

AN6001-G16

Optical Line Terminal Equipment

CLI Configuration Guide

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Code: MN000003551

FiberHome Telecommunication Technologies Co., Ltd.

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1 Documentation Guide

Document Orientation

The CLI Configuration Guide introduces how to start and configure services for the AN6001-G16 in the CLI mode.

Intended Readers

- ◆ Commissioning engineers
- ◆ Operation and maintenance engineers

Version Information

Version	Version Information
A	Initial version, applicable to the V1R1 version of the AN6001-G16.

Related Documentation

Document	Applied to
<i>AN6001-G16 Optical Line Terminal Equipment Product Overview</i>	Network planning phase
<i>AN6001-G16 Optical Line Terminal Equipment Quick Installation Guide</i>	Network deployment phase / network maintenance phase
<i>AN6001-G16 Optical Line Terminal Equipment UNM2000 Configuration Guide</i>	Network deployment phase / network maintenance phase

2 Logging into the Device

☒ Login Through Hyper Terminal

☒ Login Through Telnet

2.1 Login Through Hyper Terminal

Properly connect the PC to the CONSOLE port of the main control service card with the serial port line. Log into the AN6001-G16 through the hyper terminal. Follow the steps below:

1. Click the **Start** menu on the desktop, and select **All Programs**→**Accessories**→**Telecom**→**Hyper Terminal** to bring up the **Connection Description** dialog box.



Note:

The Windows XP operating system is used as an example here.

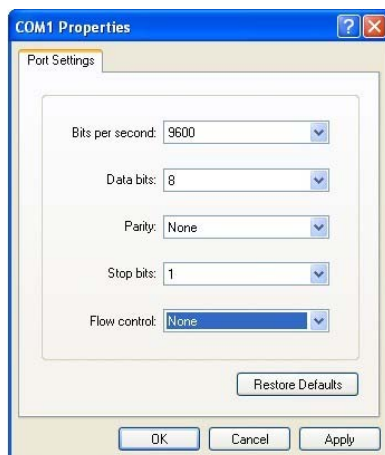
2. In the **Connection Description** dialog box, enter the name of the object to be connected and select an icon for it.



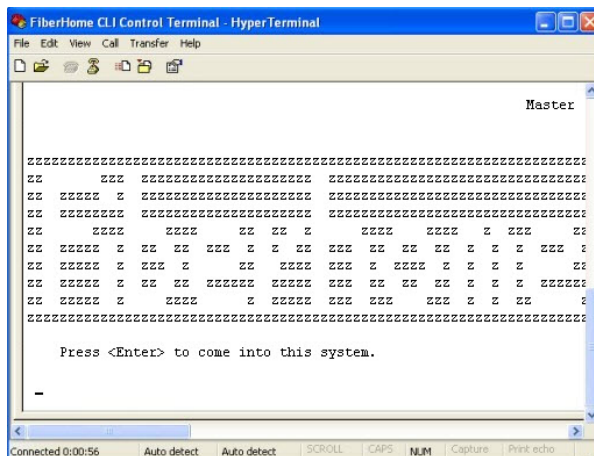
3. Click **OK**, and the **Connect To** dialog box appears.
4. In the **Connect To** dialog box, select the computer's **COM1** port to be connected to the **CONSOLE** port of the main control service card through the serial port line.



5. Click **OK**, and the **COM1 Properties** dialog box appears.
6. In the **COM1 Properties** dialog box, click the **Restore Defaults** button.



7. Click **OK** to start up the CONSOLE.



8. Press the <Enter> key, and enter the user name and password to log into the CLI network management system.

Login: **GEPON**

// The default user is the administrator user, and the user name is "GEPON".

Password: *********

// The initial password is "GEPON".

User> **enable**

// In the read-only mode, use the "enable" command to enter the management mode.

Password: *********

// The initial password of the administrator user is "GEPON".

Admin#

// After the prompt "Admin #" appears, you can enter command lines to perform network management operations on the AN6001-G16.



Note:

- ◆ If the command prompt is **User**, the system is in the common user mode; if the command prompt is **Admin#**, the system is in the administrator mode.
- ◆ The user name is case insensitive, while the password is case sensitive.



Caution:

Users should memorize their passwords and keep them secret. Regularly changing passwords is recommended.

-
9. Select **File**→**Save** from the menu bar of the CONSOLE window to save the configurations for the CONSOLE.

2.2 Login Through Telnet

When logging into the equipment through a hyper terminal, you can configure the out-of-band management IP address and in-band management IP address for the equipment. After the aforesaid configuration, you can log into the equipment though Telnet. Follow the steps below:

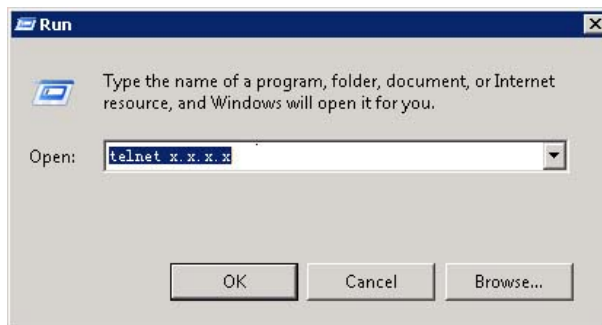
1. Click the **Start** menu on the desktop, and select **Run** to bring up the **Run** dialog box.



Note:

The Windows XP operating system is used as an example here.

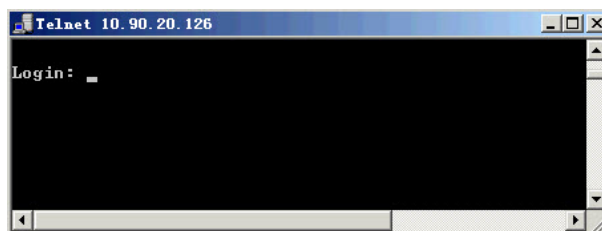
2. Enter telnet x.x.x.x in the **Run** dialog box.



Note:

x.x.x.x is the out-of-band management IP address for the equipment (configured under the directory of Admin (config-if-meth-1)) or the in-band management IP address (the IP address of the management VLAN configured under the directory of Admin(config)).

3. Click **OK** to bring up the **Telnet x.x.x.x** window.



4. Enter the user name and the password to log into the CLI network management system.

Login:**GEPON**

// The default user is administrator, and the user name is "GEPON".

Password:*****

// The initial password is "GEPON".

User>**enable**

// In the read-only mode, users can enter the management mode via the command "enable".

Password:*****

// The initial password of the administrator account is "GEPON".

Admin#

// After the prompt "Admin # " appears, users can type command lines to operate on the AN6001-G16.



Note:

- ◆ If the command prompt is **User**, the system is in the common user mode; if the command prompt is **Admin#**, the system is in the administrator mode.
 - ◆ The user name is case insensitive, while the password is case sensitive.
-



Caution:

Users should memorize their passwords and keep them secret. Regularly changing passwords is recommended.

3 Overview of Command Lines

- ☒ Command Mode
- ☒ Syntax
- ☒ Interaction Feature

3.1 Command Mode

Command Mode (Directory)	Directory Name	Prompt Example	Access Command Example
Common user mode	user	user>	Common user login
Privileged user mode	admin	Admin#	user>enable
Global configuration mode	config	Admin(config)#	Admin#config
Protocol	config-dhcp	Admin(config-dhcp)#	Admin(config)#dhcp
	config-ospf	Admin(config-ospf)#	Admin(config)#ospf
	config-aaa	Admin(config-aaa)#	Admin(config)#aaa
	config-igmp	Admin(config-igmp)#	Admin(config)#igmp
Multicast VLAN and multicast configuration	config-mvlan vlan_id	Admin(config-mvlan100)#	Admin(config) #multicast-vlan 100
VLAN IF	config-vlanif- vlanid	Admin(config-vlanif-200)#	Admin(config)#interface vlanif 200
PON mode (slot / port)	config-if-pon- frame/slot/pon	Admin(config-if-pon-1/1/2)#	Admin(config)#interface pon 1/1/2
Ethernet mode (slot / port)	config-if-eth- frame/slot/eth	Admin(config-if-eth-1/19/1)#	Admin(config)#interface eth 1/19/1
Fan	config-if-fan- frame/slot	Admin(config-if-fan-1/23)#	Admin(config)#interface fan 1/23 (Slot 23 is dedicated for the fan unit)
Maintenance network port	config-if-meth- port	Admin(config-if-meth-1) #	Admin(config)#interface meth 1 (Port 1 is dedicated for the out-of-band management network port)
Debugging and diagnosis	diagnose	Admin(diagnose)#	Admin#diagnose

3.2 Syntax

Command Format

A command consist of a command name followed by an argument field.

A complete command comprises command name(s) and argument(s). A valid command may contain one or more command names and argument fields. An argument field consists of two parts: the flag and the argument. For an argument with a flag, enter the flag first, and then the argument; for an argument without flag, enter the argument only.

Format	Meaning
< >	Indicates that the content in < > is the argument (parameter) value.
<a/b/...>	Indicates that all the parameter values in < > should be configured.
[]	Indicates that the parameter in [] is mandatory.
[a b ...]	Indicates that one of the mandatory parameters in [] should be selected.
{ }	Indicates that the parameter in { } is optional.
{ }* (1 ~ n)	Indicates that the optional parameter in { } can be configured for one to n times.

3.3 Interaction Feature

Intelligent Match

Intelligent match allows you to type only the first one or several letters of a command keyword plus the Tab key. If a unique keyword starting with the letters entered is found, the CLI network management system will replace the letters you have entered with the complete keyword and display it in the next line, with a space between the cursor and the keyword. This helps simplify the work for typing long keywords. For example, to use the **enable** command, you only need to type **en** or **ena**.

Edition Function

Key	Function
Common key	If the edition buffer area is not filled, pressing the key will insert the key content to the current cursor position, and the cursor will moves rightward accordingly.
Backspace	Presses this key to delete the character before the cursor and move the cursor backwards. When reaching the beginning of the command, the cursor stops.
Tab	Typeahead the keyword of the command.
Left arrow key ← or Ctrl + B	Moves the cursor to the left of one character.

Key	Function
Right arrow key → or Ctrl + F	Moves the cursor to the right of one character.
Up/Down arrow key ↑ / ↓	Displays historical commands. For some display terminals that do not support the upward / downward arrow key, you can press Ctrl + P to select the previous historical command or press Ctrl + O to select the next historical command.
Ctrl + U	Deletes the characters before the current cursor and moves the cursor to the beginning of the line.
Ctrl + K	Deletes the characters that follow the current cursor and moves the cursor to the end of the line.
Ctrl + D	Deletes a character after the cursor.
Ctrl + A	Moves the cursor to the beginning of the line.
Ctrl + W	Deletes a word before the cursor.
Ctrl + C	Stops executing the current command.
Q	Goes back to the upper layer directory.
Any keys except Q	Displays the command output.
?	Displays the help information.

4

Configuring Management Information

- ☒ Configuring the IP Address for In-Band Management
- ☒ Configuring the IP Address for Out-of-Band Management
- ☒ Configuring Static Routing
- ☒ Configuring the SNMP Trap Receiver Address
- ☒ Configuring the SNMP Time System
- ☒ Synchronizing Time
- ☒ Saving Current Configuration to the Flash

4.1 Configuring the IP Address for In-Band Management

Command Format

Configure the management VLAN.

```
manage-vlan <name> svlan <svlan> {cvlan <cvlan>} *1
```

Configure the management IP address.

```
manage-vlan ipv4 <name> <A.B.C.D/M>
```

Add the management VLAN to the uplink port.

```
port vlan <vlanid> {to <end-vlanid>} *1 [tag|untag] <frameid/slotid> <port-list>
```

View the management VLAN.

```
show manage-vlan [<1-4085>|all]
```

Planning Data

Procedure	Parameter	Description	Attribute	Example
Configuring the management VLAN	manage-vlan <name>	The name of the management VLAN	Mandatory	test
	svlan <svlan>	The outer management VLAN, ranging from 1 to 4085	Mandatory	1001
	{cvlan <cvlan>} *1	The inner management VLAN, ranging from 1 to 4085	Optional	2001
Configuring the management IP address	ipv4 <name>	The management IP address name	Mandatory	test
	<A.B.C.D/M>	The management IP address and the number of mask digits	Mandatory	10.90.40.123/24
Adding the management VLAN to the uplink port	vlan <vlanid>	The starting VLAN ID, ranging from 1 to 4085	Mandatory	1001
	{to <end-vlanid>} *1	The ending VLAN ID, ranging from 1 to 4085	Optional	-
	[tag untag]	The mode of adding VLAN ◆ tag: retaining the tags ◆ untag: stripping the tags	Mandatory	tag
	<frameid/slotid>	The subrack No. / slot No.	Mandatory	1/19

Procedure	Parameter	Description	Attribute	Example
	<port-list>	The port number	Mandatory	3
Viewing the management VLAN	manage-vlan [<1-4085> all]	The management VLAN ID, with "all" indicating all the management VLANs	Mandatory	all

Example

1. Configure the management VLAN.

```
Admin(config) #manage-vlan test svlan 1001 cvlan 2001
```

2. Configure the management IP address.

```
Admin(config) #manage-vlan ipv4 test 10.90.40.123/24
```

3. Add the management VLAN to the uplink port.

```
Admin(config) #port vlan 1001 tag 1/19 3
```

4. View the management VLAN.

```
Admin(config) #show manage-vlan all
```

```
-----
Manage name      : test
-----
Svlan            : 1001
Cvlan            : 2001
Port             : 19:3[T]
Device           : sub
Unit             : 1001
Ethernet address: 34:bf:90:56:bc:e7
Total protocols  : 0
Inet             : 10.90.40.123
mask             : 255.255.255.0
RX packets       : 0
TX packets       : 6
RX bytes         : 0
TX bytes         : 506
MTU              : 1492
Admin(config) #
```

4.2 Configuring the IP Address for Out-of-Band Management

Command Format

Configure the IP address for out-of-band management.

```
ip address <A.B.C.D> mask <A.B.C.D>
```

View the IP address for out-of-band management.

```
show ip address
```

Planning Data

Parameter	Description	Attribute	Example
ip address <A.B.C.D>	The IP address for out-of-band management	Mandatory	10.182.24.120
mask <A.B.C.D>	Mask	Mandatory	255.255.248.0

Example

1. Set the IP address for out-of-band management to 10.182.24.120 and the mask to 255.255.248.0.

```
Admin(config-if-meth-1)#ip address 10.182.24.120 mask 255.255.248.0
```

2. View the IP address for out-of-band management.

```
Admin(config-if-meth-1)#show ip address
```

```
debugip 10.182.24.120 mask 255.255.248.0
```

```
Admin(config-if-meth-1)#
```

4.3 Configuring Static Routing

Command Format

```
static-route destination-ip <ipaddr> mask [<mask>|<mask-length>] nexthop  
<ipaddr> {metric <metric>} *1
```

Planning Data

Parameter	Description	Attribute	Example
destination-ip <ipaddr>	The destination IP address identifying the destination IP address or destination network of the IP messages.	Mandatory	3.3.3.0
mask [<mask> <mask-length>]	◆ <mask>: the subnet mask ◆ <mask-length>: the subnet mask length	Mandatory	255.255.255.0
nexthop <ipaddr>	The next-hop IP address of the designated route.	Mandatory	1.1.1.10
{metric <metric>} *1	The priority of the route. The system selects the route with the highest priority (the smallest value) to forward IP messages. The route priority ranges from 0 to 255.	Optional	-

Example

Configure a static route, setting the destination IP address to 3.3.3.0, the mask to 255.255.255.0, and the next-hop IP address of the designated route to 1.1.1.10.

```
Admin(config) #static-route destination-ip 3.3.3.0 mask 255.255.255.0 nexthop 1.1.1.10
Admin(config) #
```

4.4 Configuring the SNMP Trap Receiver Address

Command Format

Configure the SNMP Trap receiver address.

```
snmp-agent trap-reciever add ip <ip-address> {security-name <securityname>}
*1 { [v1|v2c|v3] } *1
```

View the SNMP Trap receiver address.

```
show snmp-agent trap-receiver
```

Data Planning

Parameter	Description	Attribute	Example
ip <ip-address>	The IP address of the SNMP Trap receiver.	Mandatory	10.32.154.11
{security-name <securityname>} *1	The security name.	Optional	public
{[v1 v2c v3]} *1	The SNMP version, including v1, v2c and v3.	Optional	v2c

Example

1. Set the IP address of the SNMP Trap receiver to "10.32.154.11", the security name to "public", and the SNMP version to "v2c".

```
Admin(config) #snmp-agent trap-receiver add ip 10.32.154.11 security-name public v2c
```

2. View the SNMP Trap receiver address.

```
Admin(config) #show snmp-agent trap-receiver
```

```
IPAddress      Port  Version SecurityName  SecurityLevel  SourceIP
10.190.40.140  162   v2c     public
10.32.103.18   162   v2c     public
10.32.154.11   162   v2c     public
```

```
Total 3 trap-receiver in system.
```

```
Admin(config) #
```

4.5 Configuring the SNMP Time System

Command Format

Configure the SNMP time management.

```
snmp-time interval <0-86400> servip [ipv4|ipv6|ipv4z|ipv6z|dns] <servip>
```

View the configuration of the SNMP time management.

```
show snmp-time
```

Planning Data

Parameter	Description	Attribute	Example
interval <0-86400>	The automatic time calibration interval (unit: s), ranging from 0 to 86 400. The default value is 600s.	Mandatory	3260
servip [ipv4 ipv6 ipv4z ipv6z dns]	The IP address type for time calibration.	Mandatory	ipv4
<servip>	The IP address of the calibration server.	Mandatory	10.32.135.102

Example

1. Configure the SNMP time management.

```
Admin(config) #snmp-time interval 3260 servip ipv4 10.32.135.102
Set ok!
Admin(config) #
```

2. View the configuration of the SNMP time management.

```
Admin(config) #show snmp-time
SNMP TIME CONFIG INTERVAL=3260 Server IP : 10.32.135.102
Admin(config) #
```

4.6 Synchronizing Time

Command Format

```
time <2012-2100> <1-12> <1-31> <HH:MM:SS>
show time
```

Planning Data

Parameter	Description	Attribute	Example
<2012-2100>	Year	Mandatory	2018
<1-12>	Month	Mandatory	08
<1-31>	Day	Mandatory	17
<HH:MM:SS>	Hour, minute and second	Mandatory	04:12:30

Example

1. Calibrate the time.

```
Admin(config) #time 2018 08 17 04:12:30
```

2. View the time.

```
Admin(config)#show time  
Current Date is 2018-08-17  
Current Time is 04:12:31  
System running time is 0 day 04:11:53  
Admin(config)#
```

4.7 Saving Current Configuration to the Flash

Command Format

```
save
```

Example

Save current configuration to the Flash.

```
Admin(config)#save  
Trying save configuration to flash, please wait .....  
Admin(config)#
```

5 Authorizing Cards and ONUs

- ☒ Authorizing a Card
- ☒ Authenticating and Authorizing an ONU
- ☒ Modifying the Authentication Mode and Re-authorizing an ONU
- ☒ Deauthorizing an ONU

5.1 Authorizing a Card

Command Format

Automatically authorize all the cards detected in the hardware test.

```
card auto-auth
```

Authorize a specified card.

```
card auth <frameid/slotid> <cardtype>
```

View the card authorization information.

```
show card info
```

Data Planning

Parameter	Description	Attribute	Example
<frameid/slotid>	The subrack No./slot No.	Mandatory	1/1
<cardtype>	The card name	Mandatory	GPOP

Example

1. Authorize all the cards automatically.

```
Admin(config) #card auto-auth
Success to set all detected card authed.
Admin(config) #
```

2. Authorize the GPOP card in Slot 1 of Subrack 1.

```
Admin(config) #card auth 1/1 GPOP
Success to set 1 slot as type GPOP.
Admin(config) #
```

3. View the card authorization information.

```
Admin(config) #show card info
-----AN6001-G16-----
CARD   EXIST   CONFIG  DETECT  DETAIL
1       YES     GPOP    GPOP    MATCH
9       YES     HSCP    HSCP    MATCH/M
19      YES     HU2P    HU2P    MATCH
23      YES     FAN     FAN     MATCH
24      ---     ---     ---     ---
25      YES     PWRD    PWRD    MATCH
```

```
801      YES      HCU      HCU      MATCH
Current temperature is 42 C.
Power 2 is ON.
FAN 1 speed is 1.
Subframe type is G16.
Admin(config)#
```

5.2 Authenticating and Authorizing an ONU

5.2.1 Configuring the PON Port Authentication Mode

Command Format

```
port authentication-mode <frameid/slotid/portid> mode [phyid|phy-id+psw|
password|log-id|log-id+psw|no-auth|phy-id/psw|phy-id/log-id/psw|phy-id/
log-id+psw/psw]
```

