregation protection.

Operation Path

Open in order: "Port > Link Aggregation > Aggregation Protection".

Interface Description

The aggregation protection interface is shown as follows:



Description of configuration of main elements of aggregation protection interface:

Interface Element	Description
Group Name	The name of the static aggregation group set in Link Aggregation.
Enable	The enabled state of the aggregation group. • Enable • Disable
State	Status of the aggregation group port. • Up: if any port member is Up, the status of the aggregation group is up; • Down: if all port members are Down, the status of the aggregation group is Down.
Port Member	Port member in the aggregation group.
Aggregation Protection	The enabled state of the aggregation protection. • Enable • Disable
Default VLAN ID	The VLAN where that aggregate group port resides.
Neighbor	MAC address of the opposite device of aggregation group. Note: If no device is connected to the opposite end, the MAC address is displayed as 0000.0000.0000.
Role	Elected roles in this device and the opposite device • Master: the one with a smaller MAC address is elected as Master • Slave: the one with a larger MAC address is elected as

Copyright © 3onedata Co., Ltd.

Interface Element	Description
	Slave
Master Port	The second link port of the master device is the master port.
Error State	Error message prompt of aggregation protection: • Neighbor timed out • Loop: forming a loop • Link error (such as generating many error frames).

4.3 Port Speed Limit

Function Description

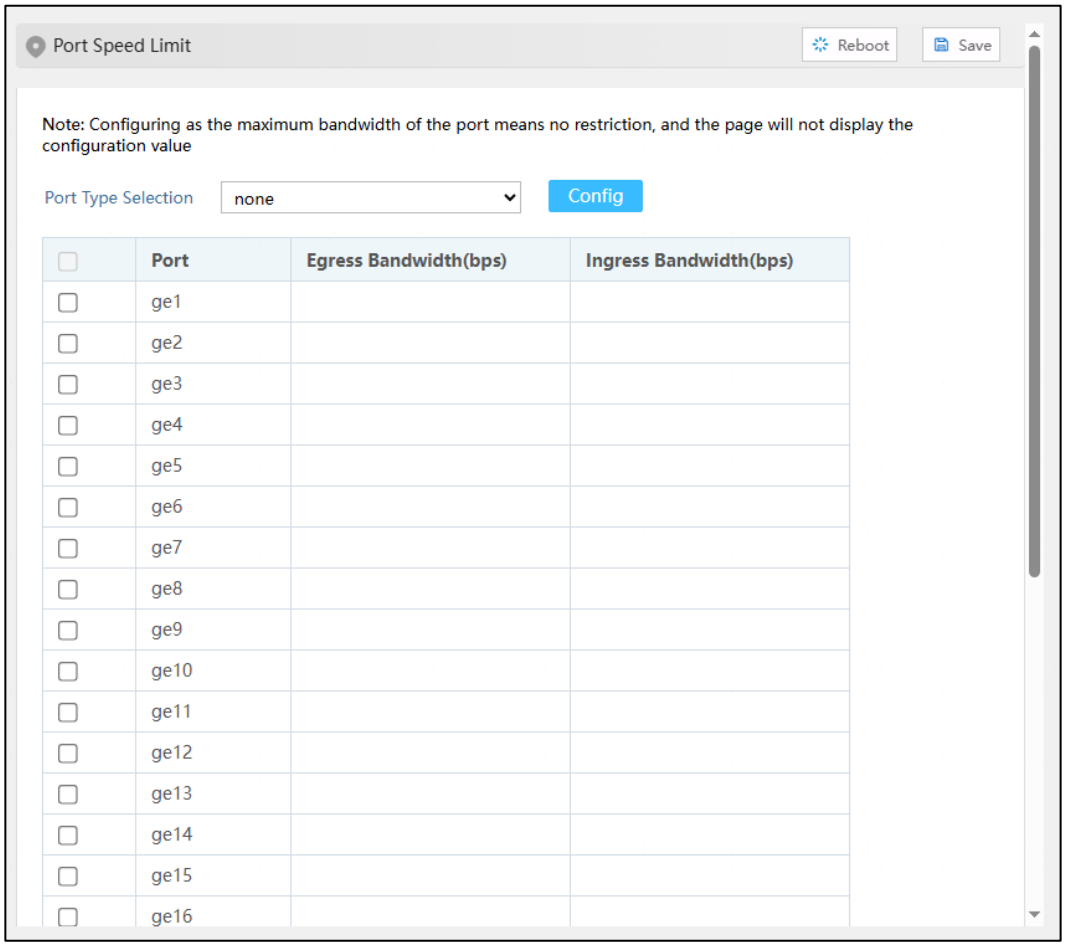
Limit the egress bandwidth and ingress bandwidth of the port.

Operation Path

Open in order: "Port > Port Speed Limit".

Interface Description

Port speed limit interface is as follows:



Copyright © 3onedata Co., Ltd.

The main element configuration description of port speed limit interface:

Interface Element	Description
Port	The corresponding port name of the device Ethernet port.
Egress Bandwidth (bps)	The limitation of port on the bandwidth of egress data transmission.
Ingress Bandwidth (bps)	The limitation of port on the bandwidth of ingress data transmission. Note: Support unit selection of K/M/G when configuring the bandwidth. In WEB display, unit conversion will be conducted and similar values will be taken according to the input value and the unit.

Note

- When using the port rate limit, flow control should be enabled, otherwise the rate between devices will no longer be a smooth curve;
- When using the port rate limit, packet loss should not occur unless the flow control is disabled. The representation of packet loss is the fluctuating transmission speed.
- Port speed limit has high requirements on network cable quality, otherwise lots of conflict packets and broken packet would appear.

4.4 Storm Control

Function Description

Configure the maximum broadcast, multicast or unknown unicast packet flow the port allows.

When the sum of each port broadcast, unknown multicast or unknown unicast flow achieves the value user sets, the system will discard the packets beyond the broadcast, unknown multicast, or unknown unicast flow limit, so that the proportion of overall broadcast, unknown multicast or unknown unicast flow can be reduced to limited range, ensuring the normal operation of network business.

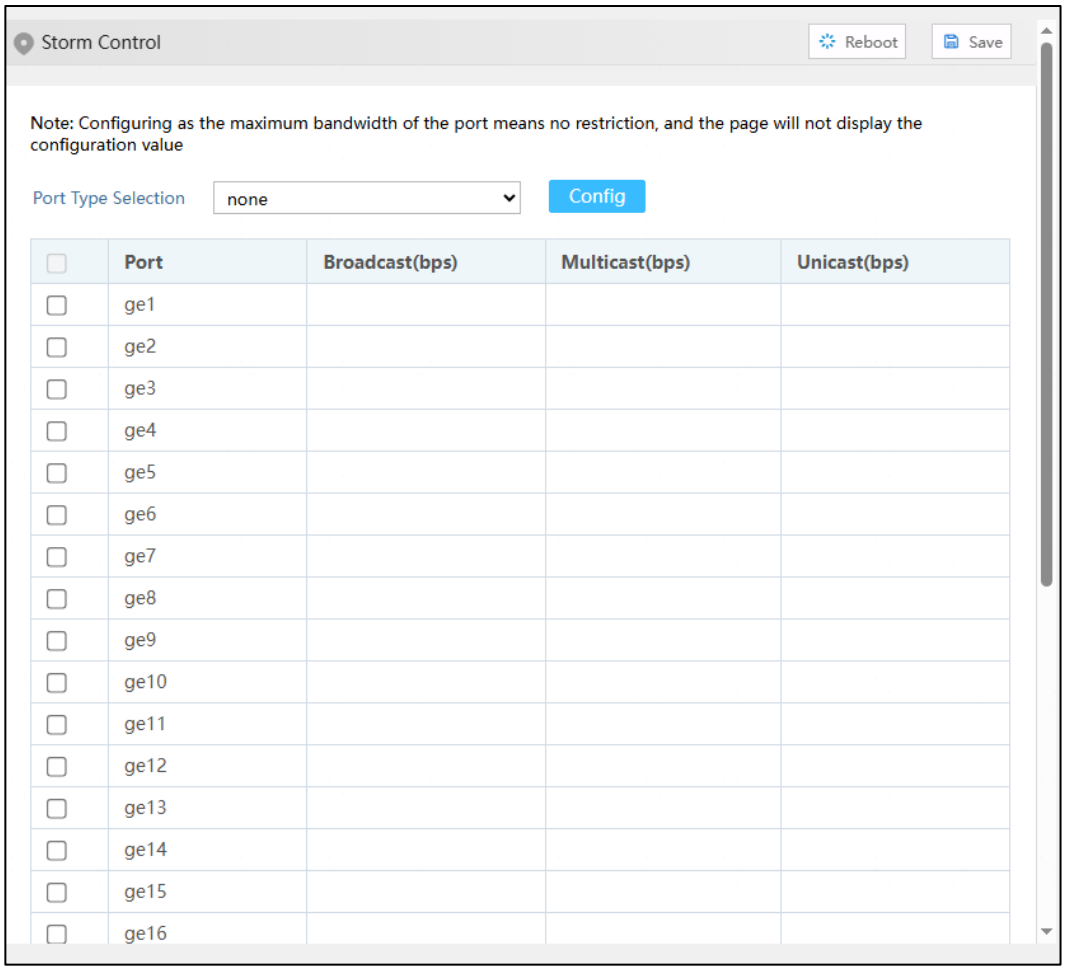
Operation Path

Open in order: "Port > Storm Control".

Interface Description

Storm control interface is as follows:

Copyright © 3onedata Co., Ltd.



Main elements configuration description of storm control interface:

Interface Element	Description
Port	The corresponding port name of the device Ethernet port.
Broadcast (bps)	The device procedure can suppress the transmission speed of broadcast packet Note: Broadcast packet, namely, the data frame with the destination address of FF-FF-FF-FF-FF-FF.
Multicast (bps)	Port suppression to the transmission speed of unknown multicast data packet. Note: Multicast packet, namely, the destination address is XX-XX-XX-XX-XX-XX data frame, the second X is odd number, such as: 1, 3, 5, 7, 9, B, D, F, other X represents arbitrary number.
Unicast (bps)	Port suppression to the transmission speed of unknown unicast data packet. Note: Unknown unicast packet, namely, the MAC address of the data frame doesn't exist in the MAC address table of the device, which

Copyright © 3onedata Co., Ltd.

Interface Element	Description
	needs to be forwarded to all ports.

Note

Support unit of K/M/G when click the "Config" button to configure the rate. In WEB display, unit conversion will be conducted and similar values will be taken according to the input value and the unit.

4.5 Port Mirroring

Function Description

Copy the data from the origin port to appointed port for data analysis and monitoring.

Operation Path

Open in order: "Port > Port Mirroring".

Interface Description

Port mirroring interface is as follows:



The main element configuration description of port mirroring interface:

Interface Element	Description
Source Port	Data source port, which can be one or more, from which the device will collect data in the specified direction.
Direction	Data direction of the source port, options are as follows: • transmit: the message sent by the source port will be mirrored to the destination port. • receive: the packet received by the source port will be mirrored to the destination port. • both: the packet received or sent by the source port will be mirrored to the destination port.
Destination Port	The destination port of device mirroring. The device only supports one destination port.

Copyright © 3onedata Co., Ltd.

Note

- The function must be shut down in normal usage, otherwise all senior management functions based on port are not available, such as RSTP, IGMP snooping etc.
- Mirror function only deals with FCS normal packet; it cannot handle the wrong data frame

4.6 Port Isolation

Function Description

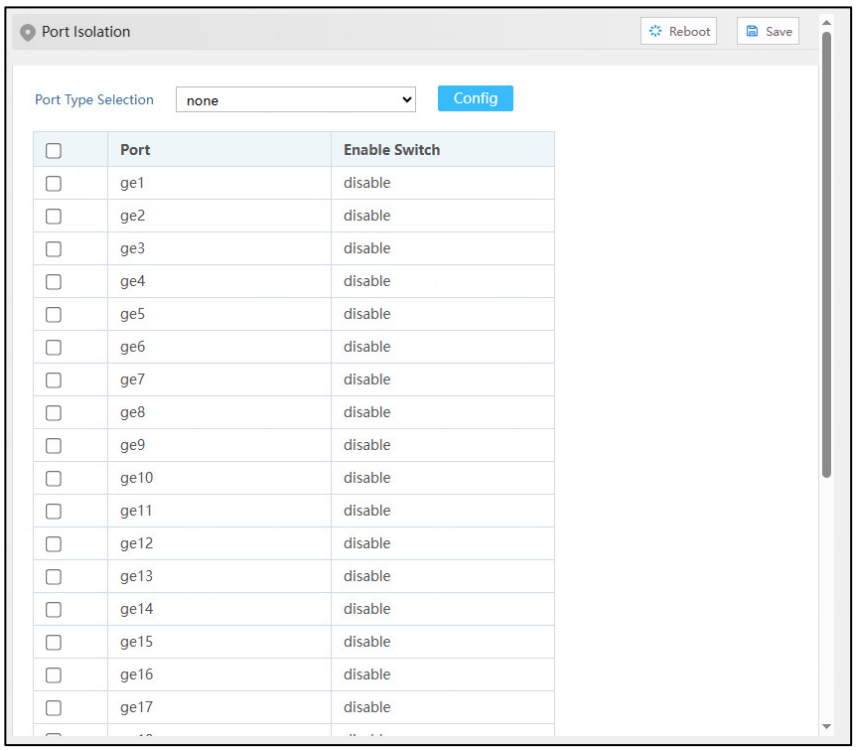
Port isolation is used for the layer 2 isolation between messages. It could add different ports to different VLANs, but waste limited VLAN resources. Adopting isolate-port characteristics can achieve isolation of ports within the same VLAN. After adding the ports to isolation group, user can achieve the layer 2 data isolation of ports within isolation group. Port isolation function has provided safer and more flexible networking scheme for users.

Operation Path

Open in order: "Port > Port Isolation".

Interface Description

Port isolation interface is as follows:



Copyright © 3onedata Co., Ltd.

The main element configuration description of isolate-port config interface:

Interface Element	Description
Port	The corresponding port name of the device Ethernet port.
Enable Switch	Port isolation enable status can be displayed as follows: • disable • enable

4.7 Port Statistics

4.7.1 Port Statistics-Overview

Function Description

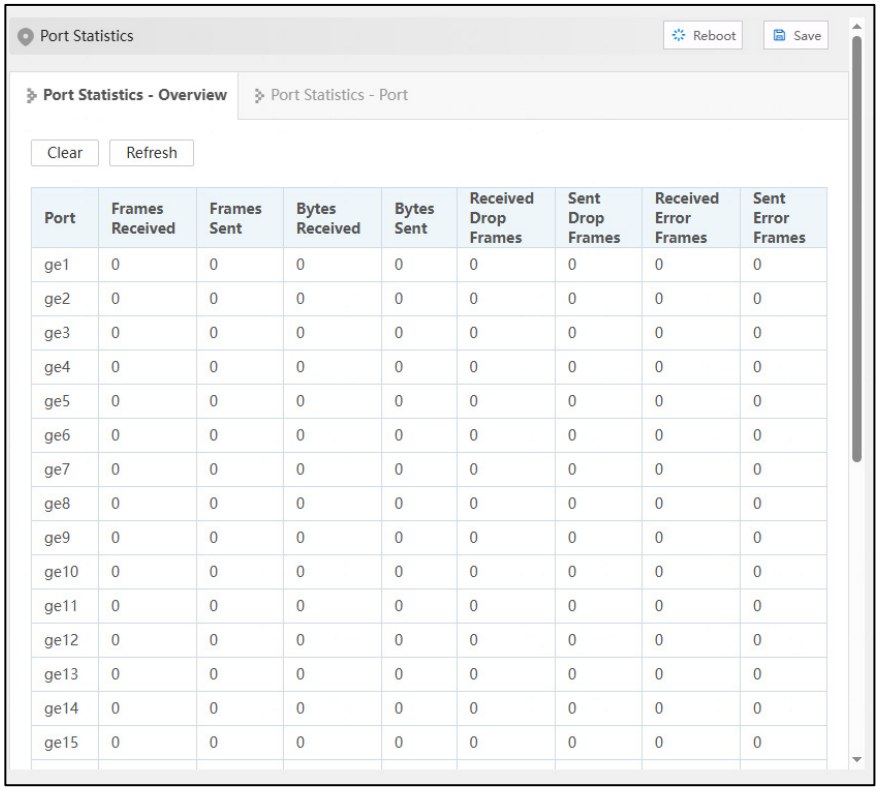
Check the number of messages and bytes, discarded messages and error messages sent and received by each port.

Operation Path

Open in order: "Port > Port statistics > Port Statistics-Overview".

Interface Description

Port Statistics-Overview interface is as follows:



Port	Frames Received	Frames Sent	Bytes Received	Bytes Sent	Received Drop Frames	Sent Drop Frames	Received Error Frames	Sent Error Frames
ge1	0	0	0	0	0	0	0	0
ge2	0	0	0	0	0	0	0	0
ge3	0	0	0	0	0	0	0	0
ge4	0	0	0	0	0	0	0	0
ge5	0	0	0	0	0	0	0	0
ge6	0	0	0	0	0	0	0	0
ge7	0	0	0	0	0	0	0	0
ge8	0	0	0	0	0	0	0	0
ge9	0	0	0	0	0	0	0	0
ge10	0	0	0	0	0	0	0	0
ge11	0	0	0	0	0	0	0	0
ge12	0	0	0	0	0	0	0	0
ge13	0	0	0	0	0	0	0	0
ge14	0	0	0	0	0	0	0	0
ge15	0	0	0	0	0	0	0	0

Copyright © 3onedata Co., Ltd.

4.7.2 Port Statistics-Port

Function Description

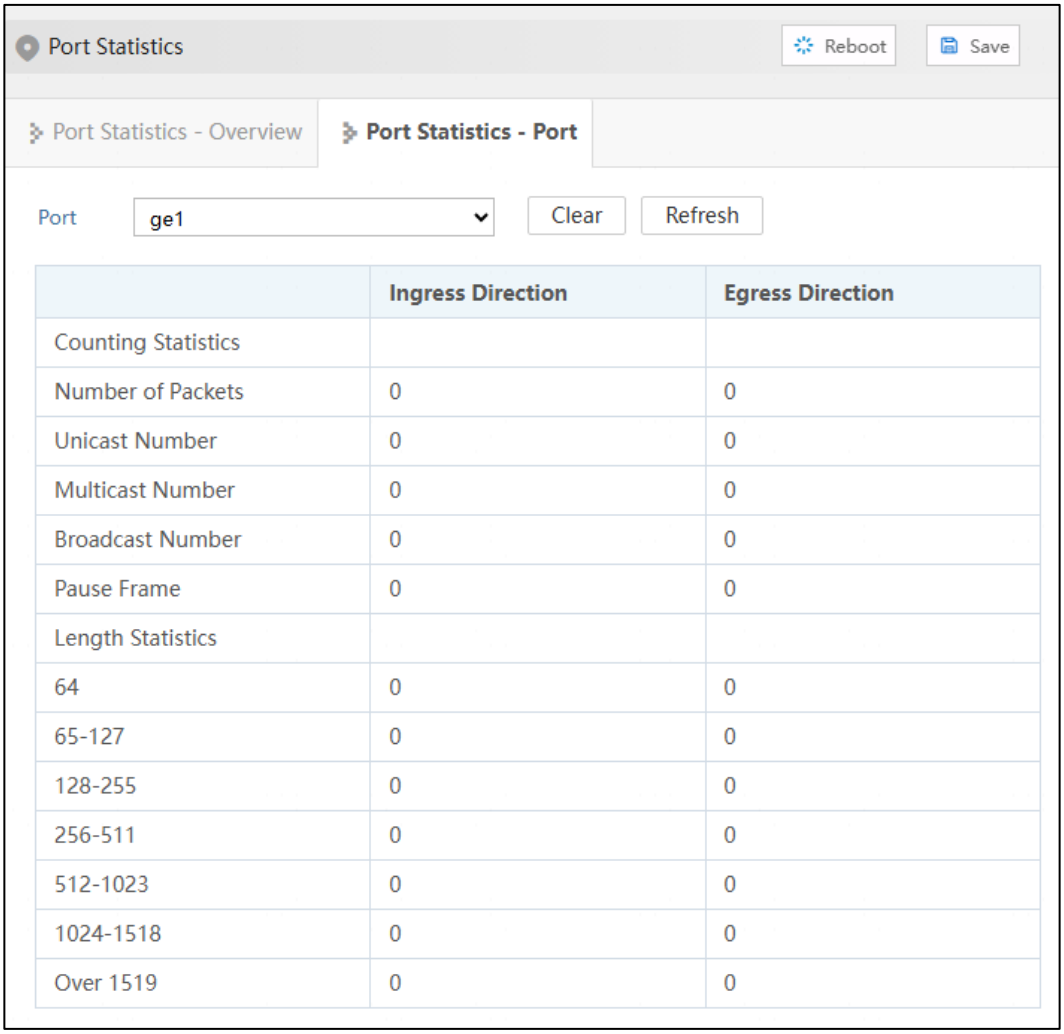
Check the classification statistics of the total number of messages sent and received by the designated port and the number of bytes of messages.

Operation Path

Open in order: "Port > Port statistics > Port Statistics-Port".

Interface Description

Port Statistics-Port interface is as follows:



	Ingress Direction	Egress Direction
Counting Statistics		
Number of Packets	0	0
Unicast Number	0	0
Multicast Number	0	0
Broadcast Number	0	0
Pause Frame	0	0
Length Statistics		
64	0	0
65-127	0	0
128-255	0	0
256-511	0	0
512-1023	0	0
1024-1518	0	0
Over 1519	0	0

Copyright © 3onedata Co., Ltd.

5 Layer 2 Configuration

5.1 VLAN

VLAN is Virtual Local Area Network. VLAN is the data switching technology that logically (note: not physically) divides the LAN device into each network segment (or smaller LAN) to achieve the virtual working group (unit).

VLAN advantages mainly include:

- Port isolation. Ports in different VLAN, even in the same switch, can't intercommunicate. Such a physical switch can be used as multiple logical switches.
- Network security. Different VLAN can't directly communicate with each other, which has eradicated the insecurity of broadcast information.
- Flexible management. Changing the network user belongs to needn't to change ports or connection; only needs to change the firmware configuration.

That is, ports within the same VLAN can intercommunicate; otherwise, ports can't communicate with each other. A VLAN is identified with VLAN ID, and ports with the same VLAN ID belong to a same VLAN.

5.1.1 VLAN Configuration

Function Description

Create VLAN and edit VLAN description.

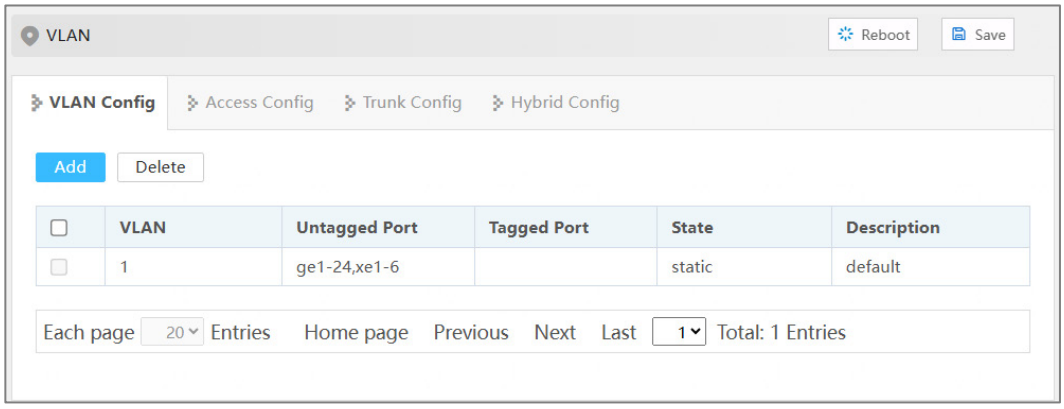
Operation Path

Open in order: "Layer-2 > VLAN > VLAN Config".

Interface Description

The VLAN configuration interface is as follows:

Copyright © 3onedata Co., Ltd.



Main element configuration description of VLAN configuration interface:

Interface Element	Description
VLAN	VLAN ID number, value range is 1-4094.
Untagged Port	Untagged port member to conduct untagged process to sending data frame.
Tagged Port	Tag port member to conduct tagged process to sending data frame.
State	VLAN status: • Static: static VLAN • Dynamic: dynamic VLAN
Description	VLAN description information, which supports 0-32 characters and consists of uppercase letters, lowercase letters, numbers, or special characters (! @ _-).

5.1.2 Access Configuration

Function Description

Configure the PVID (Port Default VLAN ID) of the Access interface, or modify it to Trunk interface.

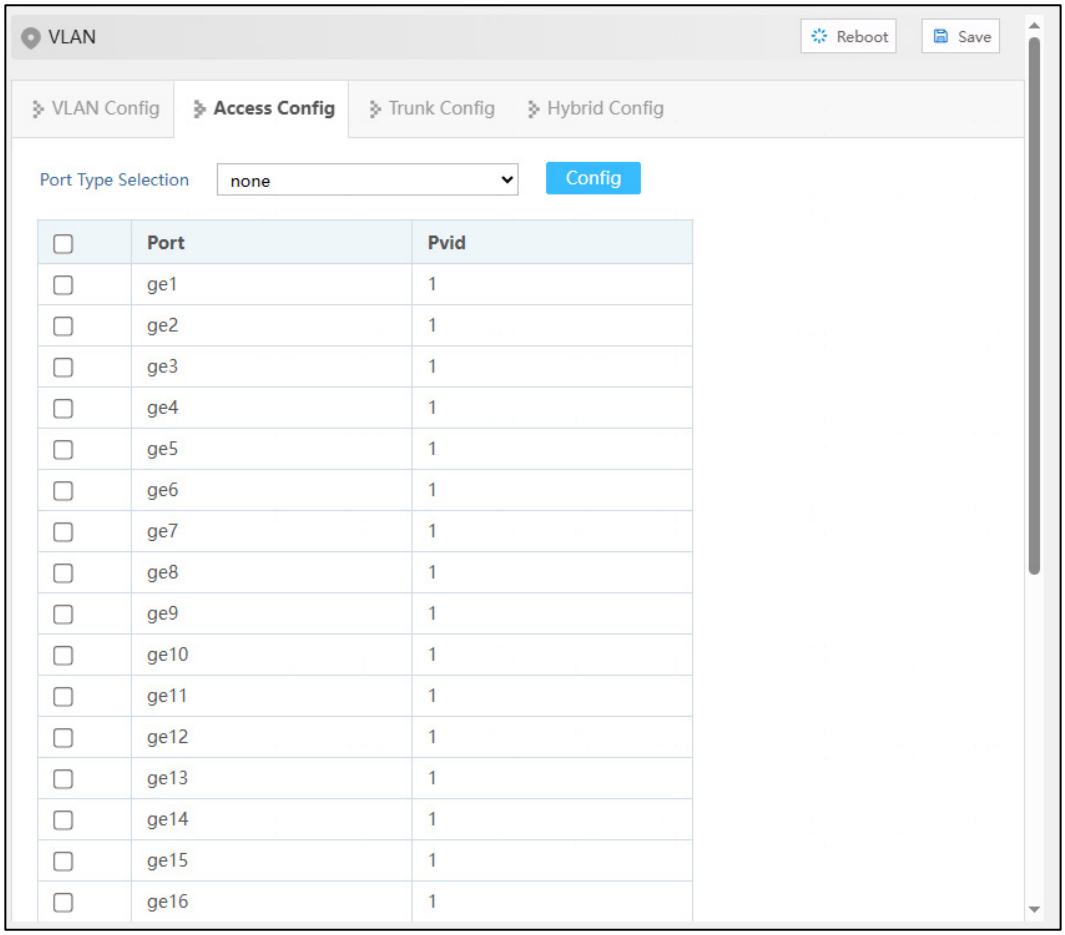
Operation Path

Open in order: "Layer-2 > VLAN > Access Config".

Interface Description

Access configuration interface is as follows:

Copyright © 3onedata Co., Ltd.



The main element configuration description of Access configuration interface.

Interface Element	Description
Port	The corresponding port name of the device Ethernet port.
Pvid	Port Default VLAN ID, which is the default VLAN of the port. Default is 1, value range is 1-4094. Note: Each port has a PVID property, when the port receives Untag messages, it adds Tag mark on them according to PVID. When the port transmits data message with the same Tag mark as PVID, it would erase the Tag mark and then transmit the message. The PVID of all ports default to 1.
Config	Check the port and click “Config” to reset PVID and port mode. • Access: port only belongs to 1 VLAN (which is the default VLAN), all ports of the switch are Access mode by default and all PVID are 1. • Trunk: port can belong to multiple VLAN, Trunk port can allow the messages of multiple VLANs to pass with Tag, but only allow the messages of one VLAN to transmit

Copyright © 3onedata Co., Ltd.

Interface Element	Description
	without tag (strip Tag) from this kind of interface. Commonly used in the connection between network devices.

5.1.3 Trunk Configuration

Function Description

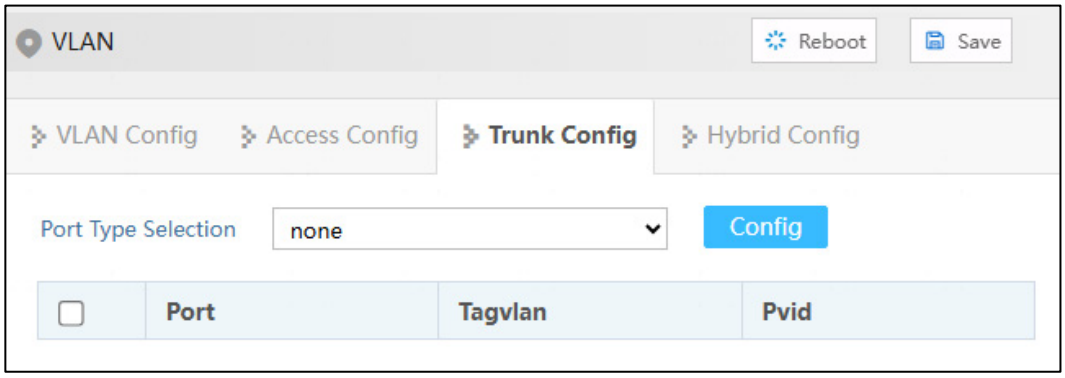
Configure the pvid value and tagvlan of Trunk port, or modify it to Access interface.

Operation Path

Open in order: "Layer-2 > VLAN > Trunk Config".

Interface Description

Trunk configuration interface is as follows:



The main element configuration description of Trunk configuration interface:

Interface Element	Description
Port	The corresponding port name of the device Ethernet port.
Tagvlan	The VLAN ID number that the port allows to pass.
Pvid	Port Default Vlan ID, which is the default VLAN of the port. Default is 1, value range is 1-4094.
Config	Check the port and click “Configure” to configure the VLAN and PVID of the port, as well as the processing of PVID when sending messages.

Copyright © 3onedata Co., Ltd.

5.1.4 Hybrid Configuration

Function Description

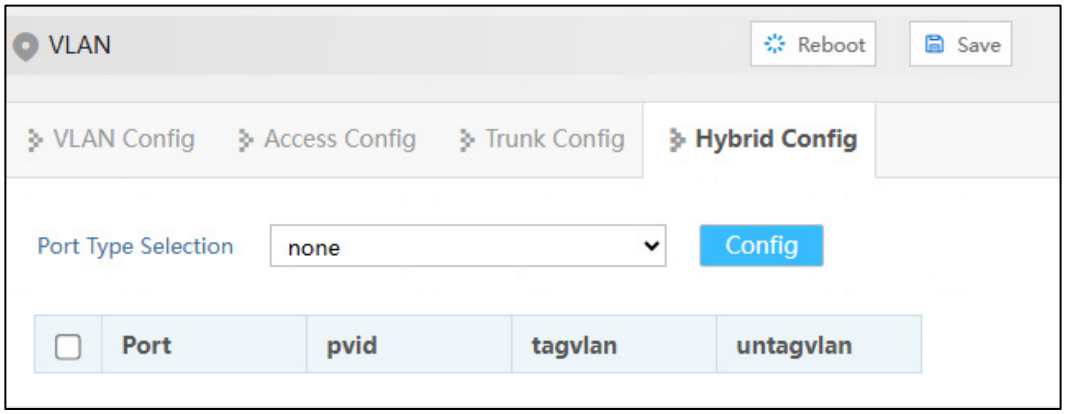
On the "Hybrid Configuration" page, user can configure Hybrid relative parameters.

Operation Path

Open in order: "Layer-2 > VLAN > Hybrid Config".

Interface Description

Hybrid configuration interface is as follows:



The main element configuration description of Hybrid configuration interface.

Interface Element	Description
Port Type Selection	Filter the ports to be configured through the drop-down list.
Config	Check or filter the entries that need to be reconfigured, click configure to reset the parameters of PVID, tagvlan, and untagvlan.
pvid	VLAN ID number, value range is 1-4094.
untagvlan	The untagged value, an individual number or range (“-” represents range). For example: 9 or 10-15.
tagvlan	The tagged value, an individual number or range (“-” represents range). For example: 9 or 10-15.
Mode setting	Click mode setting to set the type to access or trunk

Process for Port Receiving Message

Interface type	Process for Receiving Untagged Message	Process for Receiving Tagged Message
Access	Receive this message and tag it with default VLAN ID.	• Receive the message when the VLAN ID is the same as default

Copyright © 3onedata Co., Ltd.

Interface type	Process for Receiving Untagged Message	Process for Receiving Tagged Message
		VLAN ID. • Discard the message when the VLAN ID is different from the default VLAN ID.
Trunk Hybrid	Receive this message and tag it with default VLAN ID.	• Receive this message when the VLAN ID is in the list of VLAN ID that allow to pass through the interface. • Discard this message when the VLAN ID is not in the list of VLAN ID that allow to pass through the interface.

Process for Port Sending Message

Interface type	The process of transmit frame
Access	Strip the PVID Tag of the message first, then transmit it.
Trunk	• When the VLAN ID is the same as the default VLAN ID, and it is the VLAN ID allowed to pass through the interface, it would strip the Tag and send this message. • When the VLAN ID is different from the default VLAN ID, and it's the VLAN ID allowed to pass through the interface, it would remain its original Tag and send the message.
Hybrid	When the VLAN ID is the one allowed to pass through the interface, it would send this message. It could be set to whether to carry Tag during transmission.

5.2 MAC

MAC (Media Access Control) address is the hardware identity of network device; the switch forwards the message according to MAC address. MAC address has uniqueness, which has guaranteed the correct retransmission of message. Each switch is maintaining a MAC address table. In the table, MAC address is corresponding to the switch port. When the switch receives data frames, it decides whether to filter them or forward them to the corresponding port according to the MAC

Copyright © 3onedata Co., Ltd.

address table. MAC address is the foundation and premise that switch achieves fast forwarding.

5.2.1 Global Configuration

Function Description

Set the aging time of dynamic MAC addresses.

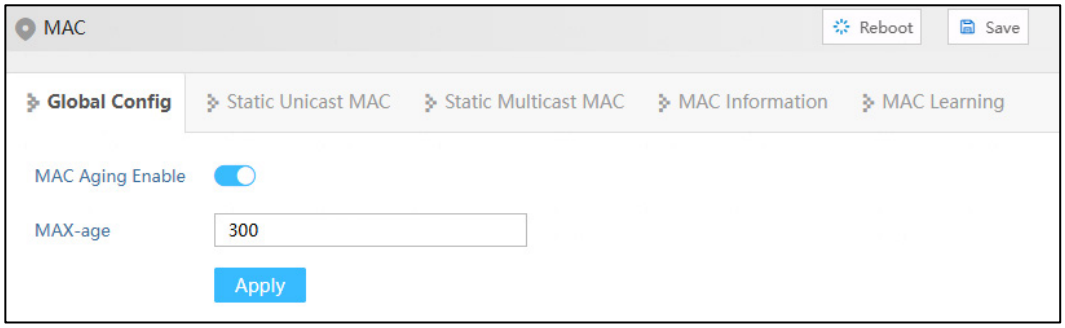
Each port in the switch is equipped with automatic address learning function, it stores the frame source address (source MAC address, switch port number) that port sends and receives in the address table. Ageing time is a parameter influencing the switch learning process; the default value is 300 seconds. When the timekeeping starts after an address record is added to the address table, if each port doesn't receive the frame whose source address is the MAC address within the ageing time, then these addresses will be deleted from dynamic forwarding address table (source MAC address, destination MAC address and their corresponding switch port number).

Operation Path

Open in order: "Layer-2 > MAC > Global Config".

Interface Description

Global configuration interface is as follows:



The main element configuration description of global configuration interface:

Interface Element	Description
MAC Aging Enable	Enable switch of MAC address aging.
MAX-age	MAC address aging-time, unit is second, default value is 300, and range is 10-1000000.

Copyright © 3onedata Co., Ltd.

5.2.2 Static Unicast MAC

Function Description

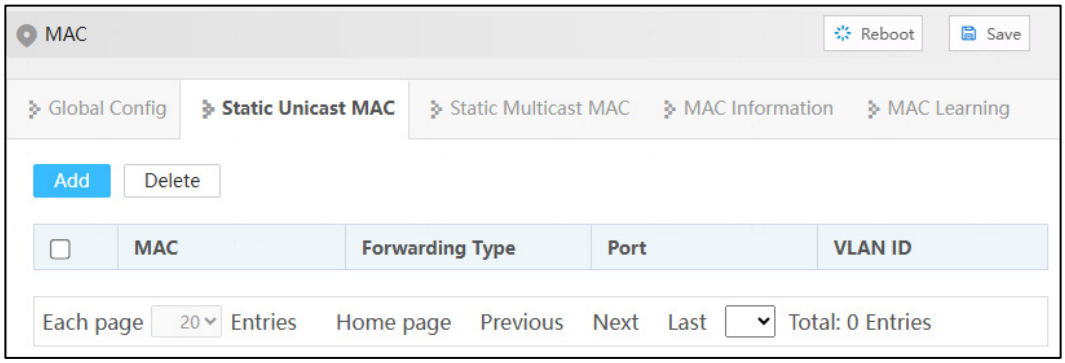
Source unicast MAC address binding and filtering will not age.

Operation Path

Open in order: "Layer-2 > MAC > Static Unicast MAC".

Interface Description

Static unicast MAC interface is as follows:



The main element configuration description of static uniicast MAC interface:

Interface Element	Description
MAC	The unicast MAC address bound by the interface, such as 0001.0001.0001.
Forwarding Type	MAC forwarding type, as shown below: • Discard • Forward
Port	The Binding Port Number.
VLAN ID	The VLAN ID number to which the data sent by this MAC address belongs, for example, 1-4094. Note: Input VLAN ID is the existing ID.

Note

- The function is a sort of security mechanism, please carefully confirm the setting, otherwise, part of the devices won't be able to communicate;
- Please don't adopt multicast address as the entering address;
- Please don't enter reserved MAC address, such as the local MAC address.

Copyright © 3onedata Co., Ltd.

5.2.3 Static Multicast MAC

Function Description

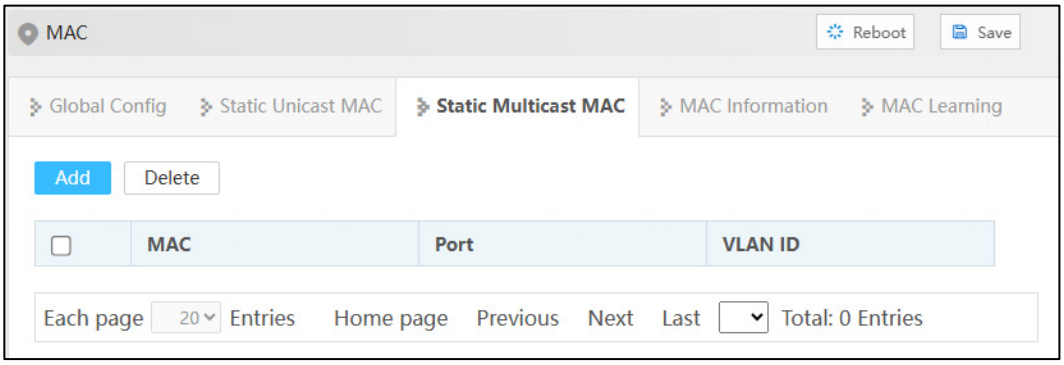
Source multicast MAC address binding will not age.

Operation Path

Open in order: "Layer-2 > MAC > Static Multicast MAC".

Interface Description

Static multicast MAC interface is as follows:



The main element configuration description of static multicast MAC interface:

Interface Element	Description
MAC	Multicast MAC address bound to the interface, for example: 0100.5e01.0001.
Port	The Binding Port Number.
VLAN ID	The VLAN ID number to which the data sent by this MAC address belongs, for example, 1-4094. Note: Input VLAN ID is the existing ID.

5.2.4 MAC Information

Function Description

Check the MAC address table information.

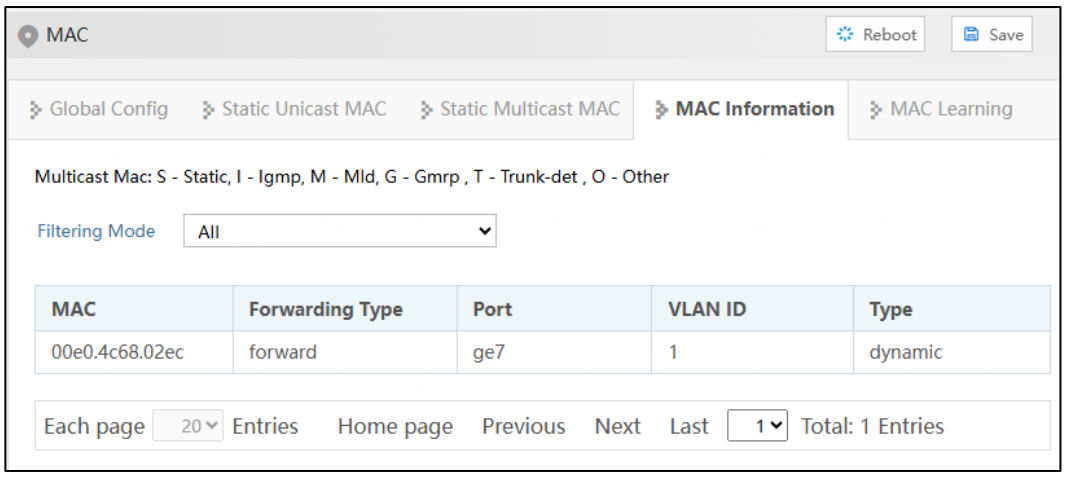
Operation Path

Open in order: "Layer-2 > MAC > MAC Information".

Copyright © 3onedata Co., Ltd.

Interface Description

MAC Information interface is as follows:



The main element configuration description of MAC information interface:

Interface Element	Description
Filtering Mode	Drop-down list of MAC mode to filter the display of the MAC address list of the specified type. The options are as follows: • All • Dynamic Unicast • Dynamic Multicast • Static Multicast • Static Unicast
MAC	The dynamic MAC addresses that the device have learned or the static MAC address information that user has configured.
Forwarding Type	MAC forwarding type, as shown below: • Discard • Forward
Port	Corresponding port number of the MAC address.
VLAN ID	VLAN ID number the data MAC address sending belongs to.
Type	The type of MAC address, it displays as follows: • dynamic • static

Copyright © 3onedata Co., Ltd.

5.2.5 MAC Learning

Function Description

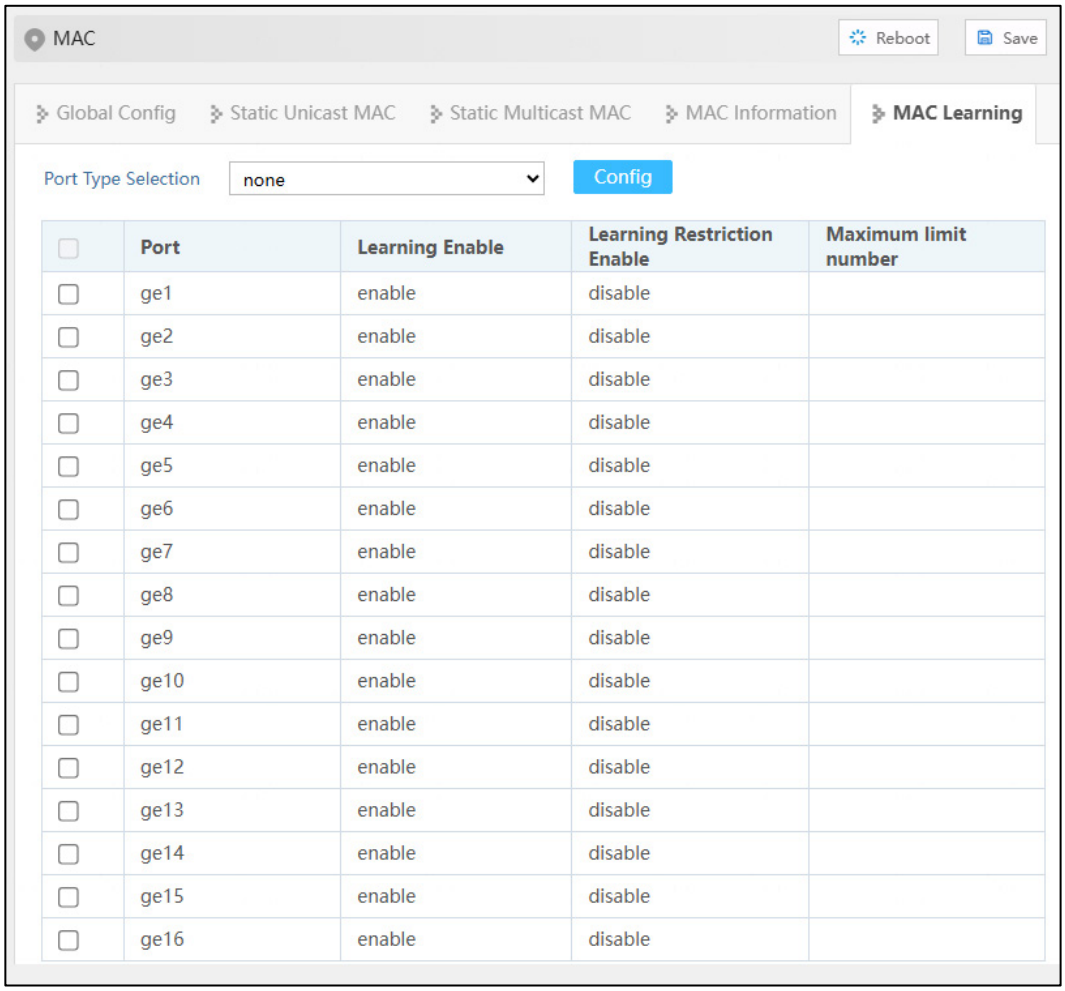
The main function of MAC learning is to limit the number of MAC learning on the port. When the MAC address table of the switch is full, it is impossible to learn new MAC addresses. At this time, if many forged messages with different source MAC addresses are sent to the switch, it will exhaust the resources of the MAC address table of the switch and lead to the failure to learn normal MAC addresses. Therefore, limiting the number of MAC learning of the switch can prevent this from happening and improve the security of the switch and the network.

Operation Path

Open in order: "Layer-2 > MAC > MAC Information".

Interface Description

The MAC learning interface is as follows:



Port	Learning Enable	Learning Restriction Enable	Maximum limit number
ge1	enable	disable	
ge2	enable	disable	
ge3	enable	disable	
ge4	enable	disable	
ge5	enable	disable	
ge6	enable	disable	
ge7	enable	disable	
ge8	enable	disable	
ge9	enable	disable	
ge10	enable	disable	
ge11	enable	disable	
ge12	enable	disable	
ge13	enable	disable	
ge14	enable	disable	
ge15	enable	disable	
ge16	enable	disable	

The main element configuration description of MAC learning interface:

Copyright © 3onedata Co., Ltd.

Interface Element	Description
Port	The corresponding port name of the device Ethernet port.
Learning Enable	"Learning Enable" means that the switch turns on or off the learning function of MAC address. When MAC learning is enabled, the switch will learn and record the MAC addresses received from each port to establish a MAC address table for forwarding packets. When MAC learning is disabled, the switch will stop learning new MAC addresses and will only use the learned MAC addresses for forwarding. The operation of the 'learning enable switch' is as follows: • Disable: disable the learning restriction; • Enable: enable the learning restriction.
Learning Restriction Enable	"Learning Restriction Enable" refers to the function of the switch to turn on or off the learning restriction of a VLAN and the number of MAC addresses learned on a port. When learning restriction is enabled, the switch will limit the number of MAC addresses learned on a certain port, and MAC addresses exceeding the limit may be discarded or ignored. When learning restriction is disabled, the switch does not limit the number of MAC addresses learned on a port. The operation of the 'learning limits enable switch' is as follows: • Disable: disable the learning restriction; • Enable: enable the learning restriction. Note: The "learning enable switch" and "learning restriction switch" can be turned on or off simultaneously, but the "learning restriction switch" only has actual impact when the "learning enable switch" is turned on.
Maximum limit number	The maximum number of restrictions means that "Learning Restriction Enable" restricts the number of MAC addresses learned on a port.

5.3 Spanning Tree

Spanning-tree protocol is a sort of layer 2 management protocol; it can eliminate the network layer 2 circuit via selectively obstructing the network redundant links. At the

Copyright © 3onedata Co., Ltd.

same time, it has link backup function. Here are three kinds of spanning-tree protocols:

- STP (Spanning Tree Protocol)
- RSTP (Rapid Spanning Tree Protocol)
- MSTP (Multiple Spanning Tree Protocol)

Spanning-tree protocol has two main functions:

- First function is utilizing spanning-tree algorithm to establish a spanning-tree that takes a port of a switch as the root to avoid ring circuit in Ethernet.
- Second function is achieving the convergence protection purpose via spanning-tree protocol when Ethernet topology changes.

Compared to STP, RSTP, MSTP can converge the network more quickly when network structure changes; MSTP is compatible with STP and RSTP, and is better than STP and RSTP. It can not only quickly converge but also send different VLAN along each path to provide better load sharing system for redundant link.

5.3.1 Global Configuration

Function Description

Configure the relevant parameters of spanning tree.

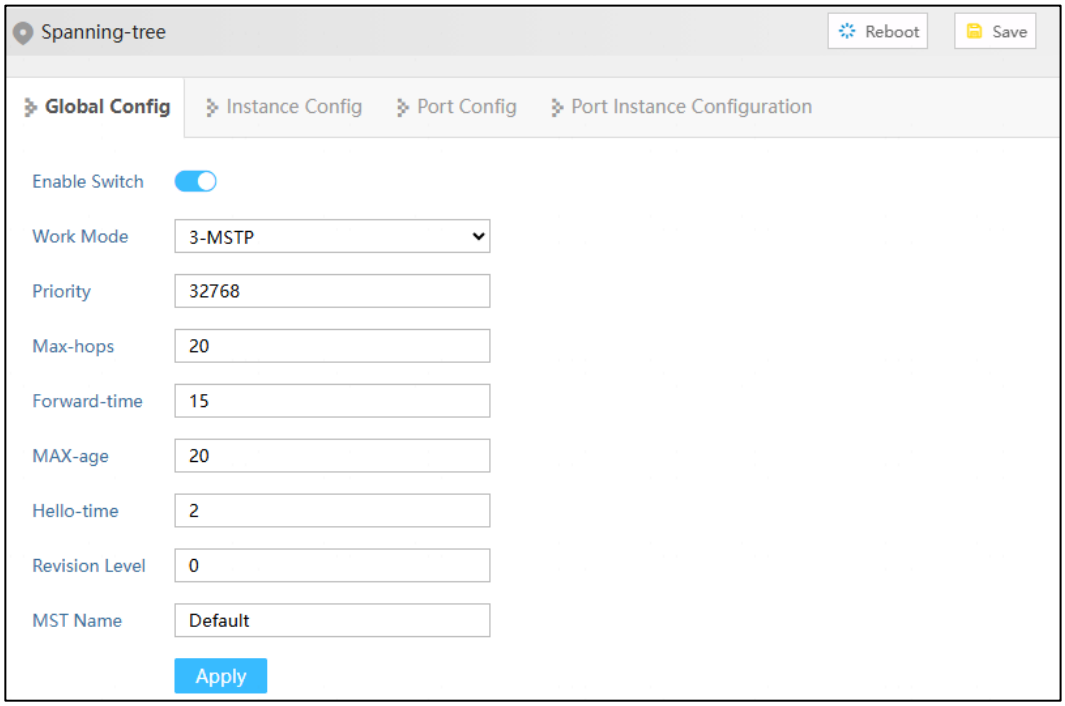
Operation Path

Open in order: "Layer-2 > Spanning-tree > Global Config".

Interface Description

Global configuration interface is as follows:

Copyright © 3onedata Co., Ltd.



The main element configuration description of global configuration interface:

Interface Element	Description
Enable Switch	Spanning-tree enable switch. Disable by default
Work Mode	Defaults to MSTP, there are three modes for spanning-tree protocol choice: • 0-STP: Spanning-tree • 2-RSTP: Rapid spanning tree • 3-MSTP: Multiple spanning-trees Note: In RSTP or MSTP mode, when the connection with STP device is found, the port will automatically migrate to STP compatible mode to work.
Priority	Bridge priority level, value range is 0-61440. Note: Smaller the priority level value is, higher the priority level is. It must be a multiple of 4096.
Max-hops	The maximum hop in MST region, defaults to 20, the value range is 1-40. Note: The maximum hop in MST region has limited the size of MST region. The maximum hop configured on a domain root will be used as the maximum hop in MST region.
Forward-time	Port state transition delay, defaults to 15s, the value range is 4-30.
MAX-age	The maximum lifetime of the message in the device, defaults to 20s, the value range is 6-40. It's used to determine

Copyright © 3onedata Co., Ltd.

Interface Element	Description
	whether the configuration message times out.
Hello-time	Message sending cycle, defaults to 2s, the value range is 1-10. Note: • The spanning tree protocol sends configuration information every Hello time to check whether the link is faulty. • In order to avoid frequent network flap, forwarding delay, aging time and handshake time should satisfy the following formula: 2× (forwarding delay -1) ≥ aging time ≥2× (handshake time -1).
MST Name	MST domain name, defaults to Default, up to 32 characters.

5.3.2 Instance Configuration

Function Description

Configure instance-to-VLAN mapping.

Multiple Spanning Tree Regions (MST Regions) are composed of multiple devices in the switched network and the network segments between them.

In a MST region, multiple spanning trees can be generated through MSTP. Each spanning tree is independent to others and corresponding to special VLAN. Each spanning tree is called an MSTI (Multiple Spanning Tree Instance).

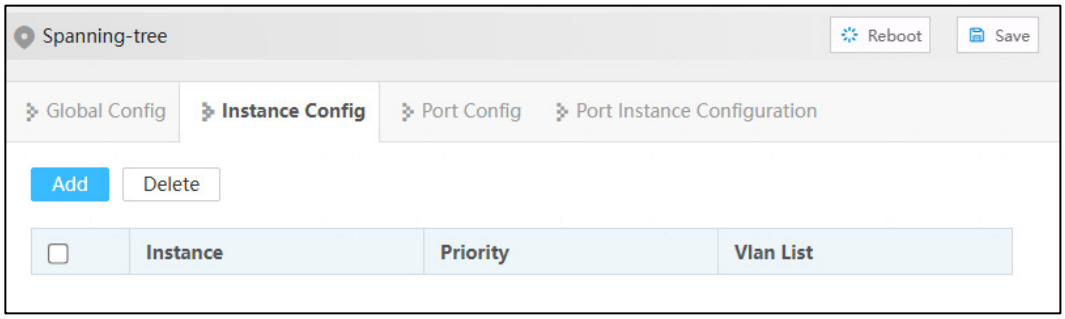
VLAN mapping table is an attribute of MST region, and it's used to describe the mapping relation between VLAN and MSTI.

Operation Path

Open in order: "Layer-2 > Spanning-tree > Instance Config".

Interface Description

Instance configuration interface is as follows:



Copyright © 3onedata Co., Ltd.

The main element configuration description of instance configuration interface:

Interface Element	Description
Instance	Instance ID number of Multiple Spanning-tree. The value range is 1-16.
Priority	Device priority level, value range is 0-61440, default to 32769, step is 4096. During adding, choose a priority based on 0-15 times the value on the 4096. Note: The priority of a device participates in spanning tree calculation. Its size determines whether the device can be selected as the root bridge of a spanning tree.
VLAN List	The list of VLANs mapped to MSTI instances, each VLAN can only correspond to one MSTI. Note: VLAN mapping table is an attribute of MST region, and it's used to describe the mapping relation between VLAN and MSTI. MSTP achieves load balancing based on the VLAN mapping table.

5.3.3 Port Configuration

Function Description

Enable port to participate in spanning-tree and configure port type, link type and BPDU protection function.

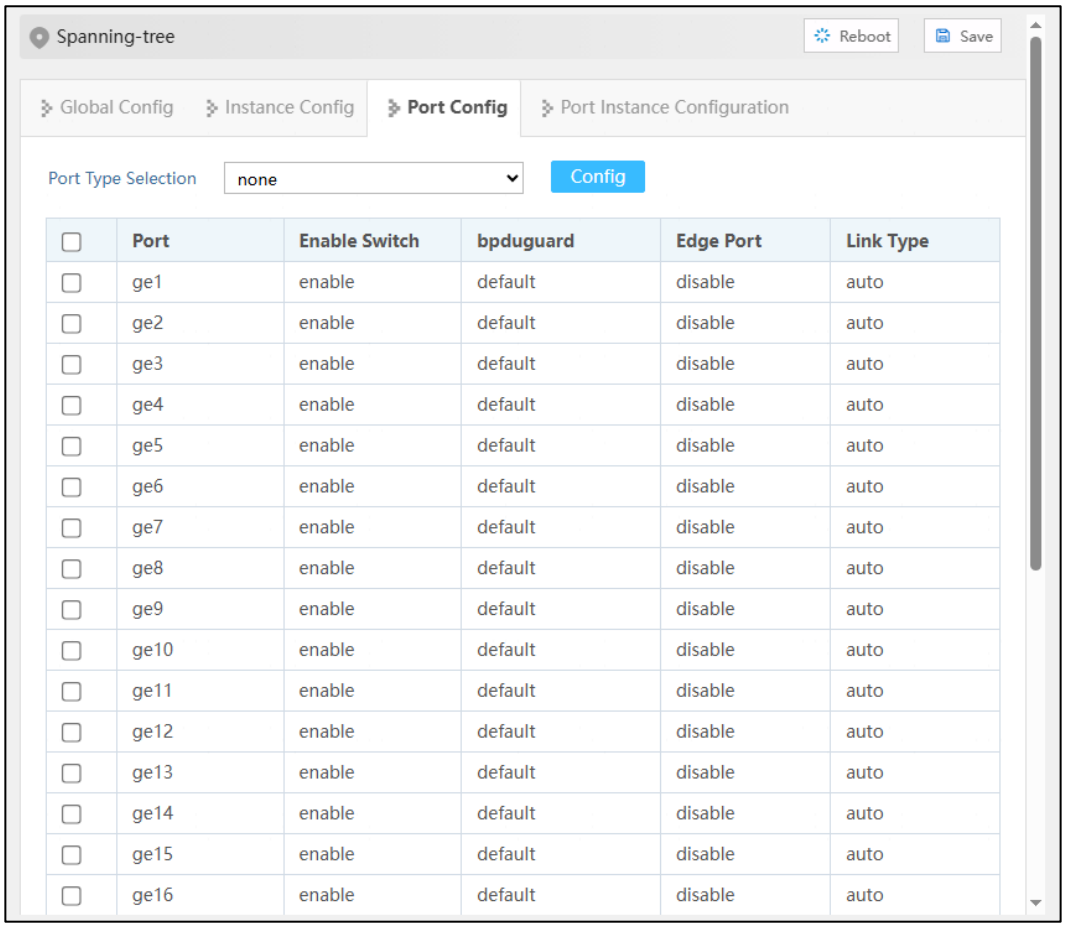
Operation Path

Open in order: "Layer-2 > Spanning-tree > Port Config".

Interface Description

Check port configuration interface as below:

Copyright © 3onedata Co., Ltd.



The main element configuration description of port configuration interface:

Interface Element	Description
Port	The corresponding port name of the device Ethernet port.
Enable Switch	The enable status of ports participating in spanning tree can be shown as follows: • Enable • Disable
bpduguard	BPDU (Bridge Protocol Data Unit) protection function. After starting the BPDU protection, if the edge port receives the BPDU message that should not exist, the edge port will be closed, and it can return to normal after a certain time. Edge Port BPDU Guard State: • Default: global configuration protection status • Enable • Disable
Edge Port	The port that directly connects to terminal instead of other switches. The edge port does not participate in the spanning

Copyright © 3onedata Co., Ltd.

Interface Element	Description
	tree operation, and can be directly transferred to the Forwarding state by Disable. Enable state of edge port: • Enable • Disable
Link Type	Fast entry of the port into the forwarding state requires that the port must be a point-to-point link, not a shared media link. Port link type: • Auto: if the port is full duplex, it is judged as a point-to-point link; If it is half-duplex, it is judged as a non-point-to-point link. • Point-to-point: point-to-point link. • Shared: Non point-to-point link.

5.3.4 Port Instance Configuration

Function Description

Configure port priority and cost

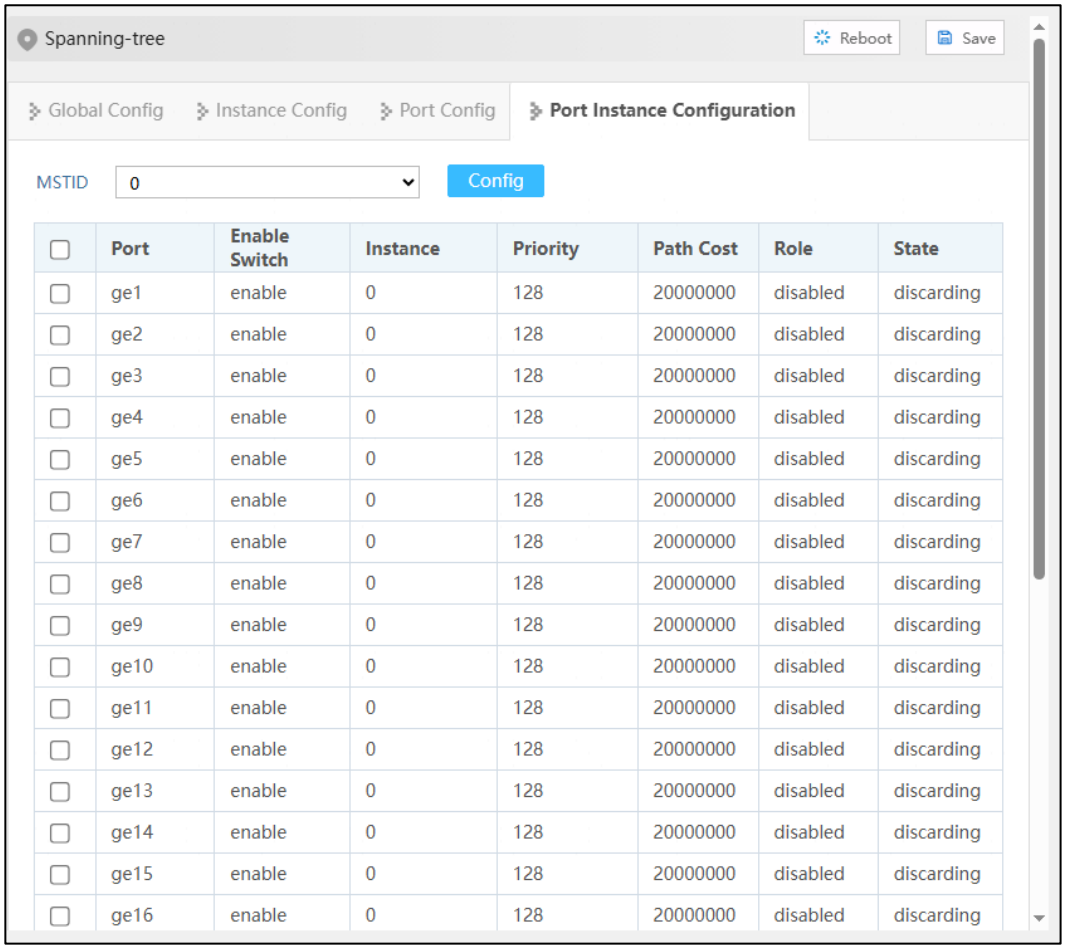
Operation Path

Open in order: "Layer-2 > Spanning-tree > Port Instance Configuration".

Interface Description

Port instance configuration interface is as follows:

Copyright © 3onedata Co., Ltd.



The main element configuration description of port instance configuration interface:

Interface Element	Description
MSTID	Choose multiple Spanning-tree ID number.
Port	The corresponding port name of the device Ethernet port.
Enable Switch	Port enable status: • Enable: participate in spanning-tree; • Disable: not participate in spanning-tree.
Instance	Instance ID number port belongs to.
Priority	Port priority, the value range is 0-240, the step size is 16, the default value is 128, and the priority based on 0-15 times the value of 16 can be selected. Note: Port priority level in bridge, port priority level is higher when the value is smaller. The higher the priority of the port, the more likely it is to be a root port.
Path Cost	The path cost from network bridge to root bridge, defaults to 20000000. Value range: 1-200000000. Note: When the configuration cost is the default value, the actual cost of link up port is converted according to the port rate, the rate of 10M

Copyright © 3onedata Co., Ltd.

Interface Element	Description
	corresponds to the cost of 2000000, and 100M corresponds to the cost of 200000.
Role	Role • unkn: Unknown; • root: Root port; • desg: Designated port; • altn: Alternate port; • back: Backup port; • disa: Disable port.
State	Port status in spanning-tree: • Disable: Port close status; • Blocking: Blocked state; • Listening: Monitoring state. • Discarding: Discarding status • Learning: Learning state; • Forwarding: Forwarding state.

5.4 Ring

Ring is a private ring network algorithm developed and designed for highly reliable industrial control network applications that require link redundancy backup. Its design concept is completely in accordance with international standards (STP and RSTP) implementation, and do the necessary for industrial control application optimization, with Ethernet link redundancy, fault fast automatic recovery ability.

Ring adopts the design of no master station. The devices running the Ring protocol discover the loop in the network by exchanging information with each other, and block a certain port. Finally, the ring network structure is trimmed into a tree network structure without loop, thus preventing messages from circulating continuously in the ring network, and avoiding the reduction of processing capacity caused by repeated reception of the same message. In a multi-Ring network composed of 250 switches, when the network is interrupted or fails, the ring can ensure that the user network automatically resumes link communication within 20 ms.

Ring needs to manually divide the ring network ports in advance, support multiple ring network types such as single ring, coupled ring, chain and Dual Homing, and provide visual management of network topology. In a single Ring, Ring supports master/slave and no master configuration to meet various network environment requirements.

Copyright © 3onedata Co., Ltd.

5.4.1 Global Configuration

Function Description

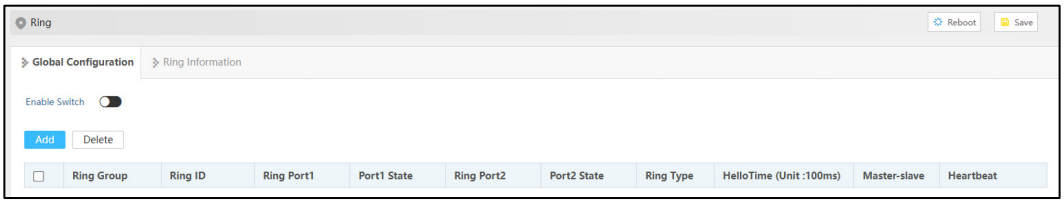
Configure Ring private protocol ring network.

Operation Path

Open in order: "Layer-2 > Ring > Global Configuration".

Interface Description

Global configuration interface is as follows:



The main element configuration description of global configuration interface:

Interface Element	Description
Enable Switch	Enable switch, which can enable the Ring network function after being enabled.
Ring Group	Support ring group 1-12, it can create multiple ring networks at the same time.
Ring ID	When multiple switches form a ring, the current ring ID would be network ID. Different ring network has different ID. Value range is 1-255. Note: The ring network identification must remain the same in one ring network.
Ring Port1	The network port 1 on the switch device used to form the ring network. Note: When the ring network type is "Couple", ring port 1 is the "Coupled Port". Coupling port is the port that connects different network identities.
Port1 State	Conduction state of ring network port 1.
Ring Port 2	The network port 2 on the switch device used to form the ring network. Note: When the ring network type is “Couple”, ring port 2 is the “console port”. Console port is the port in the chain where two rings intersect.
Port2 State	Conduction state of port 2 of ring network.

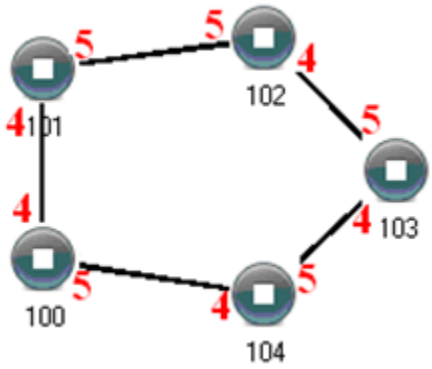
Copyright © 3onedata Co., Ltd.

Interface Element	Description
Ring Type	According to the requirement in the scene, user can choose different ring type. • Single: single ring, using a continuous ring to connect all device together. • Couple: couple ring is a redundant structure used for connecting two independent networks. • Chain: chain can enhance user's flexibility in constructing all types of redundant network topology via an advanced software technology. • Dual-homing: two adjacent rings share one switch. User could put one switch in two different networks or two different switching equipments in one network.
Hello Time (Unit: 100ms)	Hello_time is the sending time interval of Hello packet; via the ring port, CPU sends query packet to adjacent device for confirming the connection is normal or not. Value range is 0-300.
Master-slave	Single ring supports no master station and one master and multiple slave modes (optional): • No-master station mode: When all the single-loop devices are slave stations, the single-loop structure is no-master station. • One-Master Multi-Slave mode: When the device is set as master device and one end of it is backup link, it can enable backup link to ensure the normal operation of the network when failure occurs in ring network.
Heartbeat	Heartbeat detection mechanism. When this configuration is enabled, the network association will periodically send heartbeat messages to detect whether the corresponding devices are in live state, thus enhancing the reliability of the network.

Single Ring Configuration

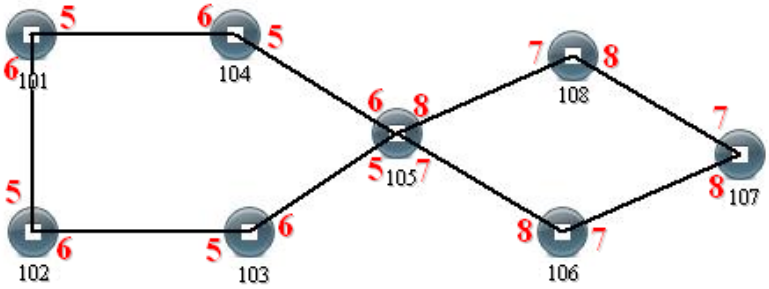
Enable Single, enable ring group 1 (other ring group is OK), Set the device port 4 and port 5 to ring port, and set other switches to the same configuration as the switch above, enable these devices, and adopt network cable to connect port 4 and port 5 of the switch, then search it via network management software, the ring topology structure picture as below:

Copyright © 3onedata Co., Ltd.



Double Ring Configuration

Double ring as shown below, in the figure, double ring is the tangency between two rings, and the point of tangency is NO. 105 switch.



Configuration Method:

Step 1 Adopt single ring configuration method to configure port 5 and port 6 of NO. 101, 102, 103, 104, 105 switches as the ring port, and the ring group is 1;

Step 2 Adopt single ring configuration method to configure port 7 and port 8 of NO. 105, 106, 107 and 108 switches as the ring ports and the ring group 2;

Step 3 Adopt network cable to connect the ring group 1;

Step 4 Adopt network cable to connect the ring group 2;

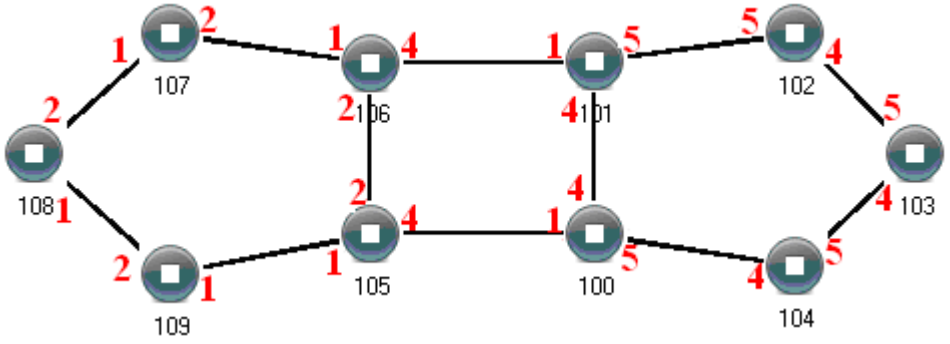
Step 5 Search the topology structure picture via network management software;

Since NO. 105 devices belong to two ring groups, the network IDs of the two ring groups cannot be the same.

Coupling Ring Configuration

Coupling ring basic framework is as the picture below:

Copyright © 3onedata Co., Ltd.



Operation method:

Step 1 Enable ring network group 1 and 2: (Hello_time could be disabled, but the time could not be set to make Hello packet send too fast, otherwise it would affect CPU processing speed seriously);

Step 2 Set the ring port of NO. 105, 106 device ring group to port 1 and port 2, network identification to 1, ring type to Single; Set the coupling port of ring group 2 to port 4, console port to 2, ring identification to 3, ring type to Coupling.

Step 3 Set the ring port of NO. 100, 101 device ring group 1 to port 4 and port 5, network identification to 2, ring type to Single; Set the coupling port of ring group 2 to port 1, console port to port 4, ring identification to 3, ring type to Coupling.

Step 4 Set the ring port of NO. 107, 108 and 109 device ring group 1 to port 1 and port 2, network identification to 1, ring type to Single; Set the ring port of NO. 102, 103 and 104 device ring group 1 to port 4 and port 5, network identification to 2, ring type to Single.

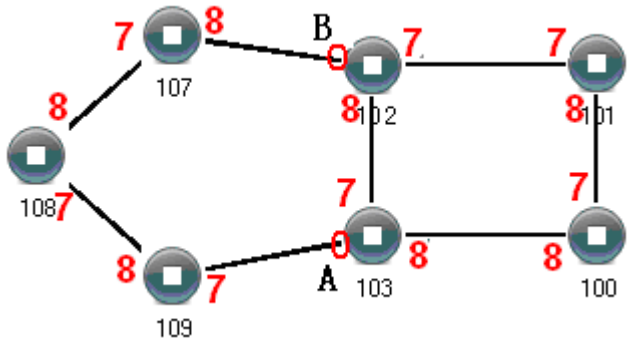
Step 5 Connect the port 4 and port 5 of five devices NO. 100-104 to the single ring in turn, adopt network cable to connect the port 1 and port 2 of four devices NO. 105109 to the single ring in turn, then adopt Ethernet cable to connect port 4 of NO. 106 device to port 1 of NO. 101 device, port 4 of NO. 105 device to port 1 of NO. 100 device, coupling ring combination is completed.

Console ports are two ports connected to NO. 105 device and NO. 106 device in the above picture. The two ports connected to NO. 100 device and NO. 101 device are also called console ports.

Chain Configuration

Chain basic framework is as the picture below:

Copyright © 3onedata Co., Ltd.



Operation method:

Step 1 Enable ring group1: (Hello_time could be disabled, but the time shouldn't be set to send Hello packet too fast, otherwise it would affect the processing speed of CPU seriously).

Step 2 Set the ring port of NO. 100, 101, 102 and 103 device ring group 1 to port 7 and port 8, network identification to 1, ring type to Single. Set the ring port of NO. 107, 108 and 109 devices ring group 1 to port 7 and port 8, network identification to 2, ring type to Chain.

Step 3 Adopt network cable to connect the port 7 and port 8 of three devices NO. 107-109, adopt network cable to connect the port 7 and port 8 of four devices NO. 100-103 to the single ring in turn, then adopt network cable to connect port 7 of NO. 107 device and port 7 of NO. 109 device to normal ports of NO. 102 and 103 device, chain combination is complete.

Note

- Port that has been set to port aggregation can't be set to rapid ring port, and one port can't belong to multiple rings;
- Network identification in the same single ring must be consistent, otherwise it cannot form a normal ring or normal communicate;
- Network identification in different ring must be different;
- When forming double ring and other complex ring, user should notice whether the network identification in the same single ring is consistent, and network identification in different single ring is different.

Copyright © 3onedata Co., Ltd.

5.4.2 Ring Information

Function Description

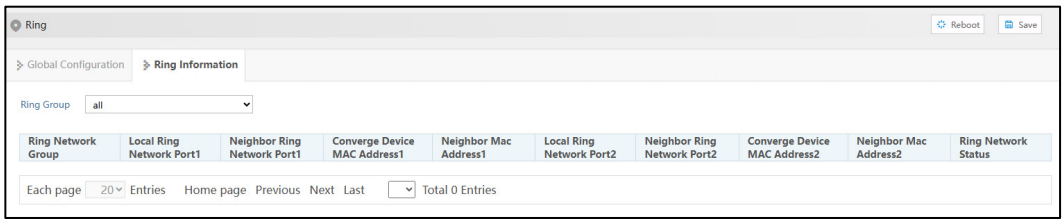
This function is provided by the system, and you can view it through the "Ring Information" page.

Operation Path

Open in order: "Layer 2 > Ring Information".

Interface Description

Ring Information interface is as follows:



The main element configuration description of Ring information interface:

Interface Element	Description
Ring Network Group	Support the display of ring network groups 1-12.
Local Ring Network Port1	The network port 1 on the switch device used to form the ring network. Note: When the ring network type is "Couple", ring port 1 is the "Coupled Port". Coupling port is the port that connects different network identities.
Neighbor Ring Network Port 1	The port number of the neighbor ring network port 1, for example: 3.
Converge Device MAC Address 1	The MAC address 1 of the convergence device is the MAC address 1 of the ring network device, for example, 00:22:6f:01:d0:a2.
Neighbor MAC Address 1	The MAC address 1 of the neighbor device of the ring network group, for example: 00:22:6f:01:cc:a2.
Local Ring Network Port 2	The network port 2 on the switch device used to form the ring network. Note: When the ring network type is “Couple”, ring port 2 is the “console port”. Console port is the port in the chain where two rings intersect.
Neighbor Ring Network Port 2	The port number of the neighbor ring network port 2, for example: 5.

Copyright © 3onedata Co., Ltd.

Interface Element	Description
Converge Device MAC Address 2	The MAC address 2 of the convergence device is the MAC address 2 of the ring network device, for example, 00:22:6f:01:d0:a2.
Neighbor MAC Address 2	The MAC address 2 of the neighbor device of the ring network group, for example: 00:22:6f:01:cc:a2.
Ring Network Status	Ring network status display: ● stable: indicates that the current ring network group is in a stable state; ● open: indicates that the current ring network group is in an open state.

5.5 HSR/PRP

HSR (High-availability Seamless Redundancy) and PRP (Parallel Redundancy Protocol) are two industrial network redundancy protocols. The user configures the working mode of HSR/PRP to decide that the device handles redundant frames, and configures the port mode to decide how the port participates in the redundant network.

- Working modes define global behavior: prp-dup-for PRP termination or diagnostics; hsr-* is used to define whether the device is a node (n), as a host agent (h), or a transparent bridge (t) in the HSR ring.
- Port pattern defines local roles: hsr is used to connect HSR rings; prp-a/prp-b are used to connect two independent networks of PRP respectively; san is used to connect single-port devices.
- Typical configuration combinations:

  – PRP device terminal: working mode = prp-dup-discard, port mode = prp-a for one port and prp-b for the other port.
  – HSR Ring Node (DAN): working mode = hsr-n, port mode = two ring ports set hsr (one or more non-ring ports can be used for uplink/local applications, set non-redundant/normal mode or san if this port is to be connected to another SAN device).
  – HSR redundancy box (RedBox): working mode = hsr-h, port mode = two ring network ports set hsr, and one or more ports connecting single-port devices set san.
  – PRP redundancy box (RedBox): working mode = prp-dup-discard, port mode = one port is set to prp-a, the other port is set to prp-b (connected to PRP

Copyright © 3onedata Co., Ltd.

dual network), and one or more ports connected to single-port devices are set to san.

– HSR listening/bridging point: working mode = hsr-t, port mode = ring network entry port set hsr, ring network egress port set hsr (or another ring network interface).

5.5.1 Global Configuration

Function Description

Configure a redundant network of HSP/PRP devices.

Note:

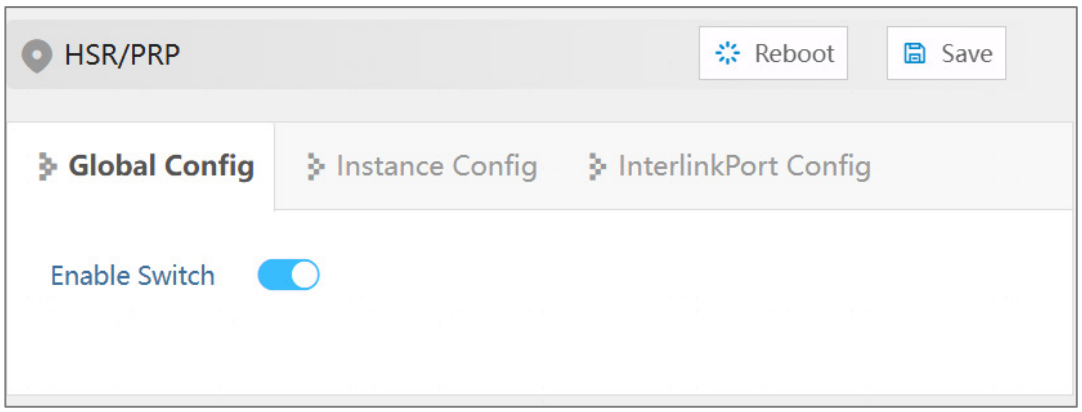
You need to configure all "Spanning Tree > Port Configuration > Enable Switch" to "disable".

Operation Path

Open in order: "Layer 2 > HSR/PRP > Global Config".

Interface Description

Global configuration interface is as follows:



The main element configuration description of global configuration interface:

Interface Element	Description
Enable Switch	Enable switch, which can enable the HSR/ PRP redundant network function.

5.5.2 Instance Configuration

Function Description

Configure the redundant network instance configuration of the HSP/PRP appliance.

Note:

Copyright © 3onedata Co., Ltd.

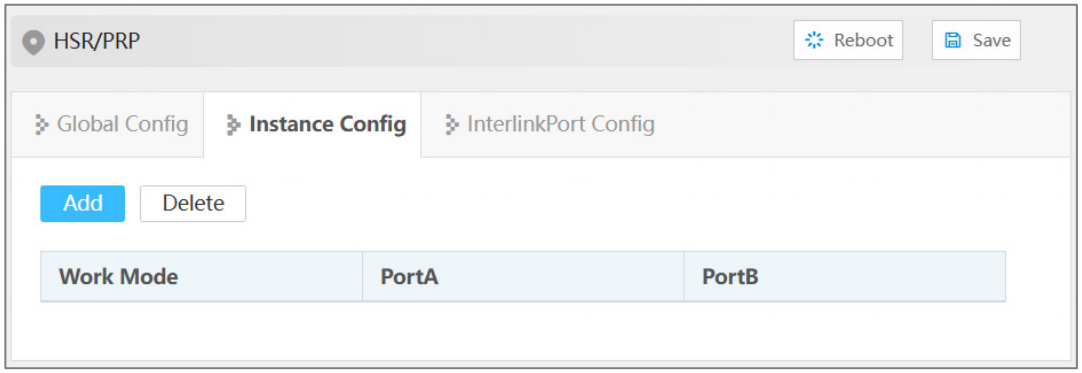
You need to configure all "Spanning Tree > Port Configuration > Enable Switch" to "disable".

Operation Path

Open in order: "Layer 2 > HSR/PRP > Instance Configuration".

Interface Description

Instance configuration interface is as follows:



The main element configuration description of instance configuration interface:

Interface Element	Description
Work Mode	The operating mode defines how the device globally handles repeated frames received from the redundant interface and how frames are sent to the redundant interface. ● prp-dup-discard (PRP repeat frame discard): This is the standard reception behavior of PRP. The device is connected to two separate networks (PRP LAN A and LAN B). After it receives two copies of the same data frame (via interfaces of type prp-a and prp-b, respectively), it keeps the first valid arrival frame and immediately (zero recovery time) discards the repeated frames that arrive later. ● prp-dup-accept (PRP repeat frame acceptance): In this mode, all frames received by the device from LAN A and LAN B, whether repeated or not, will be passed to the upper layer for processing. Duplicate frames are not discarded. ● hsr-h (HSR Host/RedBox): The device handles HSR redundancy on behalf of the single-port device (SAN) to which it is connected. It has two interfaces connected to the HSR ring. For frames emitted by the SAN, RedBox

Copyright © 3onedata Co., Ltd.

Interface Element	Description
	sends replicas with the HSR Tag into the ring on both HSR ports. For traffic targeted to the SAN, it will receive two identical frames from the HSR port (both directions of the ring), identify and discard duplicate frames according to the sequence number, and then forward the unique frame from the interface connected to the SAN (usually the san mode port). ● hsr-n (HSR Node): The device itself is a node (DAN) in the HSR ring network. It has two hsr interfaces which are connected to the ring(hsr mode port). It receives ring network traffic (possibly with two copies), processes traffic destined for itself (possibly deduplicates), and also participates in ring network traffic forwarding (receiving frames, updating Hop Counts, forwarding to another interface). Frames it sends from non-redundant ports (usually uplink ports for local applications or networks, which need to be configured separately) are copied in two copies and sent to two HSR interfaces. ● hsr-t (HSR Transparent): The device handles HSR ring traffic transparently. It forwards all detected HSR frames, does not check the serial number or discard duplicate frames. It also does not modify the sequence number in the frame. Devices usually do not actively send HSR Tag frames to the ring network (unless it itself is also running in hsr-n or hsr-h mode the port is communicating). If a native app sends a frame over a non-ring port, the device does not automatically copy the frame.
PortA	Configure the port of the HSR/PRP redundant network device PortA.
PortB	Configure the port of the HSR/PRP redundant network device PortB.

Copyright © 3onedata Co., Ltd.

5.5.3 Interlink Port Configuration

Function Description

Configure the redundant network instance configuration of the HSP/PRP appliance.

Note:

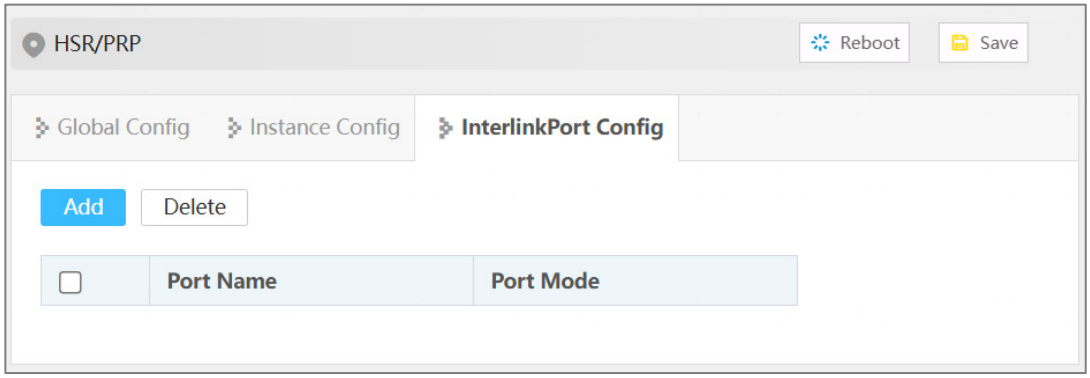
You need to configure all "Spanning Tree > Port Configuration > Enable Switch" to "disable".

Operation Path

Open in order: "Layer 2 > HSR/PRP > InterlinkPort Config".

Interface Description

Interlink port configuration interface is as follows:



The main element configuration description of Interlink port configuration interface:

Interface Element	Description
Port Name	The corresponding port name of the device Ethernet port.
Port Mode	Port patterns define the role that physical or logical interfaces play in an HSR/PRP redundant network. ● hsr: this port is connected to the HSR ring network. It sends and receives Ethernet frames with an HSR Tag (containing information such as serial number, path control, etc.). Configuration location: Usually configured on the device interface that makes up the HSR ring (devices running in hsr-n or hsr-h operating mode). ● prp-a (PRP LAN A Port): This port is connected to one of the PRP's dual networks-LAN A. It is an ordinary Ethernet port that sends and receives standard Ethernet frames without special tags.

Copyright © 3onedata Co., Ltd.

Interface Element	Description
	Configuration location: Configured on the device interface connected to the PRP LAN A network segment (device running in prp-dup-discard or prp-dup-accept operating mode). ● prp-b (PRP LAN B Port): This port is connected to another independent network in PRP's dual networks-LAN B. The properties are exactly the same as prp-a. Configuration location: Configured on the device interface connected to the PRP LAN B network segment (device running in prp-dup-discard or prp-dup-accept operating mode). Relationship to prp-a: a device must be configured with one prp-a port and one prp-b port to take advantage of the redundancy mechanism of PRP (i.e. prp-dup-discard/accept function). These two interfaces are connected to two networks that are physically isolated. ● san (Single Attached Node Port) This port connects a non-redundant single-port device. This port sends and receives only standard Ethernet frames without any redundant tags. Configuration location: It is usually configured on an interface of a redundancy box (a device running in hsr-h mode of operation) for connecting single-port SAN devices. Frames emitted from this port will be copied by the redundant box and sent to the ring network through its hsr port; After the redundant frame targeting SA is deduplicated by the redundancy box, the unique frame is sent to the SAN device from this SAN port.

Copyright © 3onedata Co., Ltd.

5.6 MRP

MRP (Media Redundancy Protocol), in MRP ring network, one device is regarded as redundancy manager, and the others are redundancy client. MRP supports up to 50 devices, and when the loop network is interrupted, the loop reconfiguration time is less than 200ms.

Function Description

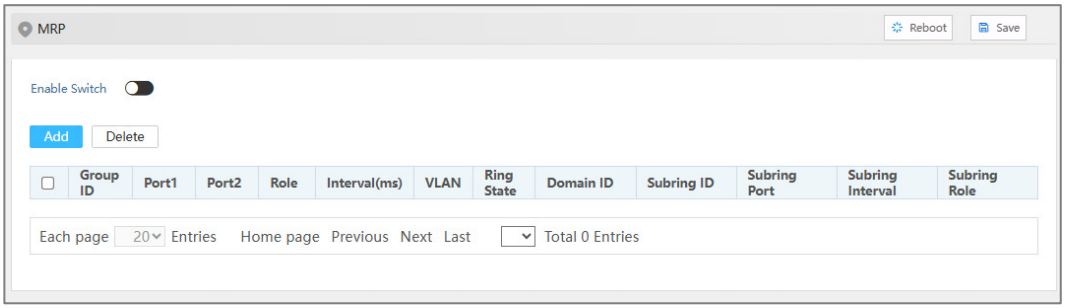
Configure MRP ring network.

Operation Path

Open in order: "Layer-2 > MRP".

Interface Description

MRP interface is as below:



The main element configuration descriptions of MRP interface:

Interface Element	Description
Enable Switch	Enable switch, which can enable the MRP ring network function after being enabled.
Group ID	The ID of ring network, its value range is 1-50.
Port1	Ring network port 1, the ports that make up the ring network and the forwarding state of port data.
Port2	Ring network port 2, the ports that make up the ring network and the forwarding state of port data.
Role	The redundant role of device in the ring network can be selected as follows: • manager: media redundancy manager • client: media redundancy client
Interval (ms)	When the MRP ring network is disconnected, the ring network reconfigures the convergence time. The options are as follows:

Copyright © 3onedata Co., Ltd.

Interface Element	Description
	• 200ms • 500ms
VLAN	VLAN ID used by MRP management message, its value range is 1-4094.
Ring State	Status of MRP ring network, Open or Close.
Domain ID	MRP ring network group domain ID, the format is x.x.x.x.x.x.x.x.x.x.x.x.x.x.x.x.
Subring ID	In the network running MRP protocol, in order to provide redundancy for the interconnection link between MRP rings, two links are used to connect two MRP rings, and the ID of the ring formed by this interconnection link is the subring ID.
Subring Port	Interconnection link ports between MRP rings.
Subring Interval	When the interconnected link is disconnected, the ring network reconfigures the convergence time. The options are as follows: • 200ms • 500ms
Subring Role	The redundant role of device in the interconnected link can be selected as follows: • manager: media redundancy manager • client: media redundancy client

5.7 GMRP

GMRP stands for GARP Multicast Registration Protocol, which is a specific application of GARP (Generic Attribute Registration Protocol).

5.7.1 Global Configuration

Function Description

GMRP optimizes layer 2 multicast management through dynamic protocol mechanisms, making it particularly suitable for industrial network scenarios that require high real-time and flexibility. The core functions reflect the extended application of the GARP protocol in the multicast field. GMRP is a pure Layer 2

Copyright © 3onedata Co., Ltd.

multicast management protocol and is suitable for non-IP multicast. GMRP automatically updates multicast paths through dynamic protocols, avoiding the complexity and scalability limitations of static configuration.

Operation Path

Open in order: "Layer-2 > GMRP > Global Config".

Interface Description

Global configuration interface is as follows:



The main element configuration description of global configuration interface:

Interface Element	Description
Enable Switch	GMRP Enable Switch - When activated, GMRP can be used to dynamically manage multicast membership protocols at the Layer 2 (Data Link Layer) network, allowing switching devices (e.g., switches) to automatically maintain multicast MAC address table entries.

5.7.2 Port Configuration

Function Description

Configure GMRP port

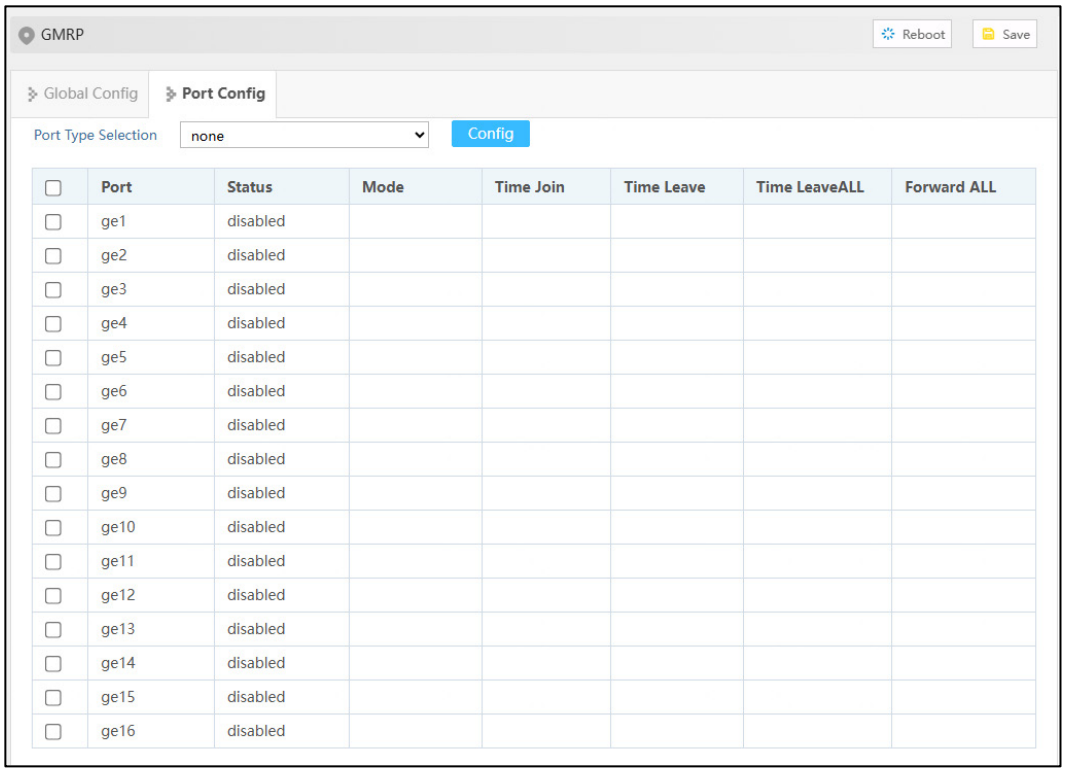
Operation Path

Open in order: "Layer-2 > GMRP > Port Config".

Interface Description

Check port configuration interface as below:

Copyright © 3onedata Co., Ltd.



The main element configuration description of port configuration interface:

Interface Element	Description
Port	The corresponding port name of the device Ethernet port.
Status	Port GMRP enable status: • enable • disable: port is not enabled.
Mode	GMRP provides three registration modes to control the dynamic registration and deregistration of multicast MAC addresses: • Normal mode (default): Allows dynamic registration and deregistration of multicast addresses. Applicable to scenarios with frequent network topology changes. • Fixed Mode: Prohibit deregistration of registered multicast addresses (even upon receiving Leave messages) and reject new registration requests. Suitable for stable networks requiring fixed multicast paths. • Forbidden mode: Prohibit the registration of new multicast addresses and clear all registered dynamic table entries (except for proxy-registered ones). Commonly used for port isolation or high-security requirement scenarios.
Time Join	Join Timer: Control the retransmission interval of Join

Copyright © 3onedata Co., Ltd.

Interface Element	Description
	messages (registration requests). If no JoinIn acknowledgment is received from the peer before the Join Timer expires, the Join message is retransmitted. Default value: 20 centiseconds. Valid Range: 1~4,294,967,295 milliseconds. The Join Timer value must be less than one-third of the Leave Timer value.
Time Leave	Leave Timer: Activated upon receiving a Leave message. If no new Join message is received before timeout, the multicast address will be deregistered. Prevent accidental deletion of multicast paths due to transient network fluctuations. Default value: 60 centiseconds. Valid Range: 1–4,294,967,295 milliseconds (ms). The Leave Timer value must be less than the LeaveAll Timer value.
Time LeaveALL	LeaveAll Timer: Periodically sends LeaveAll messages to trigger network-wide multicast attribute re-registration, ensuring network state consistency. All devices synchronously purge expired entries based on the minimum timer value. Default value: 100 centiseconds. Valid Range: 1–4,294,967,295 milliseconds (ms). The LeaveAll Timer value must be greater than the Leave Timer value.
Forward ALL	Forward ALL defaults to disable. If the GMRP multicast filtering mechanism is not enabled, the switch will broadcast multicast traffic to all ports, causing network congestion. When GMRP is enabled, the switch forwards multicast traffic only to registered ports, replacing the default "Forward All" behavior to optimize bandwidth utilization.

Copyright © 3onedata Co., Ltd.

5.8 ERPS

Ethernet Ring Protection Switching (ERPS) is the Ethernet Ring Network Link Layer Technology with high reliability and stability. ERPS is a protocol defined by the International Telecommunication Union Telecommunication Standardization Sector (ITU-T) to eliminate loops at layer 2. Because the standard number is ITU-T G.8032/Y1344, ERPS is also called G.8032. ERPS defines Ring Auto Protection Switching (RAPS) Protocol Message and protection switching mechanisms. It can prevent the broadcast storm caused by data loop when the Ethernet ring is intact. When the Ethernet ring link failure occurs, it has high convergence speed that can rapidly recover the communication path between each node in the ring network.

5.8.1 Timer Configuration

Function Description

Configure the parameters of ERPS ring network timer After the failure of the node device or link in the ERPS ring is restored, in order to prevent the flap, the timer to the ERPS ring will be enabled to help reduce the interruption time of traffic flow.

In ERPS protocol, timers used mainly include WTR (Wait to Restore) Timer, Guard and Hold Timer.

- WTR timer

  If an RPL owner port is unblocked due to a link or node fault, the involved port may not go Up immediately after the link or node recovers. Blocking the RPL owner port may cause network flapping. To prevent this problem, the node where the RPL owner port resides starts the wait to restore (WTR) timer after receiving a RAPS (NR) message. The WTR Timer will be turned off if SF (Signal Fail) RAPS messages are received from other ports before the timer expires. If the node does not receive any RAPS (SF) message before the timer expires, it blocks the RPL owner port when the timer expires and sends NR-RB (RPL Block, RPL) RAPS message. After receiving this RAPS (NR, RB) message, the nodes set their recovered ports on the ring to the Forwarding state.

- Guard timer

  Device involved in link failure or node failure sends NR (No Request) RAPS message to other device after failure recovery or clearing operation, and starts Guard Timer at the same time, and does not process NR RAPS message before the timer expires, in order to prevent receiving expired NR RAPS message.

Copyright © 3onedata Co., Ltd.

Before the Guard timer expires, the device does not process any RAPS (NR) messages to avoid receiving out-of-date RAPS (NR) messages. After the Guard timer expires, if the device still receives a RAPS (NR) message, the local port enters the Forwarding state.

- Hold Timer

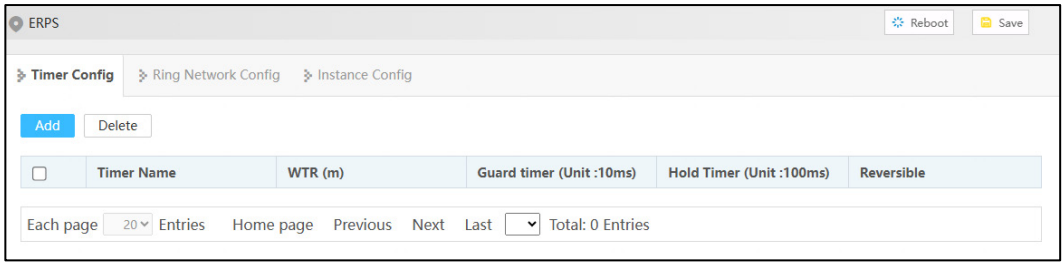
  On Layer 2 networks running ERPS, there may be different requirements for protection switching. For example, on a network where multi-layer services are provided, after a server fails, users may require a period to rectify the server fault so that clients do not detect the fault. Users can set the Hold timer. If the fault occurs, the fault is not immediately sent to ERPS until the Hold Timer expires and the fault is still not recovered.

Operation Path

Open in order: "Layer-2 > ERPS > Timer Configuration".

Interface Description

Timer configuration interface is as follows:



Main elements configuration description of timer configuration interface:

Interface Element	Description
Timer Name	The name of ERPS timer, which supports 1-32 characters and consists of uppercase letters, lowercase letters, numbers, or special characters (! @ _-).
WTR (m)	WTR timer, value range is 1-12, unit: minute.
Guard timer (unit: 10ms)	Guard timer, its value range is 1-200, unit 10ms.
Hold Timer (unit: 100ms)	Hold timer, its value range is 0-100, unit 100ms.
Reversible	ERPS reversible mode status, options as follows: • enable If the failed link recovers, the RPL owner port will be blocked again after waiting for WTR time. Blocked links are switched back to RPL. • disable If the failed link recovers, the WTR timer is not started, and the original faulty link is still blocked and will be switched to RPL.

Copyright © 3onedata Co., Ltd.

5.8.2 Ring Configuration

Function Description

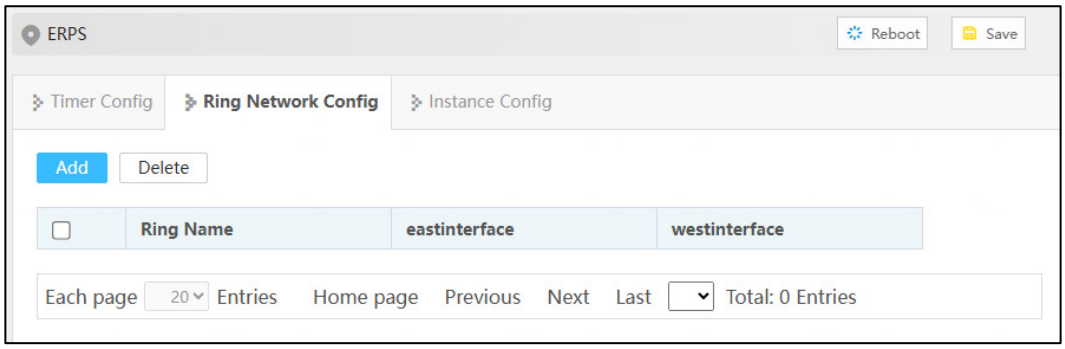
Configure ERPS ring port.

Operation Path

Open in order: "Layer-2 > ERPS > Ring Network Config".

Interface Description

Ring network configuration interface is as follows:



The main element configuration description of ring network configuration interface:

Interface Element	Description
Ring Name	The name of ERPS ring network, which supports 1-32 characters, consists of uppercase letters, lowercase letters, numbers, or special characters (! @ _-).
eastinterface	ERPS ring port. Note: When the device is an intersecting node, only EastInterface can be configured for some ports of the sub-ring.
westinterface	ERPS ring port. Notice: • ERPS ring ports can be normal physical ports or static aggregation groups. • ERPS ring port cannot be opened at the same time with other layer 2 ring network protocols, when ERPS guard instance is not 0, it can be opened at the same time with MSTP. • ERPS ring ports can't be the same ports. • ERPS ring ports must be trunk ports and allow the ring instance VLAN to pass.

Copyright © 3onedata Co., Ltd.

5.8.3 Instance Configuration

Function Description

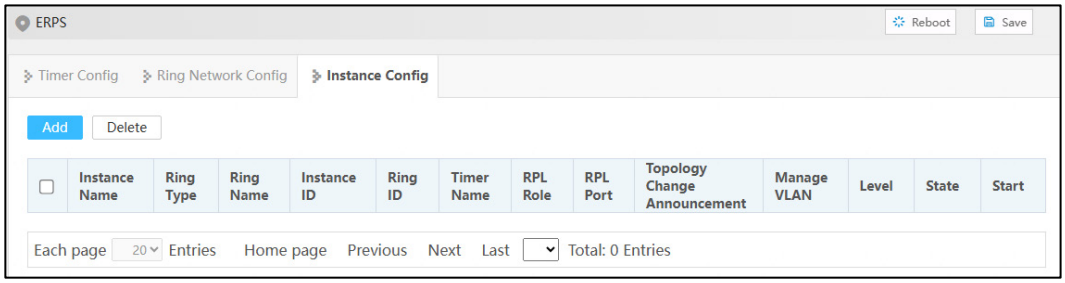
Configure ERPS ring network instance.

Operation Path

Open in order: "Layer-2 >ERPS Configuration > Instance Configuration".

Interface Description

Instance configuration interface is as follows:



The main element configuration description of instance configuration interface:

Interface Element	Description
Instance Name	The name of the ERPS instance, which supports 1-32 characters, consists of uppercase letters, lowercase letters, numbers, or special characters (! @ _-).
Ring Type	ERPS instance ring network type, the options are as follows: • Major-ring: main ring, closed ring. • Sub-ring: a sub-ring, an unclosed ring, forms a multi-ring network such as an intersecting ring with the main ring.
Ring Name	ERPS Ring Name. Note: The ring name should be created in advance in ERPS "Ring Network Configuration", and the ring network port should be specified.
Instance ID	The ID of ERPS protection instance, its value range is 0-16. The VLAN in which RAPS PDUs and data packets are transmitted must be mapped to an Ethernet Ring Protection (ERP) instance so that ERPS forwards or blocks the packets based on configured rules. Note: • By default, all VLAN in MST domain are mapped to instance 0. • The mapping with VLAN instance can be created in spanning

Copyright © 3onedata Co., Ltd.

Interface Element	Description
	tree instance configuration.
Ring ID	The ID of ERPS ring network, its value range is 1-239. The ring ID is used to uniquely identify an ERPS ring, and all nodes on the same ERPS ring should be configured with the same ring ID. Note: ERPS ring ID will be the last byte of the MAC destination of the RAPS message.
Timer Name	The name of the timer, which supports the default parameter timer or customization in the timer configuration.
RPL Role	Each device in ERPS ring is called a node. The node role is decided by user configuration, they are divided into following types: • owner: owner node is responsible for blocking and unblocking the port in RPL of the node to prevent loop forming and conduct link switching. • neighbor: neighbor node is connected to Owner node on RPL. Cooperating to the Owner node, it blocks and unblocks the ports on RPL of the node and conduct link switching. • non-owner: non-owner node is responsible for receiving and forwarding the protocol packet and data packet in the link.
RPL Port	Port connected by RPL link, the options are as follows: • West-interface • East-interface
Topology Change Announcement	Notify the network topology change of this ERPS ring to other ERPS rings, and the enabling status is as follows: • Enable • Disable
Manage VLAN	The VLAN channel of protocol packet, its value range is 1-4094.
Level	ERPS ring network level, the value range is 0-7. The higher the ring network level, the greater the value. When the R-APS message needs to be transmitted across the ring, it can only be crossed by the ring with high rank to low rank.
State	The instance statuses of ERPS are as follows: • ERPS_INIT: initial state, which is the initialized state

Copyright © 3onedata Co., Ltd.

Interface Element	Description
	when the protocol starts. • ERPS__IDLE: idle state, it would enter this state when the ring topology is complete; • ERPS_FS: force-switch state, it would enter this state when force-switch command is implemented. • ERPS_MS: manual-switch state, it would enter this state when manual-switch command is implemented. • ERPS_PROTECTION: protection state, it would enter this state when the ring link has failure. • ERPS_PENDING: pending state, it would enter this state when the ring link has recovered from failure.
Start	ERPS instance startup status: • start • stop

5.9 IGMP Snooping

IGMP Snooping (Internet Group Management Protocol Snooping) is an IPv4 layer 2 multicast Protocol. It maintains the egress interface information of Group broadcast by snooping for the multicast protocol messages sent between the layer 3 multicast device and the user host, to manage and control the forwarding of multicast data message in the data link layer.

5.9.1 Global Configuration

Function Description

Enable/disable IGMP-Snooping and resident multicast.

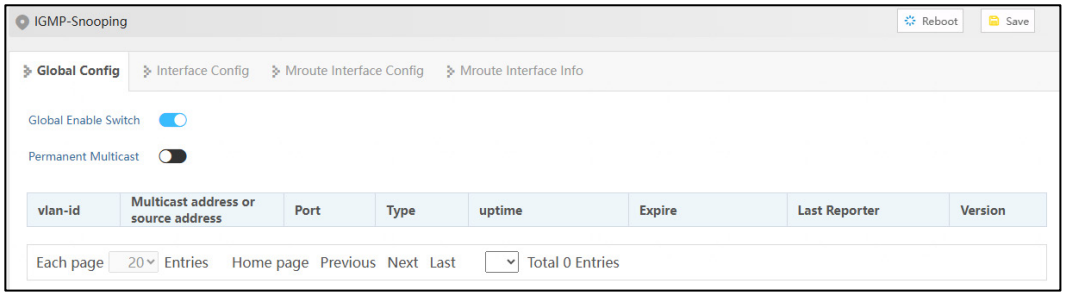
Operation Path

Open in order: "Layer-2 > IGMP-Snooping > Global Config".

Interface Description

Global configuration interface is as follows:

Copyright © 3onedata Co., Ltd.



The main element configuration description of global configuration interface:

Interface Element	Description
Global Enable Switch	Global enable configuration of IGMP-Snooping. By enabling IGMP Snooping, layer 2 devices can dynamically establish layer 2 multicast forwarding entries by listening to the IGMP protocol messages between the IGMP querier and the user host, thus realizing layer 2 multicast.
Permanent Multicast	Do not age the received IGMP report member groups.
vlan-id	VALN ID of the port that receives multicast messages.
Multicast addresses or source address	Based on the network environment, the multicast address and source address information can be displayed.
Port	Port number that receives multicast messages.
Type	The method of adding multicast member ports to multicast groups. Possible display options are: • Remote: Dynamic grouping, joining multicast groups by sending messages through the terminal devices connected to the interface. • Static: Static grouping, joining multicast groups by configuring ports through commands. • Remote (static): Dynamic (static), joining multicast groups through static or dynamic means.
uptime	Time that receives multicast messages.
Expire	Time when the multicast message expires. Possible display options are: • Static: Static address, multicast does not automatically expire and needs to be manually deleted or reconfigured. • Permanent: Permanent multicast, even if the multicast group members change, the multicast route will not be

Copyright © 3onedata Co., Ltd.

Interface Element	Description
	automatically deleted. • Include: When a network device receives multicast data, it checks whether the data belongs to the multicast group in the include list. If so, allow these data to pass through; If not, discard these data. • Exclude: When a network device receives multicast data, it checks whether the data belongs to the multicast group in the exclude list. If so, discard these data; If not, allow these data to pass through.
Last Reporter	The IP address of the multicast member who sends the last report message to join the multicast group.
Version	Version of IGMP Snooping.

5.9.2 Interface Configuration

Function Description

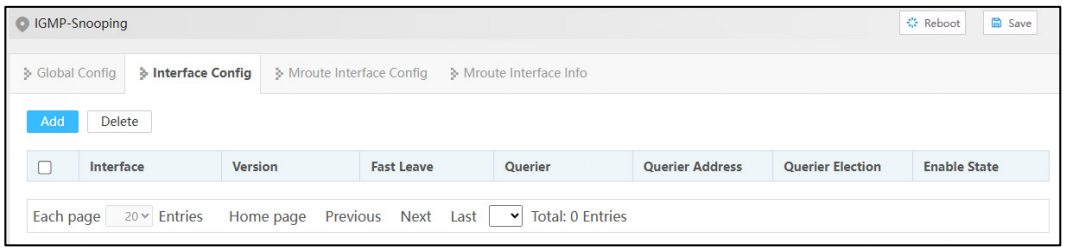
Configure parameters related to IGMP Snooping of VLANIF interface.

Operation Path

Open in order: "Layer-2 > IGMP-snooping > Interface Config".

Interface Description

Interface configuration interface is as follows:



The main element configuration description of interface configuration interface:

Interface Element	Description
Interface	VLANIF interface, the value range is 1-4094.
Version	Different versions of IGMP Snooping can handle corresponding versions of IGMP protocol. IGMP Snooping protocol version, with the following options:

Copyright © 3onedata Co., Ltd.

Interface Element	Description
	• 1 • 2 • 3
Fast Leave	The enable state of the multicast group fast leave. After enabling fast leave, when the switch receives the IGMP Leave message sent by the host from a certain port and leaves a certain multicast group, it directly deletes the port from the multicast forwarding table without waiting for the port aging, which can save bandwidth and resources. Note: When there are multiple receivers under the port, this function will cause other receivers in the same multicast group to interrupt receiving multicast data. It is recommended to configure this function on a port with only one receiver connected.
Querier	Enable status of IGMP Snooping inquirer. After the IGMP Snooping querier function is enabled, the switch will regularly send IGMP Query messages to all interfaces (including router ports) in the VLAN by broadcast. If the IGMP querier already exists in the multicast network, it will cause the IGMP querier to be re-elected.
Querier Address	The source IP address of IGMP Snooping querier when sending inquiry message.
Querier Election	Enable election status of IGMP Snooping querier. IGMPv2 uses an independent inquirer election mechanism. When there are multiple multicast routers on the shared network segment, the router with the smallest IP address becomes an inquirer, while the non-inquirer no longer sends universal group inquiry messages.
Enable State	IGMP Snooping enable status, enabling IGMP snooping on global or VLAN interface. Note: Only when IGMP snooping is enabled on the global and VLAN interfaces can the configuration of the other IGMP snooping properties on that interface take effect.