Planning Data

Parameter	Description	Attribute	Example	
<frameid/slotid/portid>	Subrack No. / slot No. / PON port No.	Mandatory	1/1/1	1/1/2
mode [phyid phy-id+psw password log-id log-id+psw no-auth phy-id/psw phy-id/log-id/psw phy-id/log-id+psw/psw]	Authentication mode ◆ phyid: physical identifier authentication ◆ phy-id+psw: physical identifier plus password authentication ◆ password: password authentication ◆ log-id: logical identifier authentication (without password) ◆ log-id+psw: logical identifier plus password authentication ◆ no-auth: no authentication ◆ phy-id/psw: physical identifier / password hybrid authentication ◆ phy-id/log-id/psw: physical identifier / logical identifier (without password) / password hybrid authentication ◆ phy-id/log-id+psw/psw: physical identifier / logical identifier (with password) / password hybrid authentication	Mandatory	phyid	no-auth

Example

1. Set physical identifier authentication for PON Port 1 of the PON interface card in Slot 1 of Subrack 1.

```
Admin(config)#port authentication-mode 1/1/1 mode phyid
Command executes success.
Admin(config)#
```

2. Set no authentication for PON Port 2 of the PON interface card in Slot 1 of Subrack 1.

```
Admin(config)#port authentication-mode 1/1/2 mode no-auth
Command executes success.
Admin(config)#
```

5.2.2 Configuring a White List

Command Format

Configure a white list.

```
whitelist add [phy-id|logic-id|password] <sn> {[checkcode] <checkcode>}*1
{[type] <onutype>}*1 {[slot] <slotno> [pon] <ponno> [onuid] <onuid>}*1
```

View the white list.

```
show whitelist [phy-id|logic-id|password] {<frameid/slotid/portid>}*1
```

Planning Data

Procedure	Parameter	Description	Attribute	Example
Configuring a white list	[phy-id logic-id password]	White list type ◆ phy-id: physical identifier authentication ◆ logic-id: logical identifier authentication ◆ password: password authentication	Mandatory	phy-id
	<sn>	◆ phy-id: physical identifier ◆ logic-id: logical identifier; ONU identifier ◆ password: physical password	Mandatory	88888888-8888
	{[checkcode] <checkcode>}*1	◆ phy-id: physical password ◆ logic-id: logical identifier; logical password	Optional	-
	{[type] <onutype>}*1	ONU type	Optional	HG260
	{[slot] <slotno> [pon] <ponno> [onuid] <onuid>}*1	Slot No., PON port No., and ONU authorization No.	Optional	1, 1, 1
Viewing the white list	[phy-id logic-id password]	White list type ◆ phy-id: physical identifier authentication ◆ logic-id: logical identifier authentication ◆ password: password authentication	Mandatory	phy-id

Procedure	Parameter	Description	Attribute	Example
	{<frameid/slotid/portid>}*1	Subrack No. / slot No. / PON port No.	Optional	1/1/1

Example

1. Configure a white list for ONU 1 connected to PON Port 1 in Slot 1, setting the physical identifier of the ONU to 888888888888, keeping the physical password empty, and setting the ONU type to HG260.

```
Admin(config) #whitelist add phy-id 888888888888 type HG260 slot 1 pon 1 onuid 1
Admin(config) #
```

2. View the physical white list for PON Port 1 in Slot 1 of Subrack 1.

```
Admin(config) #show whitelist phy-id 1/1/1
----- Physical Address Whitelist -----
Slot  Pon   Onu   Onu-Type      Phy-ID          Phy-Pwd         Used
-----
1      1      1      HG260         888888888888      Y
-----
slot 1  pon 1 item 1
Admin(config) #
```

5.3 Modifying the Authentication Mode and Re-authorizing an ONU

5.3.1 Switching the PON Port Authentication Mode

Command Format

```
port authentication-mode <frameid/slotid/portid> mode [phyid|phy-id+psw|
password|log-id|log-id+psw|no-auth|phy-id/psw|phy-id/log-id/psw|phy-id/
log-id+psw/psw]
```

Planning Data

Parameter	Description	Attribute	Example
<frameid/slotid/portid>	Subrack No. / slot No. / PON port No.	Mandatory	1/1/1
mode [phyid phy-id+psw password log-id log-id+psw no-auth phy-id/psw phy-id/log-id/psw phy-id/log-id+psw/psw]	Authentication mode ◆ phyid: physical identifier authentication ◆ phy-id+psw: physical identifier plus password authentication ◆ password: password authentication ◆ log-id: logical identifier authentication (without password) ◆ log-id+psw: logical identifier plus password authentication ◆ no-auth: no authentication ◆ phy-id/psw: physical identifier / password hybrid authentication ◆ phy-id/log-id/psw: physical identifier / logical identifier (without password) / password hybrid authentication ◆ phy-id/log-id+psw/psw: physical identifier / logical identifier (with password) / password hybrid authentication	Mandatory	phy-id/log-id+psw/psw

Example

Switch PON Port 1 of the PON interface card in Slot 1 of Subrack 1 from the physical authentication mode to the physical identifier / logical identifier (with password) / password hybrid authentication mode.

```
Admin(config) #port authentication-mode 1/1/1 mode phy-id/log-id+psw/psw
Command executes success.
Admin(config) #
```

5.3.2 Re-configuring a White List

Command Format

Configure a white list.

```
whitelist add [phy-id|logic-id|password] <sn> {[checkcode] <checkcode>}*1
{[type] <onutype>}*1 {[slot] <slotno> [pon] <ponno> [onuid] <onuid>}*1
```

View the white list.

```
show whitelist [phy-id|logic-id|password] {<frameid/slotid/portid>}*1
```

Planning Data

Procedure	Parameter	Description	Attribute	Example
Configuring a white list	[phy-id logic-id password]	White list type ◆ phy-id: physical identifier authentication ◆ logic-id: logical identifier authentication ◆ password: password authentication	Mandatory	logic-id
	<sn>	◆ phy-id: physical identifier ◆ logic-id: logical identifier; ONU identifier ◆ password: physical password	Mandatory	88888888-88
	[checkcode] <checkcode>	◆ phy-id: physical password ◆ logic-id: logical identifier; logical password	Optional	666666
	[type] <onutype>	ONU type	Optional	HG260
	[slot] <slotno> [pon] <ponno> [onuid] <onuid>	Slot No., PON port No., and ONU authorization No.	Optional	1, 1, 1
Viewing the white list	[phy-id logic-id password]	White list type ◆ phy-id: physical identifier authentication ◆ logic-id: logical identifier authentication ◆ password: password authentication	Mandatory	logic-id
	{<frameid/slotid/portid>}*1	Subrack No. / slot No. / PON port No.	Optional	1/1/1

Example

1. Configure a white list for ONU 1 connected to PON Port 1 in Slot 1, setting the logical identifier of the ONU to 888888888888, the logical password to 666666, and the ONU type to HG260.

```
Admin(config) #whitelist add logic-id 8888888888 checkcode 666666 type HG260 slot 1  
pon 1 onuid 1
```

```
Admin(config)#
```

2. View the logical white list for PON Port 1 in Slot 1 of Subrack 1.

```
Admin(config)#show whitelist logic-id 1/1/1
```

```
----- Logic SN Whitelist-----
```

Slot	Pon	Onu	Onu-Type	Logic-Id	Logic-Pwd	En	Used
1	1	1	HG260	8888888888	666666	Y	Y

```
-----
```

```
slot 1 pon 1 item 1
```

```
Admin(config)#
```

5.4 Deauthorizing an ONU

- ◆ When the no-authentication mode is configured for a PON port, deauthorize the ONU connected to the PON port using the command described in **Deauthorizing an ONU in the No-authentication Mode**.
- ◆ In other authentication modes, deauthorize the ONU using the command described in **Deleting the White List**.

5.4.1 Deauthorizing an ONU in the No-authentication Mode

Command Format

```
no authorize <frameid/slotid/portid> <onulist>
```

Planning Data

Parameter	Description	Attribute	Example
<frameid/slotid/portid>	Subrack No. / slot No. / PON port No.	Mandatory	1/1/1
<onulist>	ONU authorization No.	Mandatory	1

Example

De-authorize ONU 1 under PON Port 1 in Slot 1 of Subrack 1.

```
Admin(config)#no authorize 1/1/1 1
```

```
Command executes success.
```

```
Admin(config)#
```

5.4.2 Deleting an ONU from the Physical Identifier White List

Command Format

```
no whitelist [phy-id|logic-id|password] <slotno> <ponno> <sn> {<checkcode>}
*1
```

Planning Data

Parameter	Description	Attribute	Example
[phy-id logic-id password]	White list type ◆ phy-id: physical identifier authentication ◆ logic-id: logical identifier authentication ◆ password: password authentication	Mandatory	phy-id
<slotno>	Slot No.	Mandatory	1
<ponno>	PON port No.	Mandatory	1
<sn>	◆ phy-id: physical identifier ◆ logic-id: logical identifier; ONU identifier ◆ password: physical password	Mandatory	888888888888-88
{<checkcode>} *1	◆ phy-id: physical password ◆ logic-id: logical identifier; logical password	Optional	-

Example

Delete the physical white list for PON Port 1 in Slot 1 with the physical identifier 888888888888.

```
Admin(config)#no whitelist phy-id 1 1 888888888888
Admin(config)#
```

6 Basic Configurations

- ☒ Configuring Local End Outer VLAN Data
- ☒ Adding Ports to a VLAN
- ☒ Disabling Suppression of Multicast Packets at the Uplink Port

6.1 Configuring Local End Outer VLAN Data

Command Format

Configure local end outer VLAN data.

```
service-vlan <name> <vlanbegin> {[to]<vlanend>}*1 {[type]<value>}*1
```

View the configuration data of local end outer VLAN.

```
show service-vlan {<name>}
```

Planning Data

Parameter	Description	Attribute	Example	
service-vlan <name>	The service VLAN name. You can enter numbers, letters and underlines not exceeding 32 characters for the subscriber service name.	Mandatory	data1	ngn1
<vlanbegin>	The starting VLAN ID, ranging from 1 to 4085. The starting VLAN ID should not be larger than the ending VLAN ID.	Mandatory	500	300
{[to]<vlanend>} *1	The ending VLAN ID, ranging from 1 to 4085. The starting VLAN ID should not be larger than the ending VLAN ID.	Optional	-	-
{[type]<value>} *1	The service VLAN type. Select it according to the type of service to be configured. ◆ data: data service. ◆ iptv: IPTV service. ◆ ngn: voice service in the carrier network. ◆ voip: voice service based on Internet. ◆ vod: video-on-demand service. ◆ cnc: CNC service. ◆ system: system service.	Optional	data	ngn

Example

- Set the service VLAN name to "data1", service VLAN ID to "500", and VLAN type to "data".

```
Admin(config) #service-vlan data1 500 type data
```

- Set the service VLAN name to "ngn1", service VLAN ID to "300", and VLAN type to "ngn".

```
Admin(config) #service-vlan ngn1 300 type ngn
Admin(config) #
```

3. View the configuration data of local end outer VLAN.

```
Admin(config) #show service-vlan
servicevlan 101 :
name : data1,    type : data
vlan range: 500 #####end.
servicevlan 102 :
name : ngn1,     type : ngn
vlan range: 300 #####end.
Admin(config) #
```

6.2 Adding Ports to a VLAN

Command Format

Add the uplink port to a VLAN.

```
port vlan <vlanid> {to <end-vlanid>}*1 [tag|untag] <frameid/slotid> <port-
list>
```

Add all the slots to the VLAN.

```
port vlan <vlanid> {to <end-vlanid>}*1 allslot
```

Planning Data

Parameter	Description	Attribute	Example
<vlanid>	VLAN ID	Mandatory	300
{to <end-vlanid>}*1	Ending VLAN ID	Optional	-

Parameter	Description	Attribute	Example
[tag untag]	Configure the tag processing mode for the uplink service VLAN. Two options are available: untag and tag. ◆ In the untag mode, the tags of the uplink packets will be stripped automatically when they pass the port and the packets will be further transmitted in the untagged mode, while the downlink untagged packets will be added with corresponding tags when they pass the port. ◆ In the tag mode, the tags of the uplink / downlink data packets will not be processed when they pass the port.	Mandatory	tag
<frameid/slotid>	Subrack No. / slot No.	Mandatory	1/19
<port-list>	Port number	Mandatory	4

Example

1. Add the uplink port to VLAN 300 in the tag mode.

```
Admin(config) #port vlan 300 tag 1/19 4
```

2. Add all the slots to VLAN 300.

```
Admin(config) #port vlan 300 allslot
```

```
Admin(config) #
```

6.3 Disabling Suppression of Multicast Packets at the Uplink Port

Command Format

```
no traffic-suppress <frameid/slotid/portid> [broadcast|multicast|unknown|all]
```

Planning Data

Parameter	Description	Attribute	Example
<frameid/slotid/- portid>	Subrack No. / slot No. / port No.	Mandatory	1/19/3
[broadcast multicast unknown all]	◆ broadcast ◆ multicast: multicast service ◆ unknown: unknown unicast packets ◆ all: all types of packets	Mandatory	multicast

Example

Disable multicast packet suppression for Port 3 in Slot 19 of Subrack 1.

```
Admin(config) #no traffic-suppress 1/19/3 multicast
Admin(config) #
```

7

Configuring Voice Services



Example of Configuring Voice Service



Optional Functions

7.1 Example of Configuring Voice Service

7.1.1 Configuring the H.248 Voice Service

Command Format

Configure parameters of the H.248 uplink interface.

```
ngn-uplink-interface name <name> protocol-type [mgcp|h.248|sip] { [mgc] <1-3> <addr> <0-65535>*3 { [keepalive] [enable|disable|passive]}*1 { [m-dns] [ipv4|ipv6] <ipaddr>*1 { [s-dns] [ipv4|ipv6] <ipaddr>*1 { [dhcp] [enable|disable]}*1 { [sip-reg-addr] <addr>*1 { [sip-reg-port] <0-65535>*1 { [sip-proxy-addr] <addr>*1 { [sip-proxy-port] <0-65535>*1 { [sip-expires] <0-4294967294>*1
```

Configure parameters of the NGN uplink user.

```
ngn-uplink-user service <name> { [vid] <vid>*1 { [potsqinqstate] [enable|disable] svlanid <0-4085>*1 { [service-cos] <value>*1 { [customer-cos] <value>*1 { [ip-mode] [static|pppoe|dhcp|pppoev6|dhcipv6]}*1 { [public-ip] [ipv4|ipv6] <ipaddress/prefix>*1 { [public-gate] [ipv4|ipv6] <ipaddress>*1 { [pppoeuser] <name>*1 { [password] <pwd>*1 { [dhcp-option60] [enable|disable]}*1 { [dhcp-value] <value>*1 { [domainname] <name>*1 { [protocol-port] <0-65535>*1 { [user-index] <value>*1
```

Configure the user telephone number.

```
ngn-uplink-user-port phone <value> { [username] <name>*1 { [sip-user-name] <name>*1 { [sip-user-password] <password>*1 { [user-index] <value>*1
```

Configure the NGN softswitch platform interconnection profile. (optional)

```
ngn-softswitch-profile <profilename> fixed <value> varb <value> vare <value> step <value> fixedlen [unfixed|fixed] begint <value> shortt <value> longt <value> matchem [exclusive|immediately] switch [disable|enable] txi <value> rxi <value> voicec [g711u|g711a|nochange] offhkwt [unregiste|registe] flashthd <value> 2833n [disable|enable] 2833d <value> 2198d <value> t38edm [default|v21|all] calleridm [fsk|dtmf] onhkdt <value> dailtonett <value> noanstt <value> busytonett <value> rohtt <value> retrantt <value> ecm [disable|enable] l [chinese|english] { [id] <id>*1 { [timethd] <value> userthd <value>*1 { [heart] [notify|change]}*1 { [tripartmode] <value>*1 { [signaldscp] <value> rtpdscp <value> minport <value> maxport <value> portstep <value>*1 { [portreg] [disable|enable]}*1
```

Bind the softswitch platform interconnection profile. (optional)

```
onu ngn-iad-softswitch-profile <onulist> profile <profile-name>
```

Configure voice service parameters of the ONU.

```
onu ngn-voice-service <onuno> pots <portno> phonenum <num> {[vid] <vid>}*1
{[code-mode] [g.711m|g.711a|g.723|g.729]}*1 {[fax-mode] [transparent|
t.38]}*1 {[slience] [enable|disable]}*1 {[echo-cancel] [enable|disable]}*1
{[input-gain] <num>}*1 {[voice-value] <value>}*1 {[dtmf] [transparent|
rfc2833|sip]}*1 {[heartbeat] [enable|disable]}*1 {[potsqinqstate] [enable|
disable] svlanid <0-4085>}*1 {[service-cos] <value>}*1 {[customer-cos]
<value>}*1 {[fax-control] [passthrough|softswitch|autovbd]}*1 {[bill-
type] [16kc|12kc|revpol|free]}*1
```

Data Planning

Procedure	Parameter	Description	Attribute	Example
Configuring parameters of the H.248 uplink interface	ngn-uplink-interface name <name>	The name of the uplink interface for the NGN voice service, consisting of the service name and the interface identifier.	Mandatory	ngn1@h.248
	protocol-type [mgcp h.248 sip]	The MGC protocol type. ◆ mgcp: the MGCP protocol ◆ h248: the H248 protocol ◆ sip: the SIP protocol	Mandatory	h.248
	{[mgc] <1-3> <addr> <0-65535>} *3	<1-3>: the MGC sequence number. <addr>: the MGC address. <0-65535>: the MGC port number.	Optional	1 192.168.1. 101 2944
	{[keepalive] [enable disable passive]}*1	The heartbeat switch. ◆ enable: Enable active heartbeat. ◆ disable: Disable the function. ◆ passive: Enable passive heartbeat.	Optional	enable
	{[m-dns] [ipv4 ipv6] <ipaddr>}*1	The master DNS server.	Optional	-
	{[s-dns] [ipv4 ipv6] <ipaddr>}*1	The slave DNS server.	Optional	-
	{[dhcp] [enable disable]}*1	The DHCP function switch.	Optional	-
	{[sip-reg-addr] <addr>}*1	The SIP registrar server address.	Optional	-

Procedure	Parameter	Description	Attribute	Example
	{ [sip-reg-port] <0-65535> } *1	The port number of the SIP registrar, that is, the protocol port number of the MG registered to the SIP registrar. The value ranges from 0 to 65535, and the default value is 5060.	Optional	-
	{ [sip-proxy-addr] <addr> } *1	The address of the SIP proxy server.	Optional	-
	{ [sip-proxy-port] <0-65535> } *1	The port number of the SIP proxy server. The value ranges from 0 to 65535, and the default value is 5060.	Optional	-
	{ [sip-expires] <0-4294967294> } *1	The SIP timeout time (second). If the MG does not receive the corresponding information from the SIP server before this time expires, the registration fails. The value ranges from 0 to 4294967294.	Optional	-
Configuring parameters of the NGN uplink user	service <name>	The voice service name, same as the name of the uplink interface for the NGN voice service.	Mandatory	ngn1@h.248
	{ [vid] <vid> } *1	The signaling VLAN ID.	Optional	300
	[potsqinqstate] [enable disable]	The SVLAN enabling state.	Optional	-
	svlanid <0-4085>	The SVLAN ID.	Optional	-
	{ [service-cos] <value> } *1	The outer CoS.	Optional	-
	{ [customer-cos] <value> } *1	The inner CoS.	Optional	-
	{ [ip-mode] [static pppoe dhcp pppoev6 dhcpv6] } *1	The IP configuration mode.	Optional	-
	{ [public-ip] [ipv4 ipv6] <ipaddress/prefix> } *1	The public network IP address / mask of the ONU. Configure this item according to the operator's network planning.	Optional	ipv4 10.90.60.2/16
	{ [public-gate] [ipv4 ipv6] <ipaddress> } *1	The public network gateway IP address of the ONU. Configure this item according to the operator's network planning.	Optional	ipv4 10.90.1.154

Procedure	Parameter	Description	Attribute	Example
	{ [pppoeuser] <name> } *1	The PPPoE user name.	Optional	-
	{ [password] <pwd> } *1	The PPPoE user password.	Optional	-
	{ [dhcp-option60] [enable disable] } *1	Enables or disables the DHCP Option60 function.	Optional	-
	{ [dhcp-value] <value> } *1	The DHCP Option60 suffix.	Optional	-
	{ [domainname] <name> } *1	The end point domain name / SIP user name suffix. Configure this item according to the operator's network planning.	Optional	10.90.60.2
	{ [protocol-port] <0-65535> } *1	The ONU protocol port. Configure this item according to the operator's network planning. The value ranges from 0 to 65535 and the default value is 2944.	Optional	2944
	{ [user-index] <value> } *1	The index ID, ranging from 0 to 40000	Optional	1
Configuring the user phone number	phone <value>	The user index and logical number within the system. It is advised to set this item to the phone number defined by the softswitch platform. The value ranges from 1 to 4294967294.	Mandatory	88880003
	{ [username] <name> } *1	The endpoint user name / SIP phone number. ◆ When the MGCP or H.248 protocol is used, the end point username should be configured. ◆ When the SIP protocol is used, the SIP telephone number should be configured.	Mandatory	a1
	{ [sip-user-name] <name> } *1	The user name authenticated by SIP.	Optional	-
	{ [sip-user-password] <password> } *1	The user password authenticated by SIP.	Optional	-
	{ [user-index] <value> } *1	The index ID, ranging from 0 to 40000.	Optional	1

Procedure	Parameter	Description	Attribute	Example
Configuring the NGN softswitch platform interconnection profile (optional)	ngn-softswitch-profile <profilename>	The name of the NGN softswitch platform interconnection profile.	Mandatory	ngn1
	fixed <value>	The fixed part of the RTP resource name.	Mandatory	RTP/000
	varb <value>	The starting value of the variable part of the RTP resource name.	Mandatory	0
	vare <value>	The ending value of the variable part of the RTP resource name.	Mandatory	15
	step <value>	The step of the variable part of the RTP resource name.	Mandatory	1
	fixedlen [unfixed fixed]	The fixed length of the RTP name. ◆ unfixed ◆ fixed	Mandatory	unfixed
	begint <value>	The DigitMap start timer (second). The value ranges from 1 to 255.	Mandatory	16
	shortt <value>	The DigitMap short timer (second). The value ranges from 1 to 255.	Mandatory	4
	longt <value>	The DigitMap long timer (second). The value ranges from 1 to 255.	Mandatory	16
	matchem [exclusive immediately]	Reporting the matching result immediately when match with any rule is found. ◆ exclusive: reporting when exclusive matching is found ◆ immediately: reporting immediately	Mandatory	immediately
	switch [disable enable]	The VBD state.	Mandatory	disable
	txi <value>	The VBD Tx packet interval (ms).	Mandatory	20
	rxix <value>	The VBD Rx packet interval (ms).	Mandatory	10
	voicec [g711u g711a nochange]	The VBD encoding type. ◆ g711u: G.711U ◆ g711a: G.711A ◆ nochange: not changed	Mandatory	nochange
	offhkwt [unregiste registe]	Howler tone timeout processing	Mandatory	unregiste
	flashthd <value>	The flash duration (ms).	Mandatory	90

Procedure	Parameter	Description	Attribute	Example
	2833n [disable enable]	The RFC2833 negotiation state. ◆ disable: no auto-negotiation ◆ enable: auto-negotiation	Mandatory	disable
	2833d <value>	The default RFC2833 PT.	Mandatory	97
	2198d <value>	The default RFC2198 PT.	Mandatory	96
	t38edm [default v21 all]	The T.38 event detection mode. ◆ default: normal report ◆ v21: reporting V21 only ◆ all: all reporting V21	Mandatory	default
	calleridm [fsk dtmf]	The caller ID mode.	Mandatory	fsk
	onhkdt <value>	The minimum onhook detection time (ms).	Mandatory	600
	dailtonett <value>	The dial tone time (s).	Mandatory	60
	noanstt <value>	The no-answer tone time (s).	Mandatory	60
	busytonett <value>	The busy tone time (s).	Mandatory	60
	rohttt <value>	The howler tone time (s).	Mandatory	60
	retrantt <value>	The retransmission timer (s).	Mandatory	25
	ecm [disable enable]	The error correction switch. ◆ enable: Enable the function. ◆ disable: Disable the function.	Mandatory	disable
	l [chinese english]	The CLI language. ◆ chinese ◆ english	Mandatory	english
	{[id] <id>}*1	The profile ID.	Optional	1
	[timethd] <value>	The NGN register timer threshold (s).	Optional	-
	userthd <value>	The threshold for quantity of NGN registered users.	Optional	-
	{[heart] [notify change]}*1	The heartbeat mode.	Optional	-
	{[tripartmode] <value>}*1	The three-party service establishing mode.	Optional	-
	[signaldscp] <value>	The signaling DSCP value.	Optional	-
	rtpdscp <value>	The media stream DSCP value.	Optional	-
	minport <value>	The minimum port number for RTP flow.	Optional	-

Procedure	Parameter	Description	Attribute	Example
	maxport <value>	The maximum port number for RTP flow.	Optional	-
	portstep <value>	The step of the RTP flow port number.	Optional	-
	{ [portreg] [disable enable]}*1	The port registration.	Optional	-
Binding the softswitch platform interconnection profile (optional)	<onulist>	The ONU authorization number.	Mandatory	1
	profile <profile-name>	The name of the softswitch platform interconnection profile.	Mandatory	ngn1
Configuring voice service parameters of the ONU	<onuno>	The ONU authorization number.	Mandatory	1
	pots <portno>	The POTS port number.	Mandatory	1
	phonenum <num>	The telephone number.	Optional	88880003
	{ [vid] <vid>}*1	The VLAN ID.	Optional	-
	{ [code-mode] [g.711m g.711a g.723 g.729]}*1	The voice encoding mode, i.e., the compression encoding mode for the NGN service voice stream. Select the encoding mode as required. The default setting is G.711A.	Optional	g.711a
	{ [fax-mode] [transparent t.38]}*1	The fax mode. "transparent" refers to the transparent mode, i.e., T.30 fax. Select the fax mode as needed. The default setting is "transparent".	Mandatory	transparent
	{ [silence] [enable disable]}*1	The silence switch. When this function is enabled and no voice is detected during the conversion, mute compression packets are transmitted. ◆ enable: Enable the function. ◆ disable: Disable the function.	Mandatory	enable
	{ [echo-cancel] [enable disable]}*1	The echo suppression. The echo is suppressed when this function is enabled. ◆ enable: Enable the function. ◆ disable: Disable the function.	Optional	-
	{ [input-gain] <num>}*1	The input gain. The value range is -32 to 32.	Optional	-
	{ [voice-value] <value>}*1	The output gain. The value range is -32 to 32.	Optional	-

Procedure	Parameter	Description	Attribute	Example
	{ [dtmf] [transparent rfc2833 sip]}*1	The DTMF mode.	Optional	-
	{ [heartbeat] [enable disable]}*1	The heartbeat function. ◆ enable: Enable the function. ◆ disable: Disable the function.	Optional	-
	[potsqinqstate] [enable disable]	The SVLAN enabling state.	Optional	-
	svlanid <0-4085>	The SVLAN ID.	Optional	-
	{ [service-cos] <value>}*1	The outer CoS.	Optional	-
	{ [customer-cos] <value>}*1	The inner CoS.	Optional	-
	{ [fax-control] [passthrough softswitch autovbd]}*1	The fax control mode. ◆ passthrough: voice path ◆ softswitch: softswitch full-control ◆ autovbd: auto negotiation	Optional	-
	{ [bill-type] [16kc 12kc revpol free]}*1	The bill type. ◆ 16kc: 16KC ◆ 12kc: 12KC ◆ revpol: reversal polarity ◆ free: no charging	Optional	-

Example

1. Configure parameters of the H.248 uplink interface.

```
Admin(config) #ngn-uplink-interface name ngn1@h.248 protocol-type h.248 mgc 1
192.168.1.101 2944 keepalive enable
```

2. Configure parameters of the NGN uplink user.

```
Admin(config) #ngn-uplink-user service ngn1@h.248 vid 300 public-ip ipv4 10.90.60.2/16
public-gate ipv4 10.90.1.154 domainname 10.90.60.2 protocol-port 2944 user-index 1
Admin(config) #
```

3. Configure the user telephone number.

```
Admin(config) #ngn-uplink-user-port phone 88880003 username a1 user-index 1
Admin(config) #
```

4. Configure the NGN softswitch platform interconnection profile.

```
Admin(config) #ngn-softswitch-profile ngn1 fixed RTP/000 varb 15 vare 15 step 1 fixedlen
unfixed begint 16 shortt 4 longt 16 matchem immediately switch disable txi 20 rxi 10 voicec
nochange offhkwrt unregiste flashtd 90 2833n disable 2833d 97 2198d 96 t38edm default
```

```
calleridm fsk onhkdt 600 dailtonett 60 noanstt 60 busytonett 60 rohdt 60 retrantt 25 ecm
disable l chinese id 1
```

```
Admin(config)#
```

5. Bind the softswitch platform interconnection profile.

```
Admin(config-if-pon-1/1/1)#onu ngn-iad-softswitch-profile 1 profile ngn1
```

```
Admin(config-if-pon-1/1/1)#
```

6. Configure voice service parameters of the ONU.

```
Admin(config-if-pon-1/1/1)#onu ngn-voice-service 1 pots 1 phonenum 88880003
code-mode g.711a fax-mode transparent silence enable
```

```
Admin(config-if-pon-1/1/1)#
```

7. Save the configuration data.

```
Admin(config)#save
```

```
Trying save configuration to flash, please wait ..... save config success
```

```
Admin(config)#
```

7.1.2 Configuring the SIP Voice Service

Command Format

Configure parameters of the SIP uplink interface.

```
ngn-uplink-interface name <name> protocol-type [mgcp|h.248|sip] { [mgc] <1-3> <addr> <0-65535> } *3 { [keepalive] [enable|disable|passive] } *1 { [m-dns] [ipv4|ipv6] <ipaddr> } *1 { [s-dns] [ipv4|ipv6] <ipaddr> } *1 { [dhcp] [enable|disable] } *1 { [sip-reg-addr] <addr> } *1 { [sip-reg-port] <0-65535> } *1 { [sip-proxy-addr] <addr> } *1 { [sip-proxy-port] <0-65535> } *1 { [sip-expires] <0-4294967294> } *1
```

Configure parameters of the NGN uplink user.

```
ngn-uplink-user service <name> { [vid] <vid> } *1 { [potsqinqstate] [enable|disable] svlanid <0-4085> } *1 { [service-cos] <value> } *1 { [customer-cos] <value> } *1 { [ip-mode] [static|pppoe|dhcp|pppoev6|dhcipv6] } *1 { [public-ip] [ipv4|ipv6] <ipaddress/prefix> } *1 { [public-gate] [ipv4|ipv6] <ipaddress> } *1 { [pppoeuser] <name> } *1 { [password] <pwd> } *1 { [dhcp-option60] [enable|disable] } *1 { [dhcp-value] <value> } *1 { [domainname] <name> } *1 { [protocol-port] <0-65535> } *1 { [user-index] <value> } *1
```

Configure the user telephone number.

```
ngn-uplink-user-port phone <value> { [username] <name> } *1 { [sip-user-name] <name> } *1 { [sip-user-password] <password> } *1 { [user-index] <value> } *1
```

Configure voice service parameters of the ONU.

```
onu ngn-voice-service <onuno> pots <portno> phonenum <num> {[vid] <vid>}*1
{[code-mode] [g.711m|g.711a|g.723|g.729]}*1 {[fax-mode] [transparent|
t.38]}*1 {[slience] [enable|disable]}*1 {[echo-cancel] [enable|disable]}*1
{[input-gain] <num>}*1 {[voice-value] <value>}*1 {[dtmf] [transparent|
rfc2833|sip]}*1 {[heartbeat] [enable|disable]}*1 {[potsqinqstate] [enable|
disable] svlanid <0-4085>}*1 {[service-cos] <value>}*1 {[customer-cos]
<value>}*1 {[fax-control] [passthrough|softswitch|autovbd]}*1 {[bill-
type] [16kc|12kc|revpol|free]}*1
```

Data Planning

Procedure	Parameter	Description	Attribute	Example
Configuring parameters of the SIP uplink interface	ngn-uplink-interface name <name>	The name of the uplink interface for the NGN voice service, consisting of the service name and the interface identifier.	Mandatory	ngn1@sip
	protocol-type [mgcp h.248 sip]	The MGC protocol type. ◆ mgcp: the MGCP protocol ◆ h248: the H248 protocol ◆ sip: the SIP protocol	Mandatory	sip
	{[mgc] <1-3> <addr> <0-65535>} *3	<1-3>: the MGC sequence number. <addr>: the MGC address. <0-65535>: the MGC port number.	Optional	-
	{[keepalive] [enable disable passive]}*1	The heartbeat switch. ◆ enable: Enable active heartbeat. ◆ disable: Disable the function. ◆ passive: Enable passive heartbeat.	Optional	-
	{[m-dns] [ipv4 ipv6] <ipaddr>}*1	The master DNS server.	Optional	-
	{[s-dns] [ipv4 ipv6] <ipaddr>}*1	The slave DNS server.	Optional	-
	{[dhcp] [enable disable]}*1	The DHCP function switch.	Optional	-
	{[sip-reg-addr] <addr>}*1	The SIP registrar server address.	Optional	10.80.20.3
	{[sip-reg-port] <0-65535>}*1	The port number of the SIP registrar, that is, the protocol port number of the MG registered to the SIP registrar. The value ranges from 0 to 65535, and the default value is 5060.	Optional	5060

Procedure	Parameter	Description	Attribute	Example
	{ [sip-proxy-addr] <addr>*1	The address of the SIP proxy server.	Optional	10.80.20.3
	{ [sip-proxy-port] <0-65535>*1	The port number of the SIP proxy server. The value ranges from 0 to 65535, and the default value is 5060.	Optional	5060
	{ [sip-expires] <0-4294967294>*1	The SIP timeout time (second). If the MG does not receive the corresponding information from the SIP server before this time expires, the registration fails. The value ranges from 0 to 4294967294.	Optional	3600
Configuring parameters of the NGN uplink user	service <name>	The voice service name, same as the name of the uplink interface for the NGN voice service.	Mandatory	ngn1@sip
	{ [vid] <vid>*1	The signaling VLAN ID.	Optional	300
	[potsqinqstate] [enable disable]	The SVLAN enabling state.	Optional	-
	svlanid <0-4085>	The SVLAN ID.	Optional	-
	{ [service-cos] <value>*1	The outer CoS.	Optional	-
	{ [customer-cos] <value>*1	The inner CoS.	Optional	-
	{ [ip-mode] [static pppoe dhcp pppoev6 dhcpv6]*1	The IP configuration mode.	Optional	static
	{ [public-ip] [ipv4 ipv6] <ipaddress/prefix>*1	The public network IP address / mask of the ONU. Configure this item according to the operator's network planning.	Optional	ipv4 10.80.20.3/16
	{ [public-gate] [ipv4 ipv6] <ipaddress>*1	The public network gateway IP address of the ONU. Configure this item according to the operator's network planning.	Optional	ipv4 10.80.1.254
	{ [pppoeuser] <name>*1	The PPPoE user name.	Optional	-
	{ [password] <pwd>*1	The PPPoE user password.	Optional	-

Procedure	Parameter	Description	Attribute	Example
	{ [dhcp-option60] [enable disable]}*1	Enabling DHCP Option60.	Optional	-
	{ [dhcp-value] <value>}*1	The DHCP Option60 suffix.	Optional	-
	{ [domainname] <name>}*1	The end point domain name / SIP user name suffix. Configure this item according to the operator's network planning.	Optional	10.80.20.3
	{ [protocol-port] <0-65535>}*1	The ONU protocol port. Configure this item according to the operator's network planning. The value ranges from 0 to 65535 and the default value is 5060.	Optional	5060
	{ [user-index] <value>}*1	The index ID, ranging from 0 to 40000	Optional	1
Configuring the user phone number	phone <value>	The user index and logical number within the system. It is advised to set this item to the phone number defined by the softswitch platform. The value ranges from 1 to 4294967294.	Mandatory	88880003
	{ [username] <name>}*1	The endpoint user name / SIP phone number. ◆ When the MGCP or H.248 protocol is used, the endpoint username should be configured. ◆ When the SIP protocol is used, the SIP telephone number should be configured.	Mandatory	88882211
	{ [sip-user-name] <name>}*1	The user name authenticated by SIP.	Optional	test3
	{ [sip-user-password] <password>}*1	The user password authenticated by SIP.	Optional	test3
	{ [user-index] <value>}*1	The index ID, ranging from 0 to 40000.	Optional	1
Configuring voice service parameters of the ONU	<onuno>	The ONU authorization number.	Mandatory	1
	pots <portno>	The POTS port number.	Mandatory	1
	phonenum <num>	The telephone number.	Optional	88880003

Procedure	Parameter	Description	Attribute	Example
	{ [vid] <vid> } *1	The VLAN ID.	Optional	-
	{ [code-mode] [g.711m g.711a g.723 g.729] } *1	The voice encoding mode, i.e., the compression encoding mode for the NGN service voice stream. Select the encoding mode as required. The default setting is G.711A.	Optional	g.711a
	{ [fax-mode] [transparent t.38] } *1	The fax mode. "transparent" refers to the transparent mode, i.e., T.30 fax. Select the fax mode as needed. The default setting is "transparent".	Mandatory	transparent
	{ [silence] [enable disable] } *1	The silence switch. When this function is enabled and no voice is detected during the conversion, mute compression packets are transmitted. ◆ enable: Enable the function. ◆ disable: Disable the function.	Mandatory	enable
	{ [echo-cancel] [enable disable] } *1	The echo suppression. The echo is suppressed when this function is enabled. ◆ enable: Enable the function. ◆ disable: Disable the function.	Optional	-
	{ [input-gain] <num> } *1	The input gain. The value range is -32 to 32.	Optional	-
	{ [voice-value] <value> } *1	The output gain. The value range is -32 to 32.	Optional	-
	{ [dtmf] [transparent rfc2833 sip] } *1	The DTMF mode.	Optional	-
	{ [heartbeat] [enable disable] } *1	The heartbeat function. ◆ enable: Enable the function. ◆ disable: Disable the function.	Optional	-
	[potsqinqstate] [enable disable]	The SVLAN enabling state.	Optional	-
	svlanid <0-4085>	The SVLAN ID.	Optional	-
	{ [service-cos] <value> } *1	The outer CoS.	Optional	-
	{ [customer-cos] <value> } *1	The inner CoS.	Optional	-

Procedure	Parameter	Description	Attribute	Example
	{ [fax-control] [passthrough softswitch autovbd]}*1	The fax control mode. ◆ passthrough: voice path ◆ softswitch: softswitch full-control ◆ autovbd: auto negotiation	Optional	-
	{ [bill-type] [16kc 12kc revpol free]}*1	The bill type. ◆ 16kc: 16KC ◆ 16kc: 12KC ◆ revpol: reversal polarity ◆ free: no charging	Optional	-

Example

1. Configure parameters of the SIP uplink interface.

```
Admin(config) #ngn-uplink-interface name ngn1@sip protocol-type sip sip-reg-addr
10.80.20.3 sip-reg-port 5060 sip-proxy-addr 10.80.20.3 sip-proxy-port 5060 sip-expires 3600
```

2. Configure parameters of the NGN uplink user.

```
Admin(config) #ngn-uplink-user service ngn1@sip vid 300 ip-mode static public-ip ipv4
10.80.20.3/16 public-gate ipv4 10.80.1.254 domainname 10.80.20.3 protocol-port 5060 user-
index 1
```

3. Configure the user telephone number.

```
Admin(config) #ngn-uplink-user-port phone 88880003 username 88882211 sip-user-name
test3 sip-user-password test3 user-index 1
```

4. Configure voice service parameters of the ONU.

```
Admin(config-if-pon-1/1/1) #onu ngn-voice-service 1 pots 1 phonenum 88880003
code-mode g.711a fax-mode transparent silence enable
Admin(config-if-pon-1/1/1) #
```

5. Save the configuration data.

```
Admin(config) #save
Trying save configuration to flash, please wait .....
save config success
Admin(config) #
```

7.2 Optional Functions

7.2.1 Configuring NGN Heartbeat Parameters

Command Format

```
ngn-keepalive service <name> aliveinterval <1-65535> alivetimes <1-65535>
```

Planning Data

Parameter	Description	Attribute	Example
service <name>	The NGN service name.	Mandatory	ngn1
aliveinterval <1-65535>	The heartbeat interval (s), i.e., the interval for sending keep-alive messages.	Mandatory	60
alivetimes <1-65535>	The heartbeat timeout times. If the MGC fails to receive the keep-alive messages from the ONU in time for the set times, it is considered that the MGC loses its communication with the ONU.	Mandatory	60

Example

```
Admin(config) #ngn-keepalive service ngn1 aliveinterval 60 alivetimes 60
Admin(config) #
```

7.2.2 Configuring IAD MD5 Authentication

Command Format

```
ngn-iad-md5 domain <name> md5-state [enable|disable] {[mgid] <value>}*1
{[key] <value>}*1 {[dhg-value] <value>}*1 {[dhp-value] <value>}*1
```

Planning Data

Parameter	Description	Attribute	Example
domain <name>	The end point domain name. It should be consistent with the endpoint domain name configured in the "NGN uplink user parameter".	Mandatory	10.90.60.2
md5-state [enable disable]	The MD5 state. Configure this item according to the network planning of the operator.	Mandatory	enable

Parameter	Description	Attribute	Example
{ [mgid] <value> } *1	The MG ID. Configure this item according to the network planning of the operator.	Optional	60
{ [key] <value> } *1	The key. Configure this item according to the network planning of the operator.	Optional	60
{ [dhg-value] <value> } *1	The base g. Configure this item according to the network planning of the operator.	Optional	60
{ [dhp-value] <value> } *1	The prime p. Configure this item according to the network planning of the operator.	Optional	60

Example

```
Admin(config) #ngn-iad-md5 domain 10.90.60.2 md5-state enable mgid 60 key 60 dhg-
value 60 dhp-value 60
Admin(config) #
```

7.2.3 Configuring the Digitmap

Command Format

Configure the digitmap.

```
ngn-bitmap bitmap1 <bitmap> {id<index> <name>} *1
ngn-bitmap bitmap2 <bitmap> {id<index>} *1
ngn-bitmap bitmap3 <bitmap> {id<index>} *1
ngn-bitmap bitmap4 <bitmap> {id<index>} *1
ngn-bitmap bitmap5 <bitmap> {id<index>} *1
ngn-bitmap bitmap6 <bitmap> {id<index>} *1
ngn-bitmap bitmap7 <bitmap> {id<index>} *1
ngn-bitmap bitmap8 <bitmap> {id<index>} *1
```

Bind the digitmap profile to an ONU.

```
onu bitmap-profile <onulist> profile-id <index>
```

Planning Data

Procedure	Parameter	Description	Attribute	Example
Configuring the digitmap	<bitmap>	The digitmap, no longer than 128 bytes	Mandatory	12345677-777

Procedure	Parameter	Description	Attribute	Example
	{id <index> <name>} *1	The ID and name of the digitmap profile	Optional	3, wang
Binding the digitmap profile to an ONU	<onulist>	The ONU authorization No.	Mandatory	1
	profile-id <index>	The digitmap profile ID	Mandatory	3

Example

1. Configure the digitmap.

```
Admin(config) #ngn-bitmap bitmap1 1234567777 id 3 wang
Admin(config) #
```

2. Bind the digitmap profile to ONU 1 under PON Port 1 in Slot 1 of Subrack 1.

```
Admin(config-if-pon-1/1/1) #onu bitmap-profile 1 profile-id 3
Admin(config-if-pon-1/1/1) #
```

8 Configuring Data Services

-  Example for Data Service Configuration in the Transparent Transmission Mode
-  Example for Data Service Configuration in the VLAN Translation Mode
-  Example for Data Service Configuration in the TAG Mode

8.1 Example for Data Service Configuration in the Transparent Transmission Mode

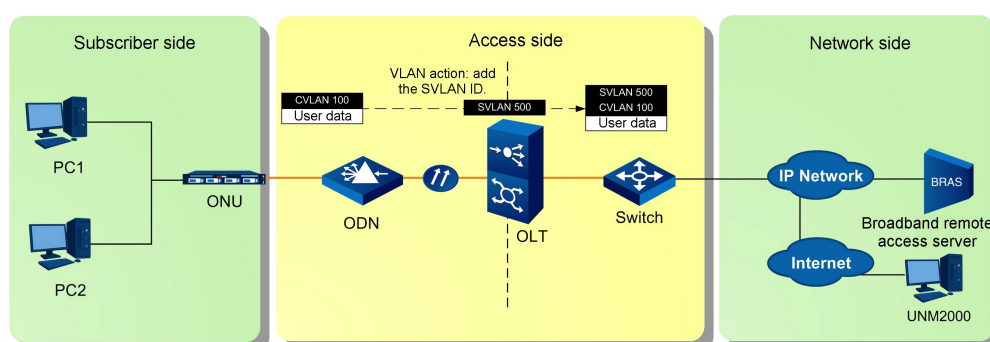
8.1.1 Network Scenario

Service Planning

- ◆ The subscribers are accessed via the ONUs.
- ◆ The subscriber services include IPTV, broadband Internet services and so on, which have high bandwidth requirement.
- ◆ QinQ transparent transmission is applied to the subscriber packets, with the outer VLAN identifying services and the inner VLAN identifying subscribers.