Copyright © 3onedata Co., Ltd.

5.9.3 MRoute Interface Config

Function Description

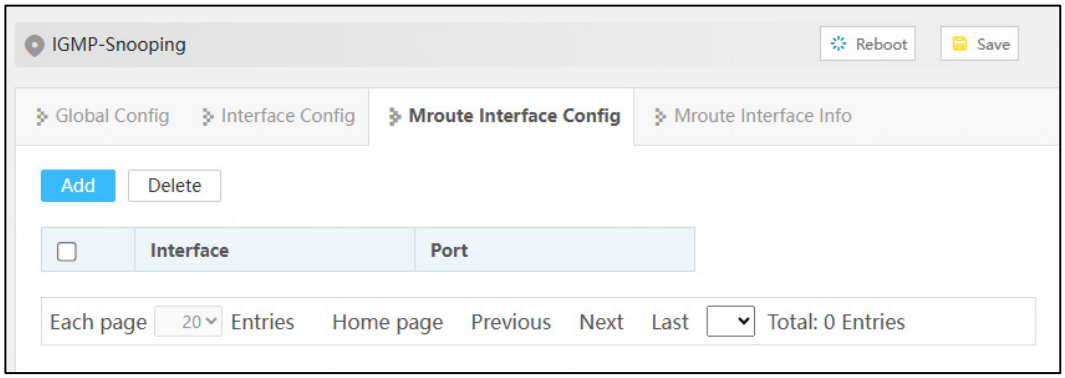
Configure multicast router ports.

Operation Path

Open in order: "Layer-2 > IGMP Snooping > Mroute Interface Config".

Interface Description

Mroute interface config interface is as below:



Main elements configuration description of routing port configuration interface:

Interface Element	Description
Interface	VLANIF interface, the value range is 1-4094.
Port	The static router port in VLAN is generally the interface of Layer 2 device towards the upstream Layer 3 multicast device. If it is necessary to forward the IGMP Report/Leave message from an interface to the upstream IGMP querier stably for a long time, the interface can be configured as a static router port.

5.9.4 Mroute Interface Info

Function Description

Check the router port information of IGMP Snooping in VLAN, including static router port and dynamic router port.

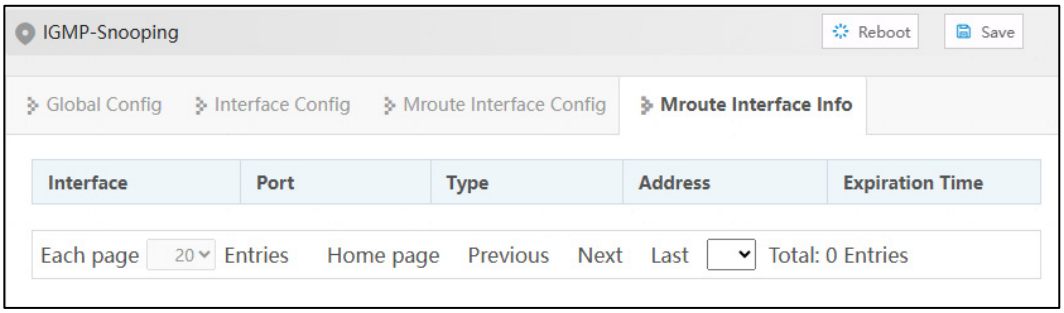
Operation Path

Open in order: "Layer-2 > IGMP-Snooping > Mroute Interface Info".

Copyright © 3onedata Co., Ltd.

Interface Description

Mroute Interface Info interface is as follows:



Configuration description of main elements of routing port information interface:

Interface Element	Description
Interface	VLANIF interface, the value range is 1-4094.
Port	Router port in VLAN.
Type	The type of router port, including dynamic and static.
Address	IP address.
Expiration Time	The remaining aging time of dynamic router port.

5.10 IPv6 MLD-Snooping

MLD Snooping (Multicast Listener Discovery Snooping) is an IPv6 layer 2 multicast Protocol. It maintains the egress port information of Group broadcast by snooping for the multicast protocol messages sent between the layer 3 multicast device and the user host, to manage and control the forwarding of multicast data message in the data link layer.

5.10.1 Global Configuration

Function Description

Enable/disable Mld-Snooping and resident multicast.

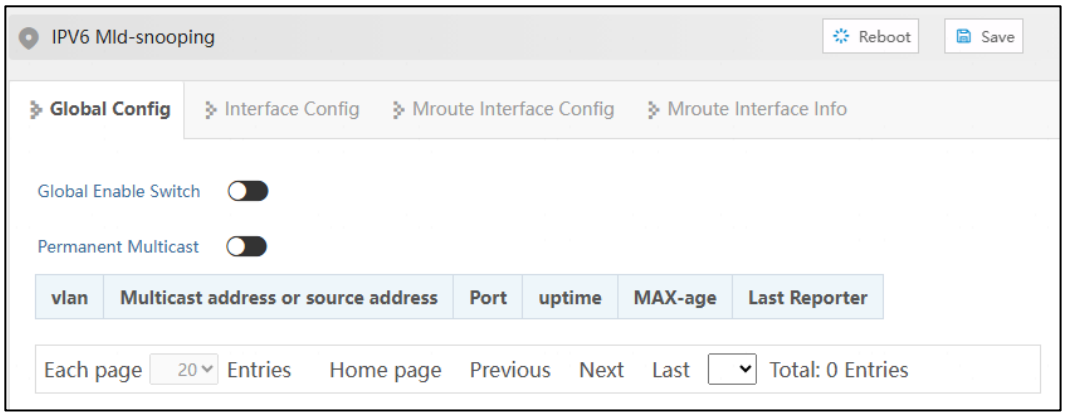
Operation Path

Open in order: "Layer 2 Configuration > MLD-Snooping Configuration > Global Configuration".

Copyright © 3onedata Co., Ltd.

Interface Description

Global configuration interface is as follows:



The main element configuration description of global configuration interface:

Interface Element	Description
Global Enable Switch	Global enable configuration of MLD-Snooping. By enabling MLD Snooping, layer 2 devices can dynamically establish layer 2 multicast forwarding entries by listening to the MLD protocol messages between the MLD querier and the user host, thus realizing layer 2 multicast.
Permanent Multicast	Configure the multicast group as a resident multicast group without aging or leaving.
vlan	VALN ID of the port that receives multicast messages.
Multicast address or source address	Based on the network environment, the multicast address and source address information can be displayed.
Port	Port number that receives multicast messages.
uptime	Time that receives multicast messages.
MAX-age	Time when the multicast message expires. Possible display options are: • Static: Static address, multicast does not automatically expire and needs to be manually deleted or reconfigured. • Permanent: Permanent multicast, even if the multicast group members change, the multicast route will not be automatically deleted. • Include: When a network device receives multicast data, it checks whether the data belongs to the multicast group in the include list. If so, allow these data to pass through; If not, discard these data.

Copyright © 3onedata Co., Ltd.

Interface Element	Description
	• Exclude: When a network device receives multicast data, it checks whether the data belongs to the multicast group in the exclude list. If so, discard these data; If not, allow these data to pass through.
Last Reporter	The IP address of the multicast member who sends the last report message to join the multicast group.

5.10.2 Interface Configuration

Function Description

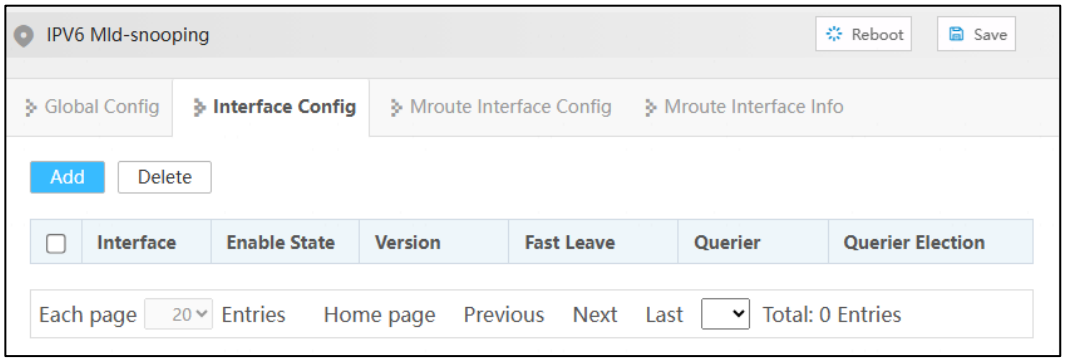
Configure parameters related to MLD Snooping of VLANIF interface.

Operation Path

Open in order: "Layer-2 > IPv6 MLD-Snooping > Interface Config".

Interface Description

Interface configuration interface is as follows:



The main element configuration description of interface configuration interface:

Interface Element	Description
Interface	VLANIF interface, the value range is 1-4094.
Enable State	MLD Snooping enable status, enabling MLD snooping on global or VLAN interface. Note: Only when MLD snooping is enabled on the global and VLAN interfaces can the configuration of the other MLD snooping properties on that interface take effect.
Version	Different versions of MLD Snooping can handle corresponding versions of MLD protocol. MLD Snooping

Copyright © 3onedata Co., Ltd.

Interface Element	Description
	protocol version, with the following options: • 1 • 2
Fast Leave	The enable state of the multicast group fast leave. After enabling fast leave, when the switch receives the MLD Done message sent by the host from a certain port and leaves a certain multicast group, it directly deletes the port from the multicast forwarding table without waiting for the port aging, which can save bandwidth and resources. Note: When there are multiple receivers under the port, this function will cause other receivers in the same multicast group to interrupt receiving multicast data. It is recommended to configure this function on a port with only one receiver connected.
Querier	Enable status of MLD Snooping querier. After the MLD Snooping querier function is enabled, the switch will regularly send MLD Query messages to all interfaces (including router ports) in the VLAN by broadcast. If the MLD querier already exists in the multicast network, it will cause the MLD querier to be re-elected.
Querier Election	Enable election status of MLD Snooping querier. When there are multiple multicast routers on the shared network segment, the router with the smallest IPv6 address becomes an inquirer, while the non-inquirer no longer sends universal group inquiry messages.

5.10.3 Mroute Interface Config

Function Description

Configure multicast router ports.

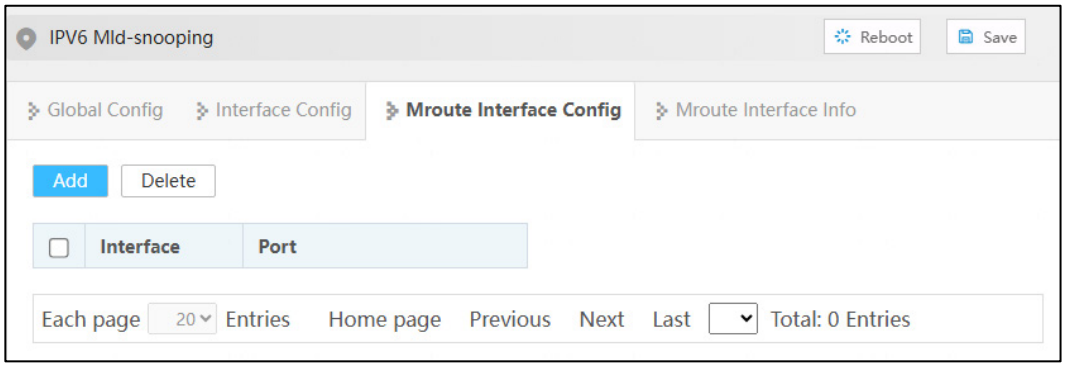
Operation Path

Open in order: "Layer-2 > IPv6 Mld-Snooping> Mroute Interface Config".

Interface Description

Mroute Interface Config interface is as below:

Copyright © 3onedata Co., Ltd.



Main elements configuration description of routing port configuration interface:

Interface Element	Description
Interface	VLANIF interface, the value range is 1-4094.
Port	The static router port in VLAN is generally the interface of Layer 2 device towards the upstream Layer 3 multicast device. When it is necessary to receive and forward multicast data from an interface stably for a long time, the interface can be configured as a static router port.

5.10.4 Routing Port Information

Function Description

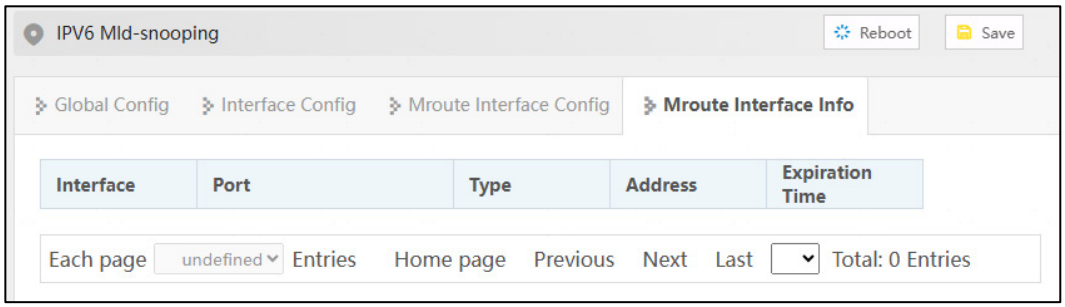
Check the router port information of MLD Snooping in VLAN, including static router port and dynamic router port.

Operation Path

Open in order: "Layer-2 > IPv6 MLD-Snooping > Mroute Interface Info".

Interface Description

Mroute Interface Info interface is as follows:



Configuration description of main elements of routing port information interface:

Copyright © 3onedata Co., Ltd.

Interface Element	Description
Interface	VLANIF interface, the value range is 1-4094.
Port	Router port in VLAN.
Type	The type of router port, including dynamic and static.
Address	IP address.
Expiration Time	The remaining aging time of dynamic router port.

5.11 Link Flap Protection

Network jitter or network cable failure will cause frequent Up/Down changes in the physical state of device interface, which will lead to link flapping and frequent changes in network topology, thus affecting user communication. For example, in the application of active-standby link, when the physical Up/Down state of the main link interface changes frequently, the service will switch back and forth between the active-standby link, which will not only increase the device burden, but also cause the loss of service data.

In order to solve the above problems, users can configure the link flapping protection function, and close the interface whose physical Up/Down state changes frequently to keep it remain Down, so that the network topology will stop changing frequently back and forth.

5.11.1 Global Configuration

Function Description

Configure relative parameters of link flapping protection.

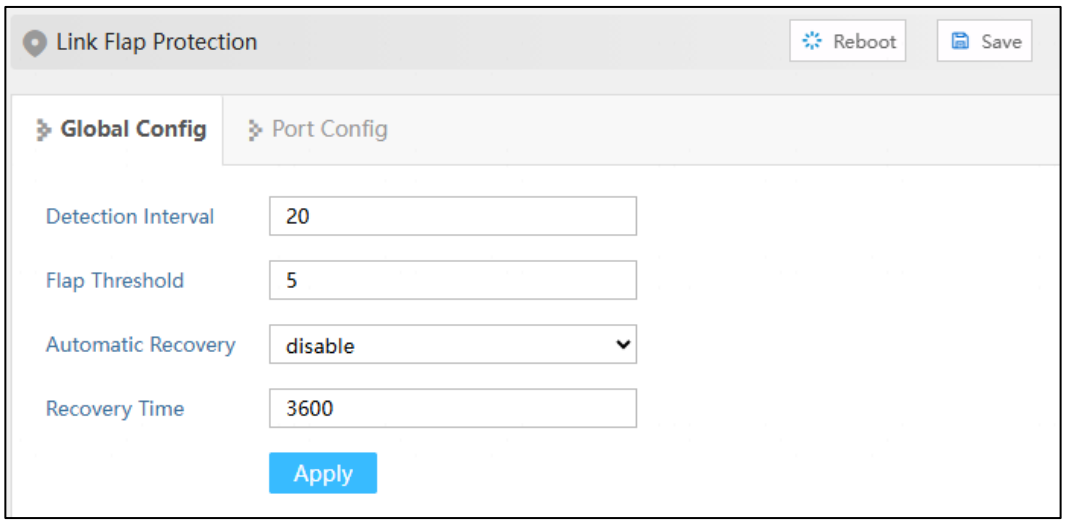
Operation Path

Open in order: "Layer-2 > Link Flap Protection > Global Config".

Interface Description

Global configuration interface is as follows:

Copyright © 3onedata Co., Ltd.



The main element configuration description of global configuration interface:

Interface Element	Description
Detection Interval	The value range of link detection interval is 10-100s, and the default value is 20s.
Flap Threshold	The threshold value of the number of oscillations detected by the link. If the number of oscillations exceeds the threshold value within the time specified by the "detection interval", an alarm log will be generated and the port will be set to shutdown. The range is from 3 to 100, default value is 5.
Automatic Recovery	Automatic recovery enable configuration. After being enabled, the port will automatically return to normal within the specified time.
Recovery Time	The value range of the time when the port automatically returns to normal is 30-86400s, and the default value is 3600s.

5.11.2 Port Configuration

Function Description

Enable link oscillation protection for this port.

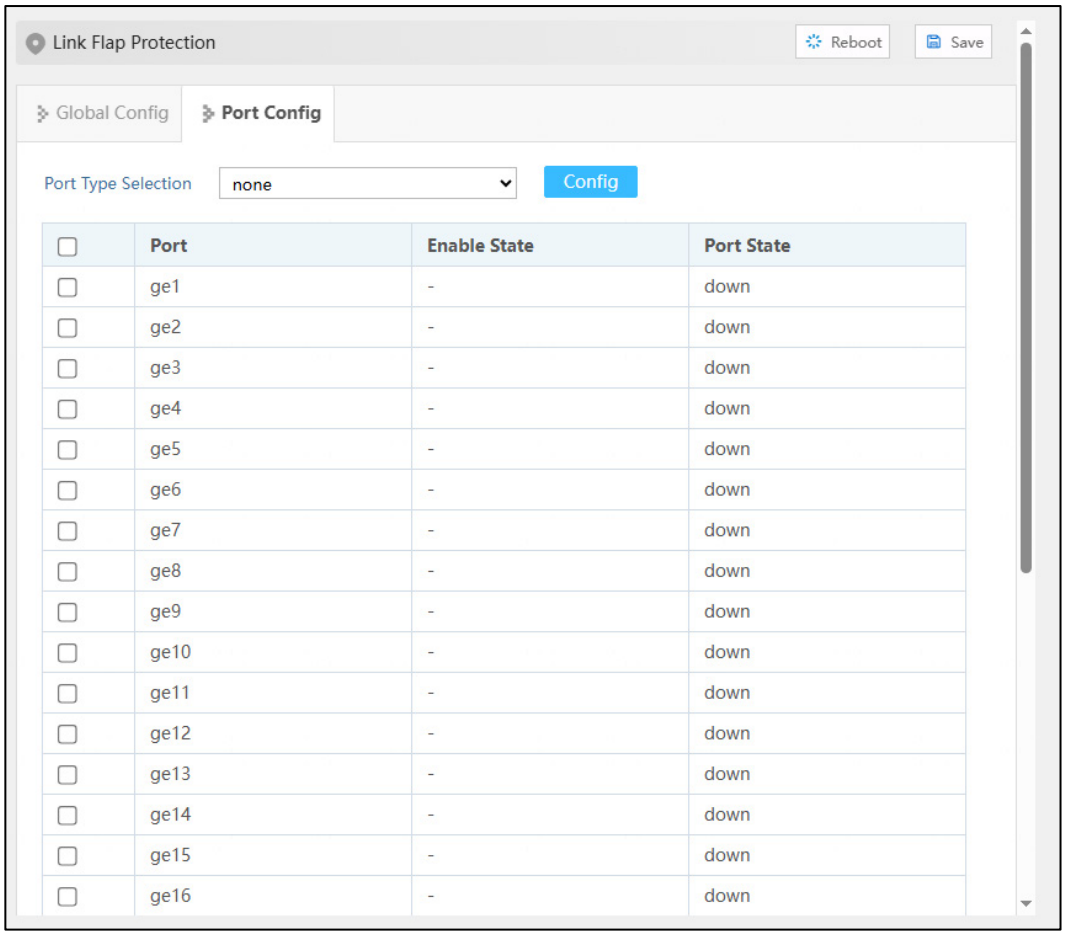
Operation Path

Open in order: "Layer-2 > Link Flap Protection > Port Config".

Copyright © 3onedata Co., Ltd.

Interface Description

Check port configuration interface as below:



The main element configuration description of port configuration interface:

Interface Element	Description
Port	The corresponding port number of this device's Ethernet port.
Enable State	The enable status of port link flapping protection can be shown as follows: • ON: means enabled; • -: means disable
Port State	Ethernet port connection status, display as follows: • down: the port is not connected or forced to shutdown • up: port is connected.

Copyright © 3onedata Co., Ltd.

5.12 Port Loopback Detection

The function of loop detection is to detect whether loop exists in external network of single port of switch. If it does, it would lead to address learning errors and broadcast storm easily, even switch and network breakdown in severe case. The influence created by port loop could be effectively eradicated when enabling port protocol and closing port with loop.

Function Description

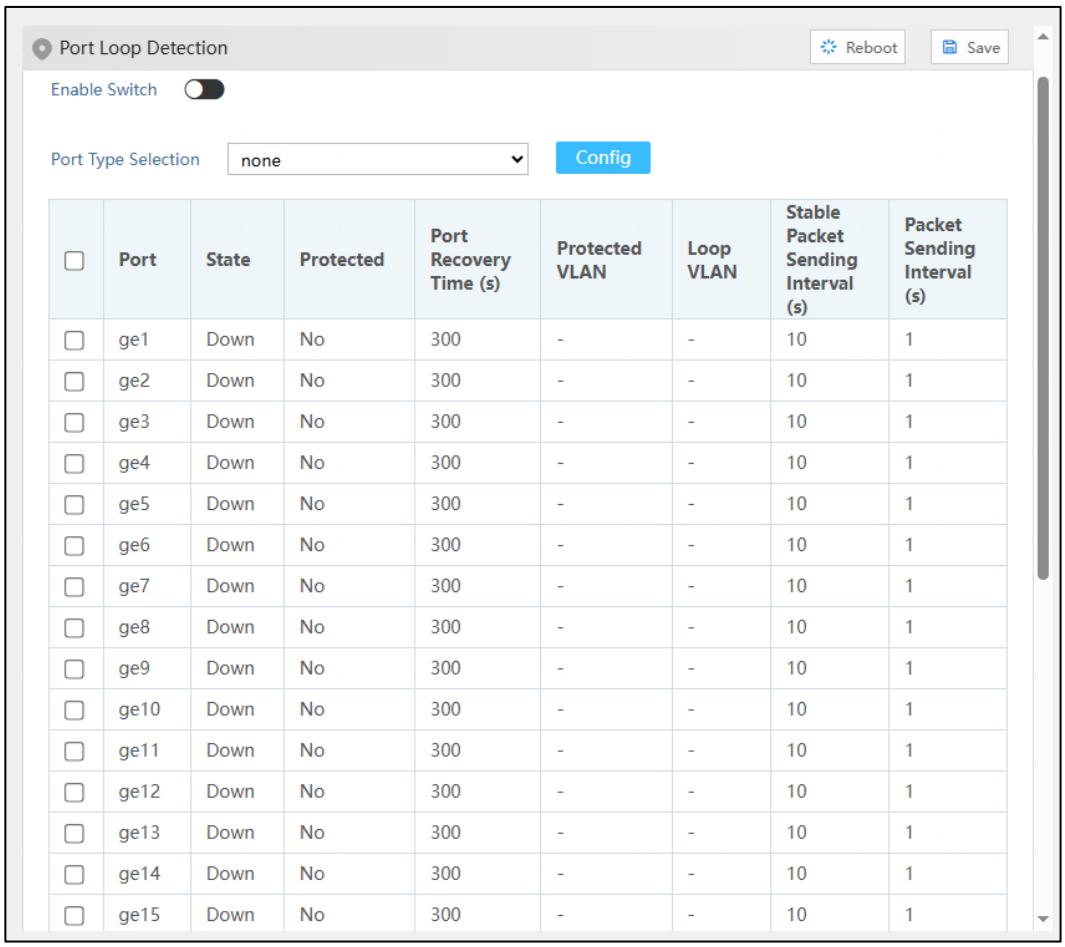
Enable port loop detection.

Operation Path

Open in order: "Layer-2 > Port Loop Detection".

Interface Description

Port loop detection interface is as follows:



Port	State	Protected	Port Recovery Time (s)	Protected VLAN	Loop VLAN	Stable Packet Sending Interval (s)	Packet Sending Interval (s)
ge1	Down	No	300	-	-	10	1
ge2	Down	No	300	-	-	10	1
ge3	Down	No	300	-	-	10	1
ge4	Down	No	300	-	-	10	1
ge5	Down	No	300	-	-	10	1
ge6	Down	No	300	-	-	10	1
ge7	Down	No	300	-	-	10	1
ge8	Down	No	300	-	-	10	1
ge9	Down	No	300	-	-	10	1
ge10	Down	No	300	-	-	10	1
ge11	Down	No	300	-	-	10	1
ge12	Down	No	300	-	-	10	1
ge13	Down	No	300	-	-	10	1
ge14	Down	No	300	-	-	10	1
ge15	Down	No	300	-	-	10	1

The main element configuration description of port loop detection interface:

Copyright © 3onedata Co., Ltd.

Interface Element	Description
Enable Switch	Global enable configuration of port loop detection.
Port	The corresponding port number of this device's Ethernet port.
State	The connection status of this port, values are: • Down: the port is physically disconnected • Up: the port is connected • Shutdown: the port is closed • No Shutdown: the port is not closed
Protected	The protected status of the port can be shown as follows: • Yes • No
Port Recovery Time (s)	The delay time for the shutdown port to automatically return to normal after detecting the loop, ranging from 300-776000 seconds.
Protected VLAN	The VLAN ID of loop protection. The value range: 1-4094, the number of VLAN ID is ≤16. Note: This parameter must be configured, otherwise there would be errors in down sending the data.
Loop VLAN	The VLAN ID of the currently generated loop.
Stable Packet Sending Interval (S)	The normal interval time of loop detection data packet sending, value range: 10-300 seconds.
Packet Sending Interval (S)	After the port is connected, the interval between sending loop detection packets. In this interval, three detection messages will be sent out, and then the packet-sending interval will return to the normal packet-sending interval.

5.13 IPDT

Function Description

Configure IPDT (IP Detection) to detect the specified destination address (ICMP) and link it with other functions, such as VRRP.

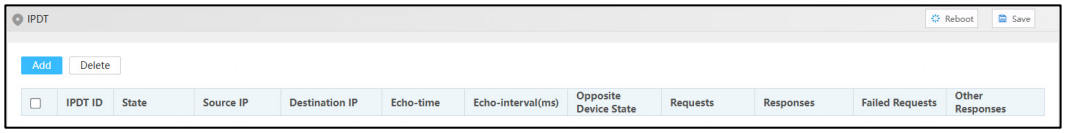
Operation Path

Open in order: "Layer-2 > IPDT".

Copyright © 3onedata Co., Ltd.

Interface Description

IPDT interface is as below:



The main element configuration descriptions of IPDT interface:

Interface Element	Description
IPDT ID	IPDT session ID, value range 1-8.
State	IPDT function enable status.
Source IP	The source IP address that sends ICMP probe packet.
Destination IP	Destination IP address of ICMP probe packet.
Echo-time	The number of request packets sent by each probe, the value range is 1-3.
Echo-interval (ms)	The time interval of each probe request, the unit is 100ms, with a value range of 5-15.
Opposite Device State	The status of the opposite device is shown as follows: • UP: the opposite end device is online normally. • DOWN: there is no response from the opposite end device, which may lead to device disconnection or link failure. • not be detected.
Requests	Display the number of probe packets sent.
Responses	Display the number of probe packets answered by the destination IP.
Failed Requests	Display the number of requests that failed.
Other Responses	Display the number of probe packets responded by other devices.

5.14 IPv6DT

Function Description

Configure IPv6DT (IPv6-Detection) to detect the specified destination IPv6 address (ICMPv6) and link it with other functions, such as IPv6 VRRP.

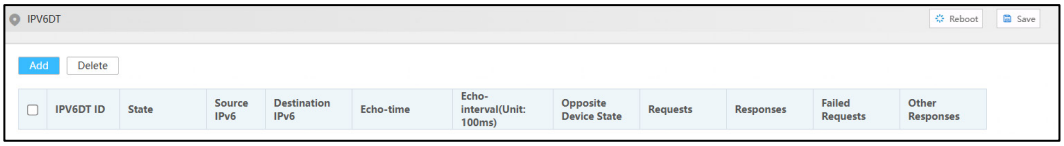
Operation Path

Open in order: "Layer-2 > IPv6DT".

Copyright © 3onedata Co., Ltd.

Interface Description

The IPv6DT interface is as follows:



Main elements configuration descriptions of IPv6DT interface:

Interface Element	Description
IPV6DT ID	IPv6DT session ID, value range 1-8.
State	IPv6DT function enable status.
Source IPv6	The source IPv6 address that sends ICMPv6 probe packet.
Destination IPv6	Destination IPv6 address of ICMPv6 probe packet.
Echo-time	The number of request packets sent by each probe, the value range is 1-3.
Echo-interval (Unit: 100ms)	The time interval of each probe request, the unit is 100ms, with a value range of 5-15.
Opposite Device State	The status of the opposite device is shown as follows: • UP: the opposite end device is online normally. • DOWN: there is no response from the opposite end device, which may lead to device disconnection or link failure. • not be detected.
Requests	Display the number of probe packets sent.
Response	Display the number of probe packets answered by the destination IPv6.
Failed Requests	Displays the number of requests that failed.
Other Responses	Displays the number of probe packets responded by other devices.

5.15 Smart-link

Smart Link, also known as backup link. A Smart Link consists of two interfaces, one of which is the backup of the other. Smart Link is commonly used in dual uplink networking, providing reliable and efficient backup and fast switching mechanism.

Copyright © 3onedata Co., Ltd.

5.15.1 Global Configuration

Function Description

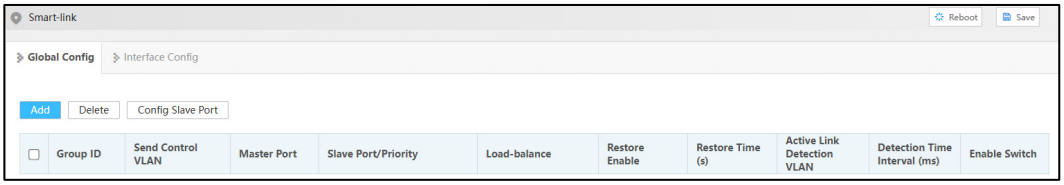
Configure Smart-link related parameters.

Operation Path

Open in order: "Layer-2 > Smart-link > Global Config".

Interface Description

Global configuration interface is as follows:



The main element configuration description of global configuration interface:

Interface Element	Description
Group ID	Smart Link Group ID, the value range is 1-16.
Send Control VLAN	Sending control VLAN is the VLAN used by Smart Link group to broadcast Flush message, and its value range is 1-4094. When Smart Link switches links, Smart Link notifies related devices to refresh MAC table and ARP table entries by sending Flush message. Note: • If the sending control VLAN is configured, the peer device needs to configure the receiving control VLAN. • Different device manufacturers may have different definitions of Flush message format, so it is recommended to use this function between the device of the same manufacturer.
Master Port	When both interfaces in the Smart Link group are in the Up state, the master interface will enter the forwarding state first, while the slave interface will remain in the standby state. Note: Smart Link group port cannot be used as a member port of ring network, aggregation group, etc.
Slave Port/Priority	• Slave port: slave interfaces in the Smart Link group will be blocked after the Smart Link group is started. When the link where the master interface is located fails, the

Copyright © 3onedata Co., Ltd.

Interface Element	Description
	slave interface will switch to the forwarding state. • Priority: slave port priority level, the value range is 1-63. Smaller the priority level value is, higher the priority level is.
Load-balance	Load sharing instance ID, the value range is 0-16. In the load sharing mode, the backup link forwards the VLAN data traffic mapped in the specified load sharing instance, which can improve the utilization rate of the link.
Restore Enable	When the original main link recovers from faults, it will remain at the block state to keep the traffic stable without preemption. If you need to restore it to the main link, you can enable the failback function of the Smart Link group, the main link would be automatically switched after the failback timer expires. Switch-back enable status, which can be displayed as follows: • Enable • Disable
Restore Time (s)	Failback delay time, it can inhibit Smart Link switching caused by link flash, the value range is 30~1200 seconds.
Active Link Detection VLAN	When there are multiple VLANs in the link, the main link detection requires monitoring and fault detection of the data transmission path of a certain VLAN, and the value range of VLAN is 1-4094.
Detection Time Interval (ms)	The detection time interval for real-time monitoring and fault detection of VLAN data transmission paths on the main link ranges from 10-10000ms, with a default of 10ms.
Enable Switch	Smart Link function enable status can be displayed as follows: • Enable • Disable

Copyright © 3onedata Co., Ltd.

5.15.2 Interface Configuration

Function Description

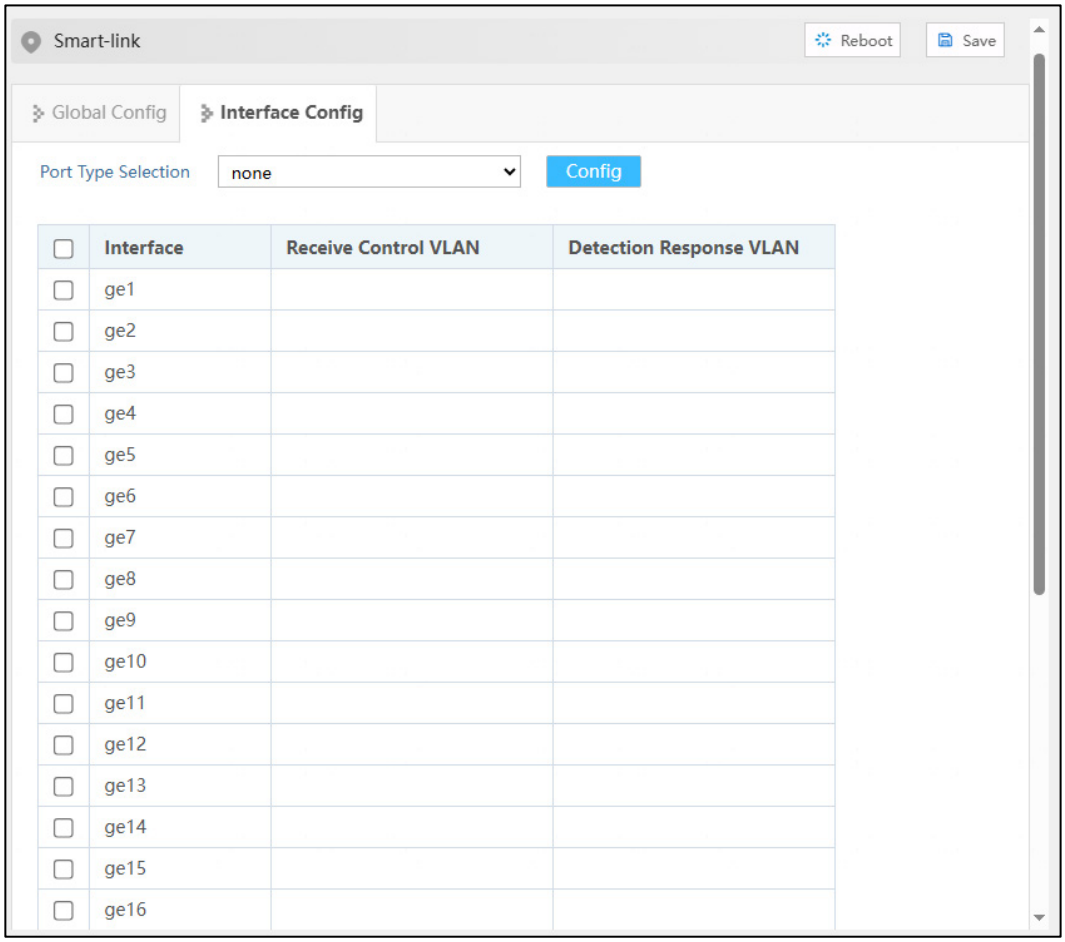
Configure Smart-link interface to receive control VLAN.

Operation Path

Open in order: "Layer-2 > Smart-link > Interface Config".

Interface Description

Interface configuration interface is as follows:



The main element configuration description of interface configuration interface:

Interface Element	Description
Interface	The corresponding port number of this device's Ethernet port.
Receive Control VLAN	Receive control VLAN is used to receive and handle the VLAN of Flush messages, the value range is 1-4094. When Smart Link has switched links, the device would handle the Flush messages received that belong to receive control VLAN, thus refreshing MAC table and ARP table.

Copyright © 3onedata Co., Ltd.

Interface Element	Description
Detection Response VLAN	In network link backup, there needs to be a mechanism to detect the health status of the main link, which may be achieved by sending specific detection messages. After the detection message is sent, if these response messages are also processed and forwarded in a specific VLAN, the detection and response mechanism is limited to a specific VLAN to ensure that these operations do not interfere with normal communication in other VLANs.

Copyright © 3onedata Co., Ltd.

6 IP Network Configuration

6.1 Interface

6.1.1 Layer 3 Interface

Function Description

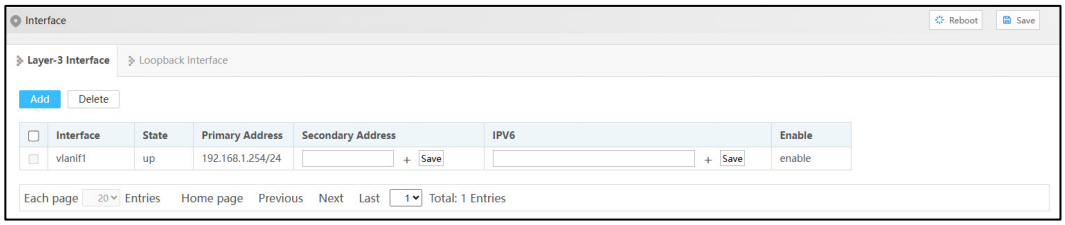
Create layer 3 VIANIF Interfaces and configure interface IP address.

Operation Path

Open in order: "IP Network > Interface > Layer-3 Interface".

Interface Description

L3 interface configuration interface is as follows:



The main element configuration description of interface configuration interface:

Interface Element	Description
Interface	VLANIF interface, the value range is 1-4094. VLANIF interface is a logical interface with layer 3 features that can be used to realize inter-VLAN access and Layer 3 task deployment by configuring the IP address of VLANIF Interfaces.
State	The connection state of the VLANIF port, which can be displayed as follows:

Copyright © 3onedata Co., Ltd.

Interface Element	Description
	• Up: connection is normal. • Down: disconnected
Primary Address	Master IPv4 address and subnet mask of VLANIF interface, such as 192.168.1.1/24.
Secondary Address	Slave IPv4 address and subnet mask of VLANIF interface, such as 192.168.8.1/24. In order to connect one interface of the switch with multiple subnets, user can configure multiple IP addresses on one interface, one as the master IP address and the rest as the slave IP address.
IPV6	Ipv6 address and prefix length of VLANIF interface, such as 1::1/127.
Enable	The VLANIF interface enabled status can be displayed as follows: • enable • disable

6.1.2 Loopback Interface

Loopback interface is virtual interface, and most of the platforms support using it to simulate real interface. This interface is in virtual forever UP state, which is more stable than any other physical interface. If the router starts, the loopback interface would be in an active state. If there are multiple routes that arrive at this loopback address, they would not be unreachable when one of the interfaces of the device is down. It is invalid when the router no longer has effect.

Function Description

Configure the parameters of loopback interface.

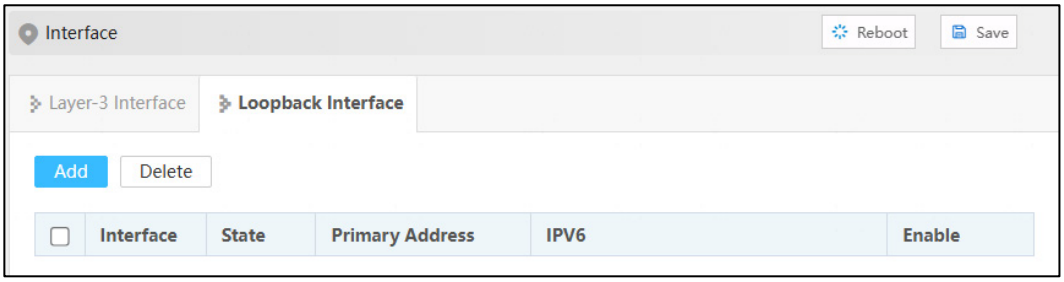
Operation Path

Open in order: "IP Network > Interface > Loopback Interface".

Interface Description

Loopback interface configuration interface is as follows:

Copyright © 3onedata Co., Ltd.



The main element configuration description of loopback interface interface:

Interface Element	Description
Interface	The name of loopback interface, value range: loopback0 or loopback1.
State	The connection state of the loopback Interface, which can be displayed as follows: • Up • Down
Primary Address	Master IPv4 address and subnet mask of loopback interface, such as 10.1.1.0/24.
IPV6	Ipv6 address and prefix length of loopback interface, such as 1::1/127.
Enable	Loopback interface enable status can be displayed as follows: • enable • disable

6.2 ARP

ARP (Address Resolution Protocol) is the protocol that resolves IP address into Ethernet MAC address (or physical address).

In local area network, when the host or other network device sends data to another host or device, it must know the network layer address (IP address) and MAC address of the opposite side. So, it needs a mapping from IP address to the physical address. ARP is the protocol to achieve the function.

Copyright © 3onedata Co., Ltd.

6.2.1 ARP Information

Function Description

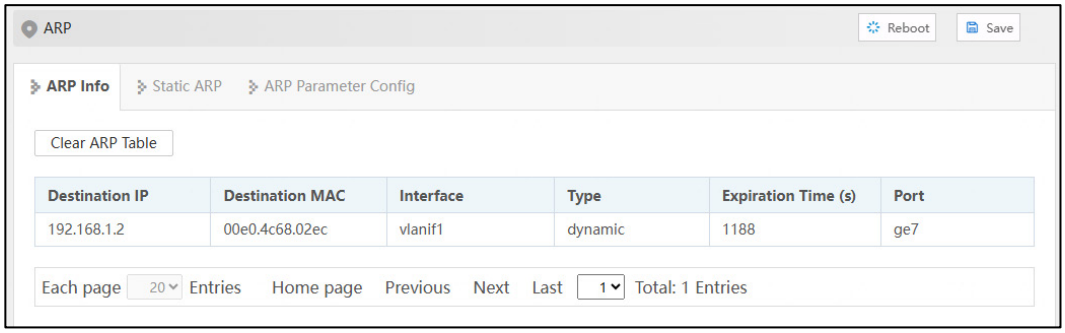
Check information such as IP address, MAC address and interface of the user via ARP table entries.

Operation Path

Open in order: "IP Network > ARP > ARP Info".

Interface Description

ARP Information interface is as follows:



The main element configuration description of ARP information interface:

Interface Element	Description
Destination IP	Static binding or ARP resolves dynamically learned IP addresses.
Destination MAC	Static binding or ARP resolves dynamically learned MAC addresses.
Interface	VLANIF Interface to which ARP entry belongs.
Type	ARP table entry type, as shown below: • Static • Dynamic
Expiration Time (s)	The remaining survive time of dynamic ARP table entries, unit: second.
Port	Ports learned to ARP table entry.

Copyright © 3onedata Co., Ltd.

6.2.2 Static ARP

Function Description

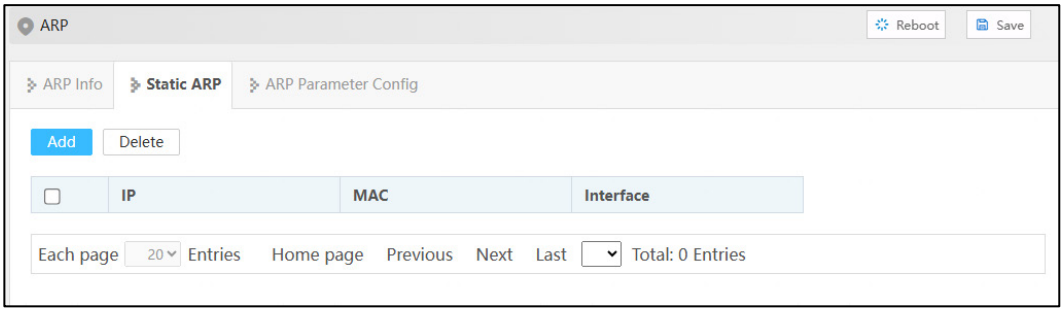
Configure static ARP entries, bind IP address and MAC address to avoid aging and prevent ARP attacks.

Operation Path

Open in order: "IP Network > ARP > Static ARP".

Interface Description

Static ARP interface is as follows:



The main element configuration description of static ARP interface:

Interface Element	Description
IP	IP address of static ARP table entry, such as 192.168.1.1.
MAC	MAC address bound to static IP address such as 0001.0001.0001.
Interface	Display VLANIF Interface to which static ARP entry belongs.

6.2.3 ARP Parameter Configuration

Function Description

Configure the aging time of dynamic ARP.

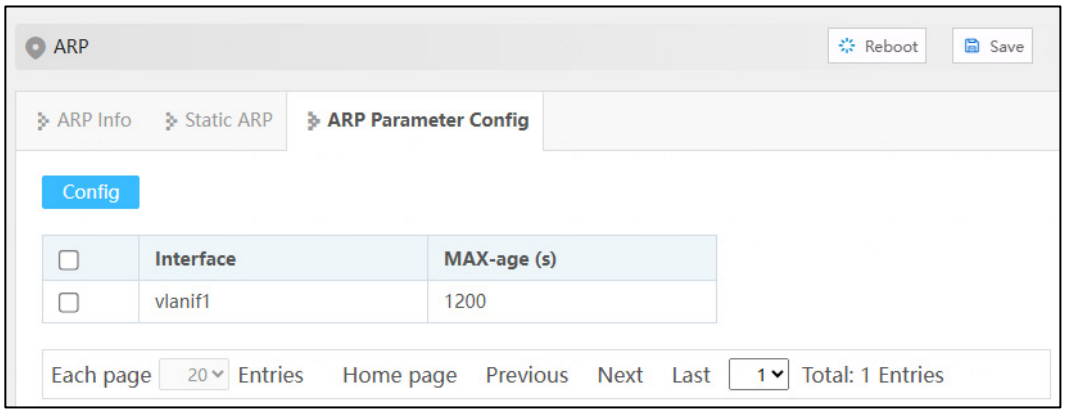
Operation Path

Open in order: "IP Network > ARP > ARP Parameter Config".

Interface Description

ARP parameter configuration interface is as follows:

Copyright © 3onedata Co., Ltd.



The main element configuration description of ARP Parameter Config interface:

Interface Element	Description
Interface	Display VLANIF Interface name in ARP entry.
MAX-age (s)	Configure aging time of dynamic ARP table entries, the value range is 1-3000 seconds.

6.3 NAT

NAT (Network Address Translation) is a process of translating an IP address in an IP data header into another IP address. In practical application, NAT is mainly used to realize the function of private network accessing public network. This way of using a few public IP addresses to represent more private IP addresses will help to slow down the exhaustion of available IP address space.

Function Description

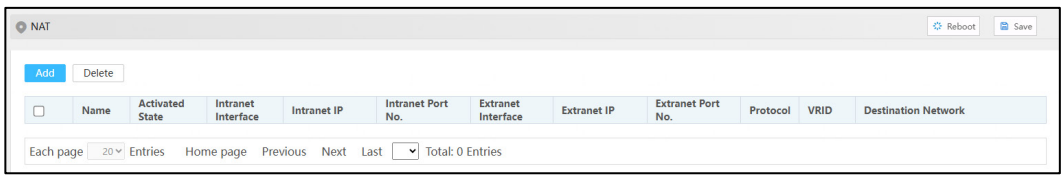
Add or delete NAT entries, and set the internal network interface and external network interface of the device.

Operation Path

Open in order: "IP Network > NAT".

Interface Description

NAT interface is as below:



Main elements configuration descriptions of NAT interface:

Copyright © 3onedata Co., Ltd.

Interface Element	Description
Name	The NAT entry name, which supports 1-32 characters, consists of uppercase letters, lowercase letters, numbers, or special characters (! @ _-).
Activated state	Whether NAT rule is activated or not, the status is as follows: • up • down
Intranet Interface	Connect the VLAN of the intranet device, access the IP of this VLAN, and access the public network through NAT.
Intranet IP	Intranet IP that can be mapped to external network through NAT.
Intranet Port No.	The port number of the intranet VLAN corresponding to the port mapping protocol. Note: tcp/udp :1-65535/ no filling indicates any port; all/icmp: No distinction between port numbers.
Extranet Interface	The VLAN connecting the external network device, through which the external network can access the internal network device through NAT.
Extranet IP	The external network IP mapped by the internal network IP through NAT.
Extranet Port No.	The port number of the external VLAN corresponding to the port mapping protocol. Note: tcp/udp :1-65535/ no filling indicates any port; all/icmp: No distinction between port numbers.
Protocol	Mapping port protocol, options are as follows: • All: supports tcp, udp and icmp protocol forwarding; • tcp: supports tcp protocol forwarding; • udp: supports udp protocol forwarding; • icmp: supports icmp protocol forwarding. Note: When all and icmp protocols are selected, it is not supported to input internal network port and external network port. please keep the internal network port and external network port blank.
VRID	VRID is the VRRP ID, with values ranging from 1 to 255. When the devices in the VRRP backup group are configured with the NAT address pool, it is possible for both devices to perform NAT translation on the packet, resulting in a conflict. Configuring the VRID allows you to optionally specify the Master device to do the NAT conversion, effectively avoiding

Copyright © 3onedata Co., Ltd.

Interface Element	Description
	collisions.
Destination Network	The destination network of internal terminal device, namely the IP address and subnet mask of the destination network, such as 10.1.1.0/24.

Copyright © 3onedata Co., Ltd.

7 Unicast Routing

7.1 IPv4

7.1.1 IPv4 Routing Table

Function Description

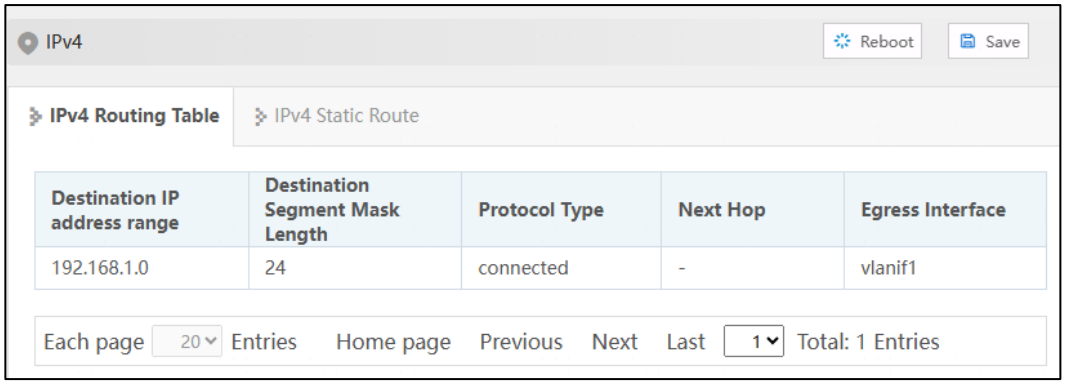
Check IPv4 routing table information.

Operation Path

Open in order: "Unicast Routing > IPv4 > Ipv4 Routing Table".

Interface Description

The IPv4 routing table interface is as follows:



The main elements configuration description of IPv4 routing interface:

Interface Element	Description
Destination IP address range	Destination IP addresses.
Destination Segment Mask Length	The length of destination subnet mask.
Protocol Type	The routing protocol type of the current connection.

Copyright © 3onedata Co., Ltd.

Interface Element	Description
Next Hop	Gateway address information of next hop.
Egress Interface	Interface name.

7.1.2 IPv4 Static Route

Static route refers to the route information that user or network administrator manually configures. When the network topology structure or link status changes, network administrator needs to manually modify relative static route information in the routing table. Static route usually adapts to simple network environment, under this environment, network administrator can clearly know the network topology structure, which is convenient for setting correct route information.

Function Description

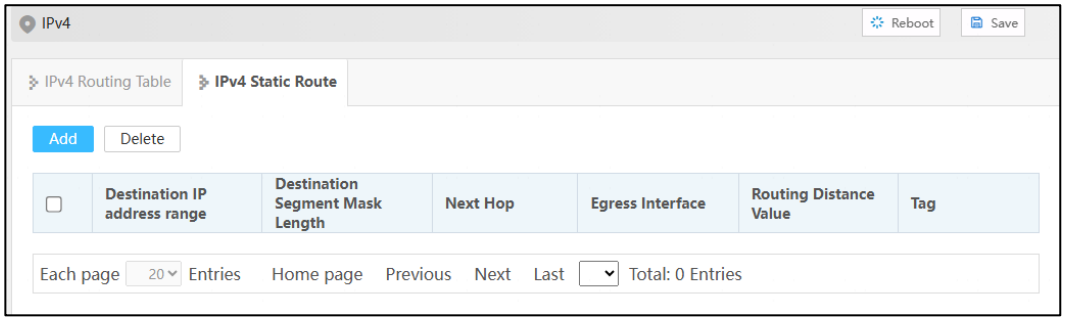
Configure IPv4 static routing.

Operation Path

Open in order: "Unicast Routing > IPv4 > IPv4 Static Route".

Interface Description

The IPv4 Static Route interface is as follows:



The main element configuration description of IPv4 Static Route interface:

Interface Element	Description
Destination IP address range	Destination network IP address, such as destination address is 10.1.1.0.
Destination Segment Mask Length	Destination IP mask length. Value range is 0-32.
Next Hop	The gateway address of the next hop, format: no input or 192.3.3.3.

Copyright © 3onedata Co., Ltd.

Interface Element	Description
Egress Interface	Interface Name.
Routing Distance Value	The routing distance value is used for priority determination. When a router receives routing information from multiple routing protocols, it will determine which routing information should be prioritized based on the management distance value of these routing information. The smaller the management distance value, the higher the credibility of the routing information, and the more likely the router is to adopt this routing information. The range is from 1 to 255, default value is 1.
Tag	IPv4 static routing label, with a value range of 0-4294967295 and a default value of 0.

7.2 IPv6

7.2.1 IPv6 Routing Table

Function Description

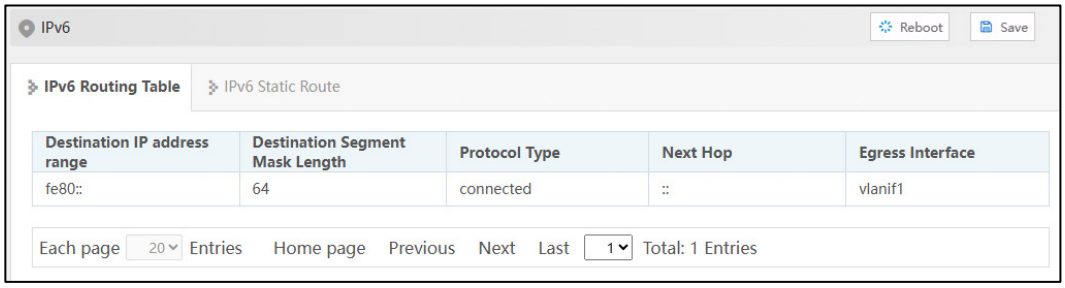
Check IPv6 routing table information.

Operation Path

Open in order: "Unicast Routing > IPv6 > IPv6 Routing Table".

Interface Description

The IPv6 routing table interface is as follows:



The main elements configuration description of IPv6 routing table interface:

Interface Element	Description
Destination IP address range	Destination IP addresses.

Copyright © 3onedata Co., Ltd.

Interface Element	Description
Destination Segment Mask Length	The length of destination subnet mask.
Protocol Type	The routing protocol type of the current connection.
Next Hop	Gateway address information of next hop.
Egress Interface	Interface name.

7.2.2 IPv6 Static Route

Static route refers to the route information that user or network administrator manually configures. When the network topology structure or link status changes, network administrator needs to manually modify relative static route information in the routing table. Static route usually adapts to simple network environment, under this environment, network administrator can clearly know the network topology structure, which is convenient for setting correct route information.

Function Description

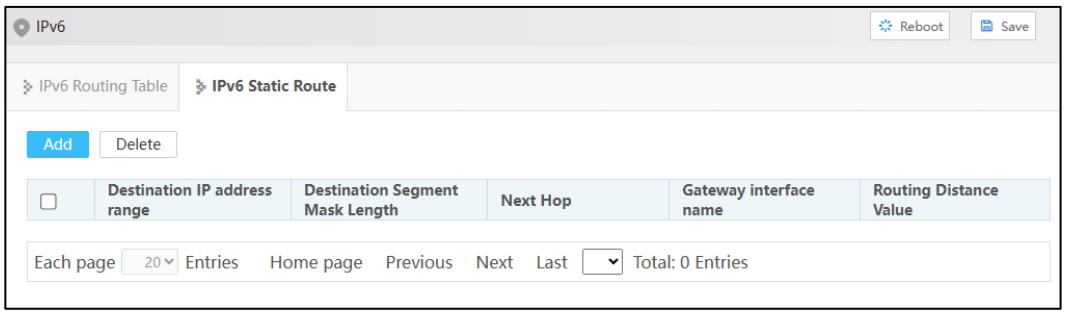
Configure IPv6 static routing.

Operation Path

Open in order: "Unicast Routing > IPv6 > IPv6 Static Route".

Interface Description

The IPv6 static route interface is as follows:



The main element configuration description of IPv6 static routing interface:

Interface Element	Description
Destination IP address range	Destination network IPv6 address, such as destination address is 0001::01.
Destination Segment Mask Length	Destination IPv6 mask length. Value range is 0-128.

Copyright © 3onedata Co., Ltd.

Interface Element	Description
Next Hop	The gateway address for the next hop can be empty, and there are two similar IPv6 address formats: • 0001:0000:0000:0000:085b:3c51:f5ff:ffdb • 0001::01
Gateway interface name	Gateway interface name
Routing Distance Value	The routing distance value is used for priority determination. When a router receives routing information from multiple routing protocols, it will determine which routing information should be prioritized based on the management distance value of these routing information. The smaller the management distance value, the higher the credibility of the routing information, and the more likely the router is to adopt this routing information. The range is from 1 to 255, default value is 1.

7.3 RIP

RIP (Routing Information Protocol) is a simple Interior Gateway Protocol (IGP) and mainly used in small network, such as Campus Network and Local Area Network with simple structure. RIP isn't used in more complex environment and large network.

RIP is simple to achieve and easier in configuration and maintenance than OSPF or IS-IS, so it's widely used in actual networking.

7.3.1 Global Configuration

Function Description

Configure RIP Global-Related parameters.

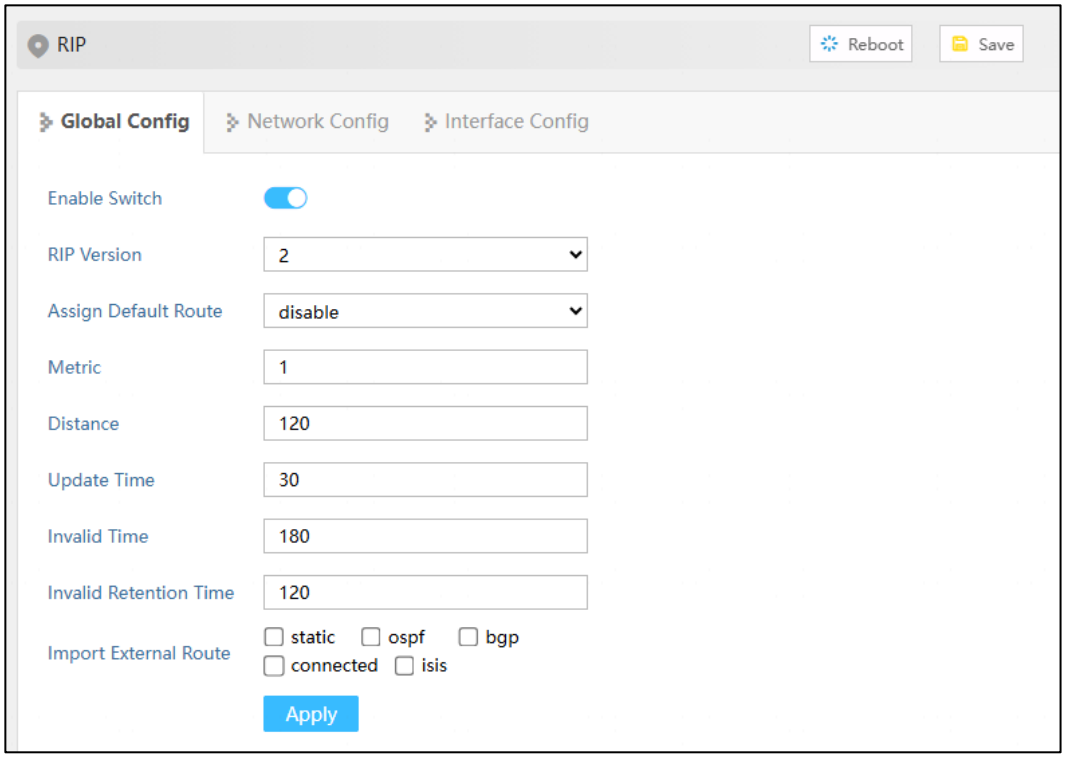
Operation Path

Open in order: "Unicast Routing > RIP > Global Config".

Interface Description

Global configuration interface is as follows:

Copyright © 3onedata Co., Ltd.



The main element configuration description of global configuration interface:

Interface Element	Description
Enable Switch	RIP function enable switch. After enabling, the RIP related parameter configuration will appear.
RIP Version	RIP version drop-down list, the default version is RIP-2, the options of version are as follows: • 1: RIP-1 is Classful Routing Protocol, it only supports releasing protocol message via broadcast mode, only natural network segments such as A, B and C can be identified. • 2: RIP-2 is a non-classified routing protocol, which is extended based on RIP-1. Note: Interface can only send/receive data packets of the RIP version configured.
Assign Default Route	The default route with the destination address of 0.0.0.0 is assigned to RIP routing database, which is disabled by default. The options are as follows: • enable • disable
Metric	Narrow metric is equal to the number of devices from this route to the destination route, with a default value of 1 and a value range of 1-15.

Copyright © 3onedata Co., Ltd.

Interface Element	Description
Distance	RIP route management distance, the default distance is 120, the value range is 1-255. When there are routes from two different routing protocols to the same destination, the smaller the management distance value of the routing protocol is, the more reliable the route obtained by the protocol is.
Update Time	Routing information update time. When the timer timeout, immediately send update message, update messages are sent every 30 seconds by default. Value range is 5-2147483647 seconds. Note: When the routing information changes, the trigger update message is immediately sent to the neighbor device instead of waiting for the update timer timeout, thus avoiding the routing loop.
Invalid Time	If no routing update message is received from the neighbor within the invalid time, the route is considered unreachable. By default, it is 180 seconds, value range is 5-2147483647 seconds.
Invalid Retention Time	If the unreachable route does not receive an update message from the same neighbor before the invalid retention timer countdown ends, the route will be completely deleted from the RIP routing table. By default, it is 120 seconds, value range is 5-2147483647 seconds.
Import External Route	Introducing external routing is learning routing from other routing protocols into RIP, with the following options available: • static: static routing • ospf: Open Shortest Path First • bgp: border gateway protocol. • connected: connected route • isis: intermediate system to intermediate system, IS-IS is an internal gateway protocol.

Copyright © 3onedata Co., Ltd.

7.3.2 Network Configuration

Function Description

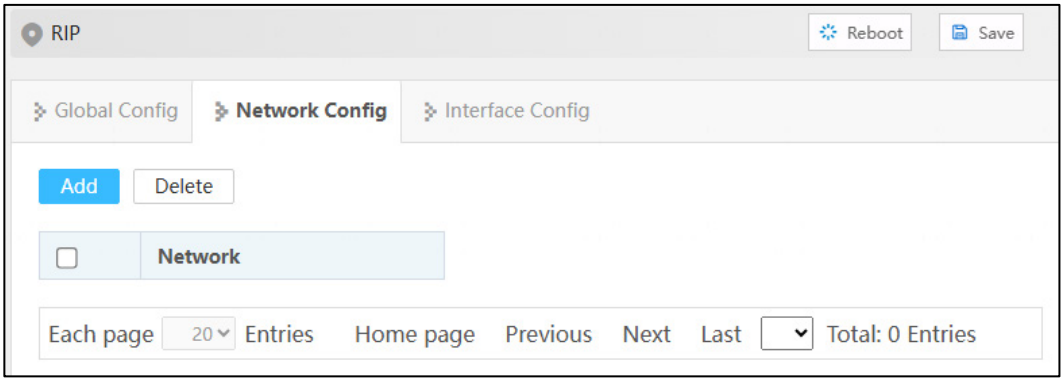
Configure RIP working network segment.

Operation Path

Open in order: "Unicast Routing > RIP > Network Config".

Interface Description

Network configuration interface is as follows:



The main element configuration description of network configuration interface:

Interface Element	Description
Network	Network segment running RIP protocol.

7.3.3 Interface Configuration

Function Description

Configure RIP interface parameters.

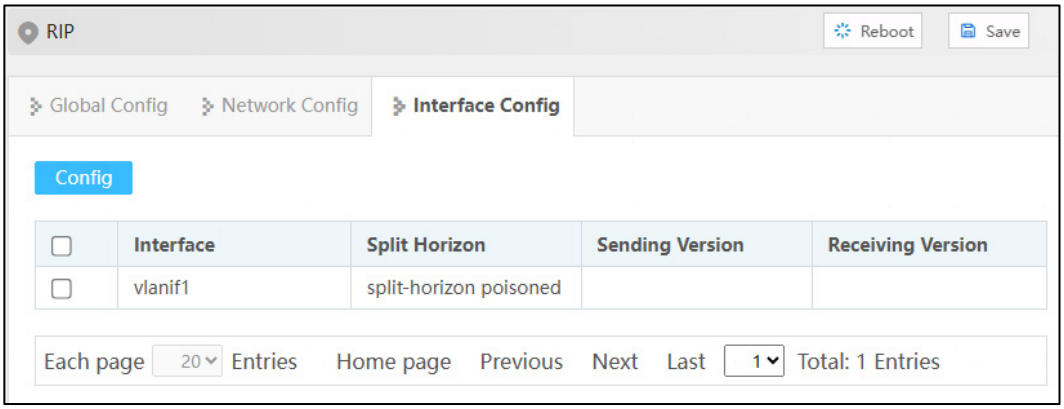
Operation Path

Open in order: "Unicast Routing > RIP > Interface Config".

Interface Description

Interface configuration interface is as follows:

Copyright © 3onedata Co., Ltd.



The main element configuration description of interface configuration interface:

Interface Element	Description
Interface	RIP interface information
Split Horizon	Horizontal partition. Options are as follows: • - • Split-horizon RIP adopts the split horizon mechanism. That is, the route learned by the router from a certain interface will not be sent back to neighbor routers from that interface. • Poison-reverse When RIP learns the route from an interface, it sets the routing metric to unreachable and sends it back to the neighbor router from the original interface.
Sending Version	RIP protocol version of sending data, options are as follows: • - • 1 • 2 • 1 & 2 • 1-compatible
Receiving Version	RIP protocol version of receiving data, options are as follows: • - • 1 • 2 • 1 & 2

7.4 RIPNG

RIPng (RIP next generation) is a simple internal gateway protocol, and an application of RIP in IPv6 network.

Copyright © 3onedata Co., Ltd.

7.4.1 Global Configuration

Function Description

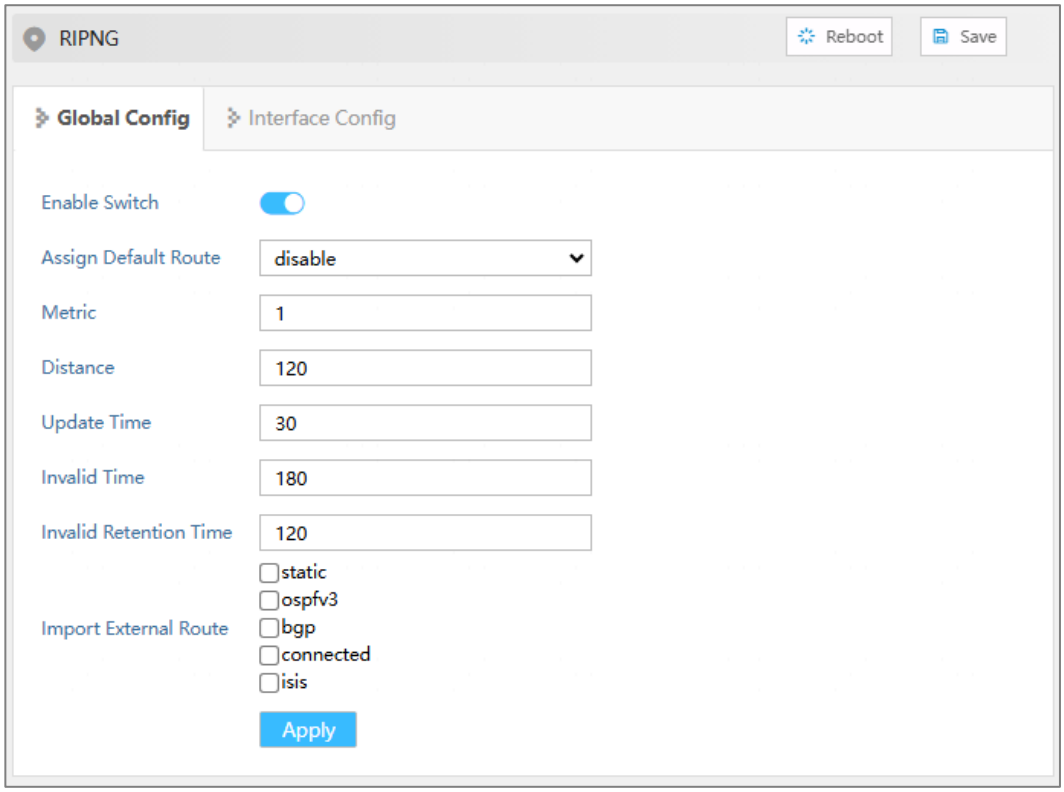
Configure RIPng global parameter.

Operation Path

Open in order: "Unicast Routing > RIPNG > Global Config".

Interface Description

Global configuration interface is as follows:



The main element configuration description of global configuration interface:

Interface Element	Description
Enable Switch	RIPng enable switch, after enabling, RIPng related parameter configuration appears.
Assign Default Route	Publish RIPng default route (::/0) with the following options: • enable • disable Note: When the destination address of the message cannot match any destination address of the routing table, the router will choose the default route to forward the message.
Metric	Default metric value used when routing to RIPng with

Copyright © 3onedata Co., Ltd.

Interface Element	Description
	external routing protocol. The metric is equal to the number of devices from this route to the destination route, with a default value of 1 and a value range of 1-16.
Distance	RIPng route management distance, the default distance is 120, the value range is 1-255. When there are routes from two different routing protocols to the same destination, the smaller the management distance value of the routing protocol is, the more reliable the route obtained by the protocol is.
Update Time	Routing information update time. When the timer timeout, immediately send update message, update messages are sent every 30 seconds by default. Value range is 5-2147483647 seconds. Note: When the routing information changes, the trigger update message is immediately sent to the neighbor device instead of waiting for the update timer timeout, thus avoiding the routing loop.
Invalid Time	If no routing update message is received from the neighbor within the invalid time, the route is considered unreachable. By default, it is 180 seconds, value range is 5-2147483647 seconds.
Invalid Retention Time	If the unreachable route does not receive an update message from the same neighbor before the invalid retention timer countdown ends, the route will be completely deleted from the RIPng routing table. By default, it is 120 seconds, value range is 5-2147483647 seconds.
Import External Route	Introducing external routing is learning routing from other routing protocols into RIPng, with the following options available: • static: static routing • ospfv3: OSPFv3 route • bgp: BGP border gateway protocol • connected: connected route • isis: external gateway protocol

Copyright © 3onedata Co., Ltd.

7.4.2 Interface Configuration

Function Description

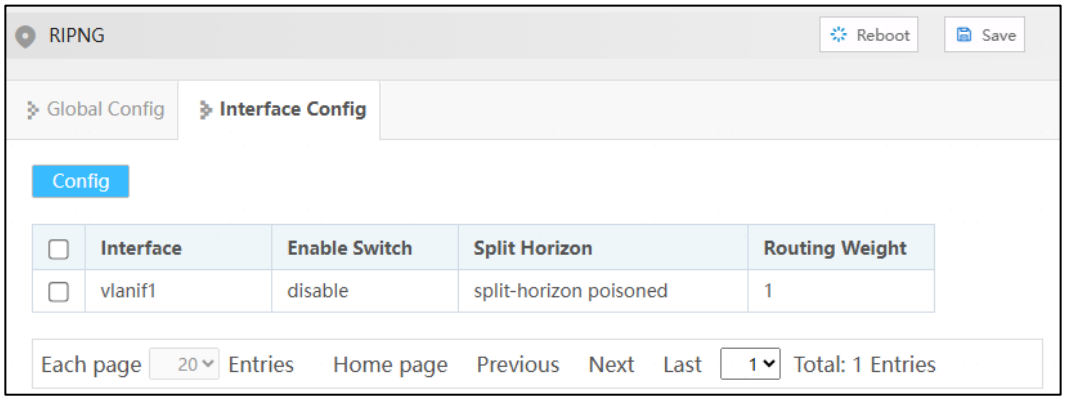
Configure the interface parameters of RIPng

Operation Path

Open in order: "Unicast Routing > RIPNG > Interface Configuration".

Interface Description

Interface configuration interface is as follows:



The main element configuration description of interface configuration interface:

Interface Element	Description
Interface	RIPng interface information.
Enable Switch	RIPng enable status, options as follows: • Disable • Enable
Split Horizon	Horizontal partition. Options are as follows: • Split-horizon Route that RIPng learns from an interface, it won't be sent from the interface to neighbor router. • Split-horizon poisoned When RIPng learns the route from an interface, it sets the routing metric to unreachable and sends it back to the neighbor router from the original interface.
Routing Weight	Additional routing metrics, ranging from 1 to 16. The added metric value (hop count) based on the original metric value of RIPng route can affect the route selection.

Copyright © 3onedata Co., Ltd.

7.5 OSPF

The Open Shortest Path First (OSPF) protocol is link-state Interior Gateway Protocol (IGP) developed by the Internet Engineering Task Force (IETF).

OSPF Version 2 (RFC 2328) is currently used for the IPv4 protocol.

- Dividing an Autonomous System (AS) into one or more logical areas
- Advertising routes by sending Link State Advertisements (LSAs)
- Exchanging OSPF packets between devices in an OSPF area to synchronize routing information
- Encapsulating OSPF packets into IP packets and then sending the packets in unicast or multicast mode

RIP is a distance-vector routing protocol. Due to RIP's slow convergence, routing loops, and poor scalability, OSPF is now the most widely accepted and used IGP.

OSPF, as a link-state based protocol, can solve many problems faced by RIP. In addition, OSPF has the following advantages:

- Multicast packet transmission to reduce load on the switches that are not running OSPF
- Classless Inter-Domain Routing (CIDR)
- Load balancing among equal-cost routes
- Packet authentication

7.5.1 Global Configuration

Function Description

Configure OSPF process ID, router ID, default route, import external route and other information.

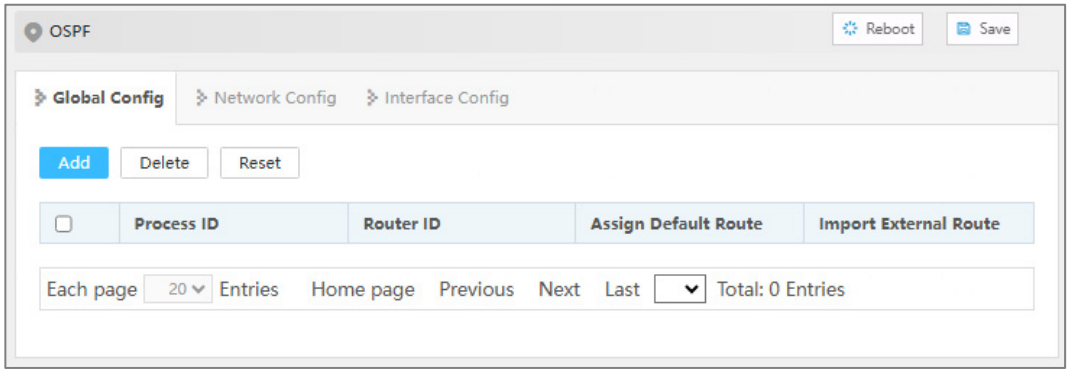
Operation Path

Open in order: "Unicast Routing > OSPF > Global Configuration".

Interface Description

Global configuration interface is as follows:

Copyright © 3onedata Co., Ltd.



The main element configuration description of global configuration interface:

Interface Element	Description
Process ID	The value range of OSPF process ID is 0-65535. OSPF supports multi-processes, and many different OSPF processes can run on the same router, which do not affect each other and are independent of each other. An interface of a router can only call one OSPF process.
Router ID	Router ID is used to uniquely identify a router running OSPF in the autonomous system. The format of ID is the same as that of IP address. Each OSPF router that runs OSPF has a router ID.
Assign Default Route	Default routes have all 0s as the destination address and mask. A device uses a default route to forward packets when no matching route is discovered.
Import External Route	The routes learned from other routing protocols are introduced into the OSPF routing table, which is suitable for autonomous system boundary routers. External routing describes how to select a route to a destination address other than AS. • connected: connected route • static: static routing • rip: RIP route • bgp • isis

Copyright © 3onedata Co., Ltd.

7.5.2 Network Configuration

Function Description

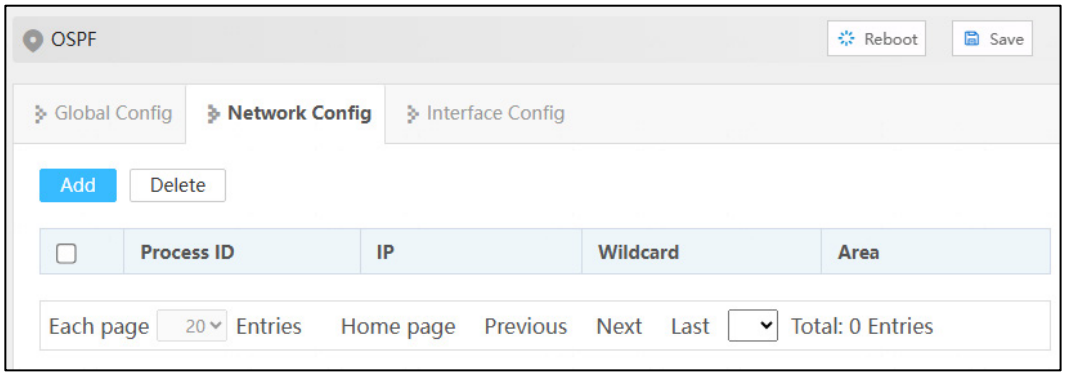
Configure the OSPF area to which each network interface of the device belongs.

Operation Path

Open in order: "Unicast Routing > OSPF > Network Config".

Interface Description

Network configuration interface is as follows:



The main element configuration description of network configuration interface:

Interface Element	Description
Process ID	The value range of OSPF process ID is 1-65535.
IP	The network address, or network address / network prefix, of the OSPF process.
Wildcard	Wildcard of the network address.
Area	Set the OSPF area to which the network interface belongs. The identification of the OSPF area supports IP address format or integer value in the range of 0-4294967295.

7.5.3 Interface Configuration

Function Description

Configure the cost, expiration time, hello interval and DR priority of the device interface.

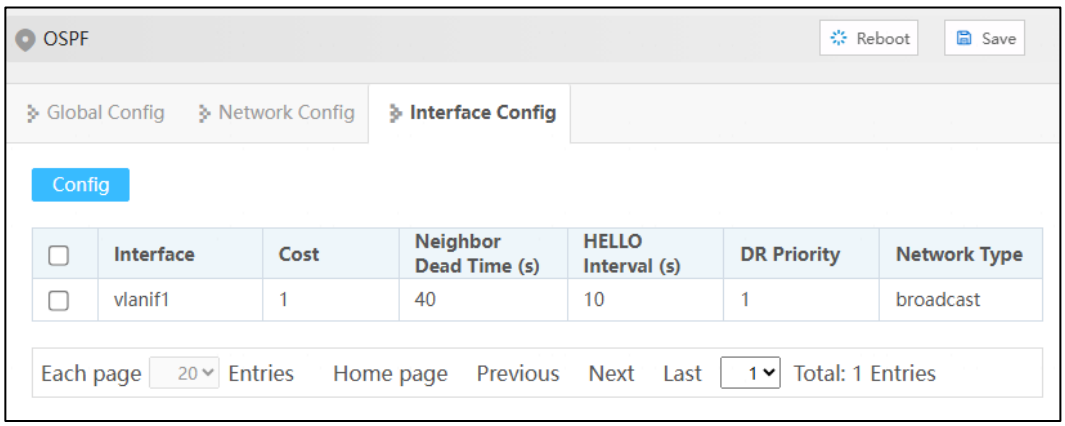
Operation Path

Open in order: "Unicast Routing > OSPF > Interface Config".

Copyright © 3onedata Co., Ltd.

Interface Description

Interface configuration interface is as follows:



The main element configuration description of interface configuration interface:

Interface Element	Description
Interface	VLANIF interface of the device.
Cost	The cost required to run OSPF protocol on the interface. The value range is 1-65535.
Neighbor Dead Time (s)	OSPF neighbor dead time, in seconds, value range 1-65535. If the Hello message from the neighbor is not received within this time, the neighbor is considered invalid. If the failure time between two adjacent routers is different, the neighbor relationship cannot be established.
Hello Interval (s)	The time interval for the interface to send Hello message, in seconds, with a value range of 1-65535. The Hello message is periodically sent to the neighbor router to maintain the neighbor relationship and the election of DR (Designated Router) / BDR (Backup Designated Router).
DR Priority	DR priority of the interface, ranging from 1 to 255. The DR priority determines the qualification of the interface for election of DR/BDR. The higher the value, the higher the priority. High priority will be taken into account when voting rights conflict.
Network Type	The network types of OSPFv3 interface correspond to different types of link layer protocols, and the network types are as follows: • Broadcast • Non-broadcast: non-broadcast point-to-multipoint

Copyright © 3onedata Co., Ltd.

Interface Element	Description
	NBMA type • Point-to-multipoint • Point-to-point: point-to-point P2P type

7.6 OSPFV3

OSPFv3 is an OSPF routing protocol running on IPv6, modified based on OSPFv2, and is an independent routing protocol.

7.6.1 Global Configuration

Function Description

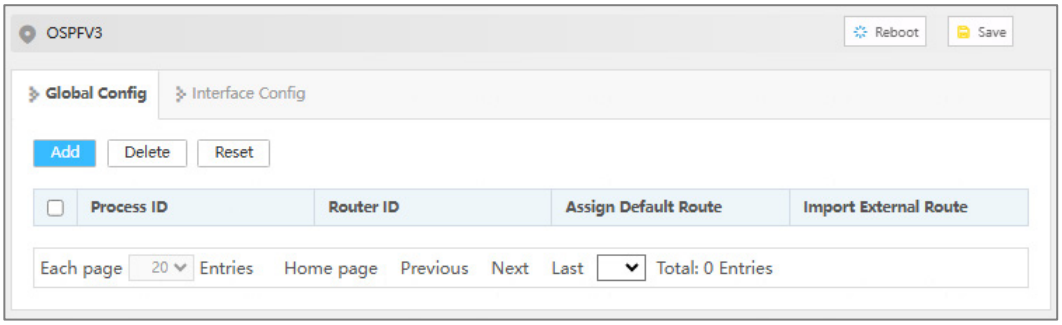
Configure OSPFv3 process ID, router ID, default route, import external route and other information.

Operation Path

Open in order: "Unicast Routing > OSPFV3 > Global Configuration".

Interface Description

Global configuration interface is as follows:



The main element configuration description of global configuration interface:

Interface Element	Description
Process ID	OSPFv3 process identification. OSPFv3 supports multiple processes. Multiple different OSPFv3 processes can be run on the same router, and they are independent of each other.
Router ID	Router ID is used to uniquely identifies an OSPF router in an AS. ID is in the same format as an IP address. Every OSPFv3 process has a router ID.

Copyright © 3onedata Co., Ltd.

Interface Element	Description
Assign Default Route	Default routes have all 0s as the destination address and mask. A device uses a default route to forward packets when no matching route is discovered.
Import External Route	The routes learned from other routing protocols are introduced into the OSPFv3 routing table, which is suitable for autonomous system boundary routers. External routing describes how to select a route to a destination address other than AS. • connected: connected route • static: static routing • rip: RIP/RIPng route information protocol • bgp: BGP border gateway protocol. • isis: IS-IS intermediate system to intermediate system

7.6.2 Interface Configuration

Function Description

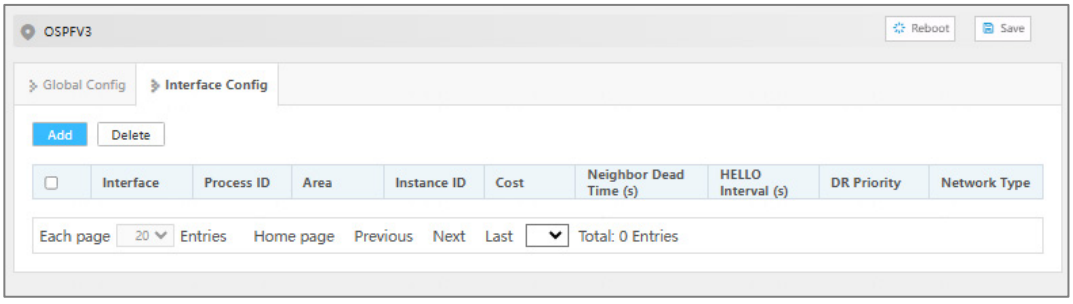
Configure the cost, expiration time, hello interval and DR priority of the device interface.

Operation Path

Open in order: "Unicast Routing > OSPFV3 > Interface Configuration".

Interface Description

Interface configuration interface is as follows:



The main element configuration description of interface configuration interface:

Interface Element	Description
Interface	VLANIF interface of the device.
Process ID	OSPFv3 process identification.

Copyright © 3onedata Co., Ltd.

Interface Element	Description
Area	The ID of the OSPFv3 area, the value range is 0-4294967295 or IPv4 address format. The OSPFv3 protocol divides the autonomous system into one or more areas in a logical sense, and achieves the unification of routing information by exchanging OSPFv3 messages among devices in the areas.
Instance ID	Instance ID the interface belongs to. OSPFv3 supports multiple processes on a link, and a physical interface can be bound to multiple instances, which are distinguished by different Instance ID.
Cost	The cost required to run OSPF protocol on the interface. The value range is 1-65535.
Neighbor Dead Time (s)	OSPF neighbor dead time, in seconds, value range 1-65535. If the Hello message from the neighbor is not received within this time, the neighbor is considered invalid. If the failure time between two adjacent routers is different, the neighbor relationship cannot be established.
Hello Interval (s)	The time interval for the interface to send Hello message, in seconds, with a value range of 1-65535. The Hello message is periodically sent to the neighbor router to maintain the neighbor relationship and the election of DR (Designated Router) / BDR (Backup Designated Router).
DR Priority	DR priority of the interface, ranging from 1 to 255. The DR priority determines the qualification of the interface for election of DR/BDR. The higher the value, the higher the priority. High priority will be taken into account when voting rights conflict.
Network Type	The network types of OSPFv3 interface correspond to different types of link layer protocols, and the network types are as follows: • Broadcast • Non-broadcast: non-broadcast point-to-multipoint NBMA type • Point-to-multipoint • Point-to-point: point-to-point P2P type

Copyright © 3onedata Co., Ltd.

7.7 ISIS

IS-IS (intermediate system to intermediate system) belongs to IGP (Interior Gateway Protocol) and is used in the autonomous system. IS-IS is also a link-state protocol, which uses the shortest path first (SPF) algorithm to calculate the route.

7.7.1 Global Configuration

Function Description

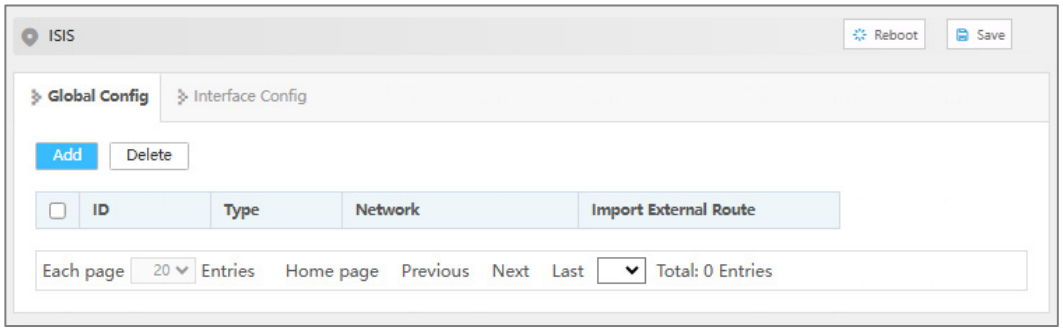
Configure IS-IS global parameter.

Operation Path

Open in order: "Unicast Routing > ISIS > Global Configuration".

Interface Description

Global configuration interface is as follows:



The main element configuration description of global configuration interface:

Interface Element	Description
ID	IS-IS process identification. IS-IS supports multi-processes, and many different IS-IS processes can run on the same router, which do not affect each other and are independent of each other.
Type	The types of IS-IS device, the options are as follows: • Level-1: The device only forms neighbor relationship with Level-1 and Level-1-2 device belonging to the same area, and is only responsible for maintaining the link state database LSDB of Level-1. • Level-2: The device can form a neighbor relationship with Level-2 devices in the same or different areas or Level-1-2 devices in other areas, and only maintain one

Copyright © 3onedata Co., Ltd.

Interface Element	Description
	Level-2 LSDB. • Level-1-2: The device will establish neighbors for Level-1 and Level-2 respectively, and maintain two LSDB for Level-1 and Level-2 respectively.
Network	The network entity name NET (Network Entity Title) of the IS-IS process is in the format of X…X.XXXX.XXXX.XXXX.00, the front "X…X" is the area address, the middle 12 "X" is the system ID of the device, and the last "00" is SEL. Note: • The zone address is used to uniquely identify different zones in the routing domain. All switches in the same Level-1 zone must have the same zone address, and switches in the Level-2 zone can have different zone addresses. • In the whole area and backbone area, it is required to keep the system ID unique.
Import External Route	The routes learned from other routing protocols are introduced into the IS-IS routing table, which is suitable for boundary routers. Traffic in the IS-IS routing domain can reach the outside of the IS-IS routing domain. • connected: connected route • static: static routing • ospf: Open Shortest Path First • bgp: BGP border gateway protocol. • rip: RIP route information protocol • isis level-2 into level-1: route penetration from Level-2 to Level-1

7.7.2 Interface Configuration

Function Description

Configure the interface parameters of IS-IS.

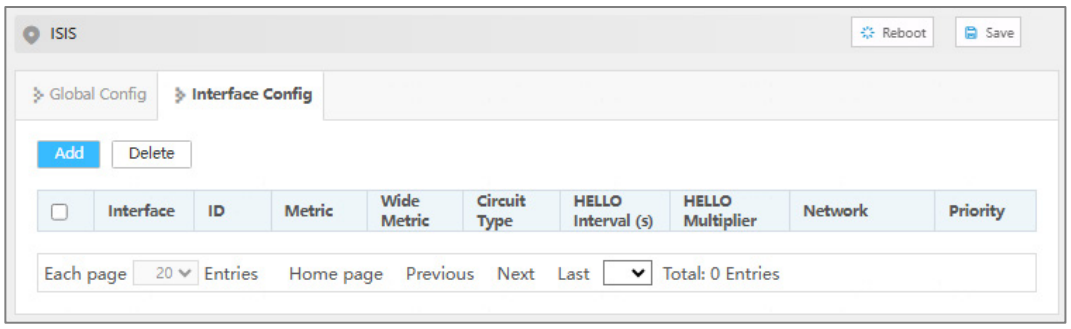
Operation Path

Open in order: "Unicast Routing > ISIS > Interface Configuration".

Interface Description

Interface configuration interface is as follows:

Copyright © 3onedata Co., Ltd.



The main element configuration description of interface configuration interface:

Interface Element	Description
Interface	VLANIF interface of the device.
ID	IS-IS process identification.
Metric	Narrow metric is the default metric for calculating the cost of IS-IS interface. Default is 10, value range is 1-63.
Wide Metric	Wide metric is an extended metric for calculating the cost of IS-IS interface. Default is 10, value range is 1-16777214. Note: In the global configuration of IS-IS routing protocol, the "narrow metric" mode is adopted by default to calculate the interface cost. The "wide metric" here exists only as an information display, and the actual wide metric calculation function is not enabled.
Circuit Type	The circuit types of IS-IS device interface, the options are as follows: • Level-1: The device only forms neighbor relationship with Level-1 and Level-1-2 device belonging to the same area, and is only responsible for maintaining the link state database LSDB of Level-1. • Level-2: The device can form a neighbor relationship with Level-2 devices in the same or different areas or Level-1-2 devices in other areas, and only maintain one Level-2 LSDB. • Level-1-2: The device will establish neighbors for Level-1 and Level-2 respectively, and maintain two LSDB for Level-1 and Level-2 respectively.
Hello Interval (s)	The time interval for the interface to send Hello message, in seconds, with a value range of 1-65535. Hello messages are periodically sent to neighbor routers to maintain the neighbor relationship.
HELLO Multiplier	The neighbor hold time is a multiple of the interval between

Copyright © 3onedata Co., Ltd.

Interface Element	Description
	Hello messages, and the value range is 2-100. If the device at one end of the link does not receive the Hello message sent by the device at the opposite end within the neighbor holding time, it is considered that the neighbor at the opposite end is invalid.
Network	The network types of IS-IS interface correspond to different types of link layer protocols, and the network types are as follows: • Broadcast • Point-to-point: point-to-point P2P type
Priority	DIS priority of the interface, the default is 64, ranging from 1 to 127. The DIS priority determines the qualification of the interface for election of DIS. The higher the value, the higher the priority.

7.8 VRRP

The Virtual Router Redundancy Protocol (VRRP) groups multiple routing devices into a virtual router and uses the virtual gateway device's IP address as the default gateway address. When the gateway fails, VRRP selects a new gateway to transmit service traffic to ensure reliable communication. VRRP protocol has two versions: VRRPv2 and VRRPv3. VRRPv2 applies to only the IPv4 network, and VRRPv3 applies to IPv4 and IPv6 networks.

Function Description

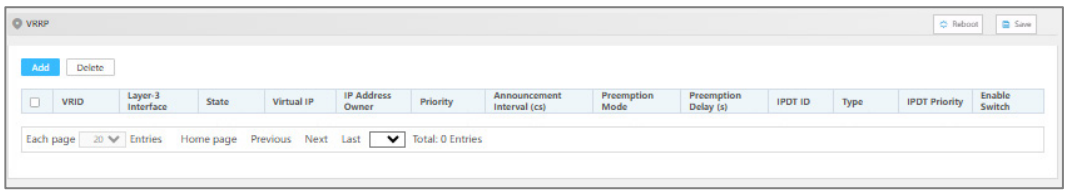
Configure IPv4 VRRP parameter.

Operation Path

Open in order: "Unicast Routing > VRRP".

Interface Description

VRRP interface is as below:



Copyright © 3onedata Co., Ltd.

The main element configuration descriptions of VRRP interface:

Interface Element	Description
VRID	Virtual router ID, valid range is 1-255.
Layer-3 Interface	Layer 3 interface information, such as, vlanif1.
State	Current status, options as follows: • Init • Master • Backup
Virtual IP	Virtual router IP address, such as 192.168.1.253.
IP Address Owner	The IP address owner takes the virtual router IP address as the real interface address.
Priority	Priority defaults to 100, the valid range is 1-255. Note: When the IP address owner is configured, the default priority can only be 255.
Announcement Interval (cs)	The Master router in the VRRP backup group will send a notification message to notify the routers in the VRRP backup group that they are working normally, unit: centisecond, valid range: 5-4095 (multiple of 5).
Preemption Mode	In the preemption mode, once the routers in the backup group find that their priority is higher than that of the current Master router, they will send VRRP announcement messages to the outside. It causes the router in the backup group to reelect the Master router and eventually replace the original Master router. Accordingly, the original Master router will become the Backup router. Preemption mode, options as follows: • false • true
Preemption Delay (s)	Set a preemption delay for a VRRP backup group to avoid frequent primary and standby state transitions among members of the backup group. Valid range is 0-255s, the default value is 0s.
IPDT ID	The value range of IPDT ID is 1-8.
Type	IPDT priority type, options are as follows: • Increased: After "Track" is enabled, the VRRP priority value is equal to the original VRRP priority value plus the IPDT priority value when the IPDT link fails. • Reduced: After "Track" is enabled, the VRRP priority value is equal to the original VRRP priority value minus

Copyright © 3onedata Co., Ltd.

Interface Element	Description
	the IPDT priority value when the IPDT link fails.
IPDT Priority	Port priority level, the value range is 1-253.
Enable Switch	VRRP enable status, options as follows: • enable • disable

7.9 IPv6 VRRP

Function Description

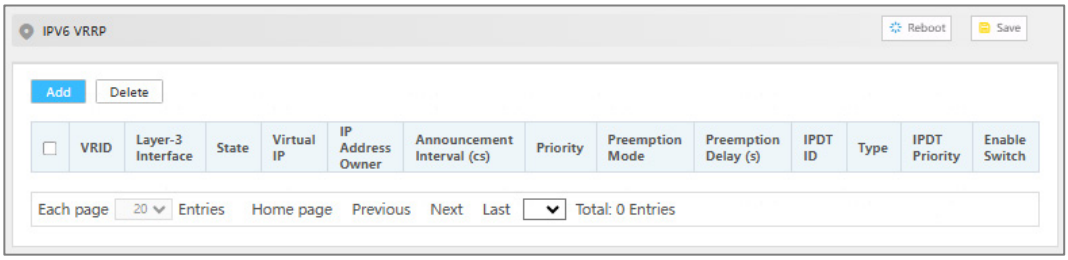
Configure IPv6 VRRP parameter.

Operation Path

Open in order: "Unicast Routing > IPv6 VRRP".

Interface Description

IPv6 VRRP interface is as below:



The main elements configuration description of IPv6 VRRP interface:

Interface Element	Description
VRID	Virtual router ID, valid range is 1-255.
Layer-3 Interface	Layer 3 interface information, such as, vlanif1.
State	Current status, options are as follows: • Init • Master • Backup
Virtual IP	Virtual routing IPv6 address, the address within the local address range of the link, such as fe80::1.
IP Address Owner	The IP address owner takes the virtual router IP address as the real interface address.
Announcement Interval (cs)	The Master router in the VRRP backup group will send a notification message to notify the routers in the VRRP backup

Copyright © 3onedata Co., Ltd.

Interface Element	Description
	group that they are working normally, unit: centisecond, valid range: 5-4095 (multiple of 5).
Priority	Priority defaults to 100, the valid range is 1-255. Note: When the IP address owner is configured, the default priority can only be 255.
Preemption Mode	In the preemption mode, once the routers in the backup group find that their priority is higher than that of the current Master router, they will send VRRP announcement messages to the outside. It causes the router in the backup group to reelect the Master router and eventually replace the original Master router. Accordingly, the original Master router will become the Backup router. Preemption mode, options as follows: • false • true
Preemption Delay (s)	Set a preemption delay for a VRRP backup group to avoid frequent primary and standby state transitions among members of the backup group. Valid range is 0-255s, the default value is 0s.
IPDT ID	The value range of IPDT ID is 1-8.
Type	IPDT priority type, options are as follows: • Increased: After "Track" is enabled, the VRRP priority value is equal to the original VRRP priority value plus the IPDT priority value when the IPDT link fails. • Reduced: After "Track" is enabled, the VRRP priority value is equal to the original VRRP priority value minus the IPDT priority value when the IPDT link fails.
IPDT Priority	Port priority level, the value range is 1-253.
Enable Switch	VRRP enable status, options are as follows: • enable • disable

Copyright © 3onedata Co., Ltd.

8 Multicast Routing

8.1 Multicast Routing

8.1.1 Multicast Routing Switch

Function Description

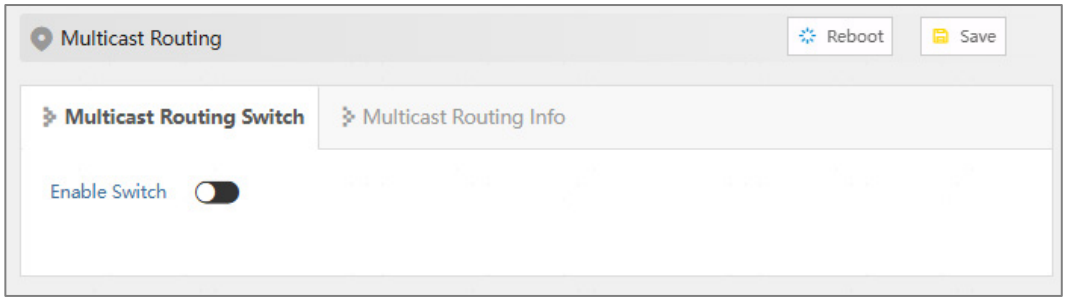
Turn on or off the layer 3 IPv4 multicast routing function.

Operation Path

Open in order: "Multicast Routing > Multicast Routing > Multicast Routing Switch".

Interface Description

The multicast routing switch interface is shown as follows:



Main elements of the multicast routing switch interface:

Interface Element	Description
Enable Switch	Click the button to enable or disable multicast routing, swipe right to enable it, swipe left to disable it.

Copyright © 3onedata Co., Ltd.

8.1.2 Multicast Routing Information

Function Description

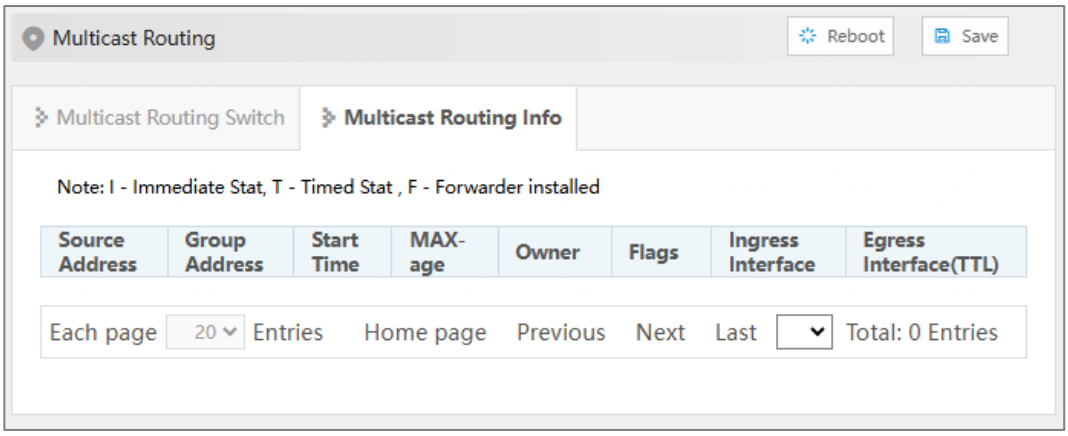
Check layer 3 multicast routing information.

Operation Path

Open in order: "Multicast Routing > Multicast Routing > Multicast Routing Information".

Interface Description

The multicast routing information interface is as follows:



Main elements of the multicast routing information interface:

Interface Element	Description
Source Address	Multicast source address
Multicast address	Multicast group address
Start Time	The existed time of the multicast route.
MAX-age	Multicast routing aging time.
Owner	The owner of a multicast route may be a multicast routing protocol.
Flags	Multicast routing protocol flag: • I: Immediate Stat (Immediately the statistics) • T: Timed Stat (Statistics Timer) • F: Forwarder installed (Set to forward table)
Ingress Interface	Multicast data ingress interface. The interface on the local device that receives multicast data.
Egress Interface (TTL)	Multicast data egress interface. The interface that forwards multicast data out.

Copyright © 3onedata Co., Ltd.

8.2 IPv6 Multicast Routing

8.2.1 Multicast Routing Switch

Function Description

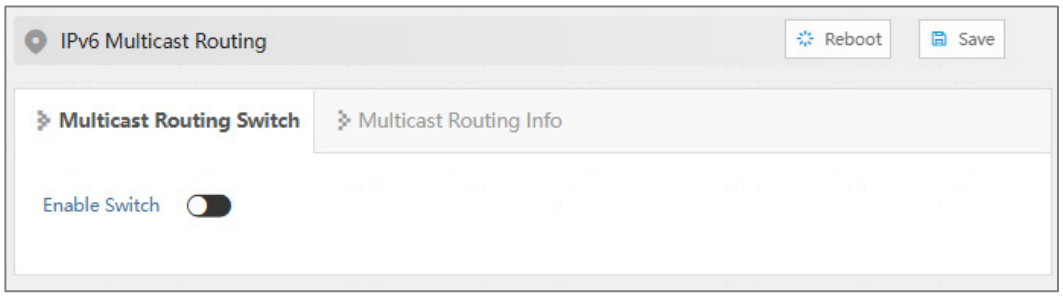
Enable IPv6 layer 3 multicast routing globally. After the multicast routing function is enabled, it can be equipped with some IPv6 layer 3 multicast protocols such as PIM(IPv6) and MLD and other IPv6 layer 3 multicast functions.

Operation Path

Open in order: "Multicast Routing > IPv6 Multicast Routing > Multicast Routing Switch".

Interface Description

The multicast routing switch interface is shown as follows:



Main elements of the multicast routing switch interface:

Interface Element	Description
Enable Switch	IPv6 layer 3 multicast routing enable switch.

8.2.2 Multicast Routing Information

Function Description

Check layer 3 multicast routing information.

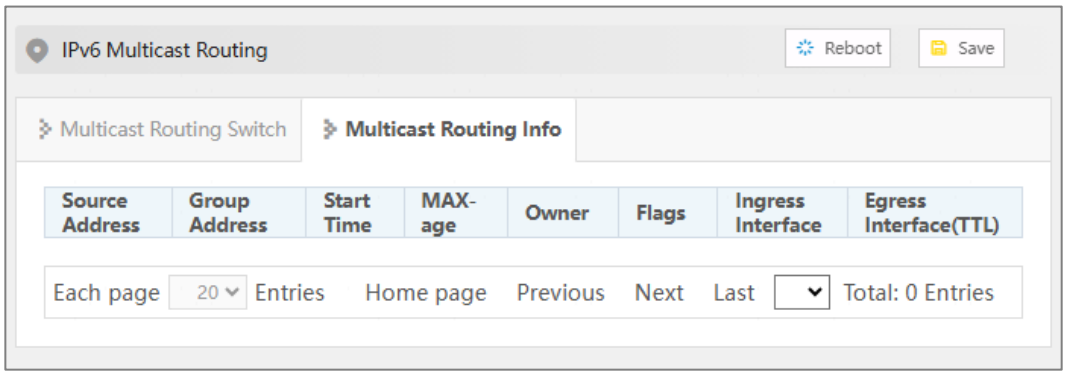
Operation Path

Open in order: "Multicast Routing > IPV6 Multicast Routing > Multicast Routing Information".

Copyright © 3onedata Co., Ltd.

Interface Description

The multicast routing information interface is as follows:



Main elements of the multicast routing information interface:

Interface Element	Description
Source Address	Multicast source address
Group Address	Multicast group address
Start Time	The existed time of the multicast route.
MAX-age	Multicast routing aging time.
Owner	The owner of a multicast route may be a multicast routing protocol.
Flags	Multicast routing protocol flag: • I: Immediate Stat (Immediately the statistics) • T: Timed Stat (Statistics Timer) • F: Forwarder installed (Set to forward table)
Ingress Interface	Multicast data ingress interface. The interface on the local device that receives multicast data.
Egress Interface (TTL)	Multicast data egress interface. The interface that forwards multicast data out.

8.3 IGMP Snooping

8.3.1 Interface Configuration

Function Description

Configure the IGMP parameters of VLANIF interface.

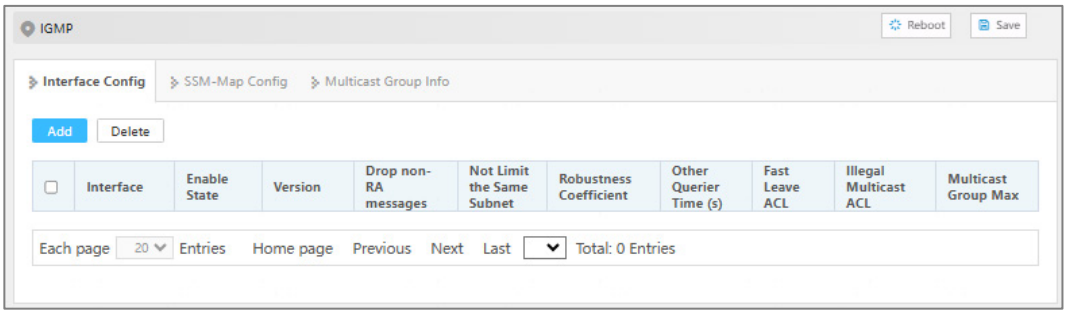
Copyright © 3onedata Co., Ltd.

Operation Path

Open in order: "Multicast Routing > IGMP > Interface Configuration".

Interface Description

Interface configuration interface is as follows:



The main element configuration description of interface configuration interface:

Interface Element	Description
Interface	Layer 3 interface, such as vlanif1.
Enable State	IGMP status: • enable • disable
Version	IGMP version, options are: • 1: IGMPv1, it defines the basic querying and reporting process of group members; • 2: IGMPv2, it adds the mechanism of polling and leaving group members on IGMPv1; • 3: IGMPv3, members are added to IGMPv2 to specify whether to receive or not to receive messages from certain multicast sources.
Drop non-RA messages	RA(Router-Alert). When a network device receives a message, only the message whose destination IP address is the interface address of the device will be sent to the corresponding protocol module for processing. If the destination address of the protocol message is not the interface address of the device, check whether the IP message header carries the Router-Alert option, if so, it will be directly sent to the corresponding protocol module for processing without checking the destination address. Note: For compatibility reasons, after receiving IGMP message, the current switch will send it to IGMP protocol module for processing by default regardless of whether its IP header contains Router-Alert

Copyright © 3onedata Co., Ltd.

Interface Element	Description
	option.
Not Limit the Same Subnet	Limit the multicast source and interface to the same subnet, otherwise the port cannot receive multicast messages.
Robustness Coefficient	Specify the robustness of the IGMP query, ranging from 2 to 7. This coefficient is used to specify the default number of times the IGMP query sends the universal group query message at startup and the number of times the IGMP query sends the specific group query message after receiving the outgoing group message.
Other Querier Time (s)	Timer time of non-inquirer. • Before the timer expires, if the inquiry message from the inquirer is received, reset the timer; • Otherwise, the original inquirer is considered invalid, and a new inquirer election process is initiated.
Fast Leave ACL	By default, when the interface works in IGMP v2 or v3, after receiving IGMP leave message, it will send a specific group query message to determine whether to age multicast member entries. After configuring the fast leave ACL, if the group address specified by the leave message is within the group address range specified by the ACL, the multicast member table entry can be aged immediately.
Illegal Multicast ACL	List of restricted multicast groups.
Multicast Group Max	The maximum number of multicast supported.

8.3.2 SSM-Map Configuration

SSM (Source-Specific Multicast) requires routers to know the multicast source designated by member hosts when they join the multicast group. A host running IGMPv3 can specify multicast source addresses in IGMPv3 Report messages. However, hosts running IGMPv1 or IGMPv2 rely on the IGMP SSM mapping function to obtain the SSM service.

Copyright © 3onedata Co., Ltd.

The mechanism of IGMP SSM Mapping is: by statically configuring SSM address Mapping rules on the router, information in IGMPv1 and IGMPv2 report packets is converted into corresponding information to provide SSM multicast service.

After the configuration of SSM Mapping rules, when the IGMP query receives the IGMPv1 or IGMPv2 report packets from the member host, it first checks the multicast group addresses carried in the paper, and then processes them separately according to the different inspection results.

- If the Multicast group is within the range of ANY-Source Multicast, then only ASM services are provided.
- If the multicast group is within the SSM group address range (the default is 232.0.0.0 ~ 232.255.255.255):
  - If the router does not have the SSM Mapping rule corresponding to the multicast group, the SSM service cannot be provided and the article is discarded.
  - If there are SSM Mapping rules corresponding to the multicast group on the router, according to the rules, the information contained in the report packet (member, multicast group) will be mapped to (multicast group, INCLUDE, member) information, and SSM service will be provided.

Function Description

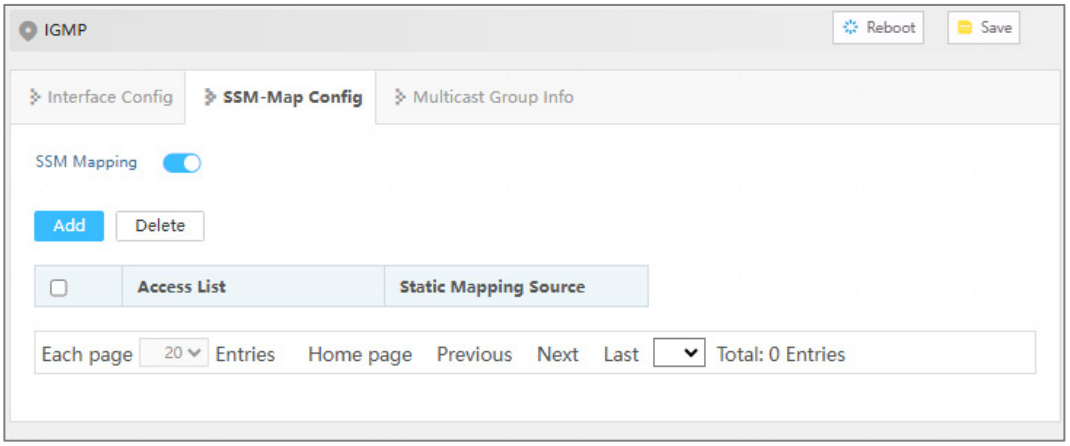
Configure SSM Mapping rule.

Operation Path

Open in order: "Multicast Routing > IGMP > SSM-Map Configuration".

Interface Description

The SSM-Map configuration interface is as follows:



Main element configuration description of SSM-Map configuration interface:

Copyright © 3onedata Co., Ltd.

Interface Element	Description
SSM Mapping	IGMP SSM Mapping Enable switch.
Access List	Access list.
Static Mapping Source	The specified multicast source address in the access list.