Network Diagram

The network diagram for the data service in the transparent transmission mode is shown in the figure below.



8.1.2 Configuring Parameters of Data Services at the ONU Ports

Command Format

Configure the quantity of services at the ONU port.

```
onu port vlan <onulist> eth <onu-port> service count <service-count>
```

Configure the type of service at the ONU port.

```
onu port vlan <onulist> eth <onu-port> service <serviceid> type [multicast |
unicast]
```

**Note:**

The service type is unicast by default. Configure it to multicast service if it is required.

Configure the VLAN mode for the service at the ONU port.

```
onu port vlan <onulist> eth <onu-port> service <serviceid> [tag|transparent]
priority <priority> tpid <tpid> vid <vlanlist>
```

Planning Data

Procedure	Parameter	Description	Attribute	Example
Configuring quantity of services at the ONU port	<onulist>	The ONU authorization No.	Mandatory	1
	eth <onu-port>	The ONU port No.	Mandatory	1
	service count <service-count>	The quantity of services	Mandatory	1
Configuring VLAN mode for the service at the ONU port	service <serviceid>	The service ID, ranging from 1 to 10	Mandatory	1
	[tag transparent]	The service VLAN mode ◆ tag: the TAG identifier ◆ transparent: transparent transmission	Mandatory	transparent
	priority <priority>	The CVLAN priority, ranging from 0 to 7. The value 7 stands for the highest priority level, and 0 the lowest one.	Mandatory	7
	tpid <tpid>	The TPID, i.e., the tag protocol identifier. The value ranges from 0 to 65534, and the default value is 33024.	Mandatory	33024
	vid <vlanlist>	The CVLAN ID, ranging from 1 to 4085	Mandatory	100

Example

1. Configure the ONU with the authorization number 1 under PON Port 1 in Slot 1 of Subrack 1, adding a service to Port 1 of the ONU.

```
Admin(config-if-pon-1/1/1) #onu port vlan 1 eth 1 service count 1
```

```
Admin(config-if-pon-1/1/1) #
```

2. Configure the VLAN mode for Port 1 of ONU 1, setting the service ID to 1, service VLAN mode to transparent transmission, priority level to 7, tag protocol identifier to 33024, and VLAN ID to 100.

```
Admin(config-if-pon-1/1/1) #onu port vlan 1 eth 1 service 1 transparent priority 7 tpid 33024 vid 100
```

```
Admin(config-if-pon-1/1/1) #
```

8.1.3 Configuring the ONU QinQ Profile

Command Format

```
onuqinq-classification-profile [add|modify] <profile-name> {<field-type>  
<field-val> <operator>}*8
```

Planning Data

Parameter	Description	Attribute	Example
[add modify]	◆ add ◆ modify	Mandatory	add
<profile-name>	The profile name	Mandatory	qinq

Parameter	Description	Attribute	Example
<field-type>	The rule domain type. The value ranges from 0 to 18. ◆ 0 (Src Mac): source MAC address ◆ 1 (Dst Mac): destination MAC address ◆ 2 (Src IPv4): source IP address ◆ 3 (Dst IPv4): destination IP address ◆ 4 (VID): VLAN ID ◆ 5 (Ethernet Type): Ethernet type ◆ 6 (Protocol Type): IP protocol type ◆ 7 (COS): Ethernet priority ◆ 8 (TOS): IP TOS/DSCP (IP v4) ◆ 9 (L4 Src Port): L4 source port ◆ 10 (L4 Dst Port): L4 destination port ◆ 11 (Dst IPv6 Prefix): destination IPv6 address ◆ 12 (Src IPv6 Prefix): source IPv6 address ◆ 13 (IP Version): IP version ◆ 14 (IPv6 Traffic Class): IPv6 traffic class ◆ 15 (IPv6 Flow Label): IPv6 flow label ◆ 16 (IPv6 Next Header): IPv6 next header ◆ 17 (Src IPv6): source IPv6 address ◆ 18 (Dst IPv6): destination IPv6 address	Optional	0
<field-val>	The rule domain value, which depends on the type of the rule domain. The rule domain type is	Optional	000000000000

Parameter	Description	Attribute	Example
	displayed before the brackets, while the rule domain value is inside the brackets. ◆ 0: the source MAC address (6 bytes) ◆ 1: the destination MAC address (6 bytes) ◆ 2: based on the source IP address classification (4 bytes) ◆ 3: based on the destination IP address classification (4 bytes) ◆ 4: based on the VLAN ID classification (2 bytes; 0 to 4085; 0 to 4095 is available for temporary requirement) ◆ 5: based on the Ethernet type (2 bytes, 0 to 0xffff) ◆ 6: based on the IP protocol type (1 byte, 0 to 0xff) ◆ 7: based on the Ethernet priority classification (1 byte, 1 to 7) ◆ 8: based on the IP TOS/DSCP (IPv4) classification (1 byte, 0 to 0xff) ◆ 9: based on the L4 source PORT classification (2 bytes, 0 to 0xffff) ◆ 10: based on the L4 destination PORT classification (2 bytes, 0 to 0xffff) ◆ 11: based on the destination IPv6 address prefix classification ◆ 12: based on the source IPv6 address prefix classification ◆ 13: based on the IP version (v4 or v6) classification (2 bytes, v4 or v6) ◆ 14: based on the IPv6 traffic class (1 byte, 0 to 255) ◆ 15: based on the IPv6 flow label (4 bytes, 0 to 0xFFFFF) ◆ 16: based on the IPv6 next header (1 byte, 0 to 255) ◆ 17: based on the source IPv6 address (16 bytes) ◆ 18: based on the destination IPv6 address (16 bytes)		

Parameter	Description	Attribute	Example
<operator>	The operator, which is an integer ranging from 0 to 6 ◆ 0 indicates "equal to" (=). ◆ 1 indicates "not equal to" (!=). ◆ 2 indicates "equal to or smaller than" (<=). ◆ 3 indicates "equal to or larger than" (>=). ◆ 4 indicates "exist then match". ◆ 5 indicates "not exist then match". ◆ 6 indicates "always match".	Optional	4

Example

Configure a QinQ profile named "qinq". The profile rule is that it is valid when the source MAC address 000000000000 exists (exist then match).

```
Admin(config) #onuqinq-classification-profile add qinq 0 000000000000 4
Admin(config) #
```

8.1.4 Binding the QinQ Profile to an ONU

Command Format

```
onu port vlan <onulist> eth <onu-port> service <serviceid> qinq [enable|
disable] {priority <priority> tpid <tpid> vid <s-vlanlist> <qinq-
classification-profile> <service-profile>} *1
```

Planning Data

Parameter	Description	Attribute	Example
<onulist>	ONU authorization No.	Mandatory	1
<onu-port>	ONU port	Mandatory	1
service <serviceid>	Service ID	Mandatory	1
qinq [enable disable]	QinQ state ◆ enable: enabled ◆ disable: disabled	Mandatory	enable
priority <priority>	The SVLAN priority, ranging from 0 to 7. The value 7 stands for the highest priority level, and 0 the lowest one.	Optional	7
tpid <tpid>	The TPID, i.e, the tag protocol identifier. The value ranges from 1 to 65535, and the default value is 33024.	Optional	33024

Parameter	Description	Attribute	Example
vid <s-vlanlist>	The SVLAN ID, ranging from 1 to 4085	Optional	500
<qinq-classification-profile>	QinQ profile name	Optional	qinq
<service-profile>	Service VLAN name	Optional	data1

Example

Enable the QinQ function for Service 1 at Port 1 of ONU 1, setting the priority of the service to "7", the TPID to "33024", the SVLAN to "500", the QinQ profile name to "qinq" and the service VLAN name to "data1". The ONU is under PON Port 1 in Slot 1 of Subrack 1.

```
Admin(config-if-pon-1/1/1) #onu port vlan 1 eth 1 service 1 qinq enable priority 7 tpid
33024 vid 500 qinq data1
Admin(config-if-pon-1/1/1) #
```

8.2 Example for Data Service Configuration in the VLAN Translation Mode

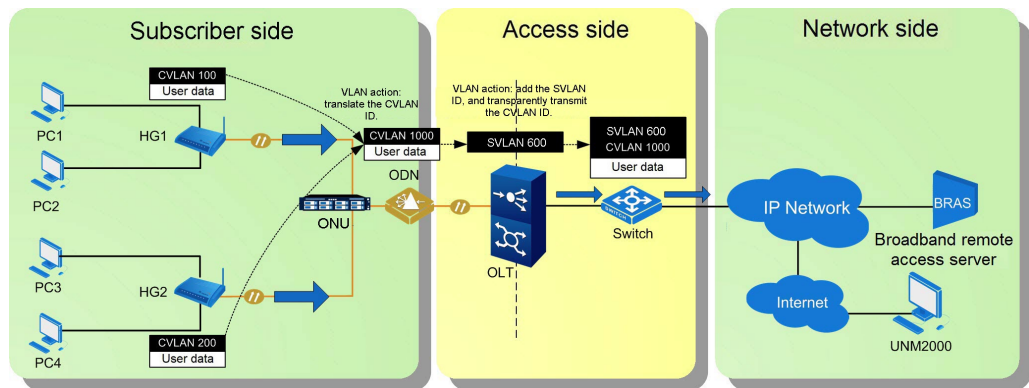
8.2.1 Network Scenario

Service Planning

The subscribers' PCs are connected to the ONU via home gateways. The home gateways add different VLAN tags to the subscribers' packets, and then transmit the packets to the ONU. The ONU translates the varied VLAN IDs into 1000 and sends the packets to the OLT. The OLT then adds the SVLAN to the subscribers' packets and sends them to the upper layer network.

Network Diagram

The network diagram for the data service in the VLAN N:1 translation mode is shown in the figure below.



- ◆ In the uplink direction, the data services uploaded by the two subscribers' PCs are added with different CVLAN IDs by the home gateways and uplinked to the ONU. The ONU translates the CVLAN IDs and transmits them to the OLT via the splitters. The OLT adds SVLAN IDs to the data services and transmits the data services to the providers network via the uplink interface.
- ◆ In the downlink direction, the data services carrying stacked VLAN tags pass by the OLT. The OLT strips the SVLAN tags off the data, and transmits the data services to the ONU via the splitter. The ONU translates the CVLAN tags and sends the data services to the corresponding HGs. The HGs strip the CVLAN tags off the data and transmit the data to the subscribers' PCs.

8.2.2 Configuring the OLT QinQ Domain

Command Format

Create a QinQ domain.

```
oltqinq-domain add <name>
```

Configure the quantity of services in the QinQ domain.

```
oltqinq-domain modify <name> service-count <service-count>
```

Configure uplink rules for the OLT QinQ domain.

```
oltqinq-domain <name> service <1-8> classification upstream {field-id <1-27> value <value> condition <condition>} *4 {serv-id <1-8>} *1
```

Configure downlink rules for the OLT QinQ domain.

```
oltqinq-domain <name> service <1-8> classification downstream {field-id <1-27> value <value> condition <condition>}*4
```

Configure the service VLAN for the QinQ domain.

```
oltqinq-domain <name> service <1-8> {vlan <1-4> user-vlanid [<0-4085>|null] user-cos [<0-7>|null] [add|translation|transparent] tpid <tpid> cos [<cos>|null] vlanid [<vlanid>|null]}*4
```

Planning Data

Procedure	Parameter	Description	Attribute	Example	
Creating a QinQ domain	<name>	The name of the QinQ domain.	Mandatory	qinqdomain	
Configuring the quantity of services in the QinQ domain	service-count <service-count>	The service quantity. The value ranges from 1 to 8. You should configure one service at least, and eight services at most.	Mandatory	2	
Configuring uplink rules for the OLT QinQ domain	service <1-8>	The service index. The quantity of services should be same as that of uplink rule clauses. The value ranges from 1 to 8.	Mandatory	1	2

Procedure	Parameter	Description	Attribute	Example	
	classification-upstream-field-id <1-27>	The uplink rule type. Altogether 27 types are provided and the default one is 1. ◆ 1: DA (destination MAC address) ◆ 2: SA (source MAC address) ◆ 3: ethtype (Ethernet type) ◆ 4: vlan4 (Layer 4 VLAN) ◆ 5: vlan3 (Layer 3 VLAN) ◆ 6: vlan2 (Layer 2 VLAN) ◆ 7: vlan1 (Layer 1 VLAN) ◆ 8: TOS (service type) ◆ 10: TTL (Time-to-Live) ◆ 11: protocol type ◆ 12: sip (source IP address) ◆ 14: dip (destination IP address) ◆ 16: L4srcport (Layer 4 source port number) ◆ 17: L4dstport (Layer 4 destination port number) ◆ 18: cos4 (Priority level 4) ◆ 19: cos3 (Priority level 3) ◆ 20: cos2 (Priority level 2) ◆ 21: cos1 (Priority level 1) ◆ 22: based on the destination IPv6 address prefix classification (DA IPv6 Prefix) ◆ 23: based on the source IPv6 address prefix classification (SA IPv6 Prefix) ◆ 24: based on the IP version (v4 or v6) classification (IP version) ◆ 25: based on the IP priority field (IPv6) classification (IPv6 Traffic Class) ◆ 26: based on the IP flow label field (IPv6 Flow Label) ◆ 27: based on next packet header (IPv6 Next Header)	Mandatory	1	1
	value <value>	The domain value corresponding to the uplink rule. Enter the value according to the domain type.	Mandatory	00000-00000-00	00000-00000-00

Procedure	Parameter	Description	Attribute	Example	
	<code>condition</code> <code><condition></code>	The uplink operator. The value ranges from 0 to 7, and the default value is 5. ◆ 0: Never (never match) ◆ 1: = (equal to) ◆ 2: != (not equal to) ◆ 3: <= (smaller than or equal to) ◆ 4: >= (larger than or equal to) ◆ 5: Exist (exist means match) ◆ 6: No exist (not exist means match) ◆ 7: Always (always match)	Mandatory	5	5
	<code>{serv-id<1-8>}*1</code>	The service ID. If no ID is entered, the service index will be used as the service ID.	Optional	1	2
Configuring downlink rules for the OLT QinQ domain	<code>service<1-8></code>	The service index. The quantity of services should be same as that of downlink rule clauses. The value ranges from 1 to 8.	Mandatory	1	2

Procedure	Parameter	Description	Attribute	Example	
	classification downstream field-id <1-27>	The downlink rule type. Altogether 27 types are provided and the default one is 1. ◆ 1: DA (destination MAC address) ◆ 2: SA (source MAC address) ◆ 3: ethtype (Ethernet type) ◆ 4: vlan4 (Layer 4 VLAN) ◆ 5: vlan3 (Layer 3 VLAN) ◆ 6: vlan2 (Layer 2 VLAN) ◆ 7: vlan1 (Layer 1 VLAN) ◆ 8: TOS (service type) ◆ 10: TTL (Time-to-Live) ◆ 11: protocol type ◆ 12: sip (source IP address) ◆ 14: dip (destination IP address) ◆ 16: L4srcport (Layer 4 source port number) ◆ 17: L4dstport (Layer 4 destination port number) ◆ 18: cos4 (Priority level 4) ◆ 19: cos3 (Priority level 3) ◆ 20: cos2 (Priority level 2) ◆ 21: cos1 (Priority level 1) ◆ 22: based on the destination IPv6 address prefix classification (DA IPv6 Prefix) ◆ 23: based on the source IPv6 address prefix classification (SA IPv6 Prefix) ◆ 24: based on the IP version (v4 or v6) classification (IP version) ◆ 25: based on the IP priority field (IPv6) classification (IPv6 Traffic Class) ◆ 26: based on the IP flow label field (IPv6 Flow Label) ◆ 27: based on next packet header (IPv6 Next Header)	Mandatory	1	1
	value <value>	The value of the selected downlink domain. Enter the value according to the domain type.	Mandatory	00000-00000-00	00000-00000-00

Procedure	Parameter	Description	Attribute	Example	
	condition <condition>	The downlink operator. The value ranges from 0 to 7, and the default value is 5. ◆ 0: Never (never match) ◆ 1: = (equal to) ◆ 2: != (not equal to) ◆ 3: <= (smaller than or equal to) ◆ 4: >= (larger than or equal to) ◆ 5: exist (exist means match) ◆ 6: no exist (not exist means match) ◆ 7: always (always match)	Mandatory	5	5
Configuring the service VLAN for the QinQ domain	vlan <1-4>	The VLAN layer No., i.e., the number of the current VLAN layer. Services can be configured on up to four VLAN layers. The value ranges from 1 to 4.	Mandatory	1	2
	user-vlanid [<0-4085> null]	The original VLAN ID	Mandatory	100 200	null
	user-cos [<0-7> null]	The CoS value. null: no configuration. The value ranges from 0 to 7, and the default value is 0.	Mandatory	0	null
	[add translation transparent]	Action of the VLAN at the selected layer ◆ add: adding ◆ translation: translation ◆ transparent: transparent transmission	Mandatory	translation	add
	tpid <tpid>	The TPID, i.e., the tag protocol identifier. The value ranges from 1 to 0xfffe.	Mandatory	33024	33024
	cos [<cos> null]	The CoS value. null: no configuration. The value ranges from 0 to 7, and the default value is 0.	Mandatory	null	null
	vlanid [<vlanid> null]	The new VLAN ID. null: no configuration. The value ranges from 1 to 4085.	Mandatory	1000	600

Example

1. Create a QinQ domain named "qinqdomain".

```
Admin(config) #oltqinq-domain add qinqdomain
Admin(config) #
```

2. Set the service quantity to 2 for the QinQ domain named "qinqdomain".

```
Admin(config) #oltqinq-domain modify qinqdomain service-count 2
```

3. Configure the uplink rule for the OLT QinQ domain "qinqdomain". Configure the first service, setting the uplink rule type to 1, the selected uplink domain value to the MAC address 000000000000, the uplink operator to 5, and the service ID to 1.

```
Admin(config) #oltqinq-domain qinqdomain service 1 classification upstream field-id 1
value 000000000000 condition 5 serv-id 1
```

4. Configure the downlink rule for the OLT QinQ domain "qinqdomain". Configure the first service, setting the downlink rule type to 1, the selected downlink domain value to the MAC address 000000000000, and the downlink operator to 5.

```
Admin(config) #oltqinq-domain qinqdomain service 1 classification downstream field-id 1
value 000000000000 condition 5
```

5. Configure the service VLAN for the QinQ domain. Configure the first service as follows. Set the original VLAN ID of the first layer VLAN to "100", CoS value to "0", VLAN mode to "translation", TPID to "33024", and CoS value to "null". Set the new VLAN ID to "1000", the second layer VLAN action to "add", the VLAN ID value to "600", the TPID to "33024", and the CoS value to "null".

```
Admin(config) #oltqinq-domain qinqdomain service 1 vlan 1 user-vlanid 100 user-cos 0
translation tpid 33024 cos null vlanid 1000 vlan 2 user-vlanid null user-cos null add tpid
33024 cos null vlanid 600
Admin(config) #
```

6. Configure the uplink rule for the OLT QinQ domain "qinqdomain". Configure the second service, setting the uplink rule type to 1, the selected uplink domain value to the MAC address 000000000000, the uplink operator to 5, and the service ID to 2.

```
Admin(config) #oltqinq-domain qinqdomain service 2 classification upstream field-id 1
value 000000000000 condition 5 serv-id 2
```

7. Configure the downlink rule for the OLT QinQ domain "qinqdomain". Configure the second service, setting the downlink rule type to 1, the selected downlink domain value to the MAC address 000000000000, and the downlink operator to 5.

```
Admin(config)#oltqinq-domain qinqdomain service 2 classification downstream field-id 1
value 000000000000 condition 5
```

8. Configure the service VLAN for the Qinq domain. Configure the second service as follows. Set the original VLAN ID of the first layer VLAN to "200", CoS value to "0", VLAN mode to "translation", TPID to "33024", and CoS value to "null". Set the new VLAN ID to "1000", the second layer VLAN action to "add", the VLAN ID value to "600", the TPID to "33024", and the CoS value to "null".

```
Admin(config)#oltqinq-domain qinqdomain service 2 vlan 1 user-vlanid 200 user-cos 0
translation tpid 33024 cos null vlanid 1000 vlan 2 user-vlanid null user-cos null add tpid
33024 cos null vlanid 600
```

```
Admin(config)#
```

8.2.3 Binding the Qinq Domain to a PON Port

Command Format

```
oltqinq-domain <name>
```

Planning Data

Parameter	Description	Attribute	Example
<name>	Name of the Qinq domain	Mandatory	qinqdomain

Example

Bind the domain "qinqdomain" to PON Port 1 in Slot 1 of Subrack 1.

```
Admin(config-if-pon-1/1/1)#oltqinq-domain qinqdomain
Admin(config-if-pon-1/1/1)#
```

8.2.4 Configuring Parameters of Data Services at the ONU Ports

Command Format

Configure the quantity of services at the ONU port.

```
onu port vlan <onulist> eth <onu-port> service count <service-count>
```

Configure the type of service at the ONU port.

```
onu port vlan <onulist> eth <onu-port> service <serviceid> type [multicast |
unicast]
```

**Note:**

The service type is unicast by default. Configure it to multicast service if it is required.