8.3.3 Multicast Group Information

Function Description

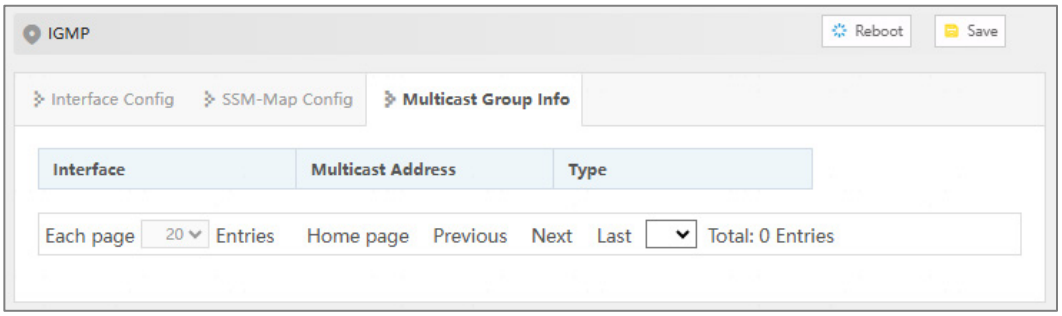
Display the multicast information received by the device interface.

Operation Path

Open in order: "Multicast Routing > IGMP > Multicast Group Information".

Interface Description

The multicast group information interface is as follows:



Main element configuration description of multicast group information interface:

Interface Element	Description
Interface	Ethernet port.
Multicast Address	The multicast address received by the interface.
Type	Multicast type: • dynamic • static

8.4 IPv6 MLD

MLD (Multicast Listener Discovery) is a protocol responsible for IPv6 multicast member management, which is used to establish and maintain the multicast group

Copyright © 3onedata Co., Ltd.

member relationship between IPv6 member hosts and their immediate neighboring multicast routers. MLD realizes the group member management function by interacting MLD messages between member hosts and multicast routers, and the MLD messages are encapsulated in IPv6 messages.

8.4.1 Interface Configuration

Function Description

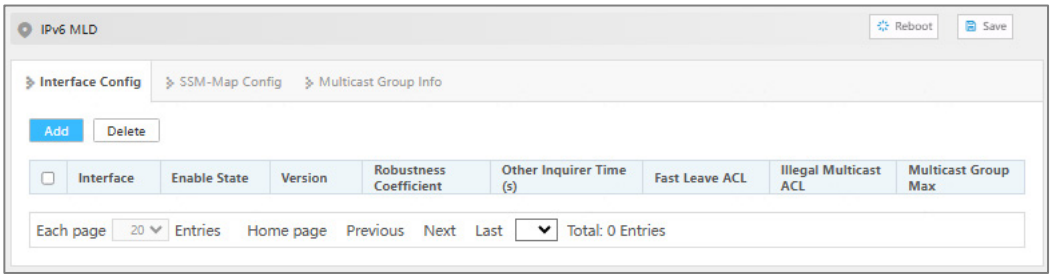
Configure MLD parameters of VLANIF interface.

Operation Path

Open in order: "Multicast Routing > IPv6 MLD > Interface Configuration".

Interface Description

Interface configuration interface is as follows:



The main element configuration description of interface configuration interface:

Interface Element	Description
Interface	Layer 3 interface, such as vlanif1.
Enable State	The MLD enabled status can be displayed as follows: • enable • disable
Version	MLD version, options are: • 1: the working mechanism of MLDv1 is the same as that of IGMPv2. • 2. based on MLDv1, the main function of MLDv2 is that member hosts can specify whether to receive or not to receive messages from some multicast sources, corresponding to IGMPv3.
Robustness Coefficient	Specify the robustness of the MLD query, ranging from 2 to 7. This coefficient is used to specify the default number of times the IGMP query sends the universal group query message at

Copyright © 3onedata Co., Ltd.

Interface Element	Description
	startup and the number of times the IGMP query sends the specific group query message after receiving the outgoing group message.
Other Inquirer Time (s)	Live time of other queriers If the non-inquirer fails to receive the inquiry message within the "life time of other MLD inquirers", the inquirer will be deemed invalid and the inquirer election will be automatically initiated.
Fast Leave ACL	By default, after receiving MLD leave message, it will send a specific group query message to determine whether to age multicast member entries. After configuring the fast leave ACL, if the group address specified by the leave message is within the group address range specified by the ACL, the multicast member table entry can be aged immediately.
Illegal Multicast ACL	List of restricted multicast groups.
Multicast Group Max	The maximum number of multicast supported.

8.4.2 SSM-Map Configuration

SSM (Source-Specific Multicast) requires routers to know the multicast source designated by member hosts when they join the multicast group. A host running MLDv2 can specify multicast source addresses in MLDv2 Report messages. However, in some cases, member hosts can only run MLDv1. In order to enable them to use SSM services, the router needs to provide MLD SSM Mapping function.

Function Description

Configure MLD SSM Mapping rules.

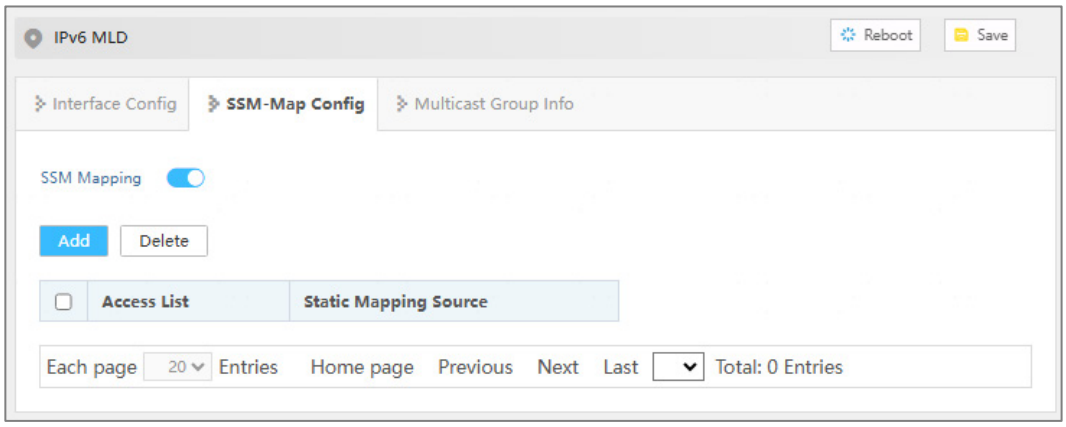
Operation Path

Open in order: "Multicast Routing > IPv6 MLD > SSM-Map Configuration”.

Interface Description

The SSM-Map configuration interface is as follows:

Copyright © 3onedata Co., Ltd.



Main element configuration description of SSM-Map configuration interface:

Interface Element	Description
SSM Mapping	MLD SSM Mapping enable switch.
Access List	Access list.
Static Mapping Source	The specified multicast source IPv6 address in the access list.

8.4.3 Multicast Group Information

Function Description

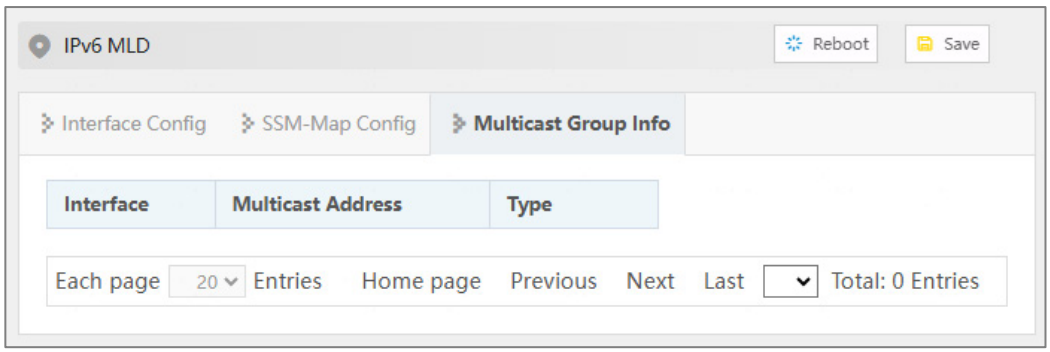
Display the multicast information received by the device interface.

Operation Path

Open in order: "Multicast Routing > IPv6 MLD > Multicast Group Information".

Interface Description

The multicast group information interface is as follows:



Main element configuration description of multicast group information interface:

Copyright © 3onedata Co., Ltd.

Interface Element	Description
Interface	Ethernet port.
Multicast Address	The multicast address received by the interface.
Type	Multicast type: • dynamic • static

8.5 PIM-SM

PIM (Protocol Independent Multicast) is unrelated to unicast routing protocol, it uses the routing information of unicast routing table to perform RPF (Reverse Path Forwarding) check on multicast messages, and creates multicast routing table entries after passing the check, thus forwarding multicast messages.

PIM protocol include: PIM-DM (PIM-Dense Mode) and PIM-SM (PIM-Sparse Mode).

PIM-SM is a multicast routing protocol in sparse mode, which uses "Pull mode" to transmit multicast data. It is usually suitable for large and medium-sized networks with relatively scattered multicast group members and a wide range. Its basic principle is as follows:

- PIM-SM assumes that all hosts do not need to receive multicast data, but only forward it to the hosts that explicitly propose that they need multicast data. The core task of PIM-SM to realize multicast forwarding is to construct and maintain RPT (Rendezvous Point Tree). RPT selects a router in PIM domain as a common root node RP (Rendezvous Point), and multicast data is forwarded to receivers along RPT through RP.
- The router connecting the receiver sends a Join Message to the RP corresponding to a multicast group, and the message is delivered to the RP hop by hop, and the path it passes forms a branch of RPT;
- If a multicast source wants to send multicast data to a multicast group, the DR (Designated Router (DR) on the multicast source side is responsible for registering with the RP, and sending a Register Message to the RP by unicast, which triggers the establishment of SPT after reaching the RP. After that, the multicast source sends the multicast data to RP along SPT. When the multicast data reaches RP, it is copied and sent to the receiver along RPT.

The working mechanism of PIM-SM can be summarized as follows:

- Neighbor Discovery

Copyright © 3onedata Co., Ltd.

- DR election
- RP Discovery
- Construct RPT
- Multicast source note
- SPT Switchover
- Assertion

8.5.1 Global Configuration

Function Description

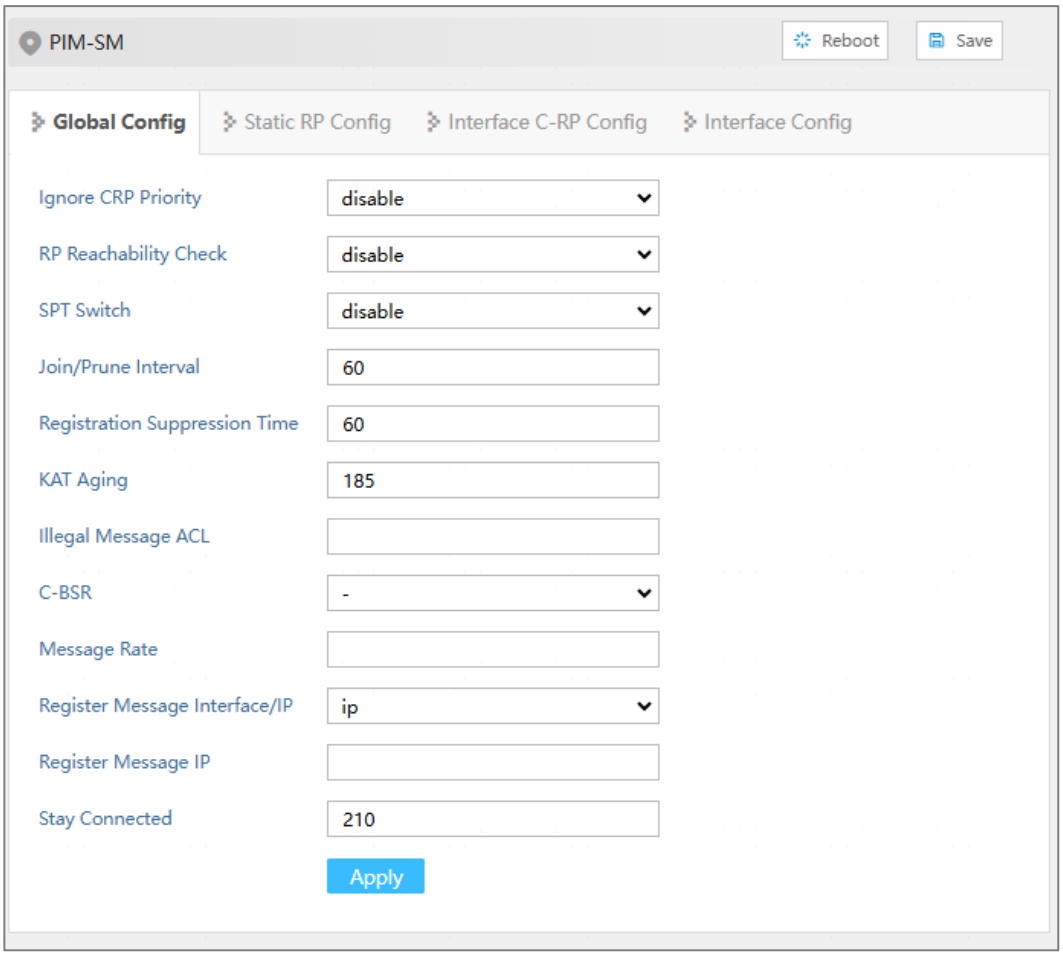
Configure global parameters of PIM-SM.

Operation Path

Open in order: "Multicast Routing > PM-SM > Global Configuration".

Interface Description

Global configuration interface is as follows:



The main element configuration description of global configuration interface:

Copyright © 3onedata Co., Ltd.

Interface Element	Description
Ignore CRP Priority	When selecting the RP corresponding to multicast, whether to ignore the priority of CRP and choose according to IP address. The one with the larger IP address is elected.
RP Reachability Check	Whether it is necessary to check the reachability of RP when sending the registration message; if it is not, it means that it cannot be registered.
SPT Switch	RP is a necessary transit station for all multicast messages. when the multicast message rate gradually increases, it will create a huge burden on RP. PIM-SM allows RP or group member DR to reduce the burden of RP by triggering SPT switching.
Join/Prune Interval	Time interval for PIM router to send join/pruning messages.
Registration Suppression Time	The time interval from receiving the registration stop message to resend the registration message, the value range is 1~65535s.
KAT Aging	The aging time of KAT timer after receiving the registration message ranges from 1 to 65535 in seconds. Note: By default, after receiving the registration message, the aging time of KAT timer = registration inhibition time * 3+registration detection time.
Illegal Message ACL	Configure illegal neighbor source address range. Note: By default, there are no restrictions on the neighbor source addresses that an interface can learn from.
C-BSR	C-BSR interface configuration. • vlanif: vlanif interface • loopback: loopback interface
Message Rate	The rate of receiving and processing multicast service messages ranges from 1 to 65535, and the unit is one/second.
Register Message Interface / IP	The VLAN interface, source IP address or loopback interface that sends the registration message.
Register Message IP	The source IP address of the registered message.
Stay Connected	Multicast source lifetime, ranging from 60-65535 seconds.

Copyright © 3onedata Co., Ltd.

8.5.2 Static RP Configuration

Function Description

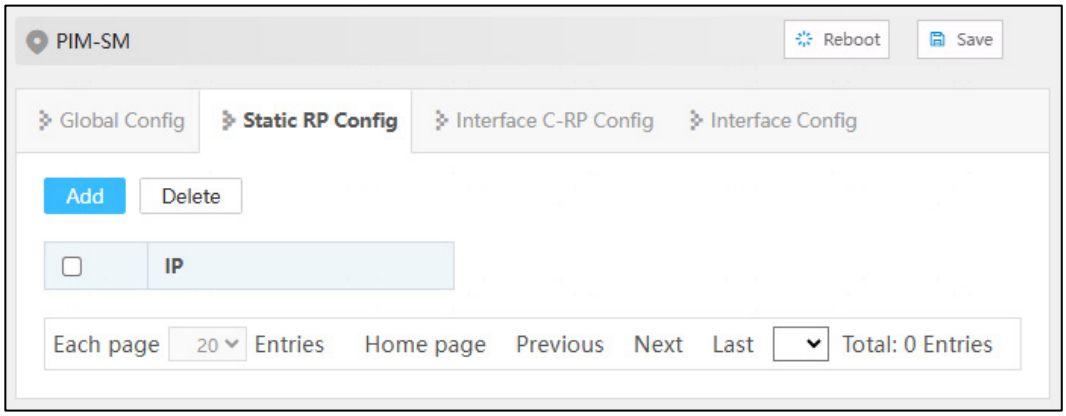
Set static RP manually.

Operation Path

Open in order: "Multicast Routing > PIM-SM > Static RP Configuration".

Interface Description

Static RP configuration interface is as follows:



The main element configuration description of static RP configuration interface:

Interface Element	Description
IP	Configure the IP address of the static RP. Note: • The address must be a legal unicast IP address, and should not be configured as the address of the 127.0.0.0/8 network segment. • When there is only one RP in the network, static RP can be manually configured instead of dynamic RP, which can avoid the frequent information interaction between C-RP and BSR occupying bandwidth.

8.5.3 C-RP Configuration of Interface

Function Description

Add and delete C-RP interfaces.

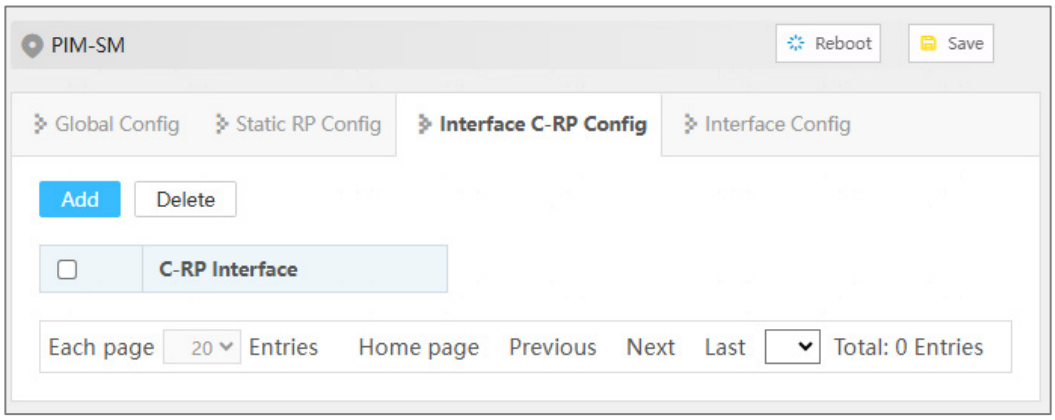
Operation Path

Open in order: "Multicast Routing > PM-SM > Interface C-RP Configuration".

Copyright © 3onedata Co., Ltd.

Interface Description

The interface C-RP configuration interface is as follows:



Main element configuration description of interface C-RP configuration interface:

Interface Element	Description
C-RP interface	To configure the C-RP interface: • vlanif: vlanif interface • loopback: loopback interface

8.5.4 Interface Configuration

Function Description

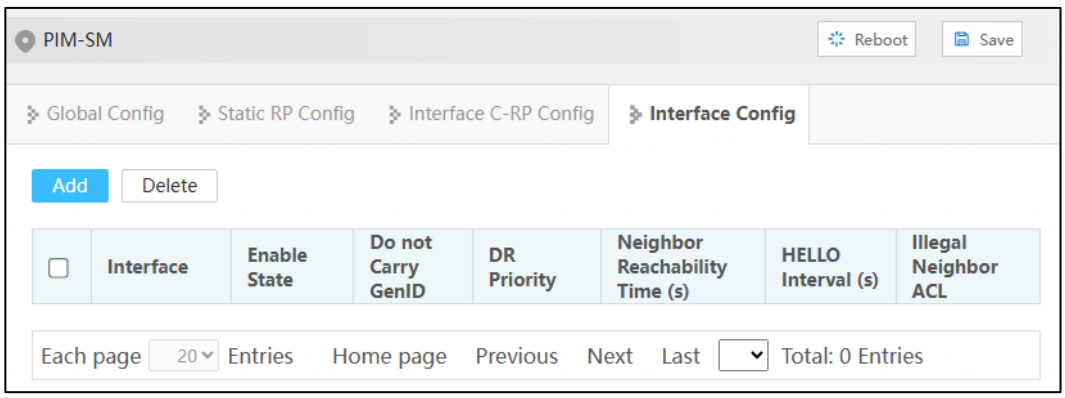
Set interface PIM-SM parameters.

Operation Path

Open in order: "Multicast Routing > PM-SM > Interface Config".

Interface Description

Interface configuration interface is as follows:



Copyright © 3onedata Co., Ltd.

The main element configuration description of interface configuration interface:

Interface Element	Description
Interface	Configure interface: • vlanif: vlanif interface • loopback: loopback interface
Do not Carry GenID	The interface is configured to send hello messages without carrying GenID information. Note: GenID is a random value at the initial creation of the interface to identify unique interface information. With this information, users can detect whether the neighbor device has been restarted.
DR Priority	Specify the priority of running for DR from 0 to 4294967294. Note: The higher the value, the higher the priority.
Neighbor Reachability Time (s)	Specify the time to keep PIM neighbor reachable, the value range is 1 ~ 65535, and the unit is seconds. Note: If specified as 65535 seconds, the PIM neighbor is always reachable.
Hello Interval (s)	Time period for sending Hello messages between PIM routers.
Illegal Neighbor ACL	Illegal neighbor source address range.

8.6 PIM-DM

PIM-DM is a multicast routing protocol in dense mode, which uses "Push mode" to transmit multicast data. It is usually suitable for small networks with relatively dense multicast group members. Its basic principle is as follows:

- PIM-DM assumes that each subnet in the network has at least one multicast group member, so multicast data will be Flooding to all nodes in the network. Then, PIM-DM prune the branches without multicast data forwarding, leaving only the branches containing receivers. This "Flooding-Prune" phenomenon occurs periodically, and the pruned branches can also be restored to forwarding status periodically.
- In order to reduce the time required for the node to return to the forwarding state when the multicast group members appear on the branched node, PIM-DM actively resumes its forwarding of multicast data by using the Graft mechanism.

Copyright © 3onedata Co., Ltd.

The forwarding path of data packets in dense mode is a Source Tree (a forwarding tree with multicast source as its root and multicast group members as its branches and leaves). Source Tree is also called SPT (Shortest Path Tree) because it uses the shortest path from multicast source to receiver.

The working mechanism of PIM-DM can be summarized as follows:

- Neighbor Discovery
- Build SPT
- Graft
- Assertion

Function Description

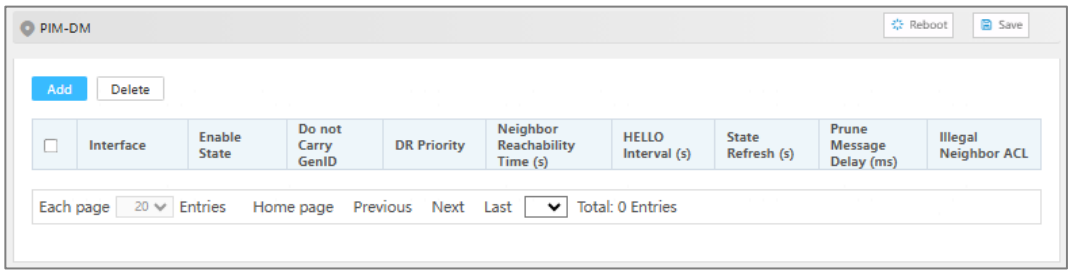
Configure PIM-DM parameters.

Operation Path

Open in order:"Multicast Routing > PIM-DM".

Interface Description

PIM-DM interface is as below:



Main elements configuration descriptions of PIM-DM interface:

Interface Element	Description
Interface	Configure interface: • vlanif: vlanif interface • loopback: loopback interface
Enable State	Enable status of interface PIM-DM.
Do not Carry GenID	The interface is configured to send hello messages without carrying GenID information. Note: GenID is a random value at the initial creation of the interface to identify unique interface information. With this information, users can detect whether the neighbor device has been restarted.
DR Priority	Specify the priority of running for DR from 0 to 4294967294. Note: The higher the value, the higher the priority.
Neighbor	Specify the time to keep PIM neighbor reachable, the value

Copyright © 3onedata Co., Ltd.

Interface Element	Description
Reachability Time (s)	range is 1 ~ 65535, and the unit is seconds. Note: If specified as 65535 seconds, the PIM neighbor is always reachable.
Hello Interval (s)	Time period for sending Hello messages between PIM routers.
State Refresh (s)	The time interval for refreshing the pruning timer status, which can prevent the clipped interface from resuming forwarding due to the timeout of pruning timer, the value range is 1-100 seconds.
Prune Message Delay (ms)	The delay time of transmitting Prune message on the shared network segment, which ranges from 0 to 32767 milliseconds.
Illegal Neighbor ACL	Illegal neighbor source address range.

8.7 IPv6-PIM-SM

8.7.1 Global Configuration

Function Description

Configure global parameters of IPv6-PIM-SM.

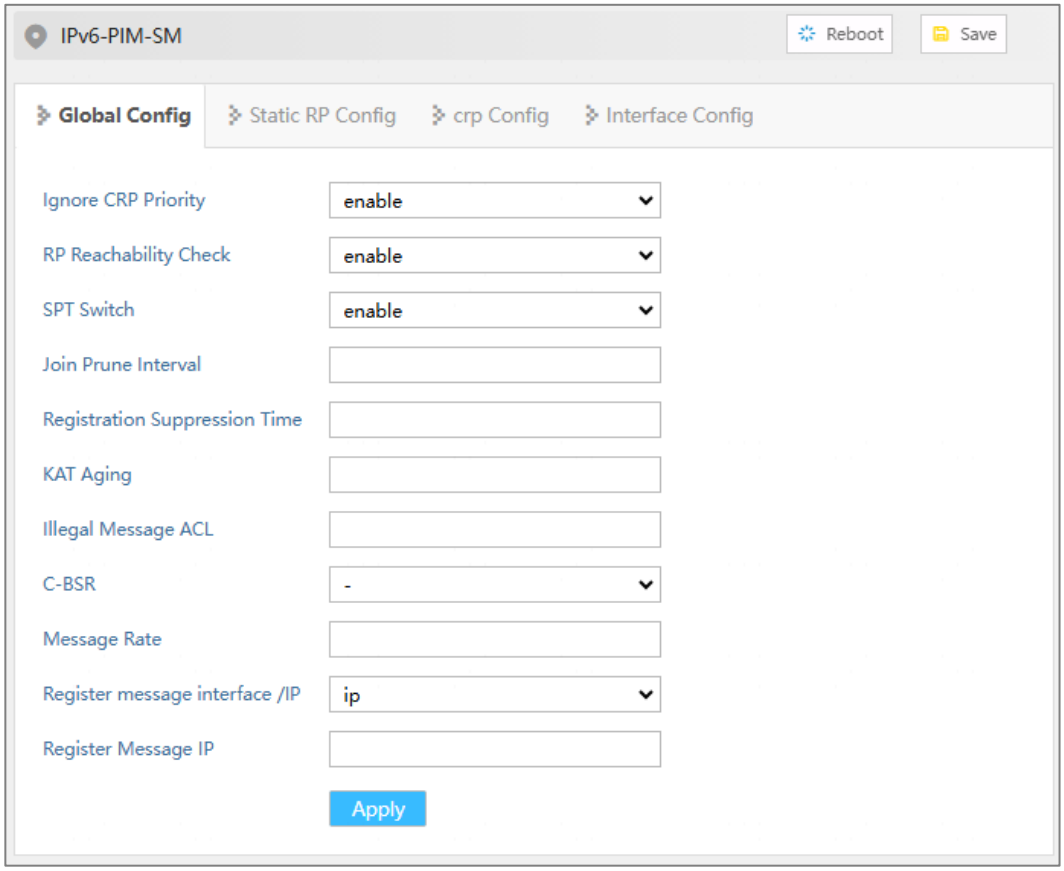
Operation Path

Open in order: "Multicast Routing > IPv6-PIM-SM > Global Configuration".

Interface Description

Global configuration interface is as follows:

Copyright © 3onedata Co., Ltd.



The main element configuration description of global configuration interface:

Interface Element	Description
Ignore CRP Priority	When selecting the RP corresponding to multicast, whether to ignore the priority of CRP and choose according to IP address. The one with the larger IP address is elected.
RP Reachability Check	Whether it is necessary to check the reachability of RP when sending the registration message; if it is not, it means that it cannot be registered.
SPT Switch	RP is a necessary transit station for all multicast messages. when the multicast message rate gradually increases, it will create a huge burden on RP. PIM-SM allows RP or group member DR to reduce the burden of RP by triggering SPT switching.
Join/Prune Interval	Time interval for PIM router to send join/pruning messages.
Registration Suppression Time	The time interval from receiving the registration stop message to resend the registration message, the value range is 1 ~ 65535s.
KAT Aging	The aging time of KAT timer after receiving the registration message ranges from 1 to 65535 in seconds.

Copyright © 3onedata Co., Ltd.

Interface Element	Description
	Note: By default, after receiving the registration message, the aging time of KAT timer = registration inhibition time * 3+registration detection time.
Illegal Message ACL	Configure illegal neighbor source address range. Note: By default, there are no restrictions on the neighbor source addresses that an interface can learn from.
C-BSR	C-BSR interface configuration. • vlanif: vlanif interface • loopback: loopback interface
Message Rate	The rate of receiving and processing multicast service messages ranges from 1 to 65535, and the unit is one/second.
Register message interface / IP	The VLAN interface, source IP address or loopback interface that sends the registration message.
Register Message IP	The source IP address of the registered message.

8.7.2 Static RP Configuration

Function Description

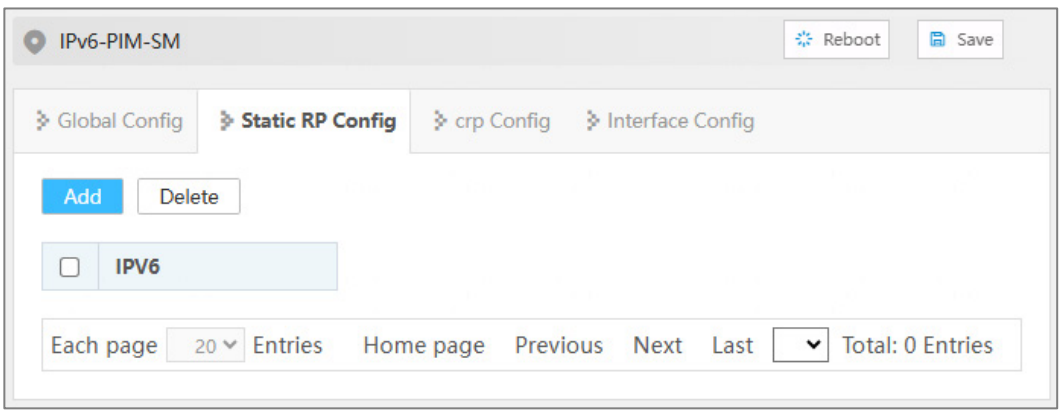
Set static RP manually.

Operation Path

Open in order: "Multicast Routing > IPv6-PIM-SM > Static RP Configuration".

Interface Description

Static RP configuration interface is as follows:



Copyright © 3onedata Co., Ltd.

The main element configuration description of static RP configuration interface:

Interface Element	Description
IPV6	Configure the IPv6 address of the static RP. Note: When there is only one RP in the network, static RP can be manually configured instead of dynamic RP, which can avoid the frequent information interaction between C-RP and BSR occupying bandwidth.

8.7.3 C-RP Configuration of Interface

Function Description

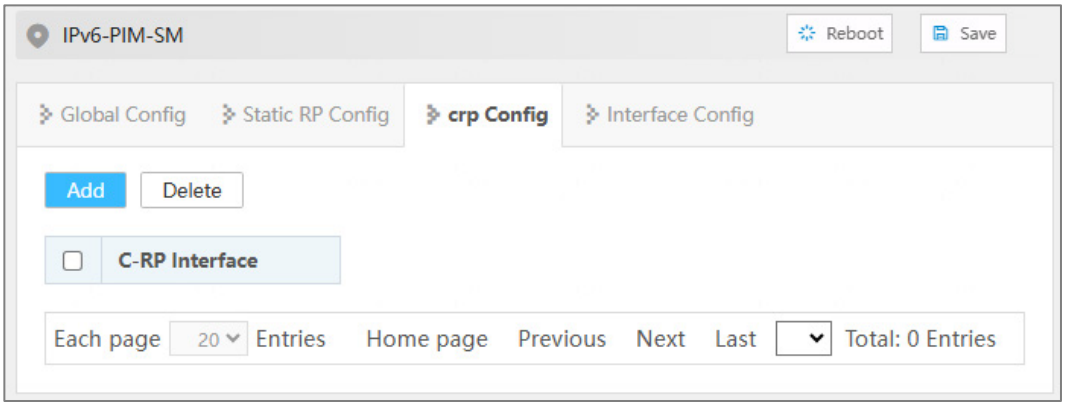
Add and delete C-RP interfaces.

Operation Path

Open in order: "Multicast Routing > IPv6-PIM-SM > Interface C-RP Configuration".

Interface Description

The interface C-RP configuration interface is as follows:



Main element configuration description of interface C-RP configuration interface:

Interface Element	Description
C-RP Interface	To configure the C-RP interface: • vlanif: vlanif interface

8.7.4 Interface Configuration

Function Description

Set interface IPv6-PIM-SM parameters.

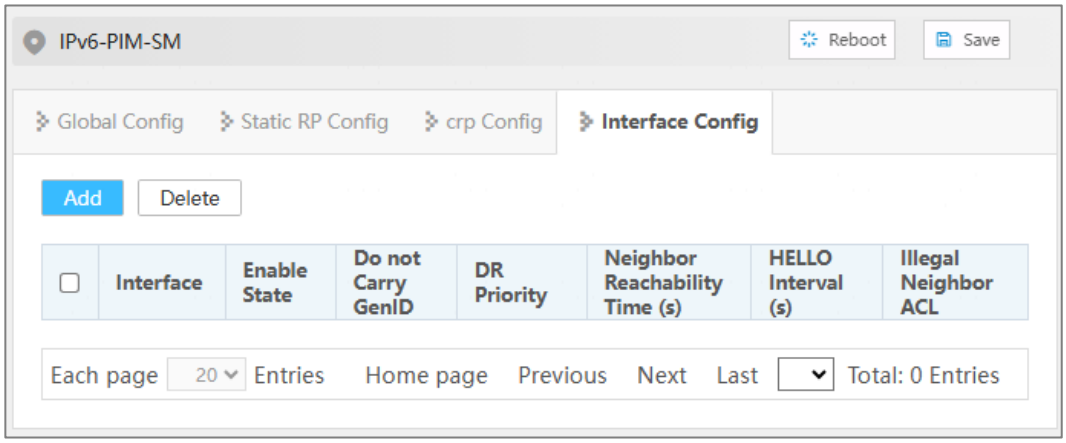
Copyright © 3onedata Co., Ltd.

Operation Path

Open in order: "Multicast Routing > IPv6-PIM-SM > Interface Configuration".

Interface Description

Interface configuration interface is as follows:



The main element configuration description of interface configuration interface:

Interface Element	Description
Interface	Configure interface: • vlanif: vlanif interface
Enable State	PIM-SM status. • enable • disable
Do not Carry GenID	The interface is configured to send hello messages without carrying GenID information. Note: GenID is a random value at the initial creation of the interface to identify unique interface information. With this information, users can detect whether the neighbor device has been restarted.
DR Priority	Specify the priority of running for DR from 0 to 4294967294. Note: The higher the value, the higher the priority.
Neighbor Reachability Time (s)	Specify the time to keep PIM neighbor reachable, the value range is 1 ~ 65535, and the unit is seconds. Note: If specified as 65535 seconds, the PIM neighbor is always reachable.
Hello Interval (s)	Time period for sending Hello messages between PIM routers.
Illegal Neighbor ACL	Illegal neighbor source address range.

Copyright © 3onedata Co., Ltd.

8.8 Enable IPv6 PIM-DM

Function Description

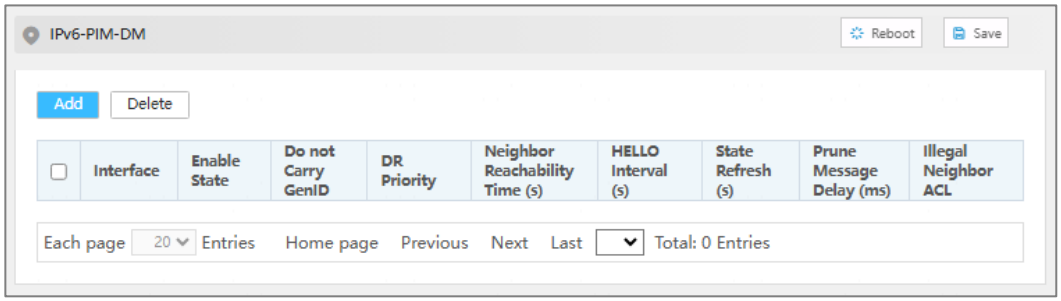
Configure IPv6-PIM-DM parameter.

Operation Path

Open in order:"Multicast Routing > IPv6-PIM-DM".

Interface Description

IPv6-PIM-DM interface is as below:



Main elements configuration descriptions of IPv6-PIM-DM interface:

Interface Element	Description
Interface	Configure interface: • vlanif: vlanif interface
Enable State	Enable status of interface PIM-DM.
Do not Carry GenID	The interface is configured to send hello messages without carrying GenID information. Note: GenID is a random value at the initial creation of the interface to identify unique interface information. With this information, users can detect whether the neighbor device has been restarted.
DR Priority	Specify the priority of running for DR from 0 to 4294967294. Note: The higher the value, the higher the priority.
Neighbor Reachability Time (s)	Specify the time to keep PIM neighbor reachable, the value range is 1 ~ 65535, and the unit is seconds. Note: If specified as 65535 seconds, the PIM neighbor is always reachable.
Hello Interval (s)	Time period for sending Hello messages between PIM routers.
State Refresh (s)	The time interval for refreshing the pruning timer status, which can prevent the clipped interface from resuming forwarding due to the timeout of pruning timer, the value

Copyright © 3onedata Co., Ltd.

Interface Element	Description
	range is 1-100 seconds.
Prune Message Delay (ms)	The delay time of transmitting Prune message on the shared network segment, which ranges from 0 to 32767 milliseconds.
Illegal Neighbor ACL	Illegal neighbor source address range.

Copyright © 3onedata Co., Ltd.

9 Network Management

9.1 ACL

The ACL (Access Control List) is a set composed of one or more rules. Rule refers to the judgment statement describing the message matching condition. These conditions may be the source address, destination address, port number of message. ACL can realize accurate identification and control of message flow in the network, and achieve the purpose of controlling network access behavior, preventing network attacks and improving network bandwidth utilization, thus ensuring the security of network environment and the reliability of network service quality.

9.1.1 ACL effective period configuration

Function Description

On the "ACL Effective Period Configuration" page, you can configure the effective period of ACL rules.

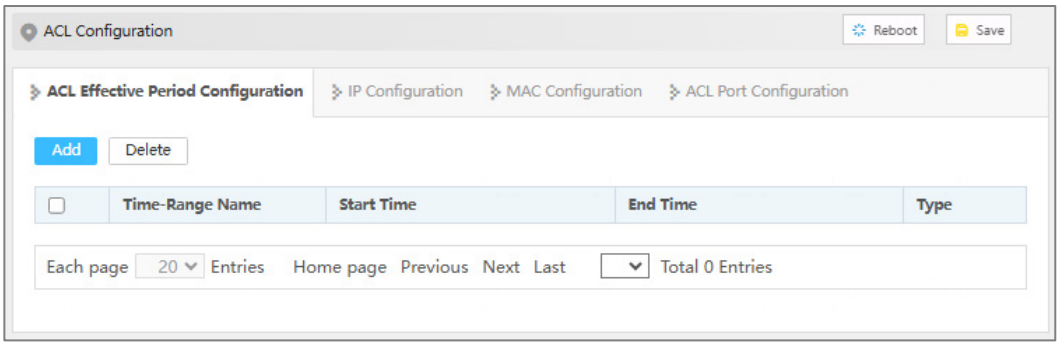
Operation Path

Open in order: "Network > ACL > ACL Effective Period Configuration".

Interface Description

ACL Effective Period Configuration interface is as follows:

Copyright © 3onedata Co., Ltd.



Main element configuration description of ACL Effective Period configuration interface:

Interface Element	Description
Add	Click "Add" to add time-range entry.
Delete	Check time range entry and click “Delete” button to delete specified entries in batches.
Time-Range Name	The name of the ACL valid time period, which supports absolute time and regular time.
Start Time	The start time of the absolute time or regular time range.
End Time	The end time of the absolute time or regular time range.
Type	Time type options are as follows: • Absolute Time; • Cycle Time.
Operation	Delete: Click the "Delete" button to delete the the current entry.

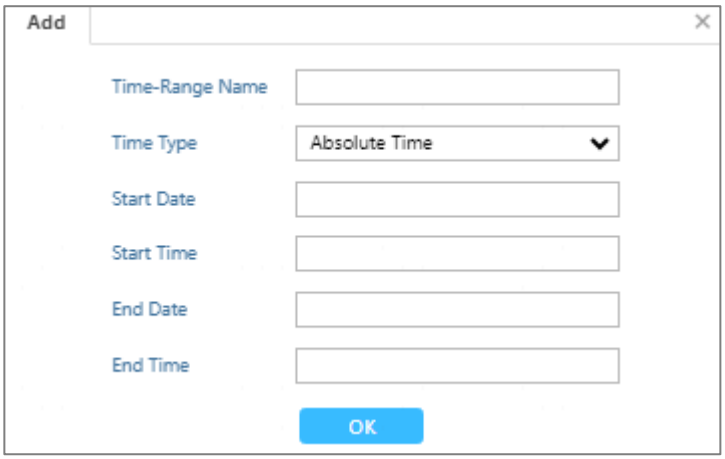
Click “Add” button to add time entry.

In the “Add” interface, check the “Absolute Time” radio box.

Interface Description 1: Add-Absolute Time

The Add-absolute time interface is as follows:

Copyright © 3onedata Co., Ltd.



The main element configuration description of Add-Absolute time interface:

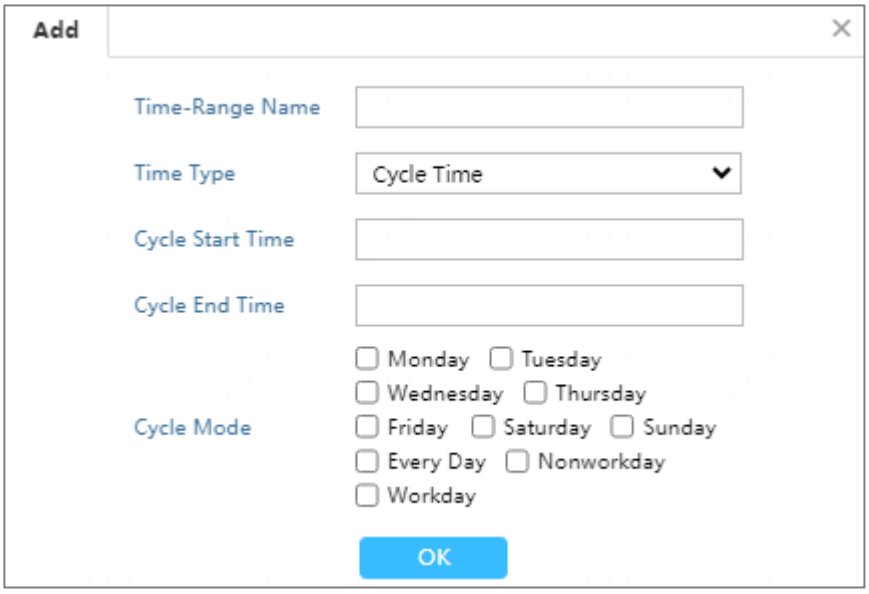
Interface Element	Description
Time-Range Name	The name of the ACL effective time period. There are two modes in the effective time period, and the options that can be checked are: • Absolute time: it starts from a certain time on a certain day of a certain year and ends at a certain time on a certain day of a certain year, which means that the rules will take effect within this time range. • Regular time: the time range is defined by taking the week or workday as the parameter, which means that the rule takes effect cyclically with a week cycle (e.g., 8: 00 to 12: 00 every Monday).
Time Type	Time type options are as follows: • Absolute Time; • Cycle Time.
Start Date	Start date of absolute time, format: YYYY-MM-DD (Year-month-day).
Start Time	The starting time of the absolute time, format: hh:mm:ss (hour:minute:second).
End Date	End date of absolute time, format: YYYY-MM-DD (Year-month-day).
End Time	End time of absolute time, format: hh:mm:ss (hour:minute:second).

In the “Add” interface, check the “Cycle Time” radio box.

Interface Description 2: Add-Cycle Time

The Add-regular time interface is as follows:

Copyright © 3onedata Co., Ltd.



The main element configuration description of Add-Cycle Time interface:

Interface Element	Description
Time-Range Name	The name of the ACL effective time period. There are two modes in the effective time period, and the options that can be checked are: • Absolute time: it starts from a certain time on a certain day of a certain year and ends at a certain time on a certain day of a certain year, which means that the rules will take effect within this time range. • Regular time: the time range is defined by taking the week or workday as the parameter, which means that the rule takes effect cyclically with a week cycle (e.g., 8: 00 to 12: 00 every Monday).
Time Type	Time type options are as follows: • Absolute Time; • Cycle Time.
Cycle Start Time	Start time range of cycle time, format: hh:mm:ss- hh:mm:ss (Hour:minute:second).
Cycle End Time	End time of cycle time, format: hh:mm:ss- hh:mm:ss (Hour:minute:second).
Cycle Mode	You can select the radio buttons for week, day, non working day, or working day, and specify the dates to be repeated. The options are as follows: • Monday • Tuesday

Copyright © 3onedata Co., Ltd.

Interface Element	Description
	• Wednesday • Thursday • Friday • Saturday • Sunday • every day • non-working day • workday

9.1.2 IP Configuration

Function Description

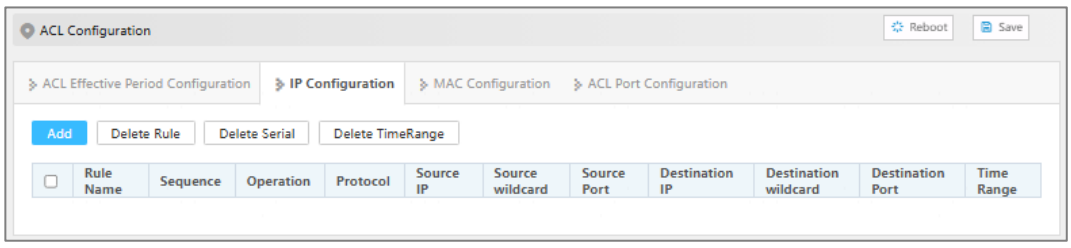
On the "IP ACL Configuration" page, user can configure IP ACL rule. Users can assign numbers to ACLs when creating them, and different numbers correspond to different types of ACLs. At the same time, in order to facilitate memory and identification, users can also create named ACLs, that is, when creating ACLs, set their names.

Operation Path

Open in order: "Network > ACL > IP Configuration".

Interface Description

The IP configuration interface is as follows:



Main element configuration description of IP configuration interface:

Interface Element	Description
Add	Click "Add" to add IP entry.
Delete Rule	Check rule entry and click “Delete” button to delete specified entries in batches.
Delete Serial	Check rule entry and click “Delete sequence” button to delete specified entries in batches.

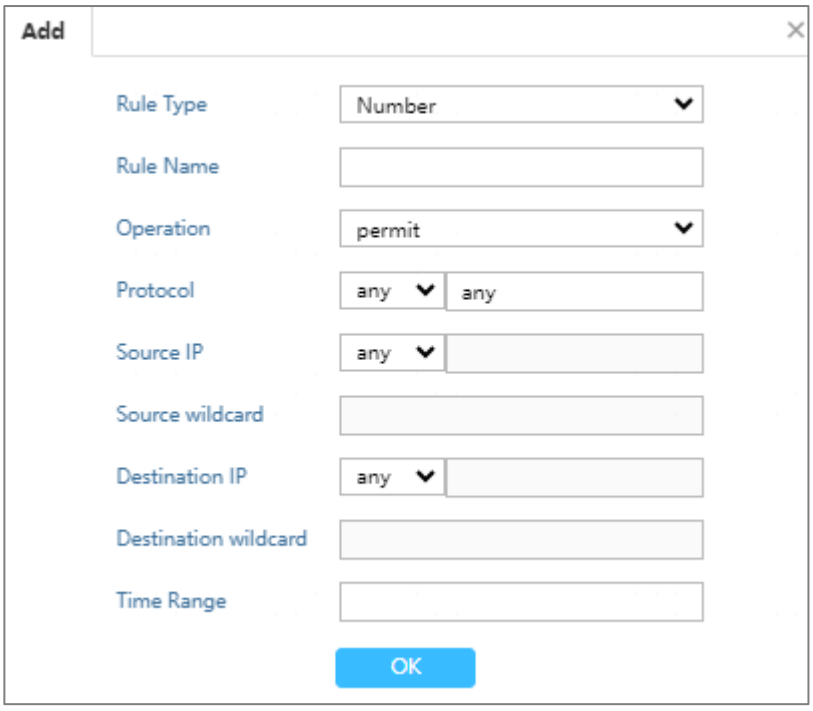
Copyright © 3onedata Co., Ltd.

Interface Element	Description
Delete TimeRange	Clear rule entries that have already been bound to TimeRange.
Rule Name	IP rule name or number.
Sequence	The content of different rules under the same rule name. Note: A maximum of 32 sequences are supported under the same rule name.
Operation	The actions of IP rules, including permit/deny, indicate permission/deny.
Protocol	Protocol type of data packets.
Source IP	Source IP address information of the packet.
Source wildcard	Source IP address wildcard mask.
Source Port	Source IP address port number
Destination IP	Destination IP address information of the packet.
Destination wildcard	Destination IP address wildcard mask.
Destination Port	Destination IP address port number
Time Range	The name of the effective period of the IP rule.

Click “Add” button to add IP rule entry.

Interface Description: Add

The interface of Add is as follows:



Copyright © 3onedata Co., Ltd.

The main elements configuration description of “Add” interface:

Interface Element	Description
Rule Type	The drop-down list of IP rule type. The options are: • Name: ACL is identified by name instead of number. • Number: When creating an ACL, specify a unique number to identify the ACL.
Rule Name	IP rule name or number. When the rule type is name, it supports the combination of @, !, _, numbers and letters that does not exceed 16 digits. When the rule type is number, 1-199 or 1300-2699 is supported. Note: • Standard ACL (1-99, 1300-1999): Only the source IP address, fragmentation information and effective time period information of the message are used to define the rule. • Extended ACL (100-199, 2000-2699): both the source IP address of IPv4 message and the destination IP address, protocol type and effective time period can be used to define rules.
Operation	The action drop-down list of ACL rules. The options are: • Permit • Deny
Protocol	The protocol type of extended ACL rules, support filtering messages based on protocol type, and the value range of protocol number is 0-255. You can click the drop-down list of “Protocol” to select an existing agreement name.
Source IP	The source IP address information of the packet, such as 192.168.1.1. No input indicates any IP address.
Source wildcard	Wildcard mask of source IP address, such as 0.0.0.255. The wildcard mask of IP address is a 32-bit numeric string used to indicate which bits in IP address will be checked. "0" means "check the corresponding bit", and "1" means "do not check the corresponding bit".
Destination IP	The destination IP address information of the packet, such as 192.168.1.1. No input indicates any IP address.
Destination wildcard	Wildcard mask of destination IP address, such as 0.0.0.255. The wildcard mask of IP address is a 32-bit numeric string used to indicate which bits in IP address will be checked. "0" means "check the corresponding bit", and "1" means "do not check the corresponding bit".

Copyright © 3onedata Co., Ltd.

Interface Element	Description
Time Range	The name of the effective period of the IP rule.

9.1.3 MAC Configuration

Function Description

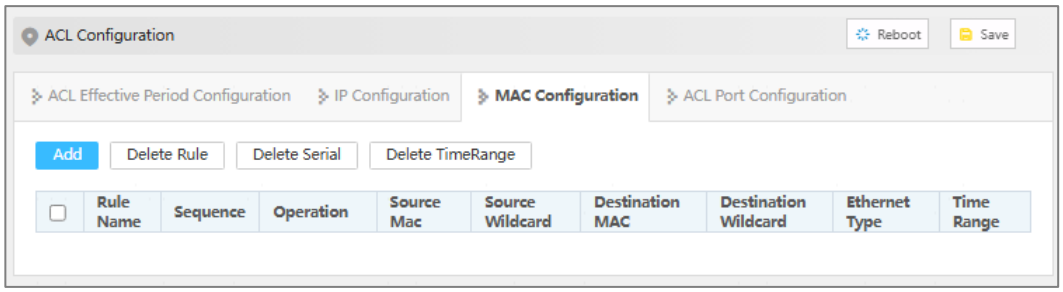
On the “MAC Configuration” page, you can create MAC rules. The layer-2 ACL uses the Ethernet header information of the message to define rules, such as according to the source MAC (Media Access Control) address, destination MAC address, etc.

Operation Path

Open in order: "Network > ACL > MAC Configuration".

Interface Description

The MAC configuration interface is as follows:



Main element configuration description of MAC configuration interface:

Interface Element	Description
Add	Click "Add" to add MAC rule.
Delete Rule	Check rule entry and click “Delete rule” button to delete specified entries in batches.
Delete Serial	Check rule entry and click “Delete sequence” button to delete specified entries in batches.
Delete TimeRange	Clear rule entries that have already been bound to TimeRange.
Rule Name	Mac rule number.
Sequence	The content of different rules under the same rule name. Note: A maximum of 32 sequences are supported under the same rule name.
Operation	The actions of MAC rules, including permit/deny, indicate permission/deny.

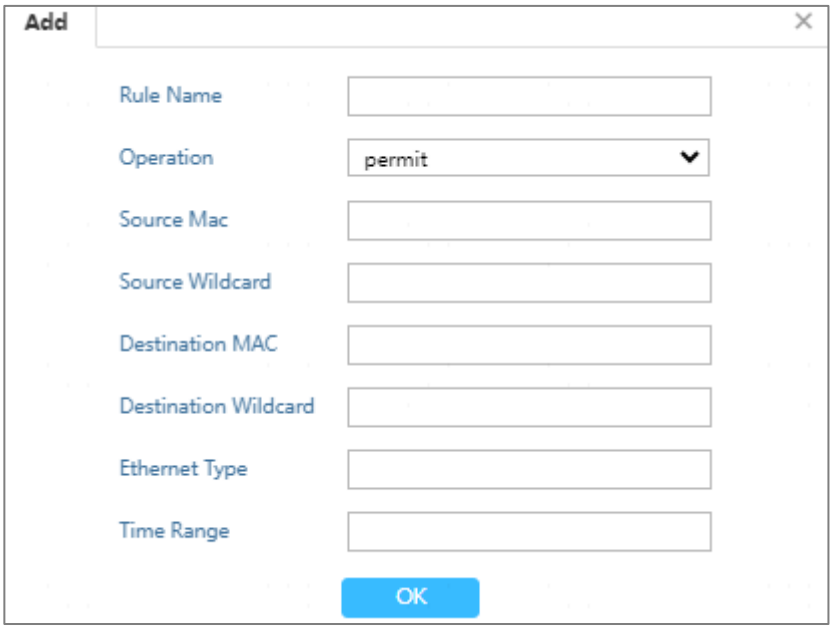
Copyright © 3onedata Co., Ltd.

Interface Element	Description
Source MAC	Source MAC address information of the packet.
Source Wildcard	Source MAC address wildcard mask.
Destination MAC	Destination MAC address information of the packet.
Destination Wildcard	Destination MAC address wildcard mask.
Ethernet Type	Ethernet type of packet.
Time Range	The name of the effective period of the MAC rule.

Click “Add” button to add IP MAC rule entry.

Interface Description: Add

The interface of Add is as follows:



The main elements configuration description of “Add” interface:

Interface Element	Description
Rule Name	MAC rule number, the value range is 100-199 or 2000-2699.
Operation	The action drop-down list of ACL rules. The options are: • Permit • Deny
Source MAC	The source MAC address information of the packet, such as 0001.0001.0001. No input indicates any MAC address.
Source Wildcard	Wildcard mask of source MAC address, such as 0001.0001.0001. Wildcard mask of MAC address, used to indicate which bits in the MAC address will be checked. "0"

Copyright © 3onedata Co., Ltd.

Interface Element	Description
	means "check the corresponding bit", and "1" means "do not check the corresponding bit".
Destination MAC	The destination MAC address information of the packet, such as 0001.0001.0001. No input indicates any MAC address.
Destination Wildcard	Wildcard mask of destination MAC address, such as 0001.0001.0001. Wildcard mask of MAC address, used to indicate which bits in the MAC address will be checked. "0" means "check the corresponding bit", and "1" means "do not check the corresponding bit".
Ethernet Type	Ethernet type of the packet, value range is 1536-65535 (0x0600-0xffff).
Time Range	The name of the effective period of the MAC rule.

9.1.4 ACL Port Configuration

Function Description

On the “ACL Port Configuration” page, you can configure ports to enable IP ACL and MAC ACL rules.

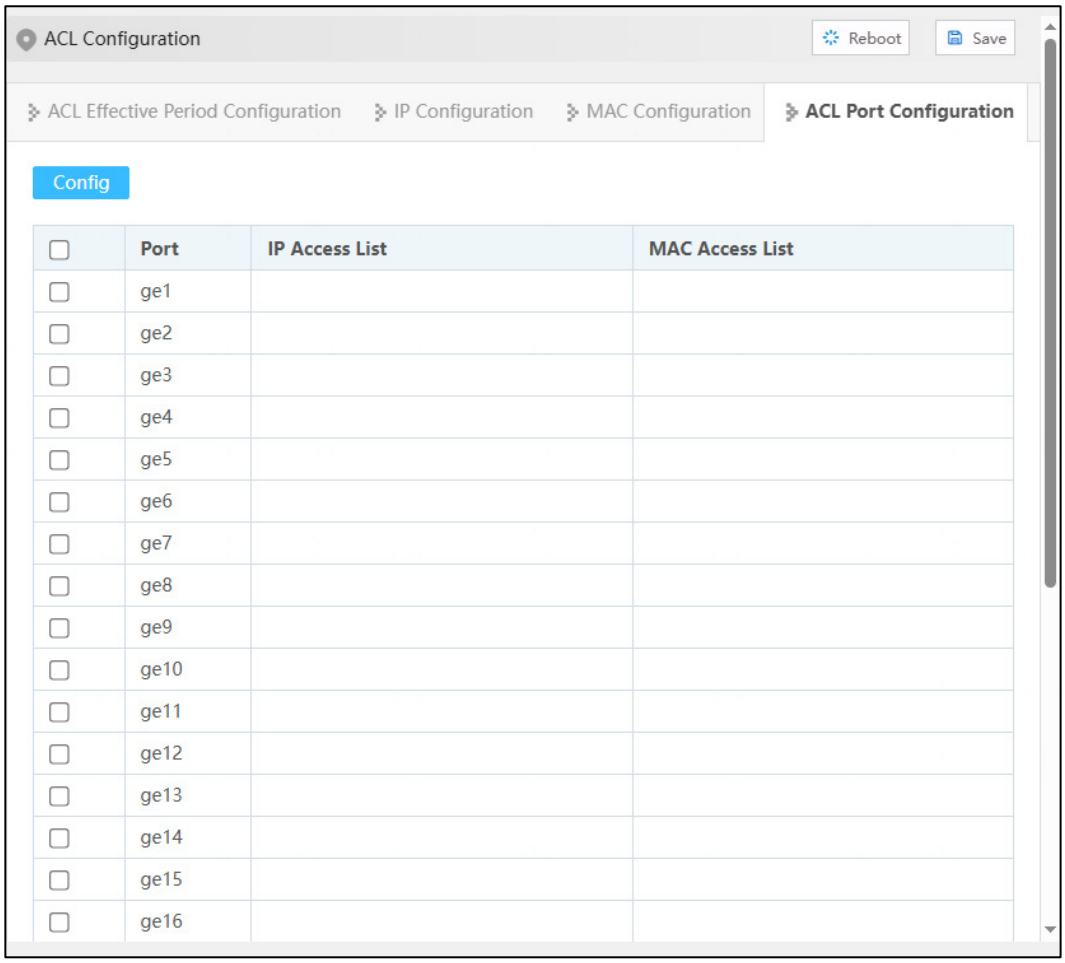
Operation Path

Open in order: "Network > ACL > ACL Port Configuration".

Interface Description

The ACL port configuration interface is as follows:

Copyright © 3onedata Co., Ltd.



The main element configuration description of ACL port configuration interface:

Interface Element	Description
Port	The Ethernet port number of the device.
IP Access List	The port supports IP ACL rules supports, supports: • In: data ingress direction; • Out: data egress direction.
MAC Access List	The port supports MAC ACL rules and supports "in": data ingress direction.

9.2 SNMP

Now, the broadest network management protocol in network is SNMP (Simple Network Management Protocol). SNMP is the industrial standard that is widely accepted and comes into use, it's used for guaranteeing the management information transmission between two points in network, and is convenient for network manager search information, modify information, locate faults, complete fault diagnosis,

Copyright © 3onedata Co., Ltd.

conduct capacity plan and generate a report. SNMP adopts polling mechanism and only provides the most basic function library, especially suit for using in minitype, rapid and low-price environment. SNMP implementation is based on connectionless transmission layer protocol UDP, therefore, it can achieve barrier - free connection to many other products.

9.2.1 SNMP Switch

Function Description

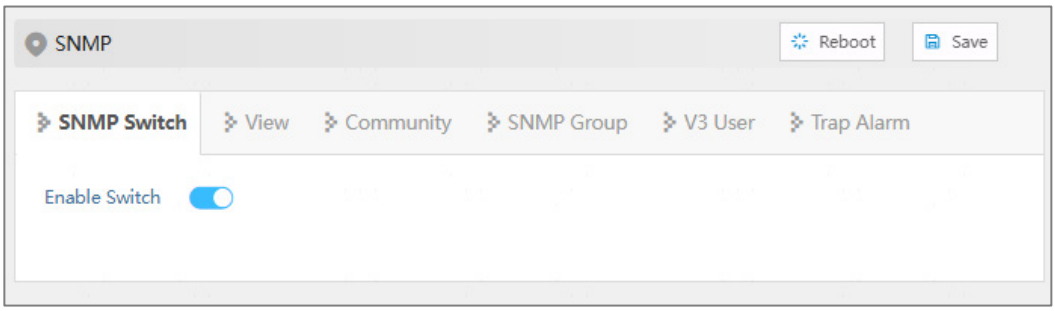
Enable/disable SNMP function.

Operation Path

Open in order: "Network > SNMP > SNMP Switch".

Interface Description

SNMP switch interface is as follows:



The main element configuration description of SNMP switch interface:

Interface Element	Description
Enable Switch	SNMP enable switch, which is enabled by default Note: If the agent side has opened, the SNMP server can't be closed.

9.2.2 View

Function Description

Add/delete SNMP view.

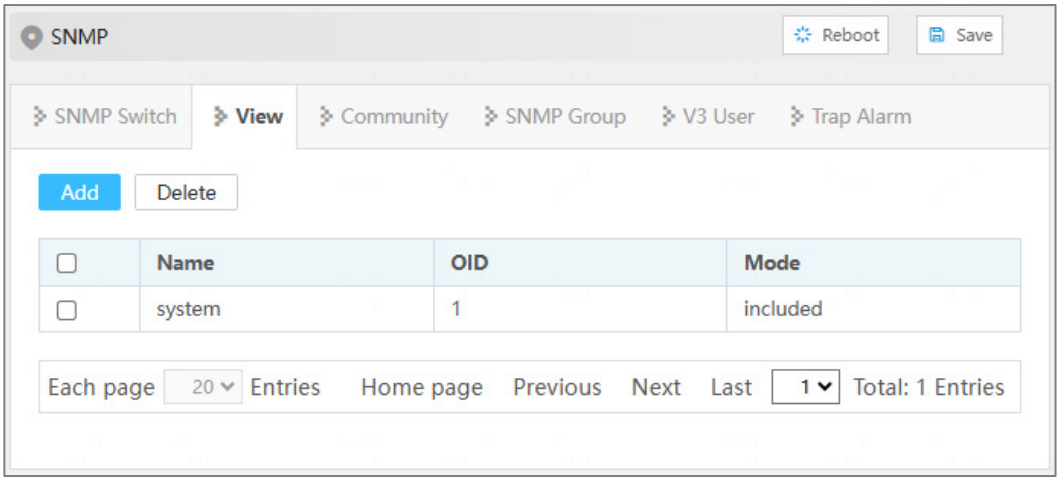
Operation Path

Open in order: "Network > SNMP > View".

Copyright © 3onedata Co., Ltd.

Interface Description

View interface is as below:



The main element configuration description of view interface:

Interface Element	Description
Name	SNMP view name definition, support 32 characters input.
OID	Node location information of MIB tree where the device resides. Note: • OID object identifier, a component node of MIB, uniquely identified by a string of numbers that represent the path. • The information of OID could be viewed via the third-party software MG-SOFT MIB Browser.
Mode	Node OID dealing method, options as below: • Included: It contains all objects under the node subtree; • Excluded: Eliminate all objects beyond the node subtree.

9.2.3 Community

Function Description

Add/delete SNMP community. Define MIB view that community name can access, set MIB object access privilege of community name as read-write privilege or read-only privilege.

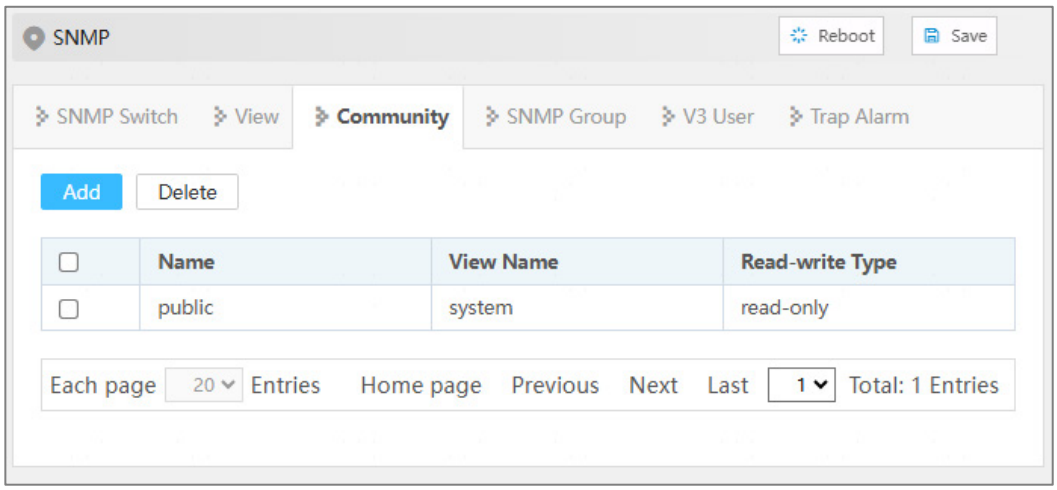
Operation Path

Open in order: “Network > SNMP > Community”.

Copyright © 3onedata Co., Ltd.

Interface Description

Community interface is as below:



The main element configuration description of community interface:

Interface Element	Description
Name	Group name, including numbers or letters, with a length of no more than 32 characters.
View Name	SNMP view name.
Read-write Type	View read-write permissions, options are as follows: • Read only • Read and write

9.2.4 SNMP Group

Function Description

Configure a new SNMP group and set the secure mode and corresponding SNMP view of the SNMP group.

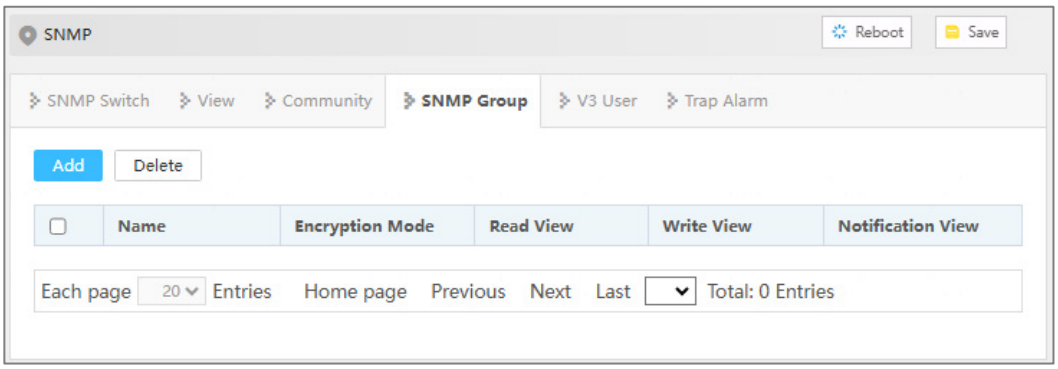
Operation Path

Open in order: “Network > SNMP > SNMP Group”.

Interface Description

SNMP Group interface is as follows:

Copyright © 3onedata Co., Ltd.



Main elements configuration description of SNMP Group interface:

Interface Element	Description
Name	SNMP group name, ranging from 1 to 32 bytes.
Encryption Mode	Whether to authenticate and encrypt the message, values: • auth: indicates that the message is authenticated but not encrypted; • noauth: indicates that the message is neither authenticated nor encrypted; • priv: indicates that the message is authenticated and encrypted.
Read View	Specify the read view of the group.
Write View	Specify the write and read view of the group
Notification View	Specify the notification view of the group.

9.2.5 V3 User

Function Description

SNMPv3 adopts User-Based Security Model (USM) authentication mechanism. Network manager can configure authentication and encryption function. Authentication is used to verify the validity of the packet sender and prevent unauthorized users from accessing it. Encryption encrypts the transmission packet between NMS and Agent to prevent eavesdropping. It adopts authentication and encryption function to provide higher security for the communication between NMS and Agent.

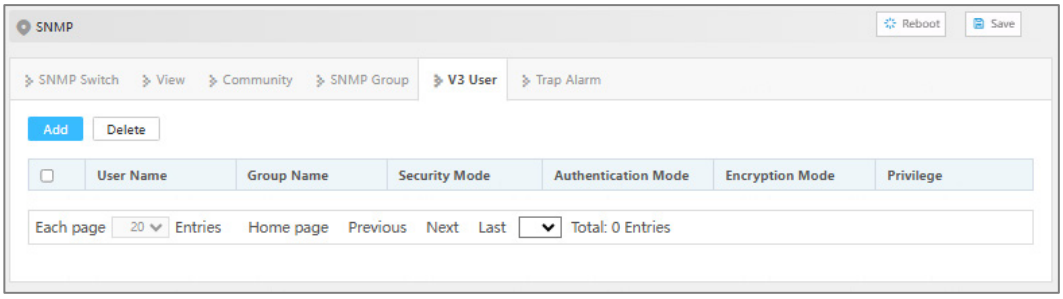
Operation Path

Open in order: "Network > SNMP > V3 User".

Copyright © 3onedata Co., Ltd.

Interface Description

V3 user interface is as follows:



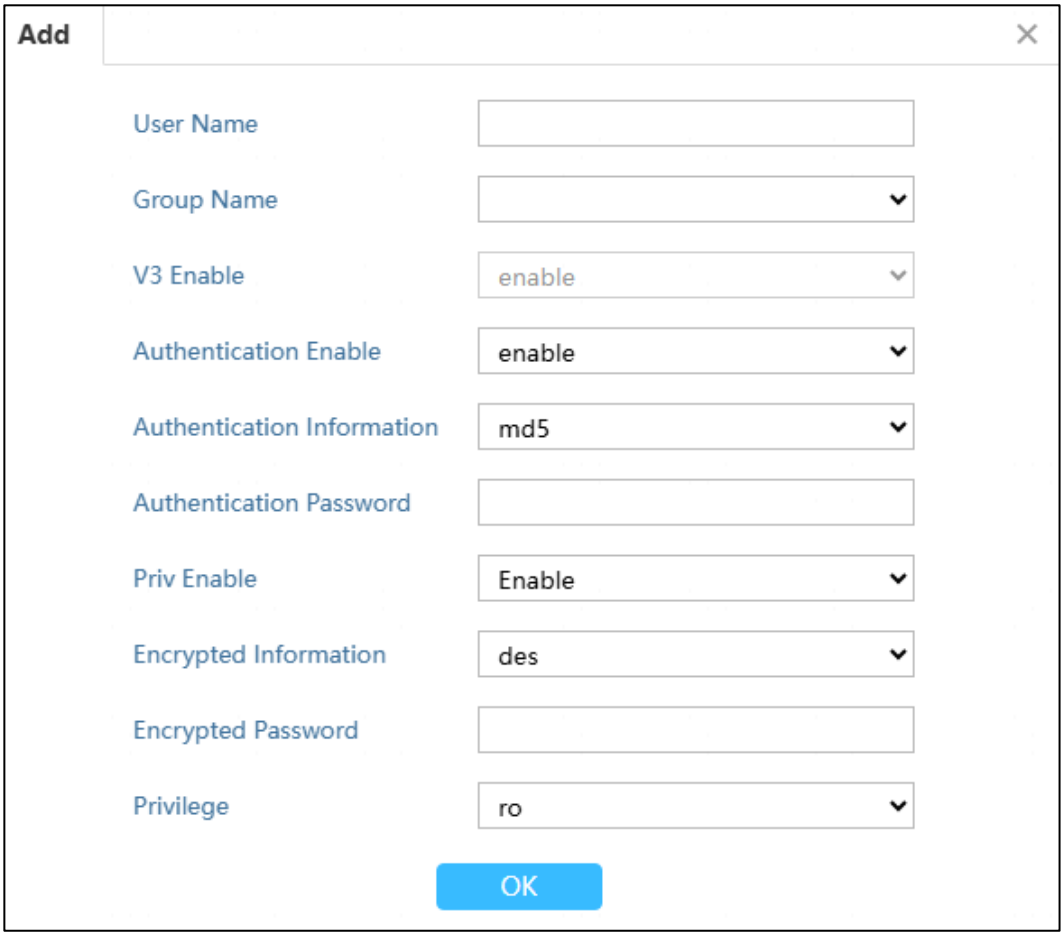
The main element configuration description of V3 user interface:

Interface Element	Description
User Name	SNMP v3 user name definition, can only contain numbers, letters, or @_! , no longer than 32 characters.
Group Name	Group name, ranging from 1 to 32 bytes. Note: Group name must be created snmp group, and only created group can create SNMP v3 users.
Security Mode	Whether to authenticate and encrypt the message, values: • auth: indicates that the message is authenticated but not encrypted; • noauth: indicates that the message is neither authenticated nor encrypted; • priv: indicates that the message is authenticated and encrypted.
Authentication Mode	Authentication mode type, acceptable value: • Md5: Information abstract algorithm 5; • Sha: Secure hash algorithm.
Encryption Mode	V3 user data encryption algorithm, options are as follows: • Des: Adopt data encryption algorithm; • Aes: Adopt advanced encryption standard.
Privilege	User protocol type, the options are as follows: • ro: Read only permission, allowing users to get the values of SNMP objects, but not allowing users to set these values. Users can get device status and information through this permission, but cannot set it; • rw: Read and write permission, allowing users to get and set the values of SNMP objects. Users can read the status and information of the device and have the right to make changes, including setting parameters, enabling, or

Copyright © 3onedata Co., Ltd.

Interface Element	Description
	disabling functions, etc.

V3 User: “Add” Interface Description



The main element configuration description of V3 user “Add” interface:

Interface Element	Description
User Name	SNMP v3 user name definition, can only contain numbers, letters, or @_! , no longer than 32 characters.
Group Name	The drop-down list of SNMP group name.
V3 Enable	V3 Enable, options are as follows: • enable • disable
Authentication Enable	Authentication Enable, options are as follows: • enable • disable
Authentication Information	Authentication information type, acceptable values: • Md5: Information abstract algorithm 5; • Sha: Secure hash algorithm.

Copyright © 3onedata Co., Ltd.

Interface Element	Description
Authentication Password	Authentication password, character string, length greater than or equal to 8 bytes.
Priv Enable	Priv Enable, options are as follows: • enable • disable
Encrypted Information	V3 user data encryption algorithm, options are as follows: • Des: Adopt data encryption algorithm; • Aes: Adopt advanced encryption standard.
Encrypted Password	Encrypted password, character string, length greater than or equal to 8 bytes.
Privilege	Select from the username drop-down list.

9.2.6 Trap Alarm

Function Description

Base on TCP/IP protocol, SNMP usually adopts UDP port 161 (SNMP) and 162 (SNMP-traps), SNMP protocol agent exists in the network device and adopts information specific to the device (MIBs) as the device interface; these network devices can be monitored or controlled via Agent. When a trap event occurs, the message is transmitted by SNMP Trap. At this point, an available trap receiver can receive the trap message.

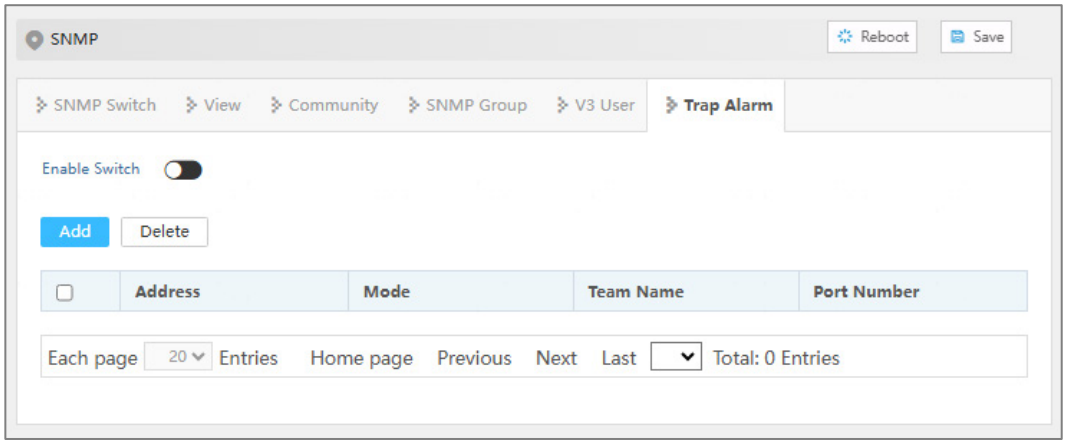
Operation Path

Open in order: "Network > SNMP > Trap Alarm".

Interface Description

Trap alarm interface is as below:

Copyright © 3onedata Co., Ltd.



The main element configuration description of Trap alarm interface:

Interface Element	Description
Enable Switch	SNMP Trap alarm enable switch.
Address	IP address of SNMP management device, used for receiving alarm information, such as PC.
Mode	SNMP management device version, options are as below: • 1 • 2c • 3
Team Name	Group name.
Port Number	Port number of Trap, it defaults to 162, the value range is 0～65535.

9.3 RMON

RMON (Remote Network Monitoring) mainly achieves statistics and alarm functions, which are used for remote monitoring and management of management device to managed devices. Statistical function refers to that managed device can periodically or continuously keep track of all the traffic information on the network segment connected to the port, for example, the total number of packets received on a network segment in a period of time, or the total number of received super long packets. Alarm function refers to that the managed device can monitor the value of the specified MIB variable. When the value reaches the alarm threshold (such as the port rate reaches the specified value or the proportion of broadcast message reaches the specified value), it can automatically log and send Trap messages to the managed device.

Copyright © 3onedata Co., Ltd.

9.3.1 Event

Function Description

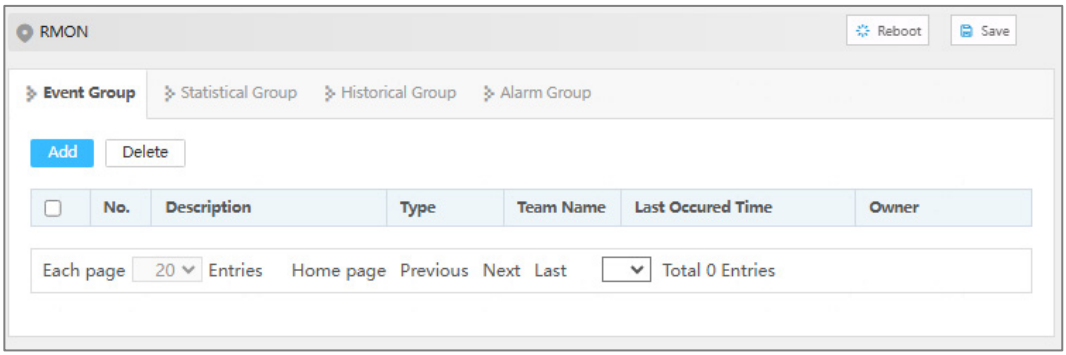
On the "Event" page, user can add, delete, or check the configuration information of event.

Operation Path

Open in order: “Network > RMON > Event Group”.

Interface Description

Event group interface is as below:



The main element configuration description of event group interface:

Interface Element	Description
No.	Triggered event serial number when monitoring MIB object exceeds threshold value. Note: This serial number corresponds to the rising event index and falling event index set in RMON alarm configuration information.
Description	Some description information for describing the event.
Type	Event dealing method, options are as below: • log: Record the event in the log table when the event is triggered; • trap: Send Trap information to management station for informing the occurring of event when the event is triggered; • Log, trap: Record the event in the log table and produce a trap information when the event is triggered.
Team Name	Community name of the network management station receiving the alarm information.
Last Occured Time	The time of the last incident occurred.
Owner	The creator of the table entry.

Copyright © 3onedata Co., Ltd.

Interface Element	Description
Operation	Check the entry and click the "Delete" button to delete it.

9.3.2 Statistical

Function Description

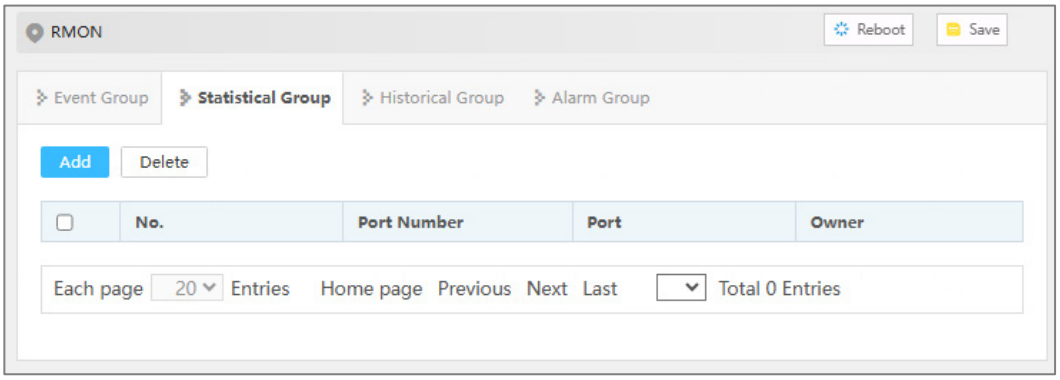
On the "Statistical" page, user can add, delete, or check the configuration information of statistical.

Operation Path

Open in order: “Network > RMON > Statistics Group”.

Interface Description

Statistical group interface is as below:



The main element configuration description of statistical group interface:

Interface Element	Description
No.	Serial number is used to identify a special application interface, when the serial number is same to the application interface serial number set before, previous configuration will be replaced.
Port Number	The counted port serial number.
Port	The name of the port being counted.
Owner	The creator of the table entry.
Operation	Check the entry and click the "Delete" button to delete it.

Copyright © 3onedata Co., Ltd.

9.3.3 History

Function Description

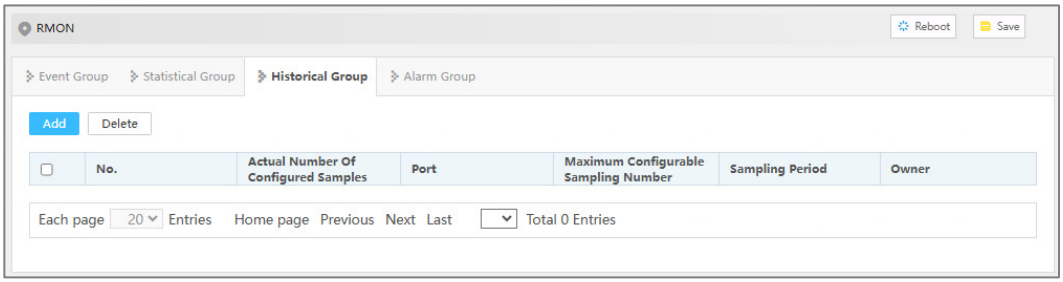
On the "History" page, user can add, delete, or check the configuration information of history.

Operation Path

Open in order: “Network > RMON > History Group”.

Interface Description

Historical group interface is as below:



The main element configuration description of historical group interface:

Interface Element	Description
No.	Serial number is used to identify a special application interface, when the serial number is same to the application interface serial number set before, previous configuration will be replaced.
Actual Number of Configured Samples	Set the historical statistics capacity corresponding to the history group, ranging from 1-65535.
Port	The recorded port name.
Maximum Configurable Sampling Number	Maximum capacity of historical statistics table supported by device.
Sampling Period	The interval time of gaining statistics data each two times.
Owner	The creator of the table entry.
Operation	Check the entry and click the "Delete" button to delete it.

Copyright © 3onedata Co., Ltd.

9.3.4 Alarm

Function Description

On the "Alarm" page, user can add, delete the alarm, or check the alarm configuration information. Alarm type adopts absolute to directly monitor MIB object value; Alarm type adopts delta to monitor changes in MIB object values between two samples;

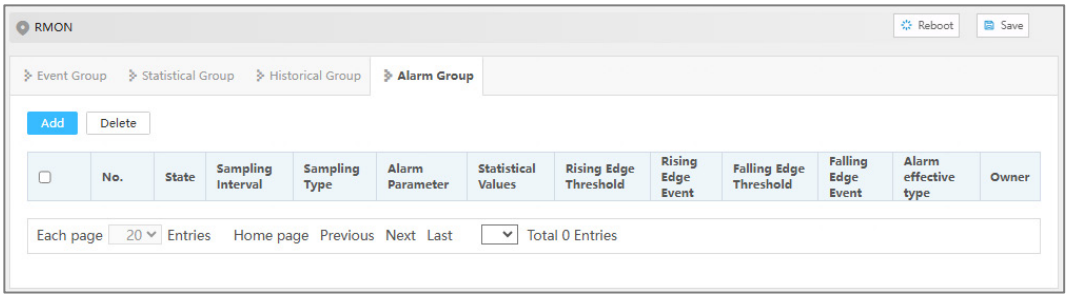
- When monitoring MIB object reaches or surpasses the rising threshold value, it will trigger corresponding event of rising event index;
- When monitoring MIB object reaches or surpasses declining threshold value, it will trigger corresponding event of declining event index;

Operation Path

Open in order: "Network > RMON > Alarm Group".

Interface Description

Alarm group interface is as below:



The main element configuration description of alarm group interface:

Interface Element	Description
No.	Triggered event serial number when monitoring MIB object exceeds threshold value. Note: This serial number corresponds to the rising event index and falling event index set in RMON alarm configuration information.
State	The status of alarm list items, which is not configurable when configuring alarm list items and is VALID by default.
Sampling Interval	Sampling time interval value, value range is 1-4294967295, unit: second.
Sampling Type	Two sampling methods, options as follows: • Absolute: When alarm variable value reaches alarm threshold value, an alarm is triggered; If the second sampling is same to last sampling alarm type, alarm isn't triggered again; • Delta: When alarm variable value reaches alarm

Copyright © 3onedata Co., Ltd.

Interface Element	Description
	threshold value during each sampling, an alarm is triggered.
Alarm Parameter	The monitored MIB node supports string format instead of oid format.
Statistical Values	That is, the defined statistical group.
Rising Edge Threshold	Alarm variable value, upper limit alarm, threshold value is between 1-12147483647. Note: In the rising process of alarm variable value, when the variable value surpasses rising threshold, an alarm occurs at least one time.
Rising Edge Event	Event index, when alarm variable value reaches or surpasses the rising event threshold value, it will activate corresponding event in event group, value range is 1-65535.
Falling Edge Threshold	Alarm variable value, lower limit alarm, threshold value is between 1-12147483647. Note: In the falling process of alarm variable value, when the variable value reaches falling threshold, an alarm occurs at least one time.
Falling Edge Event	Event index, when alarm variable value reaches or is less than the falling threshold value, it will activate corresponding event in event group, value range is 1-65535.
Alarm effective type	There are three alarm effect types. The options are as follows: • Rising edge effective • Falling edge effective • Both the rising and falling edges are effective
Owner	The creator of the table entry.
Operation	Check the entry and click the "Delete" button to delete it.

9.4 LLDP

LLDP (Link Layer Discovery Protocol) is a link layer discovery protocol defined in IEEE 802.1ab. LLDP is a standard layer-2 discovery method, which can organize the management address, device identification, interface identification and other information of local devices and publish it to its neighbor devices. After receiving the information, the neighbor devices save it in the form of standard MIB (Management Information Base) for the network management system to query and judge the communication status of links.

Copyright © 3onedata Co., Ltd.

9.4.1 Global Configuration

Function Description

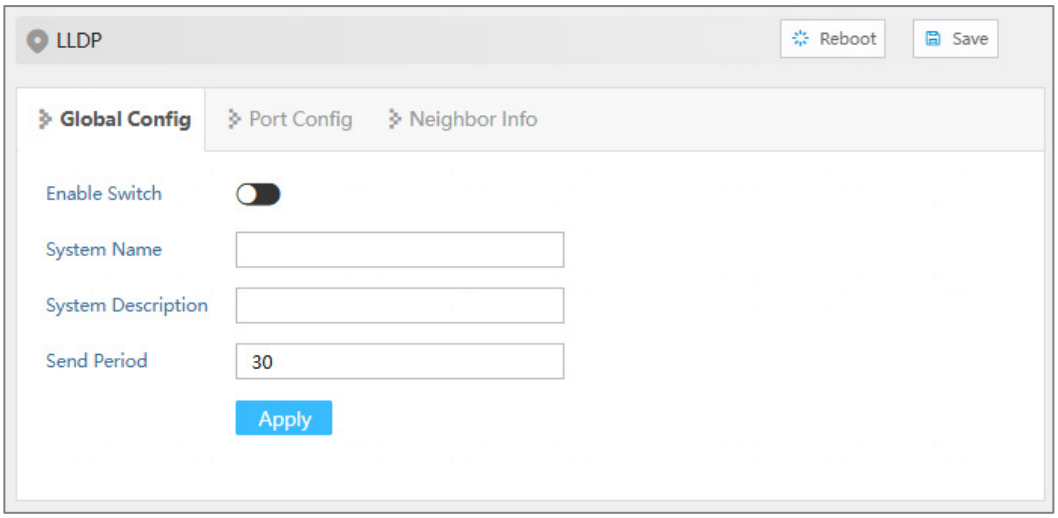
Configure LLDP global parameter.

Operation Path

Open in order: "Network > LLDP > Global Configuration".

Interface Description

Global configuration interface is as follows:



The main element configuration description of global configuration interface:

Interface Element	Description
Enable Switch	LLDP enable switch.
System Name	The system name, which supports 0-32 characters, consists of uppercase letters, lowercase letters, numbers, or special characters (! @ _-).
System Description	The system description information, which supports 0-32 characters, consisting of uppercase letters, lowercase letters, numbers, or special characters (! @ _-).
Send Period	LLDP message sending cycle, the value range is 5-32768. When no device status changes, the device periodically sends LLDP messages to its adjacent nodes. Note: Type of TLV(Type/Length/Value) encapsulated by LLDP message, which can include system name and system description.

Copyright © 3onedata Co., Ltd.

9.4.2 Port Configuration

Function Description

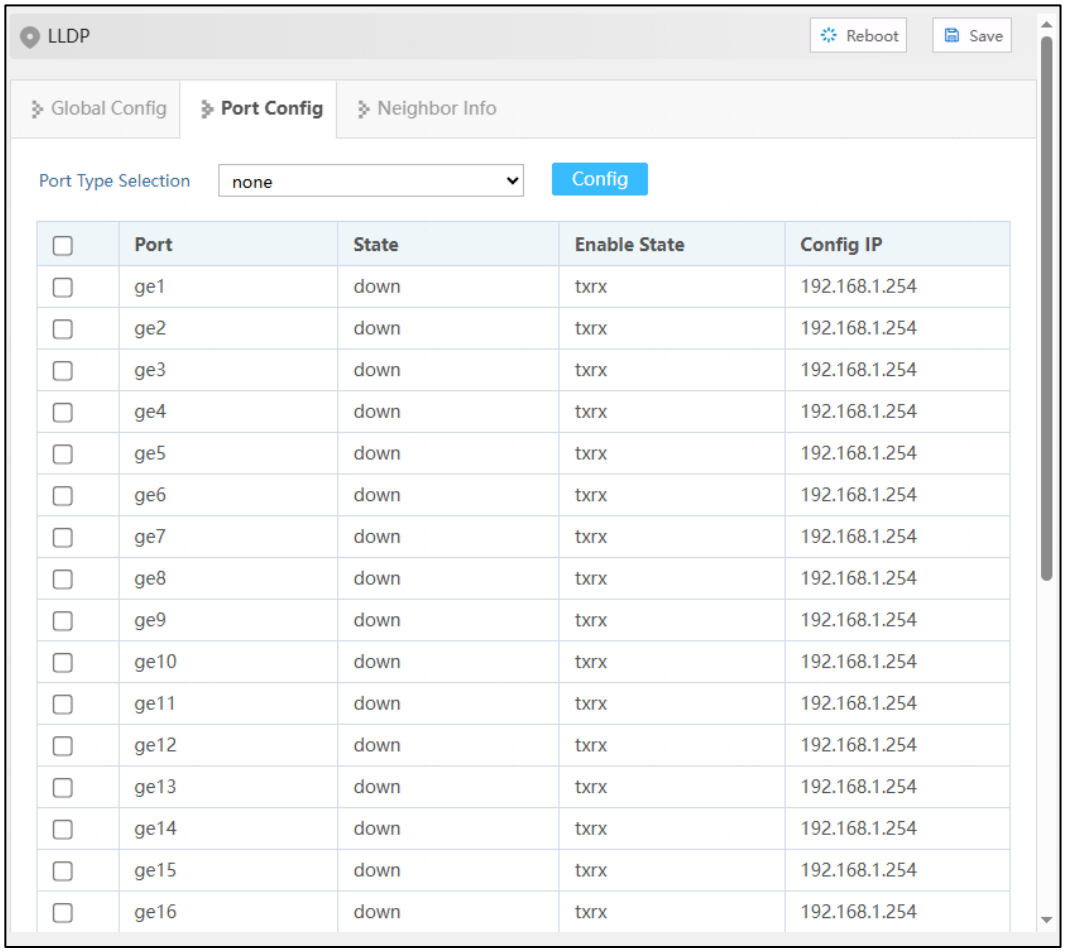
Configure the sending and receiving mode and management address of the port.

Operation Path

Open in order: "Network > LLDP > Port Config".

Interface Description

Check port configuration interface as below:



The main element configuration description of port configuration interface:

Interface Element	Description
Port	The corresponding port name of the device Ethernet port.
State	Ethernet port connection status, display status as follows: • down: port is disconnected • up: port is connected
Enable State	The options of LLDP working states of device port are as follows:

Copyright © 3onedata Co., Ltd.

Interface Element	Description
	• txonly: working mode is Tx, only sending and not receiving LLDP message. • rxonly: working mode Rx, only receiving, and not sending LLDP message. • txrx: working mode is TxRx, both sending and receiving LLDP message. • disable: the working mode is Disable, neither receiving nor sending LLDP message. Note: By default, the working mode of LLDP is TxRx when global LLDP is enabled.
Config IP	Corresponding LLDP management IP address of the port. Note: • LLDP management address is the address to be marked and managed by network management system. Management address can mark a device, which is beneficial to the drawing of network topology and network management. Management address is encapsulated in Management Address TLV field of LLDP message and sent to adjacent nodes. • The management address released by the port in the LLDP message defaults to the main IP address of the smallest VLAN o in the VLAN where the port resides. If the VLAN is not configured with a main IP address, it will be 0.0.0.0.

9.4.3 Neighbor Information

Function Description

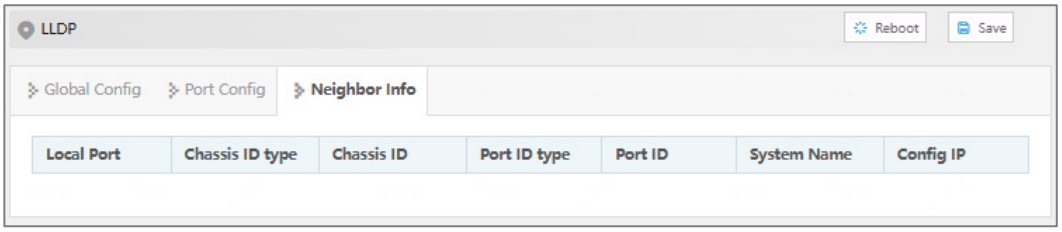
View neighbor-related information.

Operation Path

Open in order: " Network > LLDP > Neighbor Info".

Interface Description

Neighbor information interface is as follows:



Copyright © 3onedata Co., Ltd.

Main elements configuration description of neighbor information interface:

Interface Element	Description
Local Port	Local port number of local switch connected to adjacent devices.
Chassis ID type	Neighbor device ID type.
Chassis ID	Neighbor device ID.
Port ID type	ID type of neighbor port.
Port ID	Port ID of neighbor device.
System Name	System name of the neighbor device.
Config IP	Management IP address of neighbor device or port.

9.5 DHCP

DHCP (Dynamic Host Configuration Protocol) is usually applied to large LAN environment. Its main functions are centralized management and IP address distribution, which enables the host in the network to acquire IP address, Gateway address, DNS server address dynamically and improve the usage of addresses.

9.5.1 DHCP Switch

Function Description

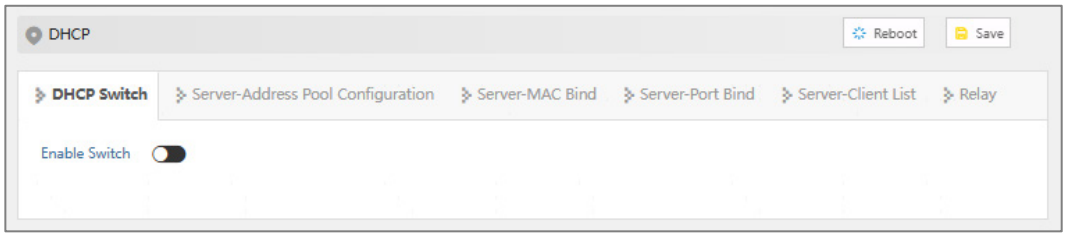
Enable/Disable DHCP Server.

Operation Path

Open in order: "Network > DHCP > DHCP Switch".

Interface Description

DHCP switch interface is as follows:



The main element configuration description of DHCP switch interface:

Copyright © 3onedata Co., Ltd.

Interface Element	Description
Enable Switch	The enable switch of DHCP server, when enabled, it can assign IP addresses to other devices connected to this device.

9.5.2 Server-Address Pool Configuration

After user defines DHCP range and exclusion range, surplus addresses constitute an address pool; addresses in the address pool can be dynamically distributed to hosts in network. Address pool is valid only for the method of automated IP acquisition; manual IP configuration can ignore this option only if conforming to the rules.

Function Description

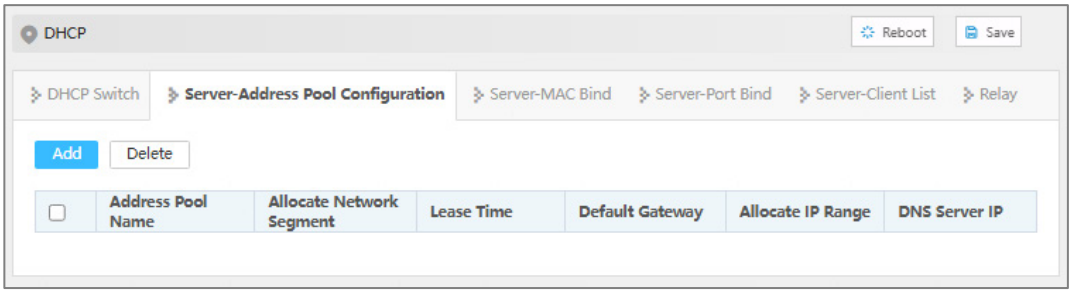
Add, delete the address pool and check the configuration information of address pool.

Operation Path

Open in order: "Network > DHCP > Server-Address Pool Configuration".

Interface Description

Server-address pool configuration interface is as follows:



The main element configuration description of Server-address pool configuration interface:

Interface Element	Description
Address Pool Name	The name of address pool, up to 32 characters.
Allocate Network Segment	Address pool distributes the IP address network segment of client, for example: 192.168.0.1/24.
Lease Time	IP address utilization valid time of client, format: day, hour, minute, range is 0-30 day, 0-24h and 0-59m, which are separated by space. Note: When the time of IP address obtained by dhcp client reaches the

Copyright © 3onedata Co., Ltd.

Interface Element	Description
	lease time, it needs to renew it otherwise the ip address would be invalid and dhcp client needs to request ip address again.
Default Gateway	Default client gateway address, example: 192.168.1.0/24
Allocate IP range	The lowest address and the highest address in the DHCP address pool. The address that belongs to the range could be distributed effectively.
DNS Server IP	IP address of DNS server.

9.5.3 Server-MAC Binding

Function Description

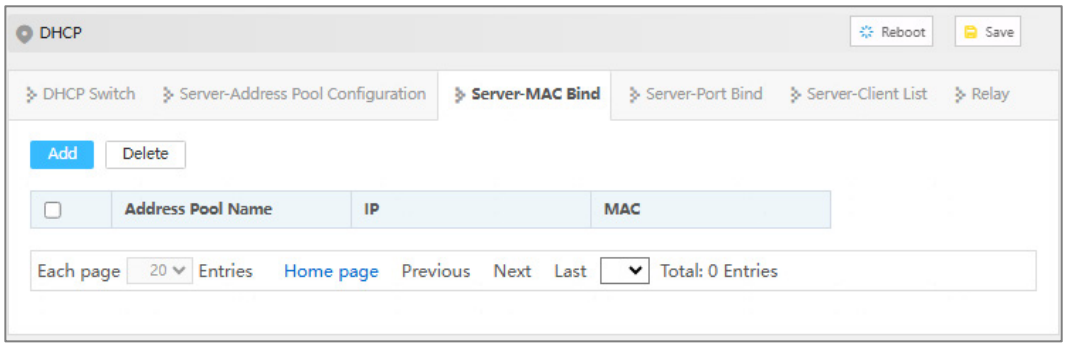
Bind the IP address assigned by the address pool to the MAC address of the device.

Operation Path

Open in order: "Network > DHCP > Server-MAC Bind".

Interface Description

Server-MAC binding interface is as follows:



The main element configuration description of Server-MAC binding interface:

Interface Element	Description
Address Pool Name	The name of DHCP address pool.
IP	IP addresses distributed by DHCP address pool, IP addresses obtained by this MAC address.
MAC	The MAC address of the IP-bound device.

Copyright © 3onedata Co., Ltd.

9.5.4 Server-Port Binding

Function Description

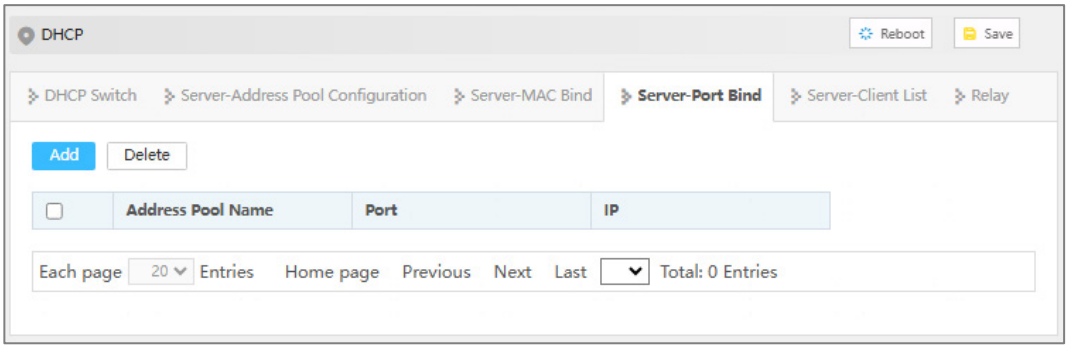
The IP address that can be assigned by the binding port.

Operation Path

Open in order: "Network > DHCP > Server-Port Bind".

Interface Description

Server-Port bind interface is as follows:



The main element configuration description of server-port bind interface:

Interface Element	Description
Address Pool Name	The name of DHCP address pool.
Port	The corresponding port name of the device Ethernet port.
IP	IP address distributed by DHCP address pool, the IP addresses that client gains in the port.

9.5.5 Server-Client List

Function Description

Check the information of DHCP client.

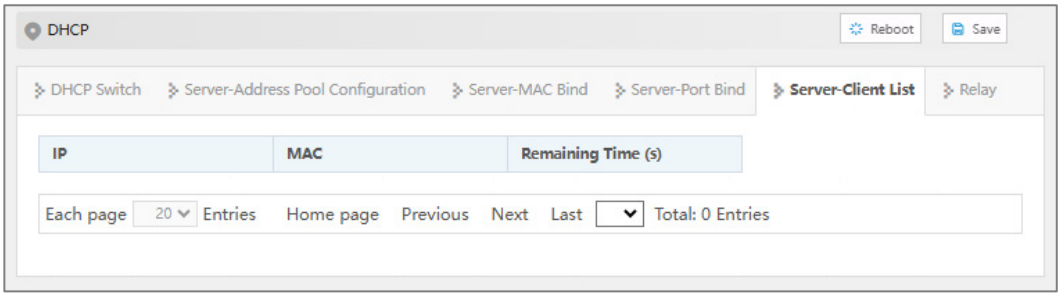
Operation Path

Open in order: "Network > DHCP > Server-Client List".

Interface Description

Server-Client list interface is as follows:

Copyright © 3onedata Co., Ltd.



The main element configuration description of server-client list interface:

Interface Element	Description
IP	IP address of DHCP client device.
MAC	MAC address of DHCP client device.
Remaining Time (s)	Aging time of IP address acquired by DHCP client.

9.5.6 Relay

DHCP relay agent forwards DHCP messages between a DHCP server and DHCP clients, and helps the DHCP server to dynamically allocate network parameters to the DHCP clients. When a DHCP server is on a different network segment from the DHCP client, the DHCP server can not receive request messages from the DHCP client, a DHCP relay agent must be deployed to forward DHCP messages to the DHCP server.

Function Description

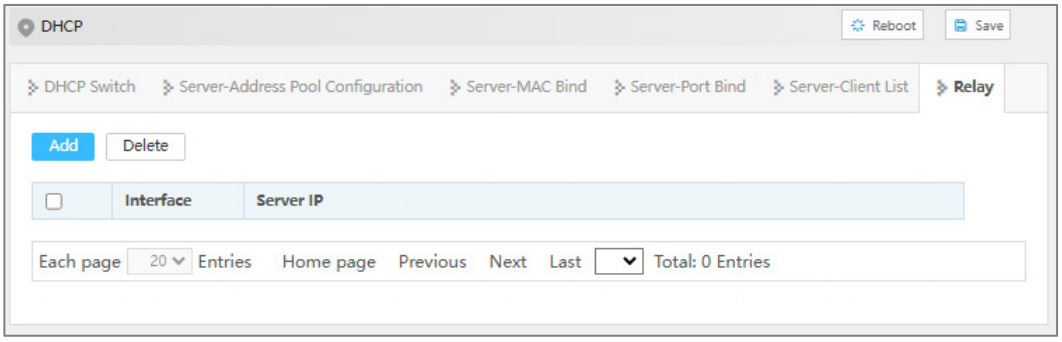
Configure the related parameters of the Relay interface.

Operation Path

Open in order: "Network > DHCP > Relay".

Interface Description

Relay interface is as follows:



Main element configuration description of Relay interface:

Copyright © 3onedata Co., Ltd.

Interface Element	Description
Interface	Interface Name.
Server IP	IP address of DHCP server represented by DHCP relay.

9.6 DHCP-Snooping

The function of DHCP Snooping

DHCP Snooping is a security feature of DHCP, which has the following functions:

1 Ensure that clients get IP addresses from legitimate servers.

If there is a pseudo-DHCP server set up privately in the network, it may cause the DHCP client to get the wrong IP address and network configuration parameters, and can't communicate normally. To enable DHCP clients to obtain IP addresses through legitimate DHCP servers, DHCP Snooping security mechanism allows ports to be set as trusted ports and untrusted ports:

- The trust port forwards the received DHCP message normally.
- The untrusted port discards the DHCP-ACK and DHCP-OFFER messages responded by the DHCP server.

The ports connecting DHCP server and other DHCP Snooping devices need to be set as trusted ports, and other ports should be set as untrusted ports, to ensure that DHCP clients can only obtain IP addresses from legitimate DHCP servers, while pseudo-DHCP servers erected privately cannot assign IP addresses to DHCP clients.

2 Record the corresponding relationship between IP address and MAC address of DHCP client

DHCP Snooping receives DHCP-ACK packets by listening to DHCP-REQUEST packets and trusted port, and records the DHCP Snooping table entry, including the client's MAC address, obtained IP address, port connected to the DHCP client, and the VLAN to which the port belongs. Using this information, you can achieve:

- ARP Detection: according to the DHCP Snooping table entry, judge whether the user sending ARP message is legal or not, to prevent ARP attack by illegal users.
- IP Source Guard: filter the messages forwarded by the port by dynamically obtaining DHCP Snooping entries to prevent illegal messages from passing through the port.

Option 82

Copyright © 3onedata Co., Ltd.

Option 82 is called the relay agent information option and records the location information of the DHCP client. When the DHCP relay or DHCP Snooping device receives the request message sent by the DHCP client to the DHCP server, it adds Option 82 to the message and sends it to the DHCP server.

Administrators can obtain location information of DHCP client from Option 82, to locate DHCP client and realize control over security and billing of client. Servers that support Option 82 can also make allocation policies for IP addresses and other parameters based on information about that Option, providing a more flexible address allocation scheme.

Option 82 can contain up to 255 sub-option. If Option 82 is defined, define at least one sub-option. Currently, the DHCP relay supports only three sub-options: Sub-Option 1 (Circuit ID, Circuit ID sub-option) and Sub-option 2 (Remote ID, Remote ID sub-option) and sub-option 3 (Subscriber ID, Subscriber ID sub-option).

9.6.1 Global Configuration

Function Description

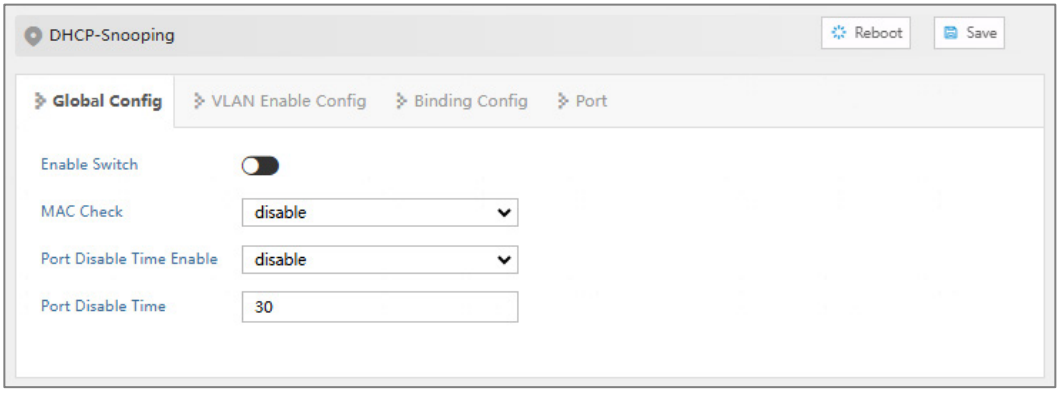
On the “Global Configuration” page, user can enable/disable DHCP Snooping.

Operation Path

Open in order: "Network > DHCP Snooping > Global Config".

Interface Description

Global configuration interface is as follows:



The main element configuration description of global configuration interface:

Interface Element	Description
Enable Switch	Swipe to the right to enable DHCP-Snooping.
MAC Check	Enable DHCP client MAC address checking. Note: Enabling DHCP-Snooping will automatically turn on

Copyright © 3onedata Co., Ltd.

Interface Element	Description
	DHCP client MAC address checking.
Port Disable Time Enable	When the DHCP message rate of a port is lower than the configured rate of the port, the port's port disable duration will be disabled.
Port Disable Time	Port disable time, the input range is 1-3600, the unit is s, and the default is 30s.

9.6.2 VLAN Enable Configuration

Function Description

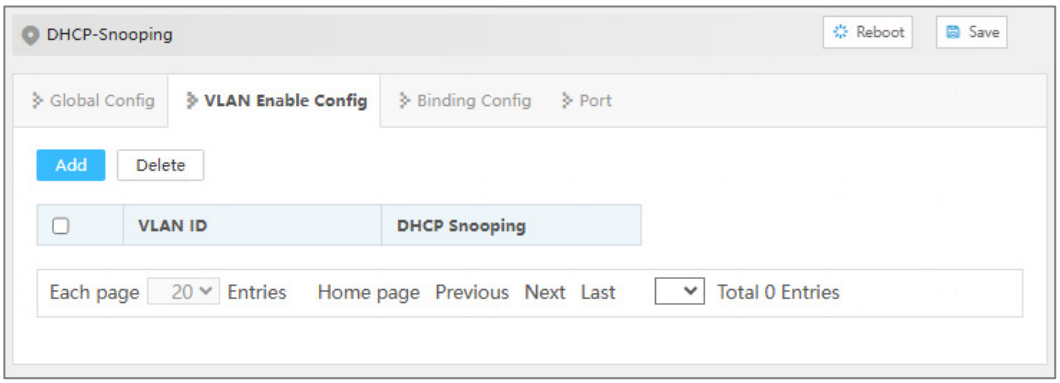
On the "VLAN Enable Configuration" page, user can specify that the VLAN to enable DHCP Snooping.

Operation Path

Open in order: "Network > DHCP Snooping > VLAN Enable Config".

Interface Description

The Vlan enable configuration interface is as follows:



Main elements configuration description of Vlan enabled configuration interface:

Interface Element	Description
VLAN ID	The VLAN number.
DHCP Snooping	Enable status of DHCP Snooping. • enable • disalbe

Copyright © 3onedata Co., Ltd.

9.6.3 Binding Configuration

Function Description

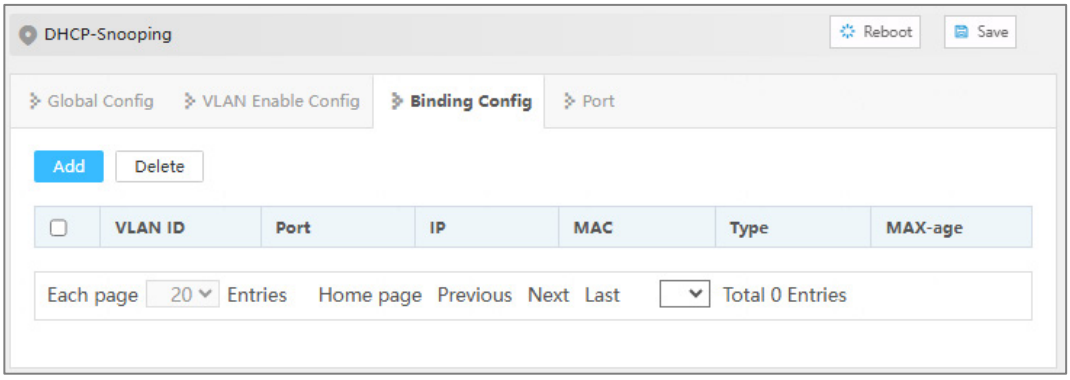
On the Binding Configuration page, user can bind ports, IP addresses and MAC addresses.