Configure the VLAN mode for the service at the ONU port.

```
onu port vlan <onulist> eth <onu-port> service <serviceid> [tag|transparent]
priority <priority> tpid <tpid> vid <vlanlist>
```

Planning Data

Procedure	Parameter	Description	Attribute	Example	
Configuring quantity of services at the ONU port	<onulist>	The ONU authorization No.	Mandatory	1	1
	eth <onu-port>	The ONU port No.	Mandatory	1	2
	service count <service-count>	The quantity of services	Mandatory	1	1
Configuring VLAN mode for the service at the ONU port	service <serviceid>	The service ID, ranging from 1 to 10	Mandatory	1	1
	[tag transparent]	The service VLAN mode ◆ tag: the TAG identifier ◆ transparent: transparent transmission	Mandatory	transparent	transparent
	priority <priority>	The CVLAN priority, ranging from 0 to 7. The value 7 stands for the highest priority level, and 0 the lowest one.	Mandatory	7	7
	tpid <tpid>	The TPID, i.e, the tag protocol identifier. The value ranges from 0 to 65534, and the default value is 33024.	Mandatory	33024	33024
	vid <vlanlist>	The CVLAN ID, ranging from 1 to 4085	Mandatory	100	200

Example

1. Configure the ONU with the authorization number 1 under PON Port 1 in Slot 1 of Subrack 1, adding a service to Port 1 of the ONU.

```
Admin(config-if-pon-1/1/1) #onu port vlan 1 eth 1 service count 1
```

```
Admin(config-if-pon-1/1/1) #
```

2. Configure the ONU with the authorization number 1 under PON Port 1 in Slot 1 of Subrack 1, adding a service to Port 2 of the ONU.

```
Admin(config-if-pon-1/1/1) #onu port vlan 1 eth 2 service count 1
```

```
Admin(config-if-pon-1/1/1) #
```

3. Configure the VLAN mode for Port 1 of ONU 1, setting the service ID to 1, service VLAN mode to transparent transmission, priority level to 7, tag protocol identifier to 33024, and VLAN ID to 100.

```
Admin(config-if-pon-1/1/1) #onu port vlan 1 eth 1 service 1 transparent priority 7 tpid 33024 vid 100
```

```
Admin(config-if-pon-1/1/1) #
```

4. Configure the VLAN mode for Port 1 of ONU 2, setting the service ID to 1, service VLAN mode to transparent transmission, priority level to 7, tag protocol identifier to 33024, and VLAN ID to 200.

```
Admin(config-if-pon-1/1/1) #onu port vlan 1 eth 2 service 1 transparent priority 7 tpid 33024 vid 200
```

```
Admin(config-if-pon-1/1/1) #
```

8.3 Example for Data Service Configuration in the TAG Mode

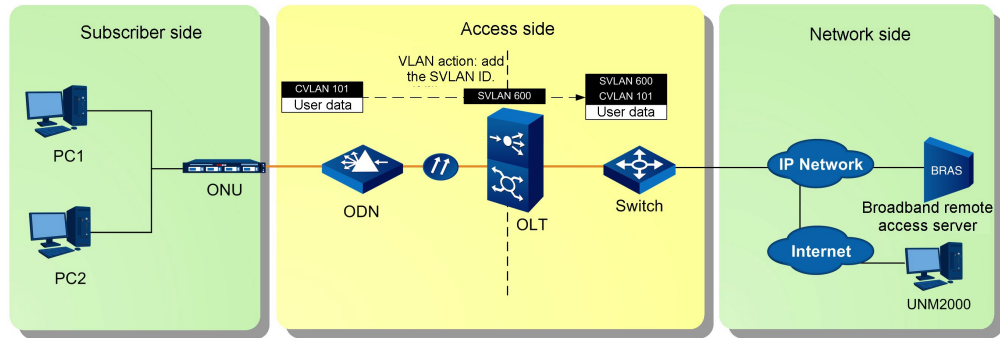
8.3.1 Network Scenario

Service Planning

- ◆ The subscribers are accessed via the ONUs.
- ◆ The subscriber services include IPTV, broadband Internet services and so on, which have high bandwidth requirement.
- ◆ The TAG mode is applied to the subscriber packets, with the outer VLAN identifying services and the inner VLAN identifying subscribers.

Network Diagram

The network diagram for the data service in the TAG mode is shown in the figure below.



8.3.2 Configuring the OLT QinQ Domain

Command Format

Create a QinQ domain.

```
oltqinq-domain add <name>
```

Configure the quantity of services in the QinQ domain.

```
oltqinq-domain modify <name> service-count <service-count>
```

Configure uplink rules for the OLT QinQ domain.

```
oltqinq-domain <name> service <1-8> classification upstream {field-id <1-27> value <value> condition <condition>} *4 {serv-id <1-8>} *1
```

Configure downlink rules for the OLT QinQ domain.

```
oltqinq-domain <name> service <1-8> classification downstream {field-id <1-27> value <value> condition <condition>} *4
```

Configure the service VLAN for the QinQ domain.

```
oltqinq-domain <name> service <1-8> {vlan <1-4> user-vlanid [<0-4085>|null] user-cos [<0-7>|null] [add|translation|transparent] tpid <tpid> cos [<cos>|null] vlanid [<vlanid>|null]} *4
```

Planning Data

Procedure	Parameter	Description	Attribute	Example
Creating a QinQ domain	<name>	The name of the QinQ domain.	Mandatory	qinqdomain
Configuring the quantity of services in the QinQ domain	service-count <service-count>	The service quantity. The value ranges from 1 to 8. You should configure one service at least, and eight services at most.	Mandatory	1
Configuring uplink rules for the OLT QinQ domain	service <1-8>	The service index. The quantity of services should be same as that of uplink rule clauses. The value ranges from 1 to 8.	Mandatory	1

Procedure	Parameter	Description	Attribute	Example
	classification upstream field-id <1-27>	The uplink rule type. Altogether 27 types are provided and the default one is 1. ◆ 1: DA (destination MAC address) ◆ 2: SA (source MAC address) ◆ 3: ethtype (Ethernet type) ◆ 4: vlan4 (Layer 4 VLAN) ◆ 5: vlan3 (Layer 3 VLAN) ◆ 6: vlan2 (Layer 2 VLAN) ◆ 7: vlan1 (Layer 1 VLAN) ◆ 8: TOS (service type) ◆ 10: TTL (Time-to-Live) ◆ 11: protocol type ◆ 12: sip (source IP address) ◆ 14: dip (destination IP address) ◆ 16: L4srcport (Layer 4 source port number) ◆ 17: L4dstport (Layer 4 destination port number) ◆ 18: cos4 (Priority level 4) ◆ 19: cos3 (Priority level 3) ◆ 20: cos2 (Priority level 2) ◆ 21: cos1 (Priority level 1) ◆ 22: based on the destination IPv6 address prefix classification (DA IPv6 Prefix) ◆ 23: based on the source IPv6 address prefix classification (SA IPv6 Prefix) ◆ 24: based on the IP version (v4 or v6) classification (IP version) ◆ 25: based on the IP priority field (IPv6) classification (IPv6 Traffic Class) ◆ 26: based on the IP flow label field (IPv6 Flow Label) ◆ 27: based on next packet header (IPv6 Next Header)	Mandatory	1
	value <value>	The domain value corresponding to the uplink rule. Enter the value according to the domain type.	Mandatory	000000000000

Procedure	Parameter	Description	Attribute	Example
	<code>condition</code> <code><condition></code>	The uplink operator. The value ranges from 0 to 7, and the default value is 5. ◆ 0: Never (never match) ◆ 1: = (equal to) ◆ 2: != (not equal to) ◆ 3: <= (smaller than or equal to) ◆ 4: >= (larger than or equal to) ◆ 5: Exist (exist means match). ◆ 6: No exist (not exist means match). ◆ 7: Always (always match).	Mandatory	5
	<code>{serv-id<1-8>}*1</code>	The service ID. If no ID is entered, the service index will be used as the service ID.	Optional	1
Configuring downlink rules for the OLT QinQ domain	<code>service <1-8></code>	The service index. The quantity of services should be same as that of downlink rule clauses. The value ranges from 1 to 8.	Mandatory	1

Procedure	Parameter	Description	Attribute	Example
	classifica- tion downstream field-id <1- 27>	The downlink rule type. Altogether 27 types are provided and the default one is 1. ◆ 1: DA (destination MAC address) ◆ 2: SA (source MAC address) ◆ 3: ethtype (Ethernet type) ◆ 4: vlan4 (Layer 4 VLAN) ◆ 5: vlan3 (Layer 3 VLAN) ◆ 6: vlan2 (Layer 2 VLAN) ◆ 7: vlan1 (Layer 1 VLAN) ◆ 8: TOS (service type) ◆ 10: TTL (Time-to-Live) ◆ 11: protocol type ◆ 12: sip (source IP address) ◆ 14: dip (destination IP address) ◆ 16: L4srcport (Layer 4 source port number) ◆ 17: L4dstport (Layer 4 destination port number) ◆ 18: cos4 (Priority level 4) ◆ 19: cos3 (Priority level 3) ◆ 20: cos2 (Priority level 2) ◆ 21: cos1 (Priority level 1) ◆ 22: based on the destination IPv6 address prefix classification (DA IPv6 Prefix) ◆ 23: based on the source IPv6 address prefix classification (SA IPv6 Prefix) ◆ 24: based on the IP version (v4 or v6) classification (IP version) ◆ 25: based on the IP priority field (IPv6) classification (IPv6 Traffic Class) ◆ 26: based on the IP flow label field (IPv6 Flow Label) ◆ 27: based on next packet header (IPv6 Next Header)	Mandatory	1
	value <value>	The value of the selected downlink domain. Enter the value according to the domain type.	Mandatory	000000000000

Procedure	Parameter	Description	Attribute	Example	
	condition <condition>	The downlink operator. The value ranges from 0 to 7, and the default value is 5. ◆ 0: Never (never match) ◆ 1: = (equal to) ◆ 2: != (not equal to) ◆ 3: <= (smaller than or equal to) ◆ 4: >= (larger than or equal to) ◆ 5: exist (exist means match) ◆ 6: no exist (not exist means match) ◆ 7: always (always match)	Mandatory	5	
Configuring the service VLAN for the QinQ domain	vlan <1-4>	The VLAN layer No., i.e., the number of the current VLAN layer. Services can be configured on up to four VLAN layers. The value ranges from 1 to 4.	Mandatory	1	2
	user-vlanid [<0-4085> null]	The original VLAN ID	Mandatory	101	null
	user-cos [<0-7> null]	The CoS value. null: no configuration. The value ranges from 0 to 7, and the default value is 0.	Mandatory	0	null
	[add translation transparent]	Action of the VLAN at the selected layer ◆ add: adding ◆ translation: translation ◆ transparent: transparent transmission	Mandatory	trans- parent	add
	tpid <tpid>	The TPID, i.e., the tag protocol identifier. The value ranges from 1 to 0xfffe.	Mandatory	33024	33024
	cos [<cos> null]	The CoS value. null: no configuration. The value ranges from 0 to 7, and the default value is 0.	Mandatory	null	null
	vlanid [<vlanid> null]	The new VLAN ID. null: no configuration. The value ranges from 1 to 4085.	Mandatory	null	600

Example

1. Create a QinQ domain named "qinqdomain".

```
Admin(config) #oltqinq-domain add qinqdomain
```

2. Set the service quantity to 1 for the QinQ domain named "qinqdomain".

```
Admin(config) #oltqinq-domain modify qinqdomain service-count 1
```

3. Configure the uplink rule for the OLT QinQ domain "qinqdomain". Configure the first service, setting the uplink rule type to 1, the selected uplink domain value to the MAC address 000000000000, the uplink operator to 5, and the service ID to 1.

```
Admin(config) #oltqinq-domain qinqdomain service 1 classification upstream field-id 1
value 000000000000 condition 5 serv-id 1
```

4. Configure the downlink rule for the OLT QinQ domain "qinqdomain". Configure the first service, setting the downlink rule type to 1, the selected downlink domain value to the MAC address 000000000000, and the downlink operator to 5.

```
Admin(config) #oltqinq-domain qinqdomain service 1 classification downstream field-id 1
value 000000000000 condition 5
```

5. Configure the service VLAN for the QinQ domain. Configure the first service as follows. Set the original VLAN ID of the first layer VLAN to 101, the CoS value to 0, the VLAN mode to "transparent", the TPID to 33024, and the CoS to "null". Set the new VLAN ID to "null", the second layer VLAN action to "add", the VLAN ID to "600", the TPID to "33024", and the CoS value to "null".

```
Admin(config) #oltqinq-domain qinqdomain service 1 vlan 1 user-vlanid 101 user-cos 0
transparent tpid 33024 cos null vlanid null vlan 2 user-vlanid null user-cos null add tpid
33024 cos null vlanid 600
Admin(config) #
```

8.3.3 Binding the QinQ Domain to an ONU

Command Format

```
onu oltqinq-domain <onuid> <name>
```

Planning Data

Parameter	Description	Attribute	Example
<onuid>	ONU authorization No.	Mandatory	1
<name>	Name of the QinQ domain	Mandatory	qinqdomain

Example

Bind the domain "qinqdomain" to ONU 1 under PON Port 1 in Slot 1 of Subrack 1.

```
Admin(config-if-pon-1/1/1) #onu oltqinq-domain 1 qinqdomain
Admin(config-if-pon-1/1/1) #
```

8.3.4 Configuring Parameters of Data Services at the ONU Ports

Command Format

Configure the quantity of services at the ONU port.

```
onu port vlan <onulist> eth <onu-port> service count <service-count>
```

Configure the type of service at the ONU port.

```
onu port vlan <onulist> eth <onu-port> service <serviceid> type [multicast|
unicast]
```



Note:

The service type is unicast by default. Configure it to multicast service if it is required.

Configure the VLAN mode for the service at the ONU port.

```
onu port vlan <onulist> eth <onu-port> service <serviceid> [tag|transparent]
priority <priority> tpid <tpid> vid <vlanlist>
```

Planning Data

Procedure	Parameter	Description	Attribute	Example
Configuring quantity of services at the ONU port	<onulist>	The ONU authorization No.	Mandatory	1
	eth <onu-port>	The ONU port No.	Mandatory	1
	service count <service-count>	The quantity of services	Mandatory	1
Configuring VLAN mode for the service at the ONU port	service <serviceid>	The service ID, ranging from 1 to 10	Mandatory	1

Procedure	Parameter	Description	Attribute	Example
	[tag transparent]	The service VLAN mode ◆ tag: the TAG identifier ◆ transparent: transparent transmission	Mandatory	tag
	priority <priority>	The CVLAN priority, ranging from 0 to 7. The value 7 stands for the highest priority level, and 0 the lowest one.	Mandatory	7
	tpid <tpid>	The TPID, i.e, the tag protocol identifier. The value ranges from 0 to 65534, and the default value is 33024.	Mandatory	33024
	vid <vlanlist>	The CVLAN ID, ranging from 1 to 4085	Mandatory	101

Example

1. Configure the ONU with the authorization number 1 under PON Port 1 in Slot 1 of Subrack 1, adding a service to Port 1 of the ONU.

```
Admin(config-if-pon-1/1/1) #onu port vlan 1 eth 1 service count 1
Admin(config-if-pon-1/1/1) #
```

2. Configure the VLAN mode for Port 1 of ONU 1, setting the service ID to 1, the service VLAN mode to "tag", the priority level to 7, the tag protocol identifier to 33024, and the VLAN ID to 101.

```
Admin(config-if-pon-1/1/1) #onu port vlan 1 eth 1 service 1 tag priority 7 tpid 33024
vid 101
Admin(config-if-pon-1/1/1) #
```

9 **Configuring the Multicast Service**

- ☒ Background Information
- ☒ Configuration Rules
- ☒ Multicast Service Configuration Examples
- ☒ Example of Configuring the SSM Multicast Service
- ☒ Optional Functions

9.1 Background Information

Multicast is a communication mode in which one copy of data packet is sent to multiple subscribers. Each multicast address stands for a multicast group, and all hosts in the multicast group can receive the same data from the multicast source.

Advantages of multicast service application:

- ◆ Saving bandwidth: There is only one copy of the same multicast data stream on each link. This can save the network bandwidth.
- ◆ Lessening the load: In the multicast mode, increase of subscribers does not visibly increase the burden on the network. This helps avoid heavy load on the video server and the CPU.
- ◆ Long-haul transmission: The multicast packets can be transmitted across network segments to allow long-haul transmission of massive data.
- ◆ Security: The multicast packets are transmitted only to the expected receivers, so as to guarantee the security of information.

9.2 Configuration Rules

The following describes the rules for global configuration of the multicast service for the AN6001-G16:

- ◆ When the multicast mode is disabled, the multicast subscribers cannot watch the programs in the multicast VLAN.
- ◆ The AN6001-G16 supports processing multicast protocol packets (including those requesting joining / leaving a multicast group and those for querying).
- ◆ The AN6001-G16 supports VLAN adding or translation for the subscriber protocol packets.
- ◆ The multicast mode is based on the VLAN. Different multicast modes can be set for different VLANs on the same equipment.
- ◆ Generally, default values can be used for the parameters in common or special multicast queries.
- ◆ The multicast SSM IP address is the multicast address, while the source IP address of SSM-Mapping is the unicast address.

9.3 Multicast Service Configuration Examples

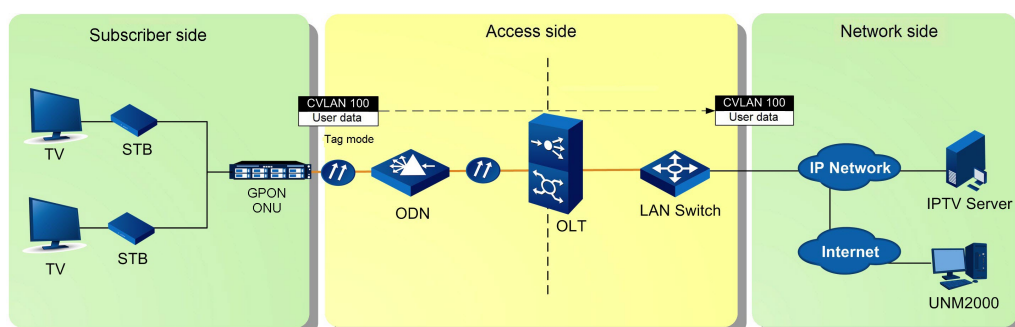
9.3.1 Network Scenario

Service Planning

Two subscribers are connected to the GPON ONU, and they can use the set top boxes (STB) to watch IPTV programs. The service in this case is the multicast service in the proxy-snooping mode. Accordingly, the OLT should work in the proxy-snooping mode.