Operation Path

Open in order: "Network > DHCP Snooping > Bind Config".

Interface Description

The bind configuration interface is as follows:



Main elements configuration description of bind configuration interface:

Interface Element	Description
VLAN ID	Binding VLAN ID information, for example: 1-4096.
Port	The corresponding port name of the device Ethernet port.
IP	Binding IP address, for example: 192.168.1.1.
MAC	Binding MAC address, for example: 0001-0001-0001.
Type	Port type: • Static Configuration • Dynamic
MAX-age	Port aging time.

9.6.4 Port Configuration

Function Description

On the port configuration page, user can configure DHCP Snooping port information.

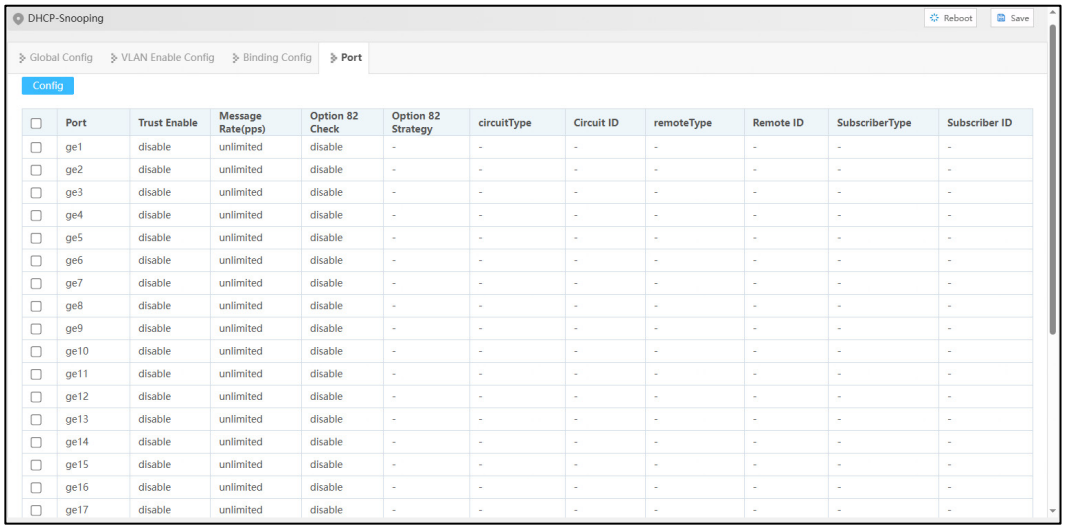
Operation Path

Open in order: "Network > DHCP Snooping > Port ".

Copyright © 3onedata Co., Ltd.

Interface Description

Check port configuration interface as below:



The main element configuration description of global configuration interface:

Interface Element	Description
Port	The corresponding port name of the device Ethernet port.
Trust Enable	Port trust enable, and the trust port forwards the received DHCP message normally.
Message Rate (pps)	Message transmission speed of port, the input range is 10-1000 (s), and the default value is 1000s.
Option 82 Check	When Option 82 check is turned on, the location information of DHCP client can be obtained from Option 82, to locate DHCP client.
Option 82 Strategy	Option 82 dealing strategy, options as follows: • Drop: Discard messages. • Keep: Adopt different modes to fill Option 82, replace prime Option 82 in message and forward, filling modes will be described as below. • Replace: Keep Option 82 in messages unchanged and forward.
Circuit Type	Circuit ID sub-option filling type, options as follows: • Normal: Normal mode; • String: Detailed mode.
Circuit ID	The filling content of the circuit ID sub-option supports ASCII and HEX formats. Note: • The input length is limited between 2 and 64;

Copyright © 3onedata Co., Ltd.

Interface Element	Description
	• When Hex is selected, the input content is a combination of uppercase and lowercase letters and numbers. • When ASCII is selected, the content is not limited.
Remote Type	Remote ID sub-option filling type, options as follows: • Normal: Normal mode; • Sysname: Directly adopt device system name to fill Option 82; • String: Detailed mode.
Remote ID	The filling content of the remote ID sub-option supports ASCII and HEX formats. Note: • The input length is limited between 2 and 64; • When Hex is selected, the input content is a combination of uppercase and lowercase letters and numbers. • When ASCII is selected, the content is not limited.
Subscriber Type	User option fill type, which supports ASCII format.
Subscriber ID	The filling content of Subscriber ID sub-option supports ASCII and HEX formats. Note: • The input length is limited between 2 and 64; • When Hex is selected, the input content is a combination of uppercase and lowercase letters and numbers. • When ASCII is selected, the content is not limited.

9.7 Modbus TCP

Function Description

Modbus TCP monitoring function can be enabled. Client can read the switch system, port, ring network, frame statistics and other parameters information via Modbus TCP protocol, which are convenient for various integrated systems to monitor and manage the device.

Note

Please see the switch read-only register address information in the "Modbus TCP data sheet" of this section.

Copyright © 3onedata Co., Ltd.

Operation Path

Open in order: "Network > Modbus TCP".

Interface Description

Interface screenshot of Modbus TCP:



The main element configuration descriptions of Modbus TCP:

Interface Element	Description
Modbus TCP	Modbus TCP monitoring enable switch, which is disabled by default. After enabling Modbus TCP monitoring function, client can read the switch device information via function code 4.

Modbus_TCP Data Sheet

Switch read-only register (support function code 4) address information and stored device information, as the table below:

Note

The following table address is hexadecimal format, please convert it into suitable format according to the demands of current debugging tool.

Information Type	Address (HEX)	Data Type	Description
System Information	0x0000	2 Words	Device ID (reserved)
	0x0002	16 Words	Name (ASCII display)
	0x0012	16 Words	Description (ASCII display)
	0x0022	3 Words	MAC Address (HEX display)
	0x0025	2 Words	IP address

Copyright © 3onedata Co., Ltd.

Information Type	Address (HEX)	Data Type	Description
	0x0027	16 Words	Contact Information
	0x0037	16 Words	Firmware Ver (ASCII display)
	0x0047	16 Words	Hardware Ver (ASCII display)
	0x0057	16 Words	Serial No.
	0x0067	1 Word	Power supply 1 status: • 0x0000: OFF • 0x0001: ON
	0x0068	1 Word	Power supply 2 status: • 0x0000: OFF • 0x0001: ON
Port Information	0x1000-0x101B	1 Word	Port connection status: • 0x0000: Link down • 0x0001: Link up • 0x0002: Disable • 0xFFFF: No port
	0x101D-0x1038	1 Word	Port operating mode: • 0x0000: 10M-Half • 0x0001: 10M-Full • 0x0002: 100M-Half • 0x0003: 100M-Full • 0x0004: 1G-Half • 0x0005: 1G-Full • 0xFFFF: No port
	0x1039-0x1054	1 Word	Port flow control status: • 0x0000: OFF • 0x0001: ON • 0xFFFF: No port
	0x1056-0x1071	1 Word	Port interface type: • 0x0000: Copper port • 0x0001: Fiber port • 0x0002: Combo port • 0xFFFF: No port
Frame Statistics	0x2000-0x2037	2 Word	Port 1-28 Tx Packets For example: sending packets quantity of port 1 is 0x44332211,

Copyright © 3onedata Co., Ltd.

Information Type	Address (HEX)	Data Type	Description
			namely: • Word 1 is 0x4433; • Word 2 is 0x2211.
	0x2039-0x2070	2 Word	Port 1-28 Rx Packets For example: Receiving packets quantity of port 1 is 0x44332211, namely: • Word 1 is 0x4433; • Word 2 is 0x2211.
	0x2072-0x20A9	2 Word	Port 1-28 Tx Error Packets For example: sending error packets quantity of port 1 is 0x44332211, namely: • Word 1 is 0x4433; • Word 2 is 0x2211.
	0x20AB-0x20E2	2 Word	Port 1-28 Rx Error Packets. For example: receiving error packets quantity of port 1 is 0x44332211, namely: • Word 1 is 0x4433; • Word 2 is 0x2211.
Ring Information	0x3000	1 Word	Link redundancy algorithm category: • 0x0000: None • 0x0001: SW-Ring V1 • 0x0002: SW-Ring V2 • 0x0003: SW-Ring V3 • 0x0004: RSTP
	0x3001	1 Word	Group I Ring Type: • 0x0000: Single Ring • 0x0001: Coupling Ring • 0x0002: Chain • 0x0003: Dual_homing
	0x3002	1 Word	Group I Ring Port 1
	0x3003	1 Word	Group I Ring Port 2

Copyright © 3onedata Co., Ltd.

Information Type	Address (HEX)	Data Type	Description
	0x3004	1 Word	Group I Ring ID:
	0x3005	1 Word	Group I HelloTime
	0x3006	1 Word	Group I Enable
	0x3007	1 Word	Group I Master- slave device: • 0x0000: master device • 0x0001: slave device
	0x3008	1 Word	Group II Ring Type: • 0x0000: Single Ring • 0x0001: Coupling Ring • 0x0002: Chain • 0x0003: Dual_homing
	0x3009	1 Word	Group II ring port1
	0x300A	1 Word	Group II ring port2
	0x300B	1 Word	Group II Ring ID
	0x300C	1 Word	Group II HelloTime
	0x300D	1 Word	Group II Enable
	0x300E	1 Word	Group II Master-slave device: • 0x0000: master device • 0x0001: slave device
	0x300F	1 Word	Group III Ring Type: • 0x0000: Single Ring • 0x0001: Coupling Ring • 0x0002: Chain • 0x0003: Dual_homing
	0x3010	1 Word	Group III ring port1
	0x3011	1 Word	Group III ring port2
	0x3012	1 Word	Group III Ring ID
	0x3013	1 Word	Group III HelloTime
	0x3014	1 Word	Group III Enable
	0x3015	1 Word	Group III Master-slave device: • 0x0000: master device • 0x0001: slave device
	0x3016	1 Word	Group IV Ring Type: • 0x0000: Single Ring

Copyright © 3onedata Co., Ltd.

Information Type	Address (HEX)	Data Type	Description
			• 0x0001: Coupling Ring • 0x0002: Chain • 0x0003: Dual_homing
	0x3017	1 Word	Group IV ring port1
	0x3018	1 Word	Group IV ring port2
	0x3019	1 Word	Group IV Ring ID
	0x301A	1 Word	Group IV HelloTime
	0x301B	1 Word	Group IV Enable
	0x301C	1 Word	Group IV Master-slave device: • 0x0000: master device • 0x0001: slave device

Instance: MODBUS TCP Configuration

Acquire the switch device name information via DebugTool analogue client, the switch information as follows:

- Switch default IP address: 192.168.1.254;
- Address of switch register that stores the device name information: 0x002;
- Number of switch register that stores the device name information: 16 words;

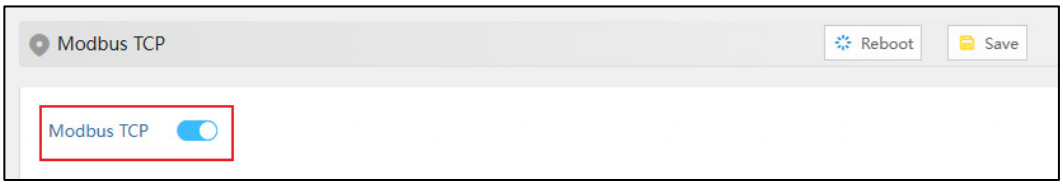
Operation Steps

First, configure the switch Modbus_TCP monitoring enable.

Step 1 Log into Web configuration interface.

Step 2 Select "Network Management > Remote Monitoring > Modbus TCP".

Step 3 Slide on the "Modbus_TCP" enable switch, as shown in the figure below.



Step 4 End.

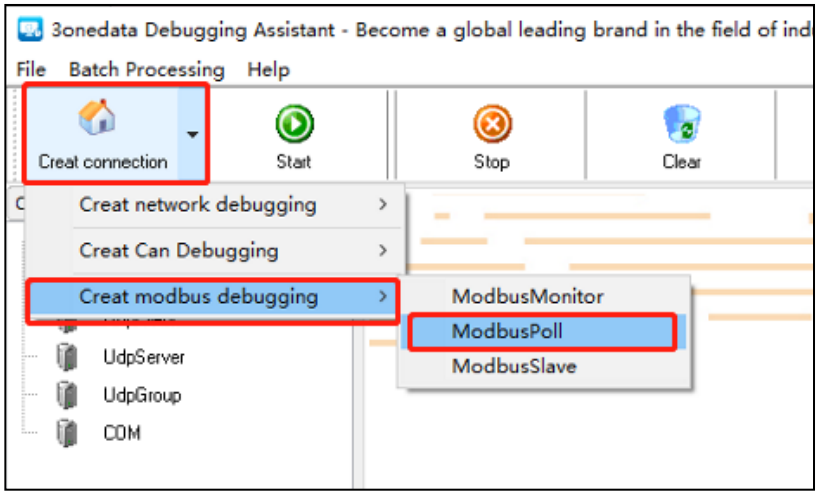
Then, run the debug tool software to acquire the device parameters.

Step 5 Open "Debug Tool".

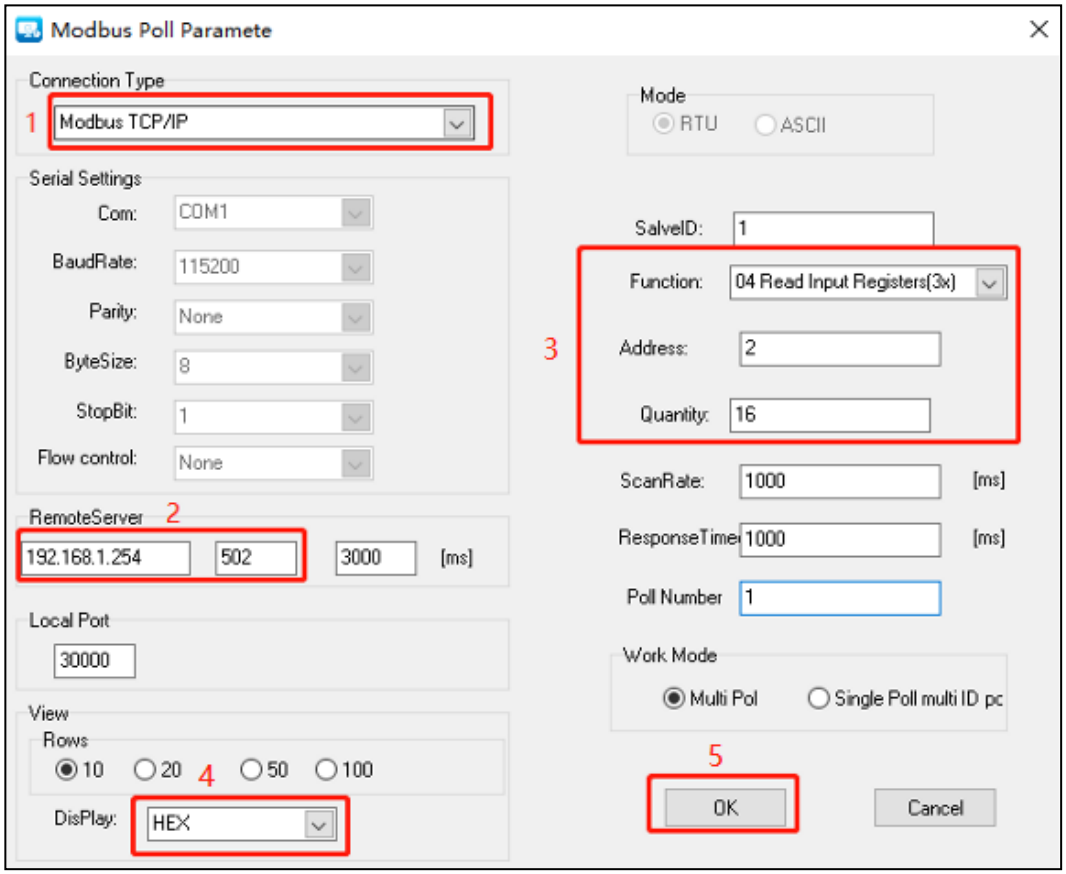
Copyright © 3onedata Co., Ltd.

Step 6 Click the drop-down list of "Create connection".

Step 7 Select "Create Modbus debugging > ModbusPoll", as the picture below.



Step 8 Configuration window of ModbusPoll parameters pops up, the configuration as the picture below:



1 On the drop-down list of "Connection Type", select "Modbus TCP/IP";

2 Enter the switch IP address "192.168.1.254" and port number "502" on the column of "Remote Server";

Copyright © 3onedata Co., Ltd.

3 Select "04 Read Input Registers (3x)" on the drop-down list of "Function";

4 Enter decimal device name register address "2" on the text box of "Address";

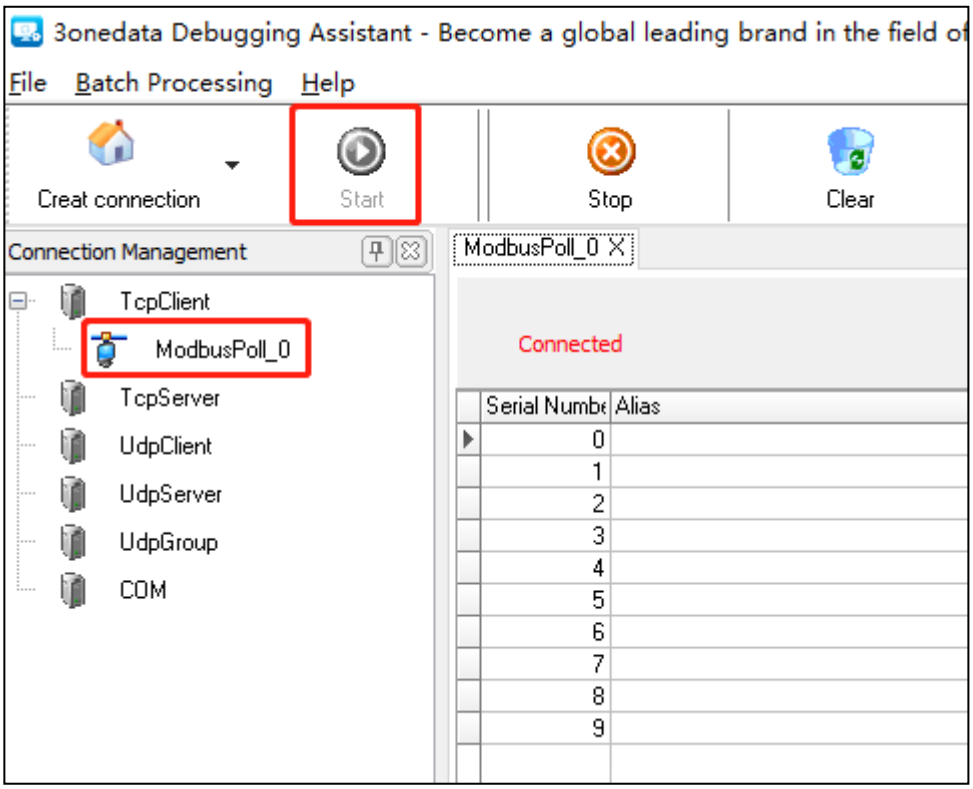
Notice:
Here the start address is decimal format, so hexadecimal register address should be converted into decimal format.

5 Enter the register amount "16" on the text box of "Quantity";

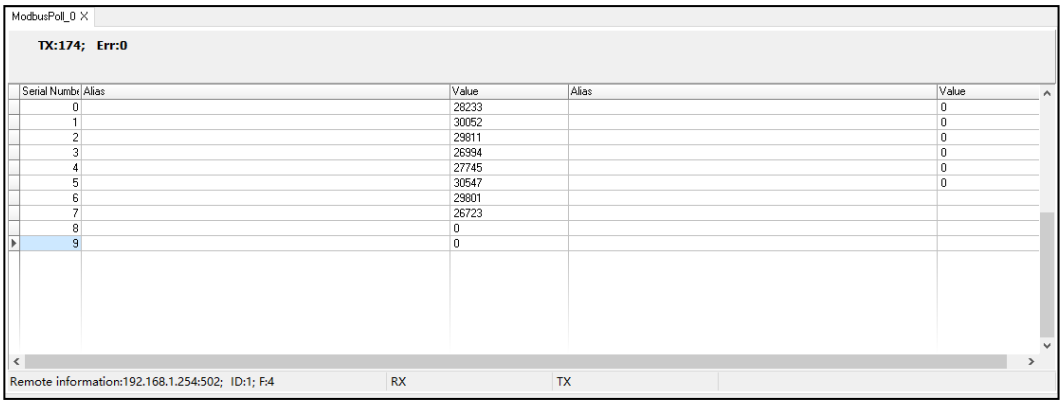
6 Select "HEX" on the drop-down list of "Display";

7 Click "OK".

Step 9 On the page of Debug Tool, select created ModbusPoll, and then click "Start";



Step 10 Check responsive data, and convert the hexadecimal value read by register into ASCII code, displayed as "Industrial Switch";



Copyright © 3onedata Co., Ltd.

Step 11 End.

Note

- Switch can establish 4 Modbus TCP monitoring connections at the same time.
- Switch port information, ring information, and frame statistics information support the sequential read of port parameters of multiple registers. For example, address range of the register that stores port connection status information is 0x1000-0x101B, each register data is 1 word; when the start address of register is 0x1000, the register number is 1, it will read port 1 status; If the register quantity is 10, it will read the status from Port 1 to Port 10; If the port doesn't exist, then the read data will be 0xFFFF.

9.8 IEC61850-MMS

9.8.1 Global Configuration

Function Description

MMS (Manufacturing Message Specification) is an application layer protocol, which is mainly used for communication between devices in the field of industrial automation. Based on the OSI model, it provides a set of services and protocols to promote seamless communication between devices and systems produced by different manufacturers. MMS plays an important role in IEC 61850 standard, which is the only global standard in the field of power system automation.

MMS Server and MMS Client play different roles in communication. MMS Server is a service provider, which manages data objects, such as the status and configuration information of intelligent electronic devices (IEDs), and performs specific services and functions. MMS Client is a service requester, which sends requests to the server, such as reading or writing data, executing program calls, or requesting file transfer.

In smart substation, the application cases of MMS protocol include substation parameter setting, real-time data reading, historical data query and so on. Through MMS protocol, remote monitoring and maintenance of intelligent electronic equipment can be realized, and the automation level and safety performance of substation can be improved. Generally speaking, MMS Server and MMS Client play a vital role in the communication system of intelligent substation, which together ensure efficient, reliable and standardized communication between substation devices.

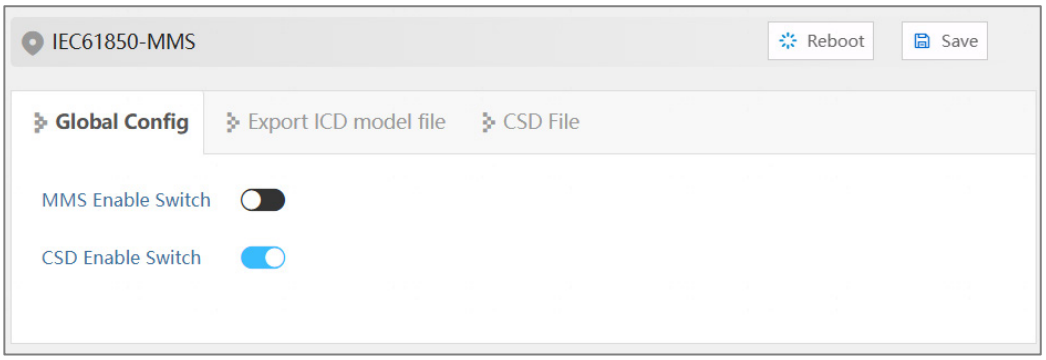
Copyright © 3onedata Co., Ltd.

Operation Path

Open in order: "Network > IEC61850 MMS > Global Config".

Interface Description

Interface screenshot of IEC61850 MMS:



Interface Element	Description
MMS Enable Switch	Enable the MMS Server service.
CSD Enable Switch	Enable the configuration system profile function.

9.8.2 Export ICD Model File

Function Description

ICD (IED Capability Description): It is provided by device manufacturers and describes the technical data model and services provided by IEDs, but does not include the actual name and communication parameters of IEDs. It contains model self-description information, device manufacturer name, device type, version number and modification information, etc. It is the factory configuration information of IED, that is, the function description file. MMS protocol supports the transmission of data and service requests defined in IDC files between IEDs. IDC model file is the basis of automation and informatization, which supports efficient communication and data management in substation.

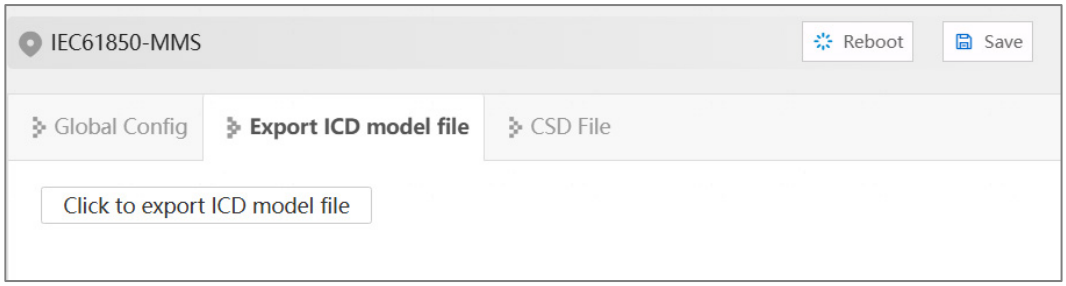
Operation Path

Open in order: "Network > IEC 61850 MMS > Export ICD model file".

Copyright © 3onedata Co., Ltd.

Interface Description

The screenshot of the interface for exporting ICD model files is as follows. Click "Click to Export ICD model File".



9.8.3 Configure CSD File

Function Description

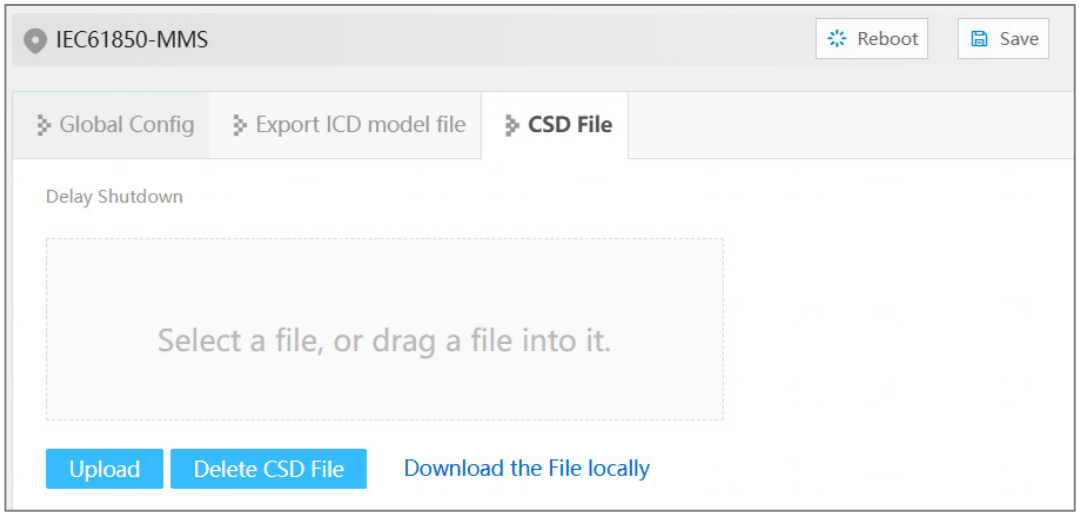
Download, upload and delete CSD configuration file.

Operation Path

Open in order: "Network > IEC 61850 MMS > CSD File".

Interface Description

CSD File interface is as follows:



The main element configuration descriptions of CSD file interface:

Interface Element	Description
Select a file, or drag a file into it	To select the uploaded configuration file, click this area to select the local configuration file, or drag the local configuration file directly into this area.

Copyright © 3onedata Co., Ltd.

Interface Element	Description
Upload	After selecting the uploaded configuration file, click the "Upload" button to start uploading the configuration.
Delete CSD file	Click the Delete CSD File button to delete the current CSD file of the system.
Download the file locally	Click to download the configuration file of the current device. The default file name is "switch.csd".

9.9 QoS

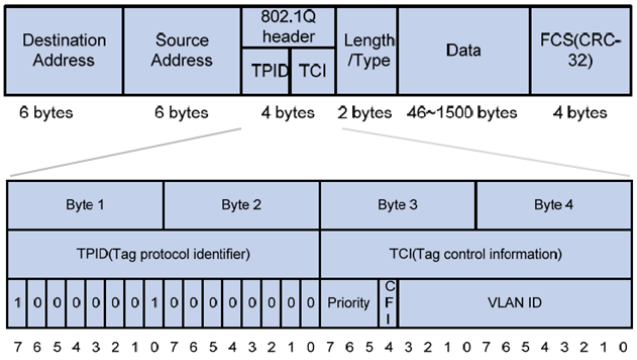
QoS (Quality of Service) is used to evaluate the ability of the service provider to meet the service needs of customers. As for network business, service quality includes transmission bandwidth, transfer delay, data packet loss rate and so on.

The service quality issues that traditional network faces are caused by network congestion. The so-called congestion refers to the phenomenon that the forwarding rate decreases and extra delays are introduced due to the relative shortage of supply resources, thus leading to the decline of service quality. As for congestion management, queue technology is generally adopted. It uses a queue algorithm to classify flow, then uses some priority algorithm to send this flow.

Priority is used to tag the priority of message transmission.

- CoS

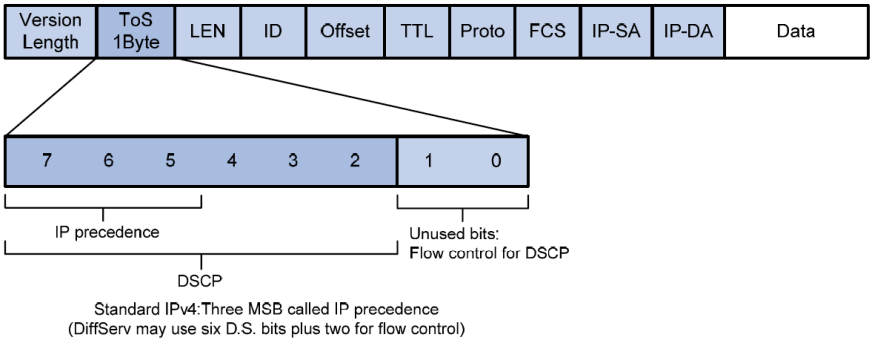
  Ethernet defines 8 business priorities (CoS, Class of Service) in the VLAN TAG of Ethernet frame head. The 802.1Q label head of 4 bytes has included 2-byte TPID（Tag Protocol Identifier) and 2-byte TCI（Tag Control Information), TPID's is 0x8100, the following graph has displayed the details of 802.1Q label head, priority field is 802.1p priority.



Copyright © 3onedata Co., Ltd.

- DSCP

  The ToS (Type of Service) domain in the head of IP message is called DS (differential Services) domain, in which the priority of DSCP (Differentiated Services Code Point) is represented by the first 6 digits (0 ~ 5 digits) of this domain, with a value range of 0-63, and the last 2 digits (the 6th and 7th digit) are reserved. The higher the priority value, the higher the priority.



9.9.1 Global Configuration

Function Description

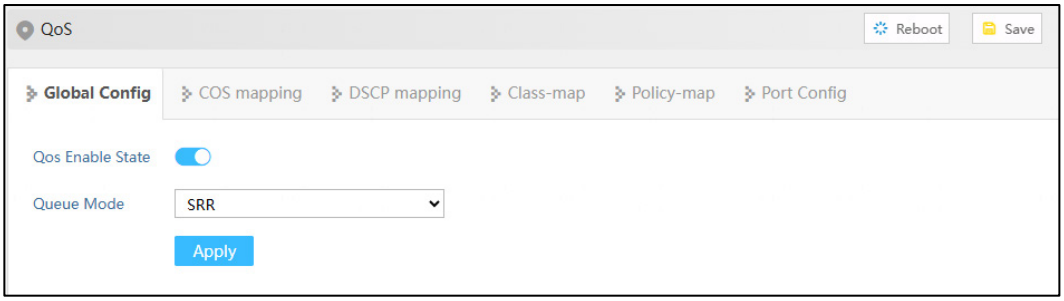
On the “Global Configuration” page, user can enable/disable QoS enable state.

Operation Path

Open in order: "Network > QoS > Global Config".

Interface Description

The screenshot of global configuration interface:



The main element configuration description of QoS classification interface:

Interface Element	Description
Queue Mode	Queuing scheduling setting, options are: • SP (Strict Priority): Strict priority queue scheduling algorithm includes 4 queues and schedules in the

Copyright © 3onedata Co., Ltd.

Interface Element	Description
	decreasing order of priority. When the queue with high priority is empty, then it would send groupings of queue with low priority. • WRR (Weighted Round Robin): a weighted round robin scheduling algorithm, in which the number of packets that each queue can transmit at a time is determined according to the set weight value. • SRR (Staged Round Robin): a staged polling scheduling algorithm. When multiple packets are received and waiting for transmission, one packet will be taken out from each queue in turn in a certain order and sent out. At the same time, bandwidth can be allocated on demand by adjusting the selection frequency between queues.

Note

- When the DSCP and CoS are not enabled, queuing and scheduling are in the order of port priority.
- When the DSCP or CoS are enabled, queuing, and scheduling according to DSCP or CoS instead of considering port priority.
- If the DSCP and CoS are enabled at the same time, queuing according to DSCP priority. When the DSCP values are the same, queuing according to CoS priority.

9.9.2 CoS Mapping

Function Description

On the page of “CoS Mapping”, user can configure mapping between CoS value and priority queues.

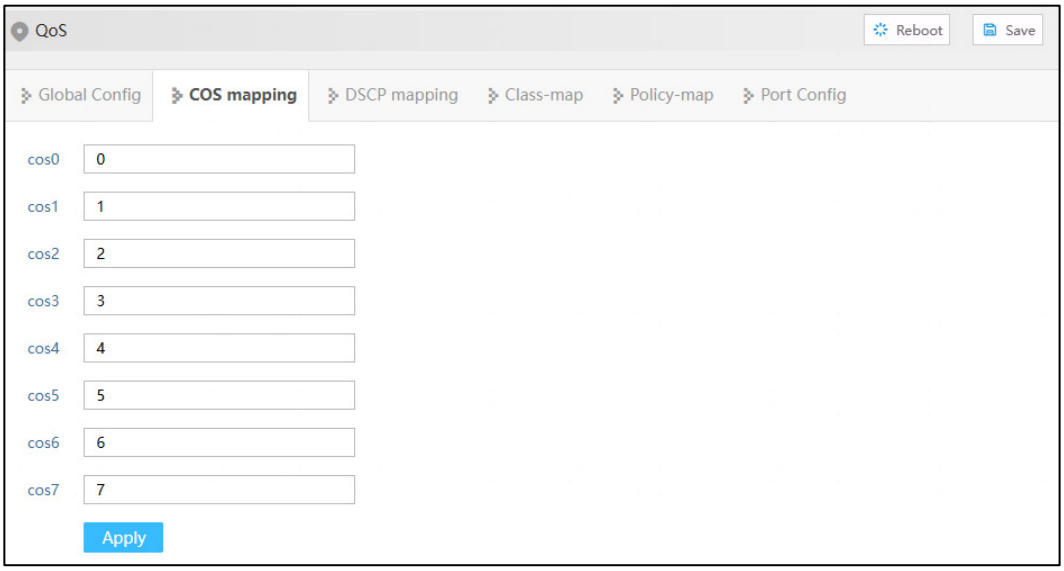
Operation Path

Open in order: “Network > QoS > CoS Mapping”.

Interface Description

Screenshot of CoS Mapping interface:

Copyright © 3onedata Co., Ltd.



The main element configuration description of CoS mapping interface:

Interface Element	Description
CoS value	Display CoS value.
Priority queue	Set mapping between CoS value and priority queue, value range is 0-7, the greater the value, the higher the priority level. • Low: low priority queue • Normal: normal priority queue; • Medium: medium priority queue • High: high priority queue

9.9.3 DSCP Mapping

Function Description

On the page of “DSCP mapping”, user can configure mapping relation between DSCP value and priority queue.

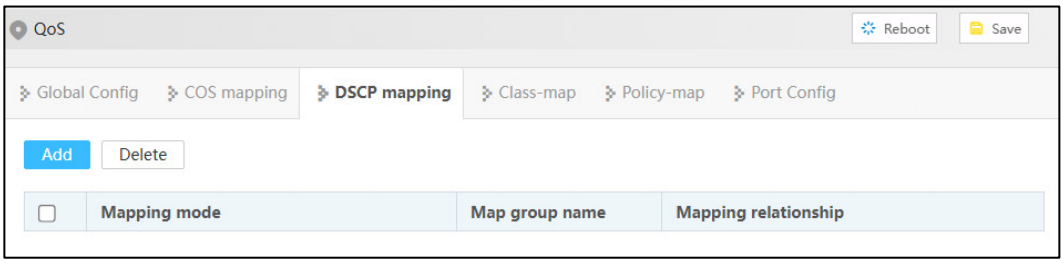
Operation Path

Open in order: “Network > QoS > DSCP mapping”.

Interface Description

DSCP Mapping interface screenshot:

Copyright © 3onedata Co., Ltd.



The main element configuration description of DSCP mapping interface:

Interface Element	Description
Map group name	The map group name, which supports 0-32 characters, consists of uppercase letters, lowercase letters, numbers, or special characters (! @ _-).
Mapping mode	Mapping mode, options as follows: • dscp-mutation: means to modify the DSCP field value of the ingress message according to the dscp field value of the egress message; • dscp-cos: represents priority mapping, which is used to realize the conversion between the DSCP, a QoS priority field carried by the message, and the internal priority of the device, to provide differentiated QoS service quality.
Mapping relationship	Incoming/outgoing DSCP values, ranging from 0-63, supporting up to 8 values, with multiple values separated by commas.

9.9.4 Class-map

Function Description

On the page of “Class-map”, user can configure mapping relation between Class-map and priority queue.

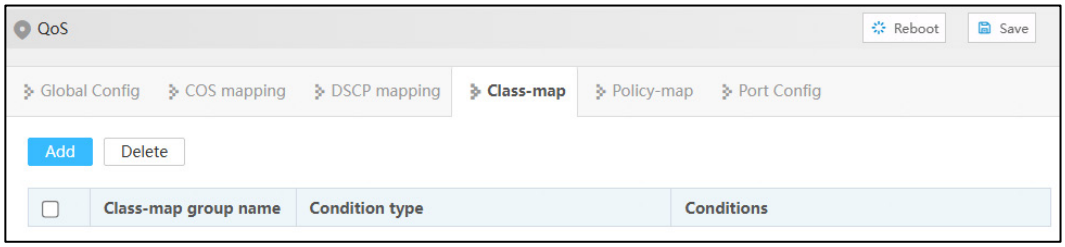
Operation Path

Open in order: "Network > QoS > Class-map".

Interface Description

Class-map interface screenshot:

Copyright © 3onedata Co., Ltd.



The main elements configuration description of “Class-map” interface:

Interface Element	Description
Class-map group name	The Class-map group name, which supports 0-32 characters, consists of uppercase letters, lowercase letters, numbers, or special characters (! @ _-).
Condition type	Condition type, options are as follows: • "-": No conditions selected. • access-group • vlan • ip-dscp • ip-precedence • layer4
Conditions	Display as follows: • access-group: "ACL Group Name" must be configured. • vlan: "Start VLAN" and "End VLAN" must be configured (valid range: 1-4094). • ip-dscp: Require configuration of "Dscp value", ranging from 0-63, supporting up to 8 values, with multiple values separated by commas. • ip-precedence: Require configuration of "Dscp value", ranging from 0-63, supporting up to 8 values, with multiple values separated by commas. • layer4: Must configure "Port Type (destination-port & source-port)", "Start Port No.", and "End Port No." (valid range: 1-65535).

Copyright © 3onedata Co., Ltd.

9.9.5 Policy-map

Function Description

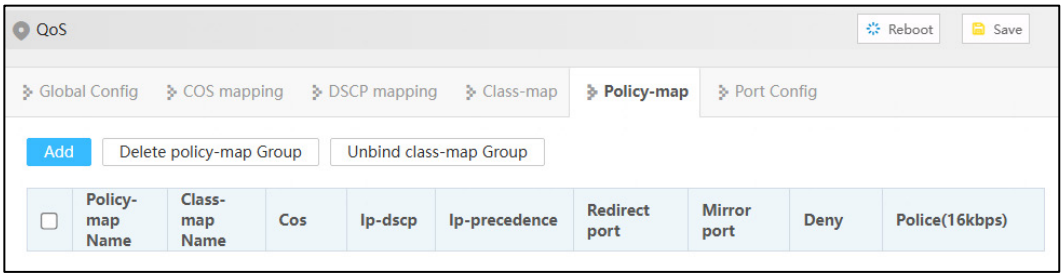
On the page of “Policy-map”, user can configure mapping relation between Policy-map and priority queue.

Operation Path

Open in order: "Network > QoS > Policy-map".

Interface Description

Policy-map interface screenshot:



The main elements configuration description of “Policy-map” interface:

Interface Element	Description
Policy-map Name	The map group name, which supports 0-32 characters, consists of uppercase letters, lowercase letters, numbers, or special characters (! @ _-).
Class-map Name	The Class-map group name, which supports 0-32 characters, consists of uppercase letters, lowercase letters, numbers, or special characters (! @ _-).
Cos	CoS mapping value.
Ip-dscp	IP-DSCP (Differentiated Services Code Point) occupies the first 6 bits of the ToS field, extending the marking range of IP-Precedence to enable more granular priority classification. Its valid range is 0-63, supporting more complex service classification.
Ip-precedence	IP-Precedence occupies the first 3 bits of the ToS (Type of Service) field in the IPv4 packet header, used to identify the transmission priority of data packets. The valid range is 0-7 (8 levels in total), with higher values indicating higher

Copyright © 3onedata Co., Ltd.

	priority.
Redirect port	Redirect port mapping relationships.
Mirror port	Mirrored port mapping relationships.

9.9.6 Port Configuration

Function Description

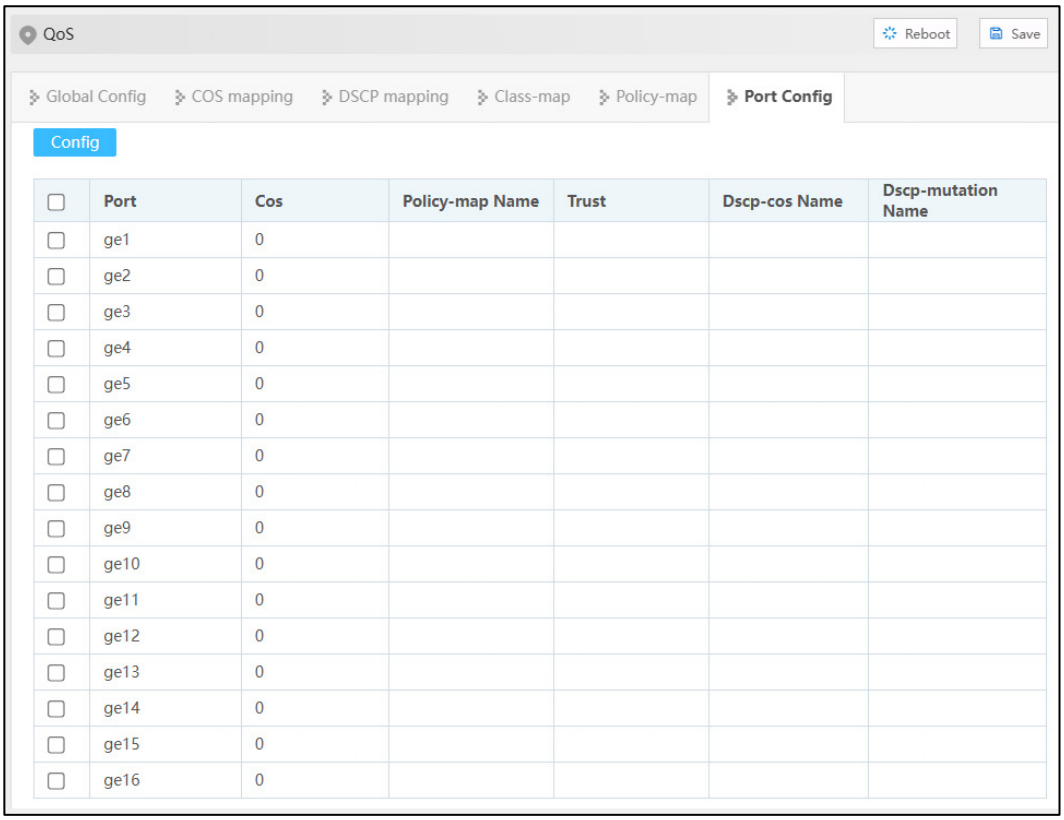
Configure the sending and receiving mode and management address of the port.

Operation Path

Open in order: "Network > QoS > Port Config".

Interface Description

Check port configuration interface as below:



The main element configuration description of port configuration interface:

Interface Element	Description
Port	The corresponding port name of the device Ethernet port.
Cos	Optional Service Classification (0-7) • 0-7

Copyright © 3onedata Co., Ltd.

Interface Element	Description
	• -: null field
Policy-map Name	Indicates that the the Policy- map is bound to the interface.
Trust	Controls whether a specific DSCP value is trusted. Only frames with trusted DSCP values are mapped to a specific QoS class and Drop Precedence Level. Frames with untrusted DSCP values are treated as a non-IP frame.
Dscp-cos Name	Indicates that the dscp-cos mapping group is bound to the interface.
Dscp-mutation Name	Indicates that the dscp-mutation mapping group is bound to the interface.

Copyright © 3onedata Co., Ltd.

10 TSN Management

10.1 PTP

PTP (Precision Time Protocol) is a time synchronization protocol for high-precision frequency synchronization and phase synchronization between network nodes. IEEE1588 is the basic protocol of PTP, which specifies the principle of high-precision clock synchronization in the network and the specification of message interaction processing. Therefore, PTP is also called IEEE1588 for short. The 1588 is divided into two versions: 1588v1 and 1588v2. The 1588v1 can only achieve sub-millisecond time synchronization accuracy, while the 1588v2 can achieve sub-microsecond synchronization accuracy, which can realize both phase synchronization and frequency synchronization. Today, 1588v1 is basically replaced by 1588v2. Based on IEEE 1588, PTP derived IEEE 802.1AS and other protocols. Different PTP protocol standards have different usage scenarios and different functions, but their principles are basically the same. On the basis of IEEE1588, IEEE802.1AS refines it to form a more targeted time synchronization mechanism. It only supports two-step and P2P mode, but does not support UDP protocol and single-step and E2E mode.

10.1.1 Clock Configuration

Function Description

Configure the PTP clock.

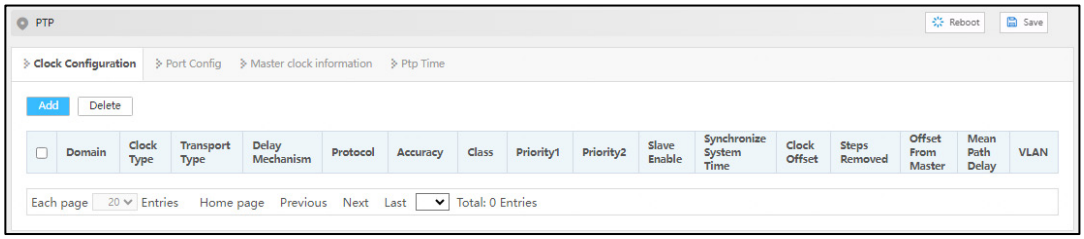
Operation Path

Open in order: "PTP > PTP > Clock Configuration".

Interface Description

Clock Configuration interface is as follows:

Copyright © 3onedata Co., Ltd.



Main elements configuration description of clock configuration interface:

Interface Element	Description
Domain	Domain ID, the value range is 0-254.
Clock Type	Clock node options as follows: • boundary: Boundary Clock This clock node has multiple PTP interfaces in the same PTP domain to participate in time synchronization. It synchronizes the time from the upstream clock node through one interface, and issues the time to the downstream clock node through the other interfaces. In addition, when the clock node is used as the clock source, the time can be released to the downstream clock node through multiple PTP interfaces. • ordinary: Ordinary Clock This clock node has only one PTP interface in the same PTP domain to participate in time synchronization, and it synchronizes time from the upstream clock node through this interface. In addition, when the clock node is used as the clock source, the time can be released to the downstream clock node through only one PTP interface. • transparent: transparent clock. This clock node has multiple PTP interfaces, but it only forwards PTP protocol messages between these interfaces and corrects the forwarding delay, and does not synchronize the time through any interface.
Transport Type	The encapsulation types used for transmitting PTP messages are as follows: • ethernet: Ethernet encapsulation • udp v4: IPv4 UDP encapsulation • udp v6: IPv6 UDP encapsulation
Delay Mechanism	Link delay measurement mechanism, options are as follows: • e2e: Request response mechanism E2E(End to End),

Copyright © 3onedata Co., Ltd.

Interface Element	Description
	which calculates the time difference according to the overall path delay time between master and slave clocks. If there is a transparent clock between the master clock and the slave clock, the transparent clock does not calculate the average path delay. • p2p: Peer-to-peer delay mechanism, which calculates the time difference according to the delay time of each link between master and slave clocks. If there is a transparent clock between the master clock and the slave clock, the transparent clock will participate in calculating the path delay of each link.
Protocol	Clock protocol type, options are as follows: • ieee1588 • 8021as
Accuracy	The time accuracy of the clock source, it ranges from 0 to 255. The smaller the value, the higher the accuracy. Note: When each clock node in PTP domain dynamically selects the optimal clock through BMC protocol, it will compare it according to the order of the first priority, time level, time accuracy, clock deviation and second priority of the clock carried in the Announce message, and the winner will become the optimal clock.
Class	The time level of the clock source, it ranges from 0 to 255. The smaller the value, the higher the level.
Priority 1	Priority 1 of the clock source. Value range is 0-255, smaller value represents higher priority.
Priority 2	Priority 2 of the clock source. Value range is 0-255, smaller value represents higher priority.
Slave Enable	When the clock node is an ordinary clock, the restrictions on the slave clock are as follows: • disable: Cancel the restriction that the local clock cannot be elected as the master clock. • enable: only as a slave clock, limiting that the local clock cannot be elected as the master clock.
Synchronize System Time	Update the master clock time of PTP domain to the system clock, with the following options: • enable • disable

Copyright © 3onedata Co., Ltd.

Interface Element	Description
Clock Offset	The logarithmic variance of the offset scale of the clock source, which measures the time offset. The value range is 0-65535.
Steps Removed	Displays the number of hops from the current clock to the main clock.
Offset From Master	Displays the deviation between the current clock and the main clock time.
Mean Path Delay	Displays the path delay of the current clock from the master clock or neighboring nodes.
VLAN	VLAN ID number, value range is 1-4094.

10.1.2 Port Configuration

Function Description

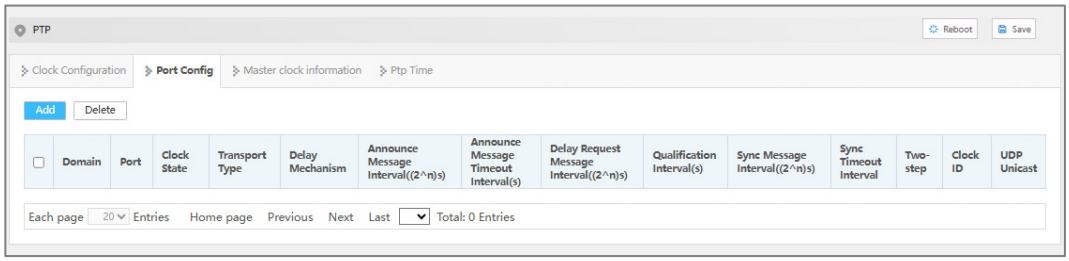
Configure PTP port.

Operation Path

Open in order: "PTP > PTP > Port Configuration".

Interface Description

Check port configuration interface as below:



The main element configuration description of port configuration interface:

Interface Element	Description
Domain	Domain ID, the value range is 0-254.
Port	The corresponding port name of the device Ethernet port.
Clock State	Display port PTP clock state.
Transport Type	The encapsulation type used for transmitting PTP messages at the port can be selected as follows: • ethernet: Ethernet encapsulation

Copyright © 3onedata Co., Ltd.

Interface Element	Description
	• udp v4: IPv4 UDP encapsulation • udp v6: IPv6 UDP encapsulation
Announce Message Interval ((2^n)s)	The time interval for the main node to periodically send the Announce message, with the range of 0-4th power second of 2.
Announce Message Timeout Interval (s)	The timeout of receiving the Announce message from the node is a multiple of the period of sending the Announce message from the master node, and the value range is 2-10.
Delay Request Message Interval ((2^n)s)	The time interval for sending the delay request message, the value range is 0-5th power second of 2.
Qualification Interval (s)	The minimum time interval for sending the Delay_Req message, the value range is 1-10th power second of 2.
Sync Message Interval ((2^n)s)	Specifies the time interval for sending Sync message, ranging from is -3-3th power second of 2.
Sync Timeout Interval	The timeout interval for sending Sync message, ranging from 2-10.
Two-step	The dual-step clock mode is enabled, and the options are as follows: • enable: the carrying mode of time stamp is two-step mode, that is, neither the Sync message nor the Pdelay_Resp message carries the time stamp of the time when this message was sent, but is carried by other subsequent messages. • disable: the carrying mode of timestamp is single-step mode, that is, the event messages Sync and Pdelay_Resp have the timestamp of the sending time of this message, and the announcement of time information is completed at the same time of message sending and receiving.
Clock ID	"Clock ID" is the clock ID of the master clock, which has the highest priority and the most accurate clock information. Note: When the master clock device sets its own clock ID to the master clock ID, it is responsible for sending the most accurate clock information to other devices. Other devices align their clocks with the master clock to ensure that time is synchronized throughout the system.

Copyright © 3onedata Co., Ltd.

Interface Element	Description
UDP Unicast	UDP Unicast is a basic communication mode of User Datagram Protocol (UDP), and its core feature is one-to-one accurate data transmission.

10.1.3 Master Clock Information

Function Description

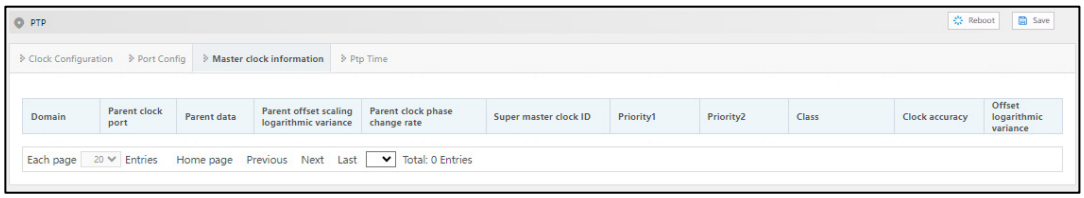
View PTP Master Clock information,

Operation Path

Open in order: "PTP > PTP > Master Clock Information".

Interface Description

Master Clock Information interface is as follows:



The main element configuration description of master clock information interface:

Interface Element	Description
Domain	Domain ID, the value range is 0-254.
Parent clock port	The Ethernet port of the master node device connected to the device, if the device is used as the master clock, it is itself.
Parent data	Refer to the master clock data in the switch that is used to synchronize individual ports and devices in the switch. During the processing of the switch, ensure that all data is transmitted synchronously within the switch and between external devices.
Parent offset scaling logarithmic variance	Indicate the deviation between clocks, i.e. the time difference between two clocks.
Parent clock phase change rate	Refer to the phase change of the clock signal with respect to the reference clock signal in unit time.
Super master clock ID	Grandmaster Clock ID is the clock ID of the master clock, which has the highest priority and the most accurate clock

Copyright © 3onedata Co., Ltd.

Interface Element	Description
	information. Note: When the master clock device sets its own clock ID to the master clock ID, it is responsible for sending the most accurate clock information to other devices. Other devices align their clocks with the master clock to ensure that time is synchronized throughout the system.
Priority 1	Priority 1 of the clock source. Value range is 0-255, smaller value represents higher priority.
Priority 2	Priority 2 of the clock source. Value range is 0-255, smaller value represents higher priority.
Class	The time level of the clock source, it ranges from 0 to 255. The smaller the value, the higher the level.
Clock accuracy	The time accuracy of the clock source, it ranges from 0 to 255. The smaller the value, the higher the accuracy. Note: When each clock node in PTP domain dynamically selects the optimal clock through BMC protocol, it will compare it according to the order of the first priority, time level, time accuracy, clock deviation and second priority of the clock carried in the Announce message, and the winner will become the optimal clock.
Offset logarithmic variance	The logarithmic variance of the offset scale of the clock source, which measures the time offset. The value range is 0-65535.

10.1.4 PTP Time

Function Description

View PTP Time.

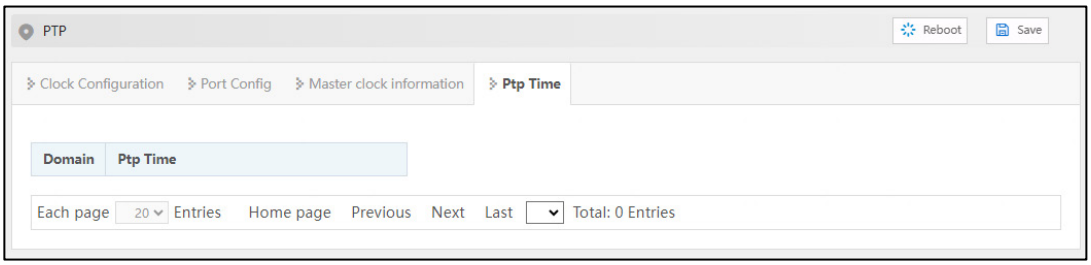
Operation Path

Open in order: "PTP > PTP > Ptp Time".

Interface Description

The PTP Time interface is as follows:

Copyright © 3onedata Co., Ltd.



The main element configuration description of PTP Time information interface:

Interface Element	Description
Domain	Domain ID, the value range is 0-254.
Ptp Time	View the Ptp Time configured in the current system.

Copyright © 3onedata Co., Ltd.

11 System Maintenance

11.1 Network Diagnosis

11.1.1 Ping

Function Description

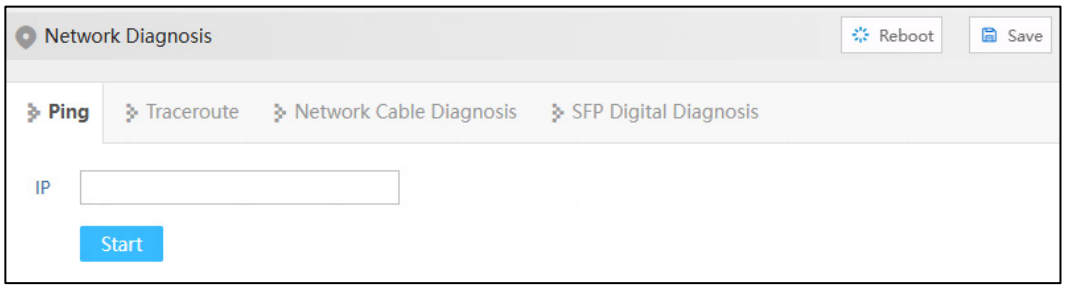
Ping is used to check whether the network is open or network connection speed. The Ping command uses the uniqueness of the IP address on the network to send a packet to the target IP address, and then asks to return a packet of the same size to determine whether the network is connected and what the delay is.

Operation Path

Open in order: "System > Network Diagnosis > Ping".

Interface Description

The Ping interface is as follows:



The main element configuration description of Ping interface:

Interface Element	Description
IP	The IPv4 or IPv6 address of the detected device, that is, the destination address. The device can check the network intercommunity to other devices via the ping command.

Copyright © 3onedata Co., Ltd.

11.1.2 Traceroute

Function Description

Test the network situation between the switch and the target host. Traceroute measures how long it takes by sending small packets to the destination device until they return. Each device along the path returns three Traceroute test results. Output result includes each test time (ms), device name (if exists) and the IP address.

Operation Path

Open in order: "System > Network Diagnosis > Traceroute".

Interface Description

Traceroute interface is as follows:



The main element configuration description of Traceroute interface:

Interface Element	Description
IP	Destination device IPv4 or IPv6 address, fill in the opposite device IP address that needs test.

11.1.3 Network Cable Diagnosis

Function Description

It can detect whether there is a fault in the cable used by the copper port of the device. When the cable is in normal condition, the length in the detection information refers to the total length of the cable. When the cable is in abnormal condition, the length in the detection information refers to the length from this interface to the fault location. The 8-wire network cable has 4 groups of differential lines, and the device can detect the length and status of each group of differential lines.

Copyright © 3onedata Co., Ltd.

Note

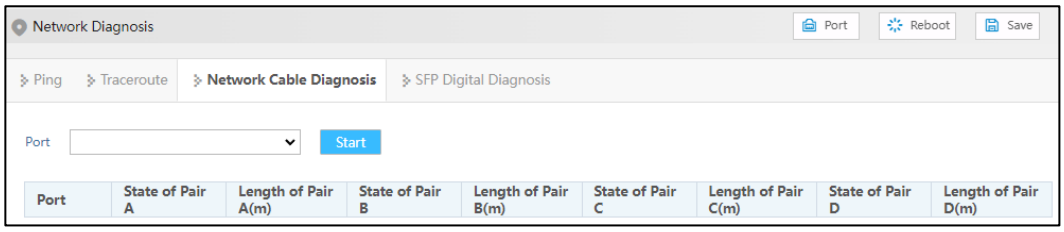
- The accuracy of detecting cable length is about 5 meters, and the test results are for reference only. The test results of different types or different manufacturers may be different.
- When testing, it will affect the normal use of the interface business in a short time, and may also cause the interface of UP to oscillate.

Operation Path

Open in order: "System > Network Diagnosis > Network Cable Diagnosis".

Interface Description

Network cable diagnosis interface screenshot is as follows:



Main elements configuration description of network cable diagnosis interface:

Interface Element	Description
Port	The corresponding port name of the device Ethernet port.
State of Pair A/B/C/D	The state of the differential line, such as OK (normal), OPEN (open circuit), SHORT (short circuit), CROSS (cross/crosstalk), etc.
Length of Pair A/B/C/D (m)	Length of the differential line, unit: meter.

11.1.4 SFP Digital Diagnosis

Function Description

Monitor SFP parameters in real time. This function has greatly facilitated the troubleshooting process of optical fiber link and the cost of on-site debugging.

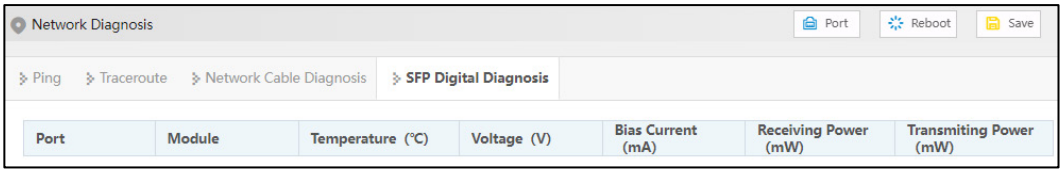
Operation Path

Open in order: "System > Network Diagnosis > SFP Digital Diagnosis".

Copyright © 3onedata Co., Ltd.

Interface Description

The SFP digital diagnostic interface is as follows:



The main element configuration description of SFP digital diagnosis interface:

Interface Element	Description
Port	The corresponding port name of the device Ethernet port.
Module	Parameter information of optical module:
Temperature (℃)	This device's SFP temperature. Its unit is ℃. The working temperature of SFP module should not exceed the normal working temperature range of the
Voltage (V)	The voltage provided by the device to SFP, unit: V. Overvoltage could lead to the breakdown of CMOS device; under voltage would disable the normal operation of lasers.
Bias Current (Ma)	The bias current of laser.
Receiving Power (Mw)	Optical input power, referring to the lowest optical power of receiving in certain rate and bit error rate.
Transmiting Power (Mw)	Optical output power, referring to the output power of optical source in the sending end of optical module.

11.2 Time

11.2.1 NTP Configuration

The full name of NTP protocol is Network Time Protocol. Its destination is to transmit uniform and standard time in international Internet. Specific implementation scheme is appointing several clock source websites in the network to provide user with timing service, and these websites should be able to mutually compare to improve the accuracy. It can provide millisecond time correction, and is confirmed by the encrypted way to prevent malicious protocol attacks.

Copyright © 3onedata Co., Ltd.

Function Description

Configure the device time and NTP server information.

Operation Path

Open in order: "System > Time > NTP Config".

Interface Description

The NTP configuration interface is as follows:



Main element configuration description of NTP configuration interface:

Interface Element	Description
NTP Enable Switch	NTP protocol enable switch.
Master Enable Switch	Master enable switch, after enabled, the device starts NTP service, and uses the local clock of the device as NTP master clock to provide clock source for other devices.
Server	IP address of NTP server, for example: 192.168.1.1. Note: As NTP client, the system will synchronize time with NTP server every 11 minutes.

11.2.2 Time Configuration

Function Description

Configure device time

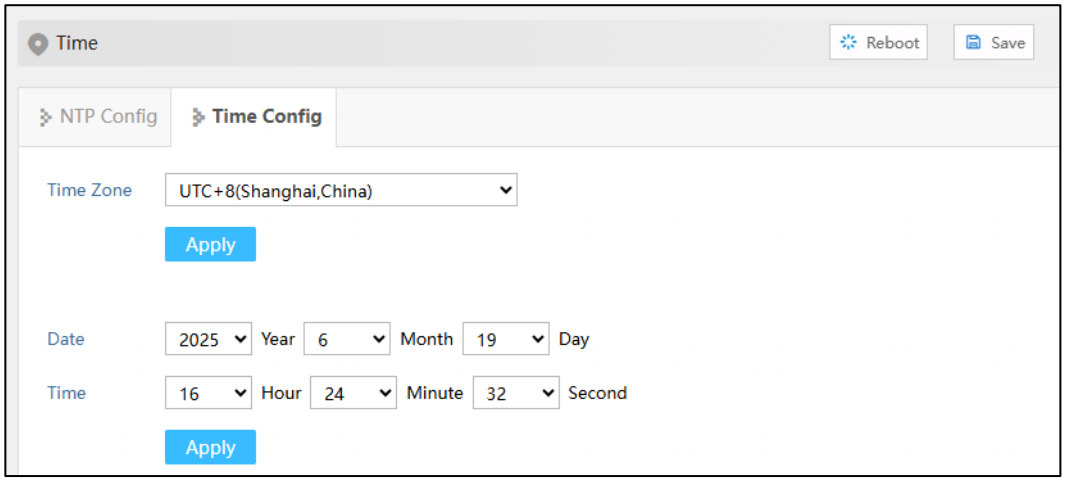
Operation Path

Open in order: "System > Time > Time Config".

Interface Description

Time config interface is as follows:

Copyright © 3onedata Co., Ltd.



Main elements configuration description of time config interface:

Interface Element	Description
Time Zone	UTC (Universal Time Coordinated) time zone. Due to different regions, users can freely set the system clock according to the regulations of their own country or region.
Date	Data configuration, year/month/day.
Time	Time configuration, hour/minute/second.

11.3 Alarm

11.3.1 Alarm Trigger

Function Description

The device system provides multiple alarm trigger sources, including port status, abnormal temperature, power failure, and excessive network load. When these trigger sources are activated, users can trigger the alarm by configuring LED indicator, relay, Trap message or email alarm mode, to respond and deal with potential problems in time.

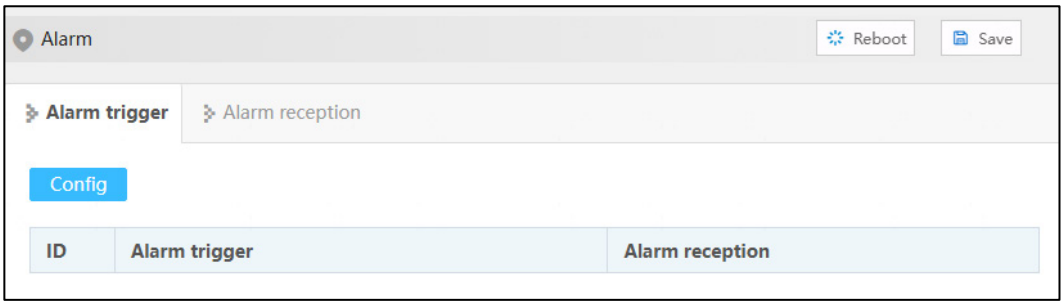
Operation Path

Open in order: "System > Alarm > Alarm trigger".

Interface Description

The Alarm trigger interface is as follows:

Copyright © 3onedata Co., Ltd.



The main element configuration description of Alarm trigger interface:

Interface Element	Description
ID	Alarm trigger entry.
Alarm trigger	Device alarm triggers include port, temperature, power supply and network load.
Alarm reception	Device alarm modes include LED, Relay, Trap and E-mail.

11.3.1.1 Port Alarm

Function Description

Configure the port alarm function. When the device port is in an abnormal state, the administrator can be informed in time, and the device state can be quickly repaired to avoid excessive loss.

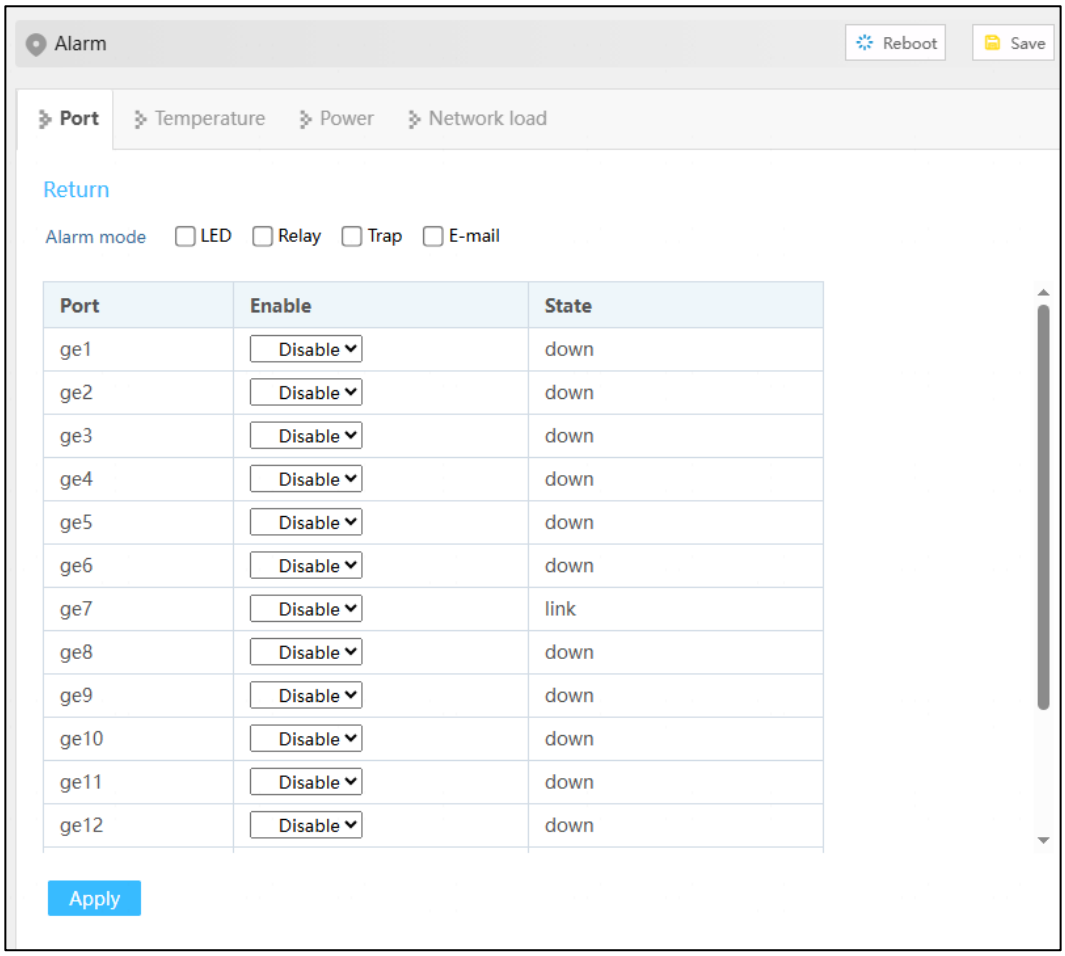
Operation Path

Open in order: "System > Alarm > Alarm Trigger > Port".

Interface Description

Port alarm interface is as below:

Copyright © 3onedata Co., Ltd.



The main element configuration description of port alarm configuration interface:

Interface Element	Description
Port	The corresponding port name of the device Ethernet port.
State	Port link status, display items as follows: • link • down
Enable	Port alarm function status, options as follows: • Enable • Disable Note: After enabling port alarm, when port occurs abnormal status, such as disconnection, the device will output an alarm signal to hint the abnormal operation of device port via setting LED indicator, relay, Trap message or e-mail.
Alarm mode	Alarm mode of port alarm, with options: • LED • Relay • Trap • E-mail Note: If checked, the LED indicator, relay, Trap message or email alarm

Copyright © 3onedata Co., Ltd.

Interface Element	Description
	mode will be turned on to trigger the alarm.

11.3.1.2 Temperature Alarm

Function Description

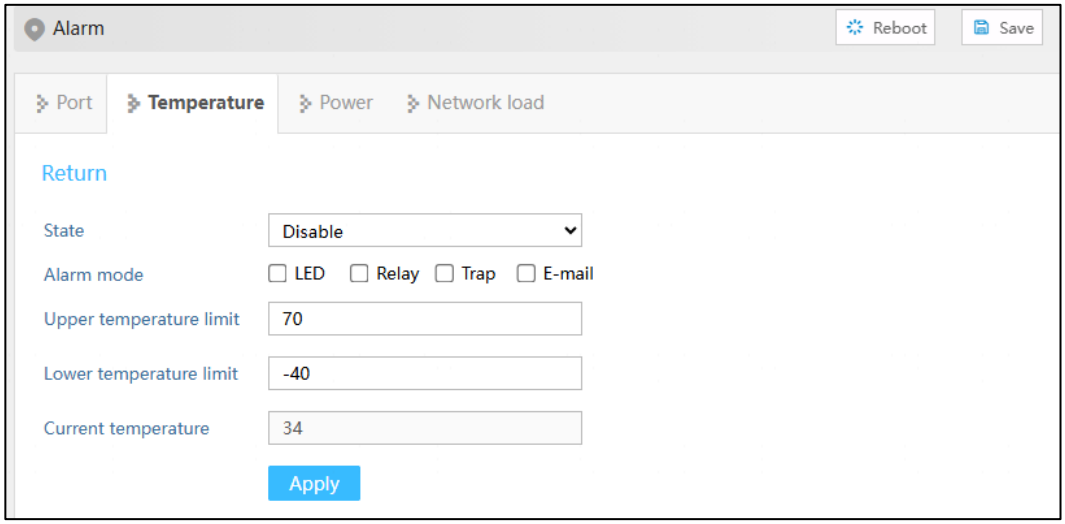
Configure the temperature alarm function. When the device temperature is in an abnormal state, the administrator can be informed in time, and the device can be quickly protected to avoid damage.

Operation Path

Open in order: "System > Alarm > Alarm Trigger > Temperature".

Interface Description

The temperature alarm interface is as follows:



The main element configuration description of temperature alarm information interface:

Interface Element	Description
State	Temperature alarm switch status, with options: • Enable • Disable Note: After the temperature alarm is enabled, when the temperature of the device is abnormal, such as when the temperature exceeds the set upper limit or lower limit, the device will output an alarm signal to remind the device that the temperature is abnormal by setting LED indicator, relay, Trap message or email.
Upper temperature limit	Set the upper limit temperature of the device, ranging

Copyright © 3onedata Co., Ltd.

Interface Element	Description
	from -40 to 120℃.
Lower temperature limit	Set the lower limit temperature of the device, ranging from -40 to 120℃.
Current temperature	Current temperature state of the device.
Alarm mode	Alarm mode of temperature alarm, with options: • LED • Relay • Trap • E-mail Note: If checked, the LED indicator, relay, Trap message or email alarm mode will be turned on to trigger the alarm.

11.3.1.3 Power Alarm

Function Description

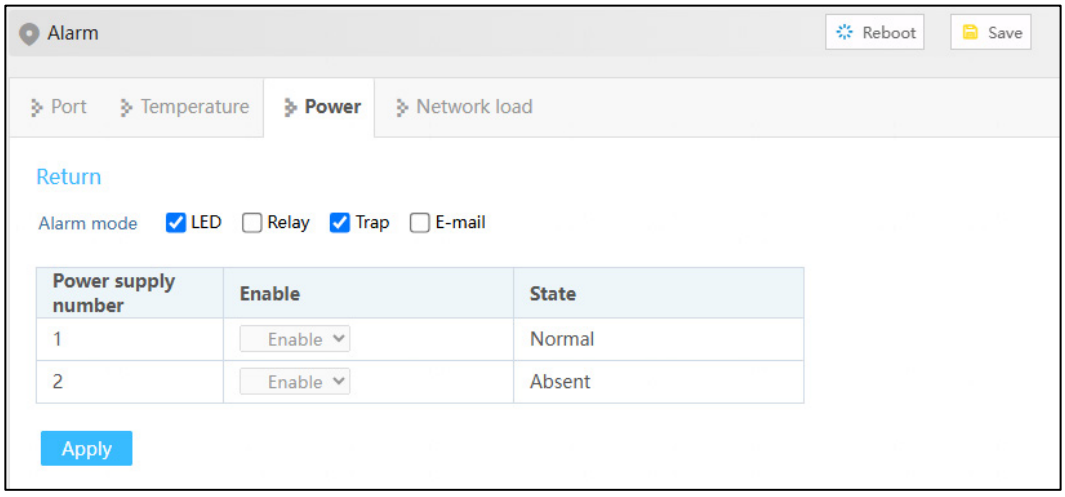
The device system provides this function, and you can set the power alarm function.

Operation Path

Open in order: "System > Alarm > Alarm Trigger > Power Supply".

Interface Description

Power alarm interface is as below:



Main elements configuration description of power alarm interface:

Interface Element	Description
Power supply number	The corresponding name of this device's power supply
Enable	The state of power supply alarm, with options:

Copyright © 3onedata Co., Ltd.

Interface Element	Description
	• Enable • Disable Note: The power alarm is applicable to dual power supplies. After it is enabled, when one of the power supplies is disconnected or fails, the device will output an alarm signal to hint the abnormal operation of device power via LED indicator, relay, Trap message or email.
State	Device power link status, display items as follows: • Normal • Absent
Alarm mode	Alarm mode of power alarm, with options: • LED • Relay • Trap • E-mail Note: If checked, the LED indicator, relay, Trap message or email alarm mode will be turned on to trigger the alarm.

11.3.1.4 Network Load Alarm

Function Description

The device system provides this function, and you can set the network load alarm function.

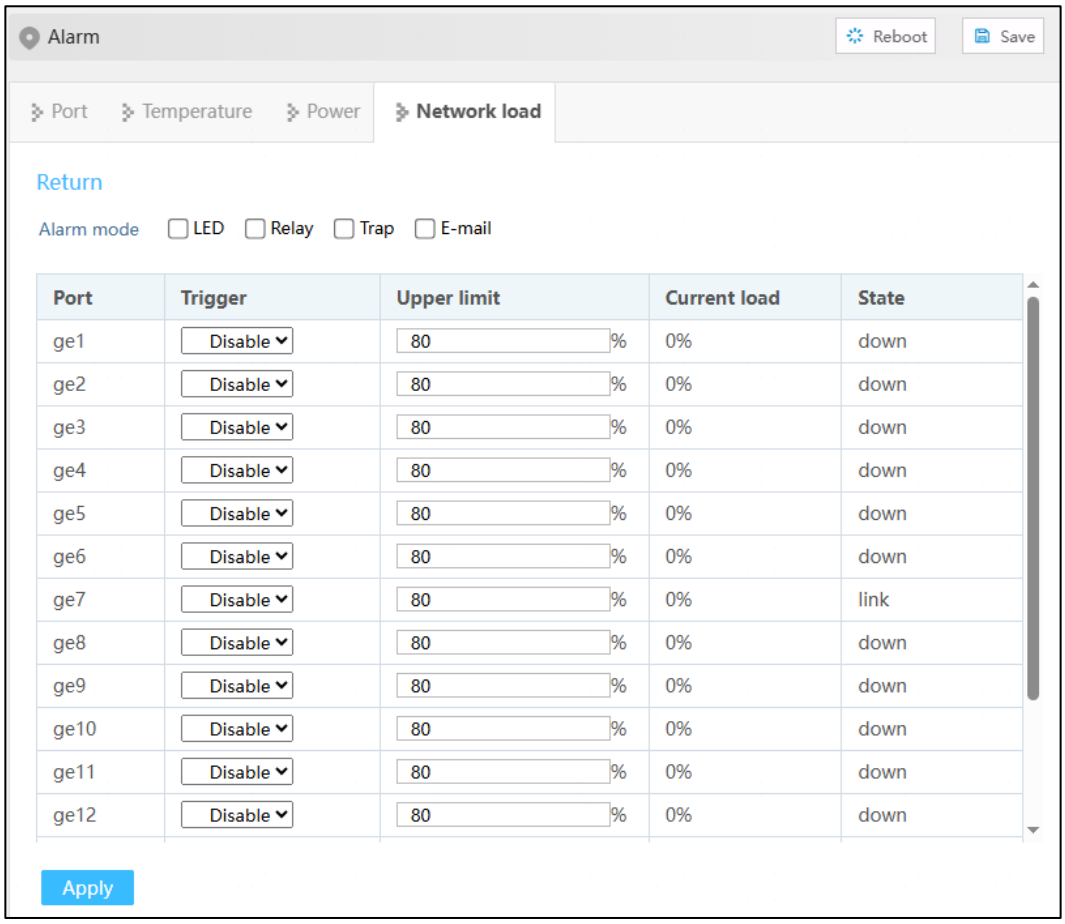
Operation Path

Open in order: "System > Alarm > Alarm Trigger > Network Load".

Interface Description

Network load alarm interface is as follows:

Copyright © 3onedata Co., Ltd.



The main element configuration description of network load alarm interface:

Interface Element	Description
Port	The corresponding port name of the device Ethernet port.
Trigger	Network load alarm switch status, with options: • Enable • Disable Note: After enabling network load alarm, when the device's network load is abnormal, such as when the current network load of the device exceeds the upper limit value, the device will output an alarm signal, which will prompt the device to be abnormal by setting LED indicator, relay Trap messages, or email.
Upper limit	Set the upper limit of network load of device, ranging from 0 to 100.
Current load	If the current network load value of the device exceeds the upper limit value, an alarm will be triggered.
State	Port link status, display items as follows: • link • down
Alarm mode	Alarm mode of network load alarm, with options:

Copyright © 3onedata Co., Ltd.

Interface Element	Description
	• LED • Relay • Trap • E-mail Note: If checked, the LED indicator, relay, Trap message or email alarm mode will be turned on to trigger the alarm.

11.3.2 Alarm Reception

Function Description

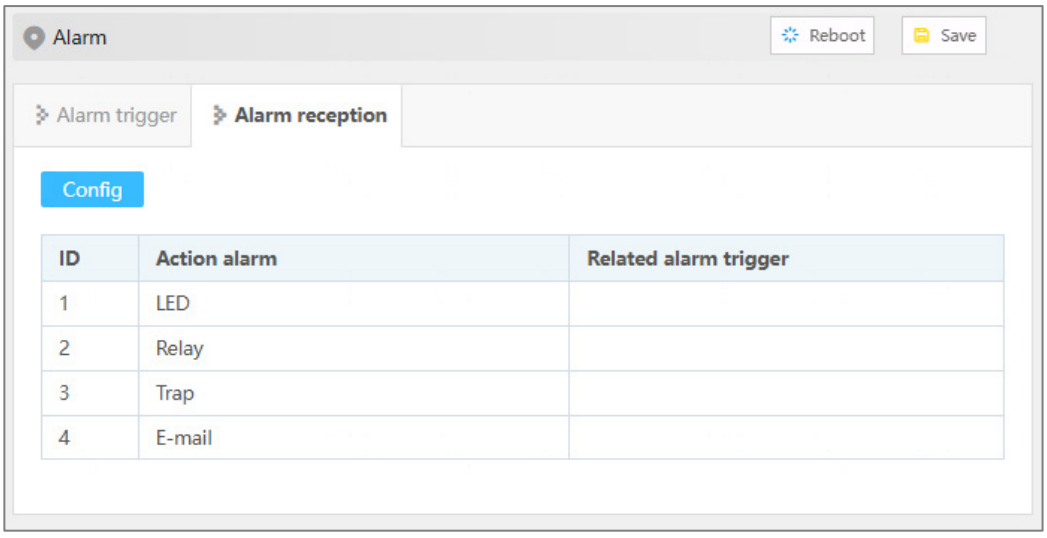
Users can check the configured LED indicator, relay, Trap, or email alarm modes, to know the different alarm modes of the device in time.

Operation Path

Open in order: "System > Alarm > Alarm Reception".

Interface Description

Alarm reception interface is as below:



The main element configuration description of alarm reception interface:

Interface Element	Description
ID	Alarm mode entry.
Action alarm	Device alarm modes include LED, Relay, Trap and E-mail.
Related alarm trigger	Device alarm triggers include port, temperature, power supply and network load.

Copyright © 3onedata Co., Ltd.

11.3.2.1 Trap Settings

Function Description

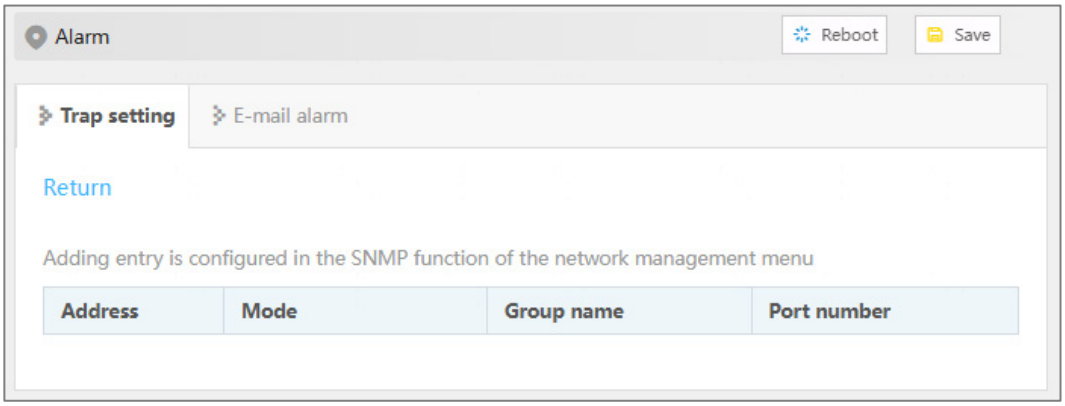
By setting the Trap message trap, the administrator can realize real-time monitoring and quick response to the device or system status, to find and deal with problems in time.

Operation Path

Open in order: "System > Alarm > Alarm Reception > Trap setting".

Interface Description

The Trap setting interface is as follows:



The main element configuration description of Trap setting interface:

Interface Element	Description
Address	IP address of SNMP management device, used for receiving alarm information, such as PC.
Mode	SNMP management device version, options as below: • v1 • v2c • v3
Group name	Group name.
Port number	The corresponding port name of the device Ethernet port.

Copyright © 3onedata Co., Ltd.

11.3.2.2 E-mail Alarm

Function Description

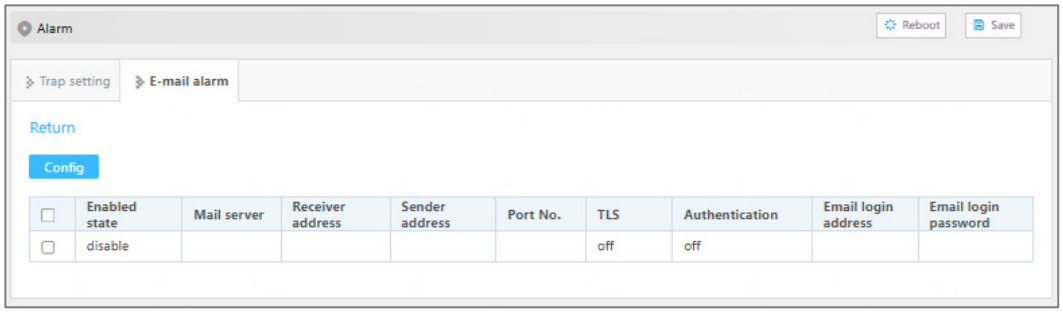
On the "Email Alarm" page, user can configure the sender, recipient, mailbox server and other parameters. The system can inform the hot start, cold start, login failure, static IP modification and password modification of the device by email.

Operation Path

Open in order: "System > Alarm > Alarm Reception > E-mail Alarm".

Interface Description

The E-Mail Alarm configuration interface is as follows:



Main elements configuration description of E-mail alarm configuration interface:

Interface Element	Description
Enable state	Enable/disable E-mail alarm.
Mail server	Server address of used E-mail should be filled according to the account of used E-mail address. The host IP address or used host name that provides E-mail delivery service for the device.
Receiver address	Mailbox address used for receiving alarm mails.
Sender address	Mailbox address used for sending alarm mails.
Port No.	Port number of mailbox server.
TLS	TLS (Transport Layer Security) is a transport-layer security encryption protocol, which is used to provide data confidentiality and integrity in network communication. By using TLS protocol, the transmission process of mail will be encrypted to prevent sensitive information from being eavesdropped or tampered with during transmission. The operation of "TLS" is as follows: • Off: disable TLS encryption protocol; • On: enable TLS encryption protocol.

Copyright © 3onedata Co., Ltd.

Interface Element	Description
Authentication	Authentication refers to whether to verify the mailbox password. The operation of "Authentication" is as follows: • Off: disable the verification email password; • On: enable the verification email password.
Email login address	User name for logging in to the mailbox server.
Email login password	Password of the user name for logging in to the mailbox server.

11.4 Configuration File Management

11.4.1 Current configuration

Function Description

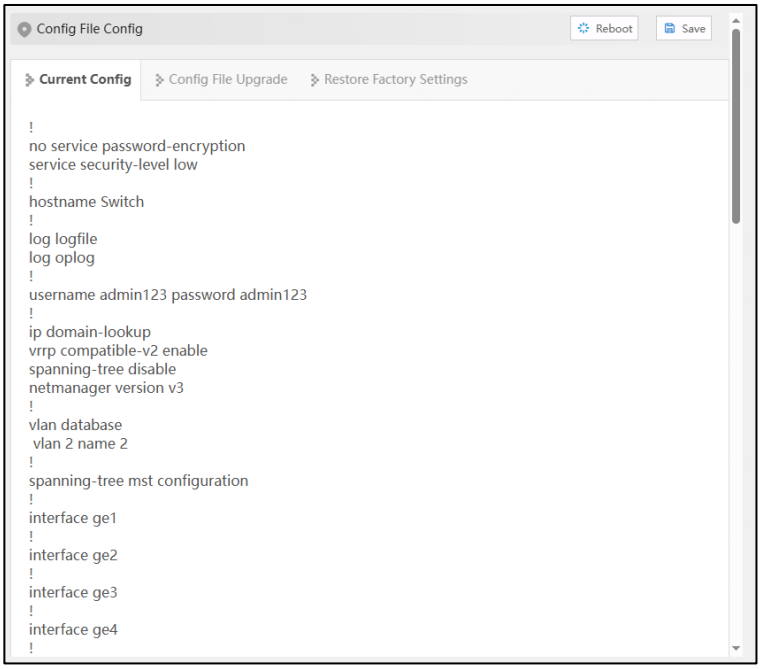
Check current configuration information.

Operation Path

Open in order: "System > Config File > Current Config".

Interface Description

The current configuration interface is as follows:



Copyright © 3onedata Co., Ltd.

11.4.2 Configuration File Update

Function Description

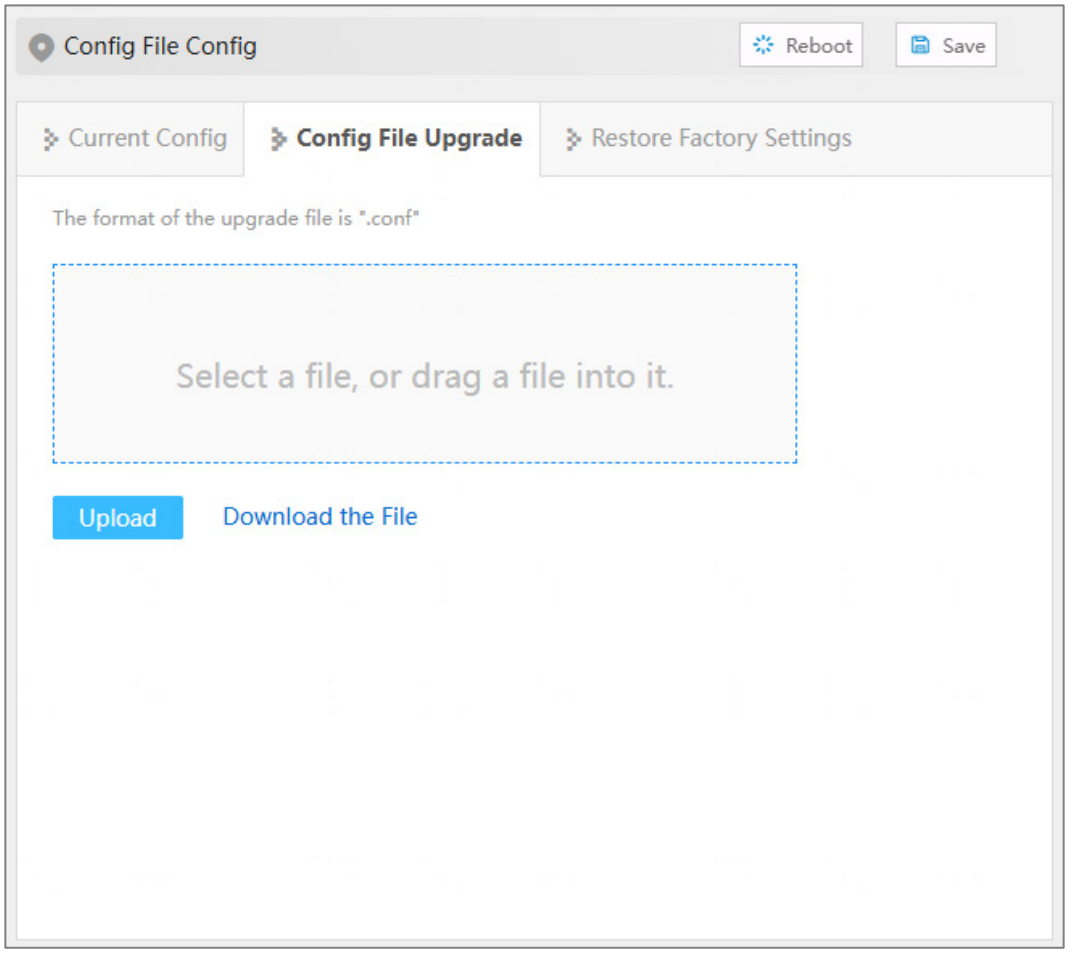
Upload and upload configuration file.

Operation Path

Open in order: "System > Config File > Config File Upgrade".

Interface Description

Configuration file upgrade interface is as follows:



The main element configuration description of configuration file upgrade interface:

Interface Element	Description
Select a file, or drag a file into it	To select the uploaded configuration file, click this area to select the local configuration file, or drag the local configuration file directly into this area.
Upload	After selecting the uploaded configuration file, click the "Upload" button to start uploading the configuration.
Download the File	Click to download the configuration file of the current device.

Copyright © 3onedata Co., Ltd.

Interface Element	Description
	The default file name is "device.conf".

11.4.3 Restore Factory Settings

Function Description

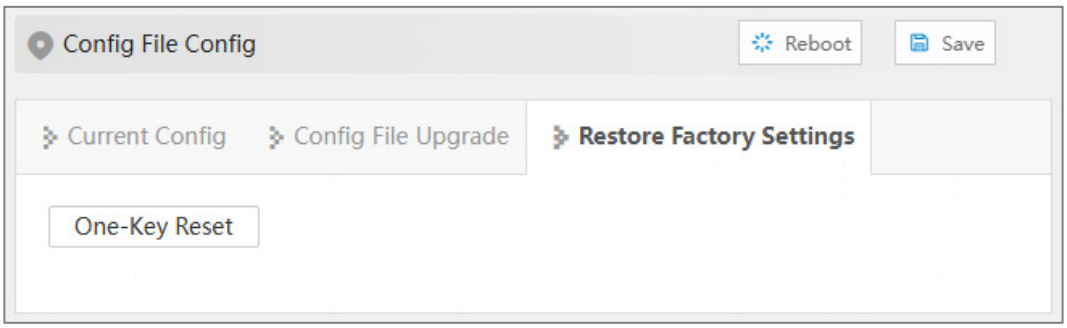
Restore device to factory settings.

Operation Path

Open in order: "System > Config File Config > Restore Factory Setting".

Interface Description

Restore Factory Settings interface is as follows:



The main element configuration description of restore factory settings interface:

Interface Element	Description
One-Key Reset	Click "One-key Reset" button, and the configuration file will be restored to the factory configuration.

11.5 Upgrade

Function Description

Update and upgrade the device program.

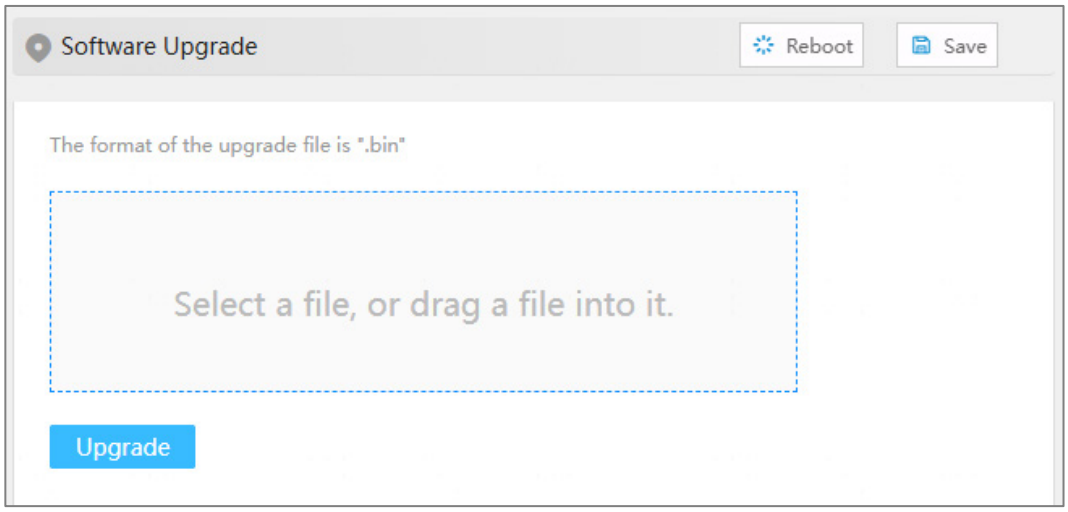
Operation Path

Open in order: "System > Software Upgrade".

Interface Description

The software upgrade interface is as follows:

Copyright © 3onedata Co., Ltd.



The main elements configuration description of software update interface:

Interface Element	Description
Select a file, or drag a file into it	For the upgrade files, click this area to select the local upgrade files, or drag the local upgrade files directly into this area.
Upgrade	After selecting the upgraded files, click the "Upgrade" button to start the upgrade process. Note: Generally, upgrade firmware is in ".bin" format.

11.6 Log Information

11.6.1 Log Information

Function Description

Check the log information of the device. Log information mainly records user operation, system failure, system safety and other information, including user log, security log and diagnostic log.

- User log: records user operations and system operation information.
- Security log: records information including account management, protocol, anti-attack, and status.
- Diagnostic log: records information that assists in problem identification.

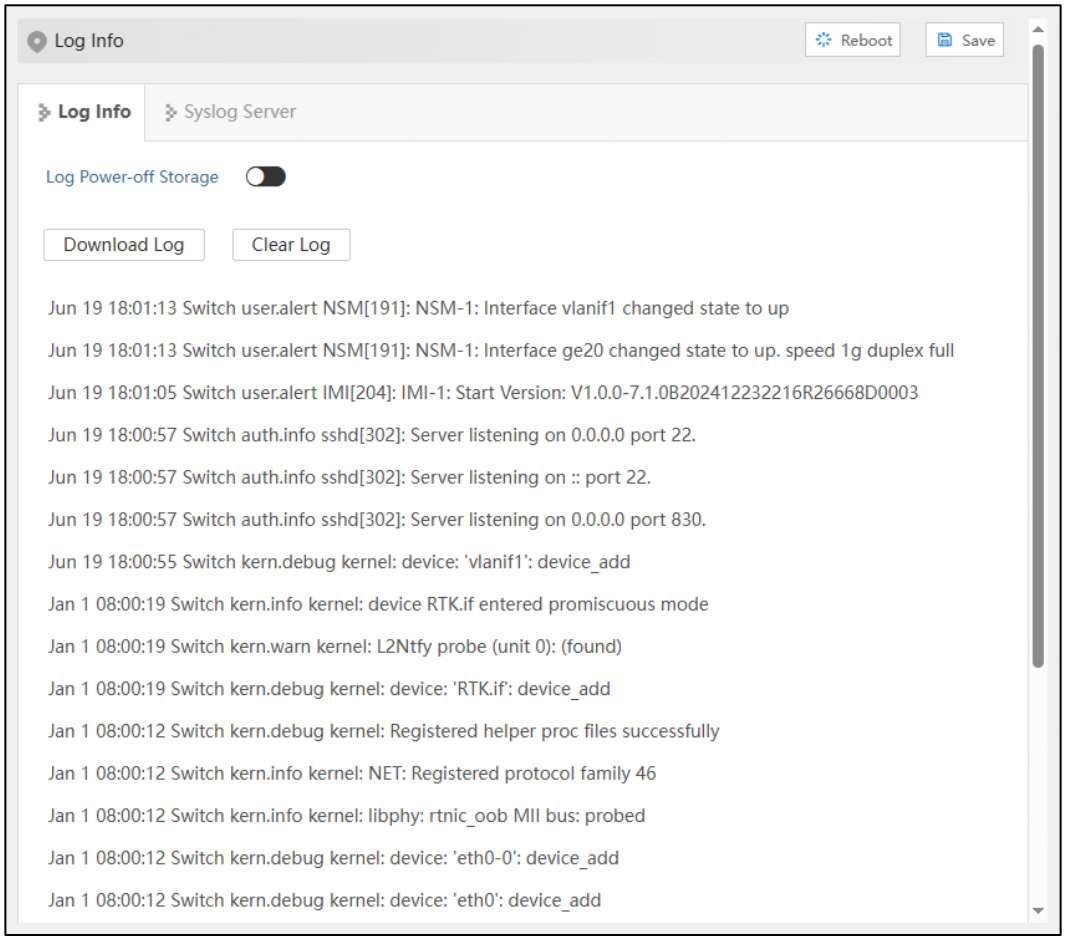
Operation Path

Open in order: "System > Log Info > Log Info".

Copyright © 3onedata Co., Ltd.

Interface Description

Log information interface is as follows:



Main elements configuration description of log information interface:

Interface Element	Description
Log Power-off Storage	Log information is stored in FLASH, log information will not be lost after power failure.
Download Log	Click the "Download Log" button to download the current log information to the local.
Clear Log	Click the “Clear Log” button to clear the current log information record.

Copyright © 3onedata Co., Ltd.

11.6.2 Operation Log

Function Description

View system operation logs of the device. The operation log primarily records user access or login to the device system via Web, console, and Telnet.

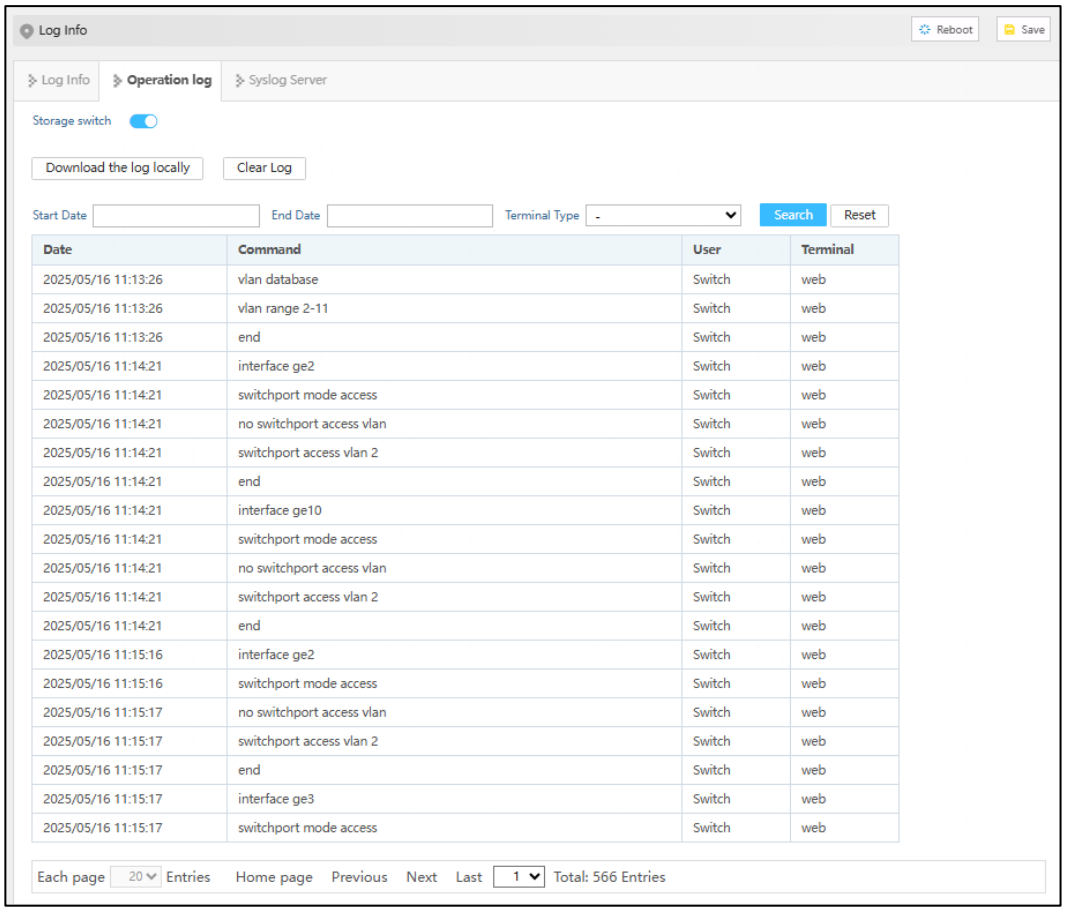
- Log B: Records user access to the device system via the web interface.
- Console log: Records user connections to the device system via command-line interface through console.
- Telnet log: Records user connections to the device system via command-line interface through Telnet.

Operation Path

Open in order: “System > Log Info > Operation Log".

Interface Description

Operate Log interface is as follows:



The main element configuration description of operation log interface:

Copyright © 3onedata Co., Ltd.

Interface Element	Description
Storage switch	By turning the storage switch on or off, you can enable/disable the operation log for the storage device system.
Download the log locally	Click the "Download the log locally button to download the current log information to the local.
Clear Log	Click the “Clear Log” button to clear the current log information record.
Start Date	Select the start date for viewing operation logs.
End Date	Select the end date for viewing operation logs.
Terminal Type	Select the terminal type for viewing operation logs, and options are as follows: • - • Web • Console • Telnet

11.6.3 Syslog Server

Function Description

Configure the Syslog server IP address, and the system log information can be sent to the configured syslog server.

Operation Path

Open in order: "System > Log Info > Syslog Server".

Interface Description

The Syslog server interface is as follows:



Copyright © 3onedata Co., Ltd.

Syslog server interface main elements configuration instructions:

Interface Element	Description
Syslog Server	IP address of Syslog server Note: • Supports port configuration and the input format is IP: port, for example: 192.168.1.1:80. • Users can configure up to 4 syslog servers at a time. If the configuration of one or more syslog servers needs to be canceled, delete the input box, and click Set.

Copyright © 3onedata Co., Ltd.

12 FAQ

12.1 Login Problem

1. **Why the web page display abnormally when browsing the configuration via WEB?**

   Before accessing the WEB, please eliminate IE cache and cookies. Otherwise, the web page will display abnormally.

2. **What should I do if I forget my login password?**

   IF you forget the login password, you can initialize the password by restoring factory settings. The specific method is to search by BlueEyes_Ⅱ software and use restore factory setting function, then the password will be initialized. Both of the initial user name and password are "admin123".

3. **Is configuring via WEB browser same to configuring via BlueEyes_Ⅱ software?**

   Both configurations are the same, without conflict.

12.2 Configuration Problem

1. **Why the bandwidth can't be increased after configuring Trunking (port aggregation) function?**

   Check whether the port attributes set to Trunking are consistent, such as rate, duplex mode, VLAN and other attributes.

2. **How to deal with the problem that part of switch ports are impassable?**

   When some ports on the switch are impassable, it may be network cable, network

Copyright © 3onedata Co., Ltd.

adapter and switch port faults. User can locate the faults via following tests:

- Keep connected computer and switch ports unchanged, change other network cables;
- Keep connected network cable and switch port unchanged, change other computers;
- Keep connected network cable and computer unchanged, change another switch port;
- If the switch port faults are confirmed, please contact supplier for maintenance.

3. **How about the order of port self-adaption state detection?**

   The port self-adaption state detection is conducted according to following order: 1000Mbps full duplex, 100Mbps full duplex, 100Mbps half-duplex, 10Mbps full duplex, 10Mbps half-duplex, detect in order from high to low, connect automatically in supported highest speed.

12.3 Indicator Problem

1. **Why is the power supply indicator off?**

   Possible reasons include:

   - Not connected to the power socket; troubleshooting, connected to the power socket.
   - Power supply or indicators faults; troubleshooting, change the power supply or device test.
   - Power supply voltage can't meet the device requirements; troubleshooting, configure the power supply voltage according to the device manual.

2. **Link/Act indicator isn't bright, what's the reason?**

   Possible reasons include:

   - The network cable portion of Ethernet copper port is disconnected or bad contact; troubleshooting, connect the network cable again.
   - Ethernet terminal device or network card works abnormally; troubleshooting, eliminate the terminal device fault.
   - Not connected to the power socket; troubleshooting, connected to the power socket.
   - Interface rate doesn't match the pattern; troubleshooting, examine whether the device transmission speed matches the duplex mode.

Copyright © 3onedata Co., Ltd.

3. **Ethernet copper port and fiber port indicator are connected normally, but can't transmit data, what's the reason?**

   When the system is power on or network configuration changes, the device and switch configuration in the network will need some time. Troubleshooting, after the device and switch configuration are completed, Ethernet data can be transmitted; if it's impassable, power off the system, and power on again.

4. **Why does the communication crashes after a period, namely, it cannot communicate, and it returns to normal after restarting?**

   Reasons may include:

   - Surrounding environment disturbs the product; troubleshooting, product grounding adopts shielding line or shields the interference source.
   - Site wiring is not normative; Troubleshooting, optical fiber, network cable, optical cable cannot be arranged with power line and high-voltage line.
   - Network cable is disturbed by static electricity or surge; Troubleshooting, change the shielded cable or install a lightning protector.
   - High and low temperature influence; troubleshooting, check the device temperature usage range.

Copyright © 3onedata Co., Ltd.

13 Maintenance and Service

Since the date of product delivery, our company provides 5-year product warranty. According to our company's product specification, during the warranty period, if the product exists any failure or functional operation fails, our company will repair or replace the product for users free of charge. However, the commitments above do not cover damage caused by improper usage, accident, natural disaster, incorrect operation, or improper installation.

In order to ensure that consumers benefit from our company's managed switch products, consumers can get help and solutions in the following ways:

- Internet Service;
- Service Hotline;
- Product repair or replacement;

13.1 Internet Service

More useful information and tips are available via our company website. Website: http://www.3onedata.com

13.2 Service Hotline

Users of our company's products could call technical support office for help. Our company has professional technical engineers to answer your questions and help you solve the product or usage problems ASAP. Free service hotline: +86-4008804496

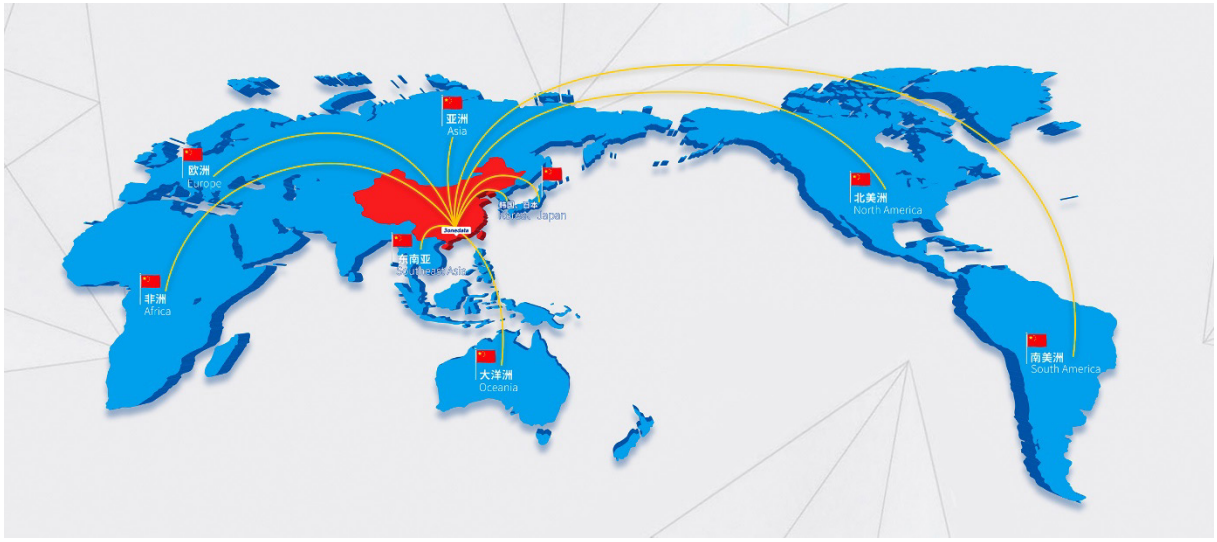
13.3 Product Repair or Replacement

As for the product repair, replacement or return, customers should firstly confirm with the company's technical staff, and then contact the salesmen to solve the problem.

Copyright © 3onedata Co., Ltd.

According to the company's handling procedure, customers should negotiate with our company's technical staff and salesmen to complete the product maintenance, replacement or return.

Copyright © 3onedata Co., Ltd.



3onedata Co., Ltd.

Headquarter Address:	3/B, Zone 1, Baiwangxin High Technology Industrial Park, Song Bai Road, Nanshan District, Shenzhen, 518108, China
Technology Support:	tech-support@3onedata.com
Service Hotline:	4008804496
Official Website:	http://www.3onedata.com