Network Diagram

The figure below shows the network diagram for the multicast services implemented by the OLT in the proxy-snooping mode.



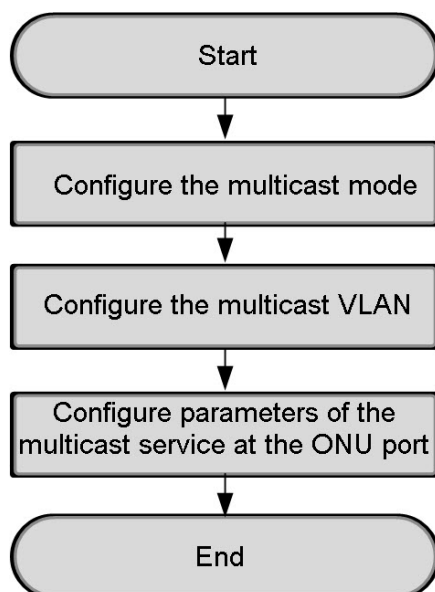
- ◆ In the downlink direction, the ONU strips the tag from the multicast stream (VLAN ID=100) on the OLT side, and transmits the stream to the set top box. The set top box then forwards the stream to video subscribers.
- ◆ In the uplink direction, the ONU attaches the tag (VLAN ID=100) to the multicast protocol packets requesting joining / leaving a multicast group received from the set top box, and transmits the packets to the OLT. The OLT then forwards the protocol packets to the IPTV server.

9.3.2 Configuration Flow

Prerequisites

The VLAN service channel has been created. Please refer to [Basic Configurations](#) for the creation method.

Configuration Flow



9.3.3 Configuring the Multicast Mode

Command Format

```
igmp mode [control|proxy-proxy|snooping|proxy-snooping|disable]
```

Data Planning

Parameter	Description	Attribute	Example
igmp mode [control proxy-proxy snooping proxy-snooping disable]	The multicast mode. ◆ control: controlled mode ◆ proxy-proxy: proxy-proxy mode ◆ snooping: snooping mode ◆ proxy-snooping: proxy-snooping mode ◆ disable: disabled mode	Mandatory	proxy-snooping

Example

Set the multicast mode to proxy-snooping mode.

```
Admin(config-igmp) #igmp mode proxy-snooping
Admin(config-igmp) #
```

9.3.4 Configuring the Multicast VLAN

Command Format

```
igmp vlan {[default]}*1 {<value>}*1
```

Planning Data

Parameter	Description	Attribute	Example
igmp vlan {[default]}*1	The default multicast VLAN	Optional	-
{<value>}*1	The multicast VLAN, ranging from 1 to 4085	Optional	100

Example

Set the multicast VLAN to 100.

```
Admin(config-igmp) #igmp vlan 100
Admin(config-igmp) #
```

9.3.5 Configuring Parameters of Multicast Service at the ONU Port

Command Format

Configure the quantity of services at the ONU port.

```
onu port vlan <onulist> eth <onu-port> service count <service-count>
```

Configure the type of service at the ONU port.

```
onu port vlan <onulist> eth <onu-port> service <serviceid> type [multicast|
unicast]
```



Note:

The service type is unicast by default. Configure it to multicast service if it is required.

Configure the VLAN mode for the service at the ONU port.

```
onu port vlan <onulist> eth <onu-port> service <serviceid> [tag|transparent]
priority <priority> tpid <tpid> vid <vlanlist>
```

Planning Data

Procedure	Parameter	Description	Attribute	Example
Configuring quantity of services at the ONU port	<onulist>	The ONU authorization No.	Mandatory	1
	eth <onu-port>	The ONU port No.	Mandatory	1
	service count <service-count>	The quantity of services	Mandatory	1
Configuring services at the ONU port	service <serviceid>	The service ID, ranging from 1 to 10	Mandatory	1
	type [multicast unicast]	The type of service at the ONU port ◆ multicast: multicast service ◆ unicast: unicast service	Mandatory	multicast
Configuring VLAN mode for the service at the ONU port	service <serviceid>	The service ID, ranging from 1 to 10	Mandatory	1
	[tag transparent]	The service VLAN mode ◆ tag: the TAG identifier ◆ transparent: transparent transmission	Mandatory	tag
	priority <priority>	The CVLAN priority, ranging from 0 to 7. The value 7 stands for the highest priority level, and 0 the lowest one.	Mandatory	0
	tpid <tpid>	The TPID, i.e, the tag protocol identifier. The value ranges from 0 to 65534, and the default value is 33024.	Mandatory	33024
	vid <vlanlist>	The CVLAN ID, ranging from 1 to 4085	Mandatory	100

Example

1. Configure the ONU with the authorization number 1 under PON Port 1 in Slot 1 of Subrack 1, adding a service to Port 1 of the ONU.

```
Admin(config-if-pon-1/1/1) #onu port vlan 1 eth 1 service count 1
Admin(config-if-pon-1/1/1) #
```

2. Set the type of Service 1 at Port 1 of ONU 1 to "multicast". The ONU is connected to PON Port 1 in Slot 1 of Subrack 1.

```
Admin(config-if-pon-1/1/1) #onu port vlan 1 eth 1 service 1 type multicast
```

3. Configure the VLAN mode for Port 1 of ONU 1, setting the service ID to 1, the service VLAN mode to "tag", the priority level to 0, the tag protocol identifier to 33024, and the VLAN ID to 100.

```
Admin(config-if-pon-1/1/1)#onu port vlan 1 eth 1 service 1 tag priority 0 tpid 33024
vid 100
```

```
Admin(config-if-pon-1/1/1)#
```

9.4 Example of Configuring the SSM Multicast Service

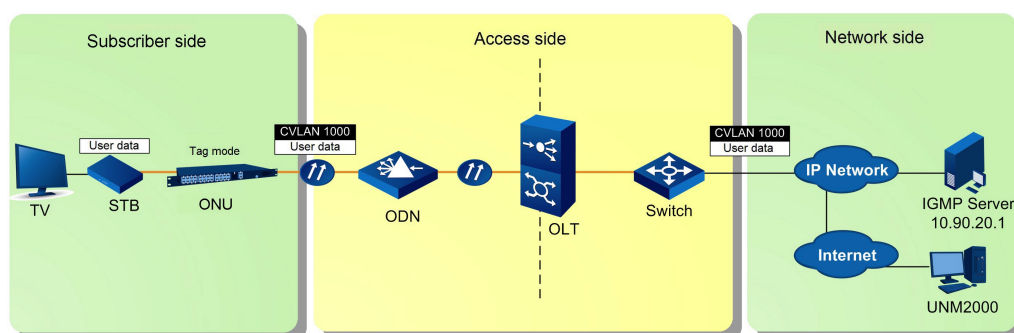
9.4.1 Network Scenario

Service Planning

A subscriber needs to watch the IPTV programs in the SSM multicast mode using the set top box. The subscriber is connected to the OLT equipment via an ONU.

Network Diagram

The network diagram for the SSM multicast service is shown in the figure below.



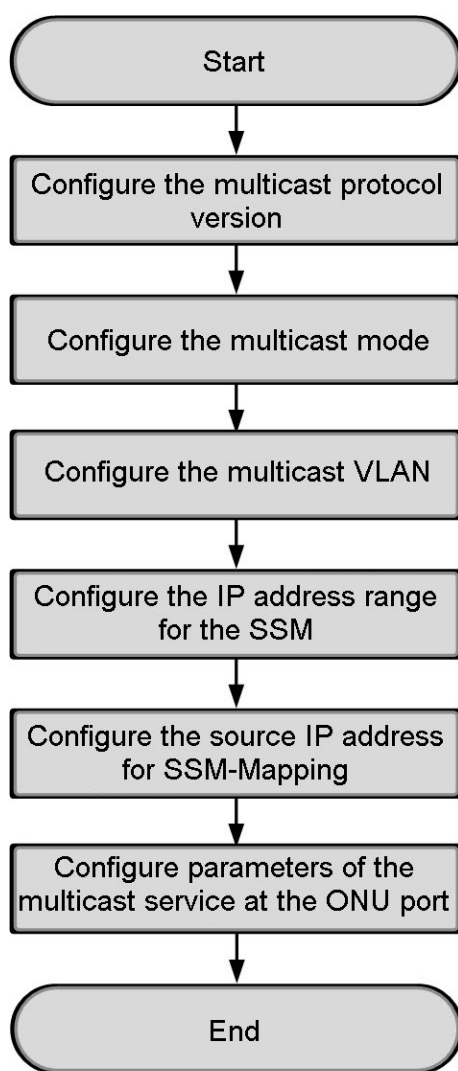
- ◆ In the downlink direction, the multicast SPT (Shortest Path Tree) is set up between the multicast source and the OLT equipment. The multicast source 10.90.20.1 provides the SSM service for the subscriber connected to the OLT. The ONU strips the VLAN tag from the multicast packets and then forwards the packets to the set top box on the subscriber side.
- ◆ In the uplink direction, the ONU adds the tag to the multicast protocol packets requesting joining / leaving a multicast group received from the set top box, and sends the packets to the OLT equipment. The OLT then forwards the protocol packets to the IPTV server.

9.4.2 Configuration Flow

Prerequisites

The VLAN service channel has been created. Please refer to [Basic Configurations](#) for the creation method.

Configuration Flow



9.4.3 Configuring the Multicast Protocol Version

Command Format

```
igmp version [v1|v2|v3]
```

Planning Data

Parameter	Description	Attribute	Example
<code>igmp version [v1 v2 v3]</code>	The multicast protocol version ◆ v1: IGMP Version 1 ◆ v2: IGMP Version 2 ◆ v3: IGMP Version 3	Mandatory	v3

Example

Set the multicast protocol version to IGMP Version 3.

```
Admin(config-igmp) #igmp version v3
Admin(config-igmp) #
```

9.4.4 Configuring the Multicast Mode

Command Format

```
igmp mode [control|proxy-proxy|snooping|proxy-snooping|disable]
```

Data Planning

Parameter	Description	Attribute	Example
<code>igmp mode [control proxy-proxy snooping proxy-snooping disable]</code>	The multicast mode. ◆ control: controlled mode ◆ proxy-proxy: proxy-proxy mode ◆ snooping: snooping mode ◆ proxy-snooping: proxy-snooping mode ◆ disable: disabled mode	Mandatory	proxy-proxy

Example

Set the multicast mode to the proxy mode.

```
Admin(config-igmp) #igmp mode proxy-proxy
Admin(config-igmp) #
```

9.4.5 Configuring the Multicast VLAN

Command Format

```
igmp vlan {[default]}*1 {<value>}*1
```

Planning Data

Parameter	Description	Attribute	Example
igmp vlan {[default]}*1	The default multicast VLAN	Optional	-
{<value>}*1	The multicast VLAN, ranging from 1 to 4085	Optional	1000

Example

Set the multicast VLAN to 1000.

```
Admin(config-igmp) #igmp vlan 1000
Admin(config-igmp) #
```

9.4.6 Configuring the Multicast SSM IP Address Range

Command Format

```
igmp-ssm ip-range <ipaddr/m>
```

Planning Data

Parameter	Description	Attribute	Example
igmp-ssm ip-range <ipaddr/m>	The SSM IP address range, i.e., the multicast addresses.	Mandatory	239.0.0.0/16

Example

Set the multicast SSM IP address range to 239.0.0.0/16.

```
Admin(config-igmp) #igmp-ssm ip-range 239.0.0.0/16
Admin(config-igmp) #
```

9.4.7 Configuring the Source IP Address of Multicast SSM-Mapping

Command Format

```
igmp ssm-map <ipaddr>
```

Planning Data

Parameter	Description	Attribute	Example
ssm-map <ipaddr>	The SSM-Mapping source IP address, i.e., the unicast address	Mandatory	10.90.20.1

Example

Set the source IP address of multicast SSM-Mapping to 10.90.20.1.

```
Admin(config-igmp) #igmp ssm-map 10.90.20.1
Admin(config-igmp) #
```

9.4.8 Configuring Parameters of Multicast Service at the ONU Port

Command Format

Configure the quantity of services at the ONU port.

```
onu port vlan <onulist> eth <onu-port> service count <service-count>
```

Configure the type of service at the ONU port.

```
onu port vlan <onulist> eth <onu-port> service <serviceid> type [multicast |
unicast]
```



Note:

The service type is unicast by default. Configure it to multicast service if it is required.

Configure the VLAN mode for the service at the ONU port.

```
onu port vlan <onulist> eth <onu-port> service <serviceid> [tag|transparent]
priority <priority> tpid <tpid> vid <vlanlist>
```

Planning Data

Procedure	Parameter	Description	Attribute	Example
Configuring quantity of services at the ONU port	<onulist>	The ONU authorization No.	Mandatory	1
	eth <onu-port>	The ONU port No.	Mandatory	1
	service count <service-count>	The quantity of services	Mandatory	1
Configuring services at the ONU port	service <serviceid>	The service ID, ranging from 1 to 10	Mandatory	1
	type [multicast unicast]	Type of service at the ONU port ◆ multicast: multicast service ◆ unicast: unicast service	Mandatory	multicast
Configuring VLAN mode for the service at the ONU port	service <serviceid>	The service ID, ranging from 1 to 10	Mandatory	1
	[tag transparent]	The service VLAN mode ◆ tag: the TAG identifier ◆ transparent: transparent transmission	Mandatory	tag
	priority <priority>	The CVLAN priority, ranging from 0 to 7. The value 7 stands for the highest priority level, and 0 the lowest one.	Mandatory	5
	tpid <tpid>	The TPID, i.e., the tag protocol identifier. The value ranges from 0 to 65534, and the default value is 33024.	Mandatory	33024
	vid <vlanlist>	The CVLAN ID, ranging from 1 to 4085	Mandatory	1000

Example

1. Configure the ONU with the authorization number 1 under PON Port 1 in Slot 1 of Subrack 1, adding a service to Port 1 of the ONU.

```
Admin(config-if-pon-1/1/1) #onu port vlan 1 eth 1 service count 1
Admin(config-if-pon-1/1/1) #
```

2. Set the type of Service 1 at Port 1 of ONU 1 to "multicast". The ONU is connected to PON Port 1 in Slot 1 of Subrack 1.

```
Admin(config-if-pon-1/1/1) #onu port vlan 1 eth 1 service 1 type multicast
```

3. Configure the VLAN mode for Port 1 of ONU 1, setting the service ID to 1, the service VLAN mode to "tag", the priority level to 5, the tag protocol identifier to 33024, and the VLAN ID to 1000.

```
Admin(config-if-pon-1/1/1) #onu port vlan 1 eth 1 service 1 tag priority 5 tpid 33024  
vid 1000
```

```
Admin(config-if-pon-1/1/1) #
```

9.5 Optional Functions

9.5.1 Configuring the Multicast Cascade Port

Command Format

```
igmp cascade slot <slotno> port <portno>
```

Planning Data

Parameter	Description	Attribute	Example
slot <slotno>	The slot number	Mandatory	19
port <portno>	The number of the uplink port	Mandatory	1

Example

Set the multicast cascade port to Port 1 in Slot 19.

```
Admin(config-igmp) #igmp cascade slot 19 port 1  
Admin(config-igmp) #
```

9.5.2 Configuring OLT Multicast Protocol Parameters

Command Format

```
igmp parameters [robustness|old|last-query-interval|last-query-count|  
query-interval|query-response-interval] <value>
```

Planning Data

Parameter	Description	Attribute	Example
igmp parameters [robustness old last-query- interval last- query-count query- interval query- response-interval]	Configuring multicast protocol parameters ◆ robustness: the robustness parameter ◆ old: the aging time for the group member ◆ last-query-interval: the last query interval ◆ last-query-count: the count of last queries ◆ query-interval: the common query interval ◆ query-response-interval: the common query response time	Mandatory	robustness
<value>	The protocol parameter value ◆ robustness: 2 to 16 ◆ old: 0 / 1 ◆ last-query-interval: 1 to 255 (unit: s) ◆ last-query-count: 1 to 16 ◆ query-interval: 11 to 255 (unit: s) ◆ query-response-interval: 1 to 255 (unit: s)	Mandatory	2

Example

Set the OLT multicast protocol robustness parameter to 2.

```
Admin(config-igmp) #igmp parameters robustness 2
Admin(config-igmp) #
```

9.5.3 Configuring ONU Multicast Parameters

Command Format

```
igmp port <frameid/slotid/portid> <onu> <port> {[control] [enable|disable]}
*1 {[bandwidth] <0-100000>} *1 {[leave] [fast|non-fast]} *1 {[max-group]
<groupno>} *1 {[signal-vlan] <vlanno>} *1
```

Data Planning

Parameter	Description	Attribute	Example
<frameid/slotid/- portid>	The subrack number / slot number / port number.	Mandatory	1/1/1
<onu>	The ONU authorization number.	Optional	1
<port>	The ONU port number.	Mandatory	1

Parameter	Description	Attribute	Example
{[control] [enable disable]}*1	The controlled mode. Enable or disable the mode.	Optional	-
{[bandwidth] <0-100000>}*1	The maximum bandwidth. The value ranges from 0 to 100000.	Optional	-
{[leave] [fast non-fast]}*1	The leaving mode. ◆ fast: leaving fast ◆ non-fast: leaving normally	Optional	non-fast
{[max-group] <groupno>}*1	The maximum number of the groups. The value ranges from 0 to 254.	Optional	31
{[signal-vlan] <vlanno>}*1	The signaling VLAN, ranging from 0 to 4085.	Optional	-

Example

Set the leaving mode to "non-fast" for Port 1 of ONU 1 under PON Port 1 in Slot 1 of Subrack 1, and set the maximum number of online groups to 31.

```
Admin(config-igmp) #igmp port 1/1/1 1 1 leave non-fast max-group 31
Admin(config-igmp) #
```

9.5.4 Configuring the Prejoin Group

Command Format

```
igmp prejoin <groupaddress>
```

Planning Data

Parameter	Description	Attribute	Example
prejoin <groupaddress>	The address of the prejoin group	Mandatory	224.1.1.1

Example

Set the address of the prejoin group to 224.1.1.1.

```
Admin(config-igmp) #igmp prejoin 224.1.1.1
Admin(config-igmp) #
```

10 **Configuring the Wi-Fi Service**

- ☒ Network Scenario
- ☒ Configuration Flow
- ☒ Configuring the WAN Connection Service at the TL1 Interface
- ☒ Configuring the Wi-Fi Service

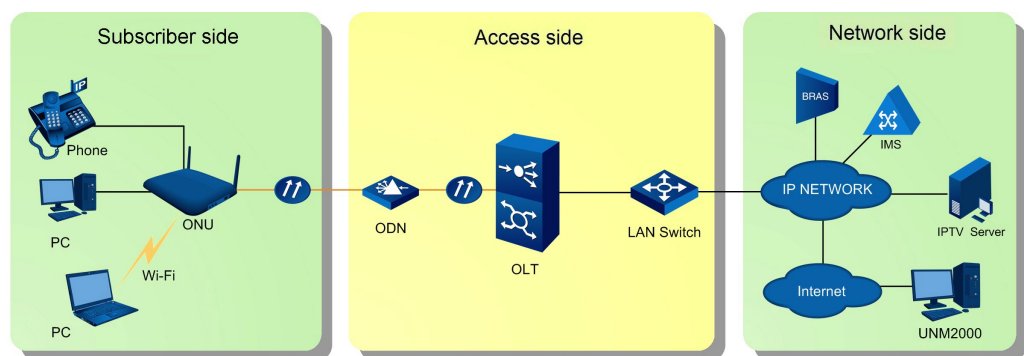
10.1 Network Scenario

Service Planning

Use the ONU supporting the Wi-Fi function to provide the Wi-Fi connection service for fiber broadband family subscribers and access other user terminals.

Network Diagram

The figure below shows the network diagram for the Wi-Fi service on the AN6001-G16.



The wireless terminal equipment accesses the network via the Wi-Fi interface of the ONU.

◆ Uplink direction:

The ONU is connected to the OLT equipment via the GPON interface to provide integrated access services.

◆ Downlink direction:

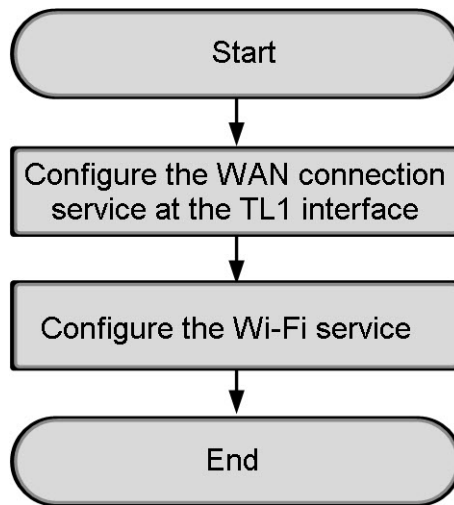
The ONU is connected to the wireless equipment via the Wi-Fi interface to access the Wi-Fi service.

10.2 Configuration Flow

Prerequisites

The VLAN service channel has been created. Please refer to [Basic Configurations](#) for the creation method.

Configuration Flow



10.3 Configuring the WAN Connection Service at the TL1 Interface

Command Format

```

onu wan-cfg <onuid> index <value> mode [tr069|internet|tr069-internet|
other|multi|voip|voip-internet|iptv|radius|radius-internet|unicast-
iptv|multicast-iptv] type [bridge|route] <vid> <cos> nat [enable|disable]
qos [enable|disable] {vlanmode [tag|transparent] tvlan [enable|disable]
<tvid> <tcos>}*1 {qinq [enable|disable] <stpid> <svlan> <scos>}*1 dsp
{[dhcp]}*1 {[dhcp-remoteid] <dhcp-remoteid>}*1 {[static] ip <A.B.C.D> mask
<A.B.C.D> gate <A.B.C.D> master <A.B.C.D> slave <A.B.C.D>}*1 {[pppoe] proxy
[enable|disable] <username> <password> <servname> [auto|payload|manual]}*1
{[null]}*1 {[active] [enable|disable]}*1 {[service-type] <service-type>}*1
{[entries] <bind-num>}*1 {[fe1|fe2|fe3|fe4|ssid1|ssid2|ssid3|ssid4]}*8
{[ssid5|ssid6|ssid7|ssid8]}*4
onu ipv6-wan-cfg <onuid> index <value> ip-stack-mode [ipv4|ipv6|both] ipv6-
src-type [dhcpv6|slaac] prefix-src-type [delegate|static] {[pppoe-
authmode] [pap|chap|mschap|auto]}*1 {[pppoe-idletime] <value>}*1 {[ipv6-
address] <ip/mask> ipv6-gateway <gateway> ipv6-master-dns <masterdns> ipv6-
slave-dns <slavedns> ipv6-static-prefix <ip/mask>}*1

```

Planning Data

Parameter	Description	Attribute	Example
<onuid>	The ONU authorization No.	Mandatory	1
index <value>	The WAN connection index	Mandatory	1

Parameter	Description	Attribute	Example
mode [tr069 internet tr069-internet other multi voip voip-internet iptv radius radius-internet unicast-iptv multicast-iptv]	The WAN connection mode	Mandatory	internet
type [bridge route]	The WAN connection type ◆ bridge: the Layer 2 bridge connection mode ◆ route: the Layer 3 route connection mode	Mandatory	route
<vid>	The VLAN ID for the WAN connection. The value ranges from 1 to 4085, and can be set to 0xffff (indicating null).	Mandatory	1
<cos>	The 802.1p priority for the WAN connection. The value ranges from 0 to 7, and can be set to 0xffff (indicating null).	Mandatory	1
nat [enable disable]	Enabling or disabling NAT for the WAN connection ◆ enable ◆ disable	Mandatory	enable
qos [enable disable]	Enabling or disabling the QoS function for the WAN connection ◆ enable ◆ disable	Mandatory	-
vlanmode [tag transparent]	The VLAN mode	Optional	-
tvlan [enable disable]	The translation state (enabled or disabled) ◆ enable: enabled ◆ disable: disabled	Optional	-
<tvid>	The translated VLAN ID. The value ranges from 1 to 4085, and can be set to 0xffff (indicating null).	Optional	-
<tcos>	The priority or CoS inside the PON. The value ranges from 0 to 7, and can be set to 0xffff (indicating null).	Optional	-
qinq [enable disable]	QinQ state ◆ enable: enabled ◆ disable: disabled	Optional	-
<stpid>	The tag protocol identifier. The value ranges from 0 to 0xfffe.	Optional	-

Parameter	Description	Attribute	Example
<svlan>	The SVLAN ID. The value ranges from 1 to 4085, and can be set to 0xffff (indicating null).	Optional	-
<scos>	The priority or CoS inside the PON. The value ranges from 0 to 7, and can be set to 0xffff (indicating null).	Optional	-
{ [dhcp] } *1	Indicates whether the DHCP mode is used.	Optional	dhcp
{ [dhcp-remoteid] <dhcp-remoteid> } *1	The DHCP remote identifier, a character string no longer than 10 bytes	Optional	-
[static]	Indicates whether the static mode is used.	Optional	-
ip <A.B.C.D>	The static IP address of the WAN connection	Optional	-
mask <A.B.C.D>	The subnet mask of the WAN connection	Optional	-
gate <A.B.C.D>	The default gateway of the WAN connection	Optional	-
master <A.B.C.D>	The preferred DNS of the WAN connection	Optional	-
slave <A.B.C.D>	The standby DNS of the WAN connection	Optional	-
[pppoe]	Indicates whether the PPPOE mode is used.	Optional	-
proxy [enable disable]	Enables or disables the PPPOE proxy for the WAN connection.	Optional	-
<username>	The user name of the PPPOE connection, which contains no more than 64 characters.	Optional	-
<password>	The password for the PPPOE connection, which contains no more than 64 characters.	Optional	-
<servname>	The name of the PPPOE service, which contains no more than 32 characters.	Optional	-
[auto payload manual]	The PPPoE dialing mode ◆ auto: automatically connected ◆ payload: connected when payload is detected ◆ manual: manually connected	Optional	-
{ [service-type] <service-type> } *1	Service type	Optional	-
{ [entries] <bind-num> } *1	The quantity of ports bound. The value ranges from 0 to 8. The value 0 indicates deletion, while the values 1 to 8 indicate setting the quantity.	Optional	1

Parameter	Description	Attribute	Example
{[fe1 fe2 fe3 fe4 ssid1 ssid2 ssid3 ssid4]}*8	Binding the Ethernet port / SSID port	Optional	fe1
{[ssid5 ssid6 ssid7 ssid8]}*4	Binding the SSID port	Optional	-
ip-stack-mode [ipv4 ipv6 both]	The protocol stack type for the WAN connection	Mandatory	ipv6
ipv6-src-type [dhcpv6 slaac]	The source of the IPv6 address	Mandatory	slaac
prefix-src-type [delegate static]	The source of the IPv6 address prefix	Mandatory	delegate
{[pppoe-authmode] [pap chap mschap auto]}*1}	PPPoE authentication mode	Optional	-
{[pppoe-idletime] <value>}*1	The wait time for automatic PPPOE disconnection, ranging from 0 to 2000.	Optional	-
[ipv6-address] <ip/mask>	The IPv6 address of the WAN connection	Optional	-
ipv6-gateway <gateway>	The default IPv6 gateway of the WAN connection	Optional	-
ipv6-master-dns <masterdns>	The preferred IPv6 DNS of the WAN connection	Optional	-
ipv6-slave-dns <slavedns>	The standby IPv6 DNS of the WAN connection	Optional	-
ipv6-static-prefix <ip/mask>	The IPv6 prefix pool of the WAN connection	Optional	-

Example

- ◆ Configure the WAN connection service for ONU 1 under PON Port 1 in Slot 1 of Subrack 1. Set the WAN connection index to 1, WAN connection mode to "internet", WAN connection type to "route", VLAN ID of WAN connection to 1, and 802.1p priority of WAN connection to 1. Enable the NAT function and DHCP function, and disable the QoS function for the WAN connection. Set the quantity of ports bound to 1, and the port bound is "FE1".

```
Admin(config-if-pon-1/1/1) #onu wan-cfg 1 index 1 mode internet type route 1 1 nat
enable qos disable dsp dhcp entries 1 fe1
```

```
Admin(config-if-pon-1/1/1) #
```

- ◆ Configure the WAN connection service for ONU 1 under PON Port 1 in Slot 1 of Subrack 1. Set the WAN connection index to 1, the protocol stack type for WAN connection to "ipv6", the IPv6 address source to "slaac", and the prefix source to "delegate".

```
Admin(config-if-pon-1/1/1) #onu ipv6-wan-cfg 1 index 1 ip-stack-mode ipv6 ipv6-src-
type slaac prefix-src-type delegate
Admin(config-if-pon-1/1/1) #
```

10.4 Configuring the Wi-Fi Service

Command Format

Configure the ONU Wi-Fi service.

```
onu wifi attribute <onuid> {[serv-no] <servno>} wifi [enable|disable]
district [etsi|fcc|thailand|philippines|indonesia|brazil|india|armenia|
malaysia|pakistan|russian|china|chile|usa|myanmar|ecuador|colombia|
argentina|stilanka|iran|yemen|saudiarabia|kuwait|iraq] channel <0-165>
{[standard] [802.11b|802.11g|802.11b/g|802.11n|802.11bgn|802.11a|
802.11an|802.11ac]}*1 {[txpower] [<0-40>|<65535>]}*1 {[frequency] [2.4ghz|
5.8ghz]}*1 {[freq-bandwidth] [20mhz|40mhz|20mhz/40mhz|80mhz]}*1
```

Configure the ONU WLAN service.

```
onu wifi connection <onuid> {[serv-no] <servno>} index <1-4> ssid [enable|
disable] [<ssid>|null] hide [enable|disable] authmode [open|shared|
wepauto|wpa-psk|wpa|wpa2psk|wpa2|wpa/wpa2|wpa-psk/wpa2psk|wpa-psk/
wpapsk2|waipsk|wai] encrypt-type [none|wep|tkip|aes|tkipaes|wpi] wpakey
[<wpakey>|null] interval <0-4194303> {[radius-serv] [unknown|ipv4|ipv6|
ipv4z|ipv6z|dns] <radius-serv> port <0-65535> pswd [<pswd>|null]}*1 {[wep-
length] [40bit|104bit] key-index <1-4> wep-key [<wep-key1>|null] [<wep-
key2>|null] [<wep-key3>|null] [<wep-key4>|null]}*1 {[wapi-serv-addr] <A.B.
C.D> <0-65535>}*1 {[wifi-connect-num] <num>}*1
```

Planning Data

Procedure	Parameter	Description	Attribute	Example
Configuring the ONU Wi-Fi service	<onuid>	The ONU authorization No.	Mandatory	1
	{[serv-no] <servno>}	The sequence number of a service.	Optional	1
	wifi [enable disable]	Enables or disables the Wi-Fi function. ◆ enable: Enable the function. ◆ disable: Disable the function.	Mandatory	enable

Procedure	Parameter	Description	Attribute	Example
	<code>district [etsi fcc thailand philippines indonesia brazil india armenia malaysia pakistan russian china chile usa myanmar ecuador colombia argentina stilanka iran yemen saudiarabia kuwait iraq]</code>	The wireless area, i.e., the wireless standard used by the Wi-Fi service. The default setting is "etsi". ◆ etsi: Europe (ETSI) ◆ fcc: North America (FCC) ◆ thailand: THAILAND ◆ philippines: PHILIPPINES ◆ indonesia: INDONESIA ◆ brazil: BRAZIL ◆ india: INDIA ◆ armenia: ARMENIA ◆ malaysia: MALAYSIA ◆ pakistan: PAKISTAN ◆ russian: RUSSIAN FEDERATION ◆ china: CHINA ◆ chile: CHILE ◆ usa: UNITED STATES ◆ myanmar: MYANMAR ◆ ecuador: ECUADOR ◆ colombia: COLOMBIA ◆ argentina: ARGENTINA ◆ stilanka: SRI LANKA ◆ iran: THE ISLAMIC REPUBLIC OF IRAN ◆ yemen: YEMEN ◆ saudiarabia: SAUDI ARABIA ◆ kuwait: KUWAIT ◆ iraq: IRAQ	Mandatory	etsi
	<code>channel <0-165></code>	The number of the wireless channel occupied by the service.	Mandatory	0
	<code>{ [standard] [802.11b 802.11g 802.11b/g 802.11n 802.11bgn 802.11a 802.11an 802.11ac] } *1</code>	The wireless standard. The default setting is "802.11bgn".	Optional	802.11bgn

Procedure	Parameter	Description	Attribute	Example
	<code>{ [txpower] [<0-40> <65535>] } *1</code>	The Tx power (unit: dBm). ◆ 4: 20% ◆ 8: 40% ◆ 12: 60% ◆ 16: 80% ◆ 20: 100% ◆ 24: 120% ◆ 28: 140% ◆ 32: 160% ◆ 36: 180% ◆ 40: 200%	Optional	20
	<code>{ [frequency] [2.4ghz 5.8ghz] } *1</code>	The operating band.	Optional	2.4ghz
	<code>{ [freq-bandwidth] [20mhz 40mhz 20mhz/40mhz 80mhz] } *1</code>	The frequency bandwidth.	Optional	20mhz/40-mhz
Configuring the ONU WLAN service	<code><onuid></code>	The ONU authorization No.	Mandatory	1
	<code>{ [serv-no] <servno> }</code>	The sequence number of a service.	Optional	1
	<code>index <1-4></code>	The SSID index. The value ranges from 1 to 4.	Mandatory	1
	<code>ssid [enable disable]</code>	Enables or disables SSID. ◆ enable ◆ disable	Mandatory	enable
	<code>[<ssid> null]</code>	The service set identifier, i.e., the name of the wireless local area network used to differentiate networks. Users who pass the identify verification can access the corresponding network. This prevents unauthorized operators from accessing the network. It contains no more than 32 characters.	Mandatory	2
	<code>hide [enable disable]</code>	Sets whether to hide the SSID. If the SSID is hidden, the user's PC will not find it. However, the user can connect the PC to the wireless network by configuring the SSID manually. ◆ enable: Hide ◆ disable: Not hide	Mandatory	enable

Procedure	Parameter	Description	Attribute	Example
	authmode [open shared wepauto wpa-psk wpa wpa2psk wpa2 wpa/wpa2 wpa-psk/wpa2psk wpa-psk/wpapsk2 waipsk wai]	The WLAN authentication mode.	Mandatory	open
	encrypt-type [none wep tkip aes tkipaes wpi]	The WLAN encryption type.	Mandatory	none
	wpakey [<wpakey> null]	The pre-shared key for the WPA encryption mode. WPA is the upgraded version of WEP. Key protection and 802.1x protocols are enhanced in WPA. Set it to NULL or a character string no longer than 64 bytes. This field is valid when the authentication mode is WPAPSK or WPA2PSK.	Mandatory	null
	interval <0-4194303>	The WAP pre-shared key updating interval (unit: second). The value ranges from 0 to 4194303, and the default value is 86400.	Mandatory	86400
	[radius-serv] [unknown ipv4 ipv6 ipv4z ipv6z dns]	The RADIUS server. The common INTERNET address.	Optional	-
	<radius-serv> port <0-65535>	The RADIUS server port. The value ranges from 0 to 65535, and the default value is 0.	Optional	-
	pswd [<pswd> null]	The RADIUS server password. The value is no longer than 32 bytes.	Optional	-
	[wep-length] [40bit 104bit]	The WEP key length (unit: bit). This field is valid when the encryption mode is WEP.	Optional	-
	key-index <1-4>	The key index. This field is valid when the encryption mode is WEP. The value ranges from 1 to 4, and the default value is 1.	Optional	-

Procedure	Parameter	Description	Attribute	Example
	wep-key [<wep-key1> null] [<wep-key2> null] [<wep-key3> null] [<wep-key4> null]	The WEP keys. The values should be NULL or character strings no longer than 32 bytes. ◆ <wep_key1>: the first WEP key ◆ <wep_key2>: the second WEP key ◆ <wep_key3>: the third WEP key ◆ <wep_key4>: the fourth WEP key	Optional	-
	[wapi-serv-addr] <A.B. C.D>	The IP address of the WAPI authentication server.	Optional	-
	<0-65535>	The port of the WAPI authentication server, ranging from 0 to 65535.	Optional	-
	{ [wifi-connect-num] <num>} *1	The quantity of Wi-Fi connections. The value ranges from 0 to 32.	Optional	-

Example

1. Enable the Wi-Fi function for ONU 1 under PON Port 1 in Slot 1 of Subrack 1. Set the wireless area to "esti", the channel number to 0; the wireless standard to "802.11bgn", the Tx power to 20 dBm, the frequency to "2.4ghz", and the bandwidth to "20mhz/40mhz".

```
Admin(config-if-pon-1/1/1) #onu wifi attribute 1 serv-no 1 wifi enable district etsi
channel 0 standard 802.11bgn txpower 20 frequency 2.4ghz freq-bandwidth 20mhz/40mhz
set hg wifi service ok!
Admin(config-if-pon-1/1/1) #
```

2. Configure the WLAN service for ONU 1 under PON Port 1 in Slot 1 of Subrack 1. Set the SSID index to 1 with the SSID enabled; and set the SSID to 2, with the SSID hidden. Set the WLAN authentication mode to "open"; the WLAN encryption type to "none"; the pre-shared key of WPA encryption mode to "null", and the WPA key updating interval to "86400".

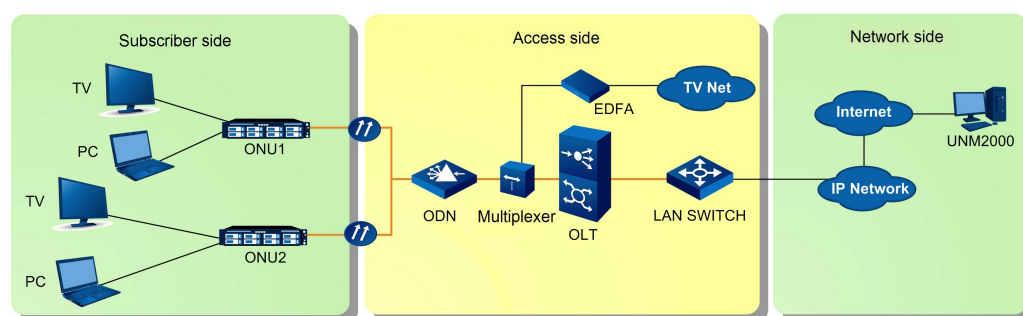
```
Admin(config-if-pon-1/1/1) #onu wifi connection 1 serv-no 1 index 1 ssid enable 2
hide enable authmode open encrypt-type none wpakey null interval 86400
set hg wifi config ok!
Admin(config-if-pon-1/1/1) #
```

11 **Configuring the CATV Service**

- ☒ Network Scenario
- ☒ Starting up the CATV Service

11.1 Network Scenario

The CATV service uses the WDM technology. Via a multiplexer, the TV signal is multiplexed with the data signal and voice signal. The downlink data wavelength is 1490 nm, the uplink data wavelength is 1310 nm, and the CATV signal wavelength is 1550 nm. The figure below shows the network diagram.



11.2 Starting up the CATV Service

Command Format

```
onu catv <onuid> [enable|disable] {catv-outp-offset <catv-outp-offset>} *1
```

Planning Data

Parameter	Description	Attribute	Example
<onuid>	The ONU authorization No.	Mandatory	3
[enable disable]	◆ enable ◆ disable	Mandatory	enable
{catv-outp-offset <catv-outp-offset>} *1	The output level adjustment, ranging from -127 to 127	Optional	1

Example

```
Admin(config-if-pon-1/1/1) #onu catv 3 enable catv-outp-offset 1
Admin(config-if-pon-1/1/1) #
```

12 **Configuring Layer 2 / Layer 3 Protocols**

- ☒ Configuring the ARP Proxy
- ☒ Configuring the OSPF Routing Protocol
- ☒ Configuring the DHCP Function
- ☒ Configuring the MSTP Service
- ☒ Configuring the LACP
- ☒ Configuring the ERPS

12.1 Configuring the ARP Proxy

12.1.1 Background Information

The Address Resolution Protocol (ARP) is an Internet protocol to map IP addresses into MAC addresses. IP address is the network-layer address of a computer. To send the network-layer data packets to the destination computer, the sending device must also know the physical address, i.e. MAC address of the destination computer. Accordingly, ARP is used to resolve a known IP address to a MAC address.

ARP Proxy is implemented as follows: A host sends an ARP request to another host located in the same network segment but not in the same physical network. Then the ARP Proxy-enabled device connected to the two hosts replies to the request. ARP Proxy allows isolated users in a VLAN or different Sub VLANs to communicate with each other. In this way, all the terminal equipment in the same network segment can communicate with each other. Meanwhile, the details of the physical network are unavailable, and the division of networks into subnets is transparent to hosts.

Advantages of the ARP Proxy:

- ◆ Enabling communication inside PON: ARP Proxy allows user traffics to be forwarded and connected based on Layer-3 routing inside the OLT, so that the isolated PON network users can communicate with each other. ARP Proxy specially applies to service scenarios requiring intercommunication such as voice services.
- ◆ Reducing upper-layer service flow and delay in network transmission: Layer-3 switching of local service flow can be implemented directly at the OLT to reduce the flow in the upper layer network.
- ◆ Simplifying network architecture: The Layer-2 aggregation switch is not needed, and this simplifies network architecture.
- ◆ Enhancing network security: The upper layer network cannot learn the MAC addresses on the user side, so that MAC spoofing and broadcast storm can be avoided.

12.1.2 Configuration Rules

The ARP proxy can be configured flexibly according to network planning. The configuration rules are as follows:

- ◆ Supports binding with multiple VLANs.
- ◆ Supports binding across network segments.
- ◆ Supports binding with multiple VLANs across network segments.

12.1.3 Network Scenario

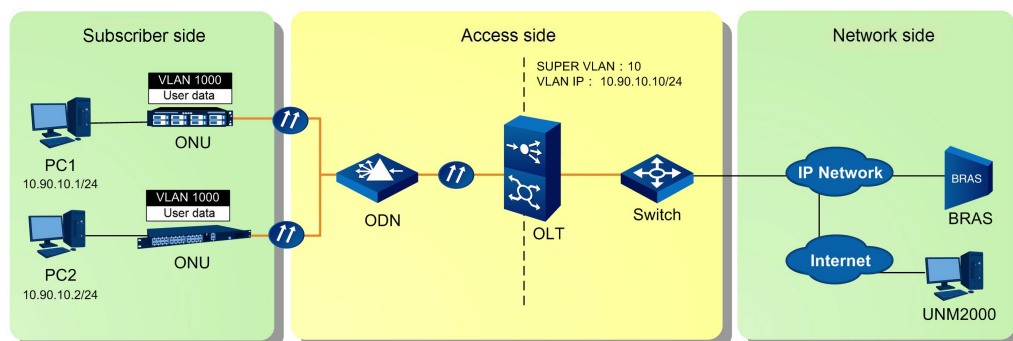
This section introduces how to configure and implement the ARP proxy function between user equipment, using the most frequently used same-VLAN and same-network segment scenario as an example. The configurations of other scenarios are similar to this.

Service Planning

The OLT equipment serves as an ARP proxy to allow internetworking among users in the same network segment (10.90.10.0/24) in the same VLAN. A Super VLAN is provided at the OLT equipment and bound with the Sub VLAN. The ARP proxy service is provided through L3 forwarding.

Network Diagram

The figure below shows the network diagram for the ARP proxy in the same-VLAN and same-network segment application.



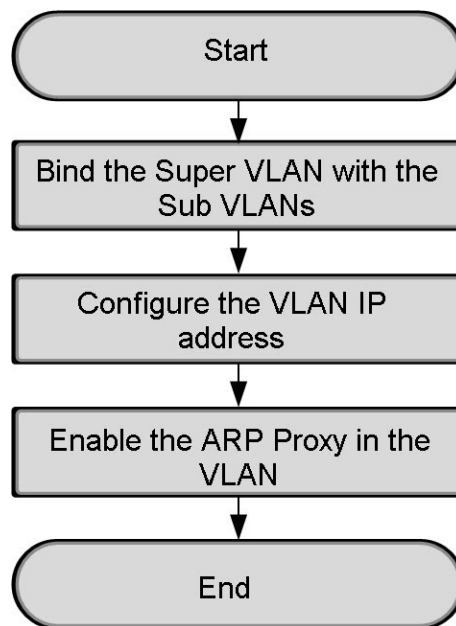
Two subscriber PCs, which belong to the same VLAN with the ID 1000, are connected to the OLT equipment via ONUs. The IP addresses of the two PCs are 10.90.10.1 and 10.90.10.2 respectively. Configure a Super VLAN and a Sub VLAN at the OLT equipment, and bind them together. After the VLAN IP address is set for the Super VLAN, the ARP proxy service can be provided by means of L3 forwarding.

12.1.4 Configuration Flow

Prerequisites

The VLAN service channel has been created. Please refer to [Basic Configurations](#) for the creation method.

Configuration Flow



12.1.5 Binding the Super VLAN to Sub VLANs

Command Format

Create a Super VLAN.

```
super-vlan <1 - 4095>
```

Bind the Super VLAN to Sub VLANs.

```
super-vlan <svid> add sub-vlan <vid-begin> {<vid-end>} *1
```

Planning Data

Procedure	Parameter	Description	Attribute	Example
Creating a Super VLAN	super-vlan <1 - 4095>	The Super VLAN ID, ranging from 1 to 4095.	Mandatory	10
Binding the Super VLAN to Sub VLANs	super-vlan <svid>	The Super VLAN ID, ranging from 1 to 4095.	Mandatory	10
	sub-vlan <vid-begin>	The starting value of the Sub VLAN ID range. The value ranges from 1 to 4085.	Mandatory	1000
	{<vid-end>} *1	The ending value of the Sub VLAN ID range. The value ranges from 1 to 4085.	Optional	-

Example

- Create Super VLAN 10.
Admin(config) #**super-vlan 10**
- Bind Super VLAN 10 with Sub VLAN 1000.
Admin(config) #**super-vlan 10 add sub-vlan 1000**
Admin(config) #

12.1.6 Configuring the VLAN IP Address

Command Format

```
super-vlan <1-4095> ip <A.B.C.D> mask <A.B.C.D>
```

Planning Data

Parameter	Description	Attribute	Example
super-vlan <1 - 4095>	The Super VLAN ID, ranging from 1 to 4095	Mandatory	10
ip <A.B.C.D>	IP address	Mandatory	10.90.10.10
mask <A.B.C.D>	Subnet mask	Mandatory	255.255.255.0

Example

Set the IP address of Super VLAN 10 to 10.90.10.10 and its subnet mask to 255.255.255.0.

```
Admin(config) #super-vlan 10 ip 10.90.10.10 mask 255.255.255.0
Admin(config) #
```

12.1.7 Enabling the ARP Proxy Function in the VLAN

Command Format

```
arp-switch <supervlan-id> route [enable|disable] inner-subvlan [enable|
disable] among-subvlan [enable|disable]
```

Planning Data

Parameter	Description	Attribute	Example
arp-switch <supervlan-id>	The ID of the Super VLAN for which the ARP proxy switch is to be configured	Mandatory	10
route [enable disable]	Enabling / disabling the route ARP proxy function	Mandatory	enable
inner-subvlan [enable disable]	Enabling / disabling the intra-Sub VLAN ARP proxy function	Mandatory	enable
among-subvlan [enable disable]	Enabling / disabling the inter-Sub VLAN ARP proxy function	Mandatory	disable

Example

Configure the ARP proxy function for Super VLAN 10: Enable route ARP and intra-Sub VLAN ARP, and disable inter-Sub VLAN ARP.

```
Admin(config) #arp-switch 10 route enable inner-subvlan enable among-subvlan disable
Admin(config) #
```

12.2 Configuring the OSPF Routing Protocol

12.2.1 Background Information

Open Shortest Path First (OSPF) is an interior gateway protocol to implement the link state routing protocol. It is generally applied to a single autonomous system (AS). All the OSPF routers in this AS maintain a same database that describes the AS structure. The database keeps the status information of the links in the routing domain. The OSPF router works out the OSPF routing table according to this database.

Advantages of the OSPF service function application:

- ◆ Wide application: Supports networks of different sizes. Large-sized data exchange networks with several hundred routers are supported.
- ◆ Fast convergence: When the network topology architecture changes, OSPF immediately sends the link state update (LSU) packets to synchronize the change to the link state databases (LSB) of all routers in the autonomous system.
- ◆ Loop-free: OSPF uses the shortest-path tree algorithm to work out loop-free routes based on the collected link state information.
- ◆ Area partition: OSPF allows an AS to be partitioned into areas to simplify management. Routing information transmitted between areas is further summarized to reduce network bandwidth consumption.

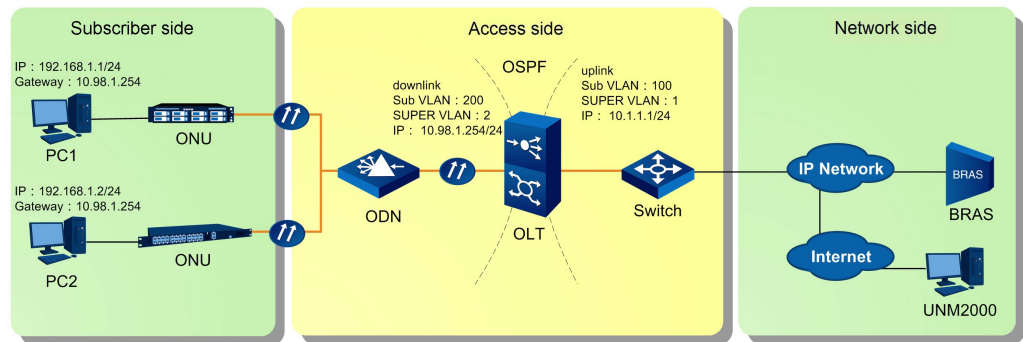
12.2.2 Network Scenario

Service Planning

It is required that the OLT equipment should serve as the OSPF edge router equipment to provide the OSPF routing function when users need to access an external IP address.

Network Diagram

The figure below shows the network diagram for configuring the OSPF routing protocol.



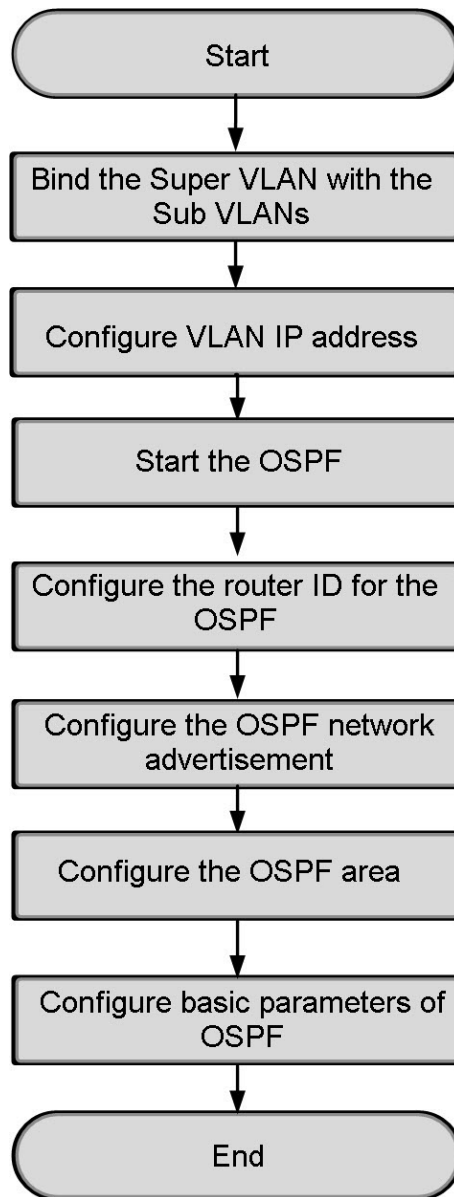
The OLT is configured with uplink and downlink Super VLANs and Sub VLANs to act as a router. When the OSPF protocol is run on it, the OLT implements the OSPF routing function. If the user's address and the preset address to access are not in the same network segment, routing and forwarding are implemented via the OLT to enable the access crossing network segments.

12.2.3 Configuration Flow

Prerequisites

The VLAN service channel has been created. Please refer to [Basic Configurations](#) for the creation method.

Configuration Flow



12.2.4 Binding the Super VLAN to Sub VLANs

Command Format

Create a Super VLAN.

```
super-vlan <1 - 4095>
```

Bind the Super VLAN to Sub VLANs.

```
super-vlan <svid> add sub-vlan <vid-begin> {<vid-end>} *1
```

Planning Data

Procedure	Parameter	Description	Attribute	Example	
Creating a Super VLAN	super-vlan <1 - 4095>	The Super VLAN ID, ranging from 1 to 4095	Mandatory	1	2
Binding the Super VLAN to Sub VLANs	super-vlan <svid>	The Super VLAN ID, ranging from 1 to 4095	Mandatory	1	2
	sub-vlan <vid-begin>	The starting value of the Sub VLAN ID range. The value ranges from 1 to 4085.	Mandatory	100	200
	{<vid-end>} *1	The ending value of the Sub VLAN ID range. The value ranges from 1 to 4085.	Optional	-	-

Example

1. Create Super VLAN 1.

```
Admin(config) #super-vlan 1
```

2. Bind Super VLAN 1 with Sub VLAN 100.

```
Admin(config) #super-vlan 1 add sub-vlan 100
```

```
Admin(config) #
```

3. Create Super VLAN 2.

```
Admin(config) #super-vlan 2
```

4. Bind Super VLAN 2 with Sub VLAN 200.

```
Admin(config) #super-vlan 2 add sub-vlan 200
```

```
Admin(config) #
```

12.2.5 Configuring the VLAN IP Address

Command Format

```
super-vlan <1-4095> ip <A.B.C.D> mask <A.B.C.D>
```

Planning Data

Parameter	Description	Attribute	Example	
<code>super-vlan <1 - 4095></code>	The Super VLAN ID, ranging from 1 to 4095	Mandatory	1	2
<code>ip <A.B.C.D></code>	IP address	Mandatory	10.1.1.1	10.98.1.254
<code>mask <A.B.C.D></code>	Subnet mask	Mandatory	255.255. 255.0	255.255. 255.0

Example

1. Set the IP address of Super VLAN 1 to 10.1.1.1 and its subnet mask to 255.255.255.0.

```
Admin(config) #super-vlan 1 ip 10.1.1.1 mask 255.255.255.0
```

```
Admin(config) #
```

2. Set the IP address of Super VLAN 2 to 10.98.1.254 and its subnet mask to 255.255.255.0.

```
Admin(config) #super-vlan 2 ip 10.98.1.254 mask 255.255.255.0
```

```
Admin(config) #
```

12.2.6 Starting the OSPF

Command Format

```
ospf [enable|disable]
```

Planning Data

Parameter	Description	Attribute	Example
<code>ospf [enable disable]</code>	Enabling or disabling the OSPF routing protocol function	Mandatory	enable

Example

Enable the OSPF function for the equipment.

```
Admin(config-ospf) #ospf enable
```

```
Admin(config-ospf) #
```

12.2.7 Configuring the Router ID for the OSPF

Command Format

```
router-id <ipaddr>
```

Planning Data

Parameter	Description	Attribute	Example
router-id <ipaddr>	The ID of the OSPF router, which is in the form of an IP address.	Mandatory	10.12.1.3

Example

Set the OSPF Router ID to 10.12.1.3.

```
Admin(config-ospf) #router-id 10.12.1.3
Admin(config-ospf) #
```

12.2.8 Configuring the OSPF Network Advertisement

Command Format

```
network <ipaddr> mask <ipaddr> area <ipaddr>
```

Planning Data

Parameter	Description	Attribute	Example	
network <ipaddr>	The network IP address of the interface that needs to run the OSPF protocol. This network should be an IP network in the configured Super VLAN.	Mandatory	10.1.1.0	10.98.1.0
mask <ipaddr>	Subnet mask	Mandatory	255.255.255.0	255.255.255.0
area <ipaddr>	The IP address of the OSPF area that the uplink port belongs to. It is displayed in dotted decimal notation.	Mandatory	1.0.0.1	1.0.0.1

Example

1. Announce the OSPF network whose IP address is 10.1.1.0, subnet mask is 255.255.255.0, and area ID is 1.0.0.1.

```
Admin(config-ospf)#network 10.1.1.0 mask 255.255.255.0 area 1.0.0.1
```

```
Admin(config-ospf)#
```

2. Announce the OSPF network whose IP address is 10.98.1.0, subnet mask is 255.255.255.0, and area ID is 1.0.0.1.

```
Admin(config-ospf)#network 10.98.1.0 mask 255.255.255.0 area 1.0.0.1
```

```
Admin(config-ospf)#
```

12.2.9 Configuring the OSPF Area

Command Format

```
area <ipaddr> nssa {translator-role [candidate|never|always]}*1
```

Planning Data

Parameter	Description	Attribute	Example
area <ipaddr>	The IP address of the OSPF area that the uplink port belongs to. It is displayed in dotted decimal notation.	Mandatory	1.0.0.1
{translator-role [candidate never always]}*1	The translator role ◆ candidate: The OLT serves as the ABR in the NSSA area. The ABR converts Type 7 LSA into Type 5 LSA only when it is selected. ◆ never: The OLT serves as the ABR in the NSSA area. The ABR does not convert Type 7 LSA into Type 5 LSA. ◆ always: The OLT serves as the ABR in the NSSA area. The ABR always converts Type 7 LSA into Type 5 LSA. The default setting is "candidate".	Optional	always

Example

Set the IP address of the OSPF area to "1.0.0.1", and the translator role to "always".

```
Admin(config-ospf)#area 1.0.0.1 nssa translator-role always
```

```
Admin(config-ospf)#
```

12.2.10 Configuring Basic Parameters of the OSPF

Command Format

Configure the failure interval for an interface.

```
super-vlan <vlanid> dead-interval <value>
```

Configure the Hello message interval for an interface.

```
super-vlan <vlanid> hello-interval <value>
```

Configure the LSA retransmission interval for an interface.

```
super-vlan <vlanid> retransmit-interval <value>
```

Configure the message update time (transmission delay) for an interface.

```
super-vlan <vlanid> transmit-delay <value>
```

Configure the priority of an interface.

```
super-vlan <vlanid> priority <value>
```

Configure the COST value for an interface.

```
super-vlan <vlanid> cost <value>
```

Configure the MTU for an interface.

```
super-vlan <vlanid> mtu <mtu>
```

Configure the network type for an interface.

```
super-vlan <vlanid> network [broadcast|non-broadcast|point-to-multipoint|  
point-to-point]
```

Data Planning

Parameter	Description	Attribute	Example	
super-vlan <vlanid>	A configured Super VLAN ID under which the interfaces need to be configured. The value ranges from 1 to 4095.	Mandatory	1	2
dead-interval <value>	The dead interval (unit: s) for an OSPF neighbor. If the Hello message is not received from an OSPF neighbor within the dead interval, the neighbor is considered invalid. The value ranges from 1 to 65535, and should be equal to or larger than four times the Hello message interval. The default value is 40s.	Mandatory	800	800
hello-interval <value>	The Hello message interval (unit: s). The value ranges from 1 to 65535, and the default value is 10s.	Mandatory	50	50
retransmit-interval <value>	The LSA retransmission interval (unit: s). If the confirmation message is not received from the far end equipment within the LSA retransmission interval, the interface will re-transmit the LSA. The value ranges from 1 to 65535, and the default value is 5s.	Mandatory	20	20
transmit-delay <value>	The time for updating messages (unit: s), i.e., the delay in transmitting the LSA at the OSPF interface. The value ranges from 1 to 65535, and the default value is 1s.	Mandatory	5	5
priority <value>	The priority value. The smaller is the value, the higher is the priority. The value ranges from 0 to 255, and the default value is 1.	Mandatory	2	2
cost <value>	The COST value, i.e., the overhead value of the message transmitted via a designated interface. The value ranges from 1 to 65535, and the default value is 10.	Mandatory	15	15
mtu <mtu>	The MTU value of the DD message (database description message, one of the five OSPF protocol messages) transmitted by an interface. The value ranges from 68 to 1500, and the default value is 1500.	Mandatory	1000	1000
network [broadcast non-broadcast point-to-multipoint point-to-point]	The network type. ◆ broadcast ◆ non-broadcast ◆ point-to-multipoint ◆ point-to-point	Mandatory	broadcast	broadcast

Example

1. Set the dead interval to 800 for the interface of Super VLAN 1.

```
Admin(config-ospf) #super-vlan 1 dead-interval 800
```

2. Set the Hello message interval to 50 for the interface of Super VLAN 1.

```
Admin(config-ospf) #super-vlan 1 hello-interval 50
```

3. Set the LSA retransmission interval time to 20 for the interface of Super VLAN 1.

```
Admin(config-ospf) #super-vlan 1 retransmit-interval 20
```

4. Set the message update time to 5 for the interface of Super VLAN 1.

```
Admin(config-ospf) #super-vlan 1 transmit-delay 5
```

5. Set the priority to 2 for the interface of Super VLAN 1.

```
Admin(config-ospf) #super-vlan 1 priority 2
```

6. Set the COST value to 15 for the interface of Super VLAN 1.

```
Admin(config-ospf) #super-vlan 1 cost 15
```

7. Set the MTU value to 1000 for the interface of Super VLAN 1.

```
Admin(config-ospf) #super-vlan 1 mtu 1000
```

8. Set the interface network type to "broadcast".

```
Admin(config-ospf) #super-vlan 1 network broadcast
```

9. Set the dead interval to 800 for the interface of Super VLAN 2.

```
Admin(config-ospf) #super-vlan 2 dead-interval 800
```

10. Set the Hello message interval to 50 for the interface of Super VLAN 2.

```
Admin(config-ospf) #super-vlan 2 hello-interval 50
```

11. Set the LSA retransmission interval time to 20 for the interface of Super VLAN 2.

```
Admin(config-ospf) #super-vlan 2 retransmit-interval 20
```

12. Set the message update time to 5 for the interface of Super VLAN 2.

```
Admin(config-ospf) #super-vlan 2 transmit-delay 5
```

13. Set the priority to 2 for the interface of Super VLAN 2.

```
Admin(config-ospf) #super-vlan 2 priority 2
```

14. Set the COST value to 15 for the interface of Super VLAN 2.

```
Admin(config-ospf) #super-vlan 2 cost 15
```

15. Set the MTU value to 1000 for the interface of Super VLAN 2.

```
Admin(config-ospf) #super-vlan 2 mtu 1000
```

16. Set the interface network type to "broadcast".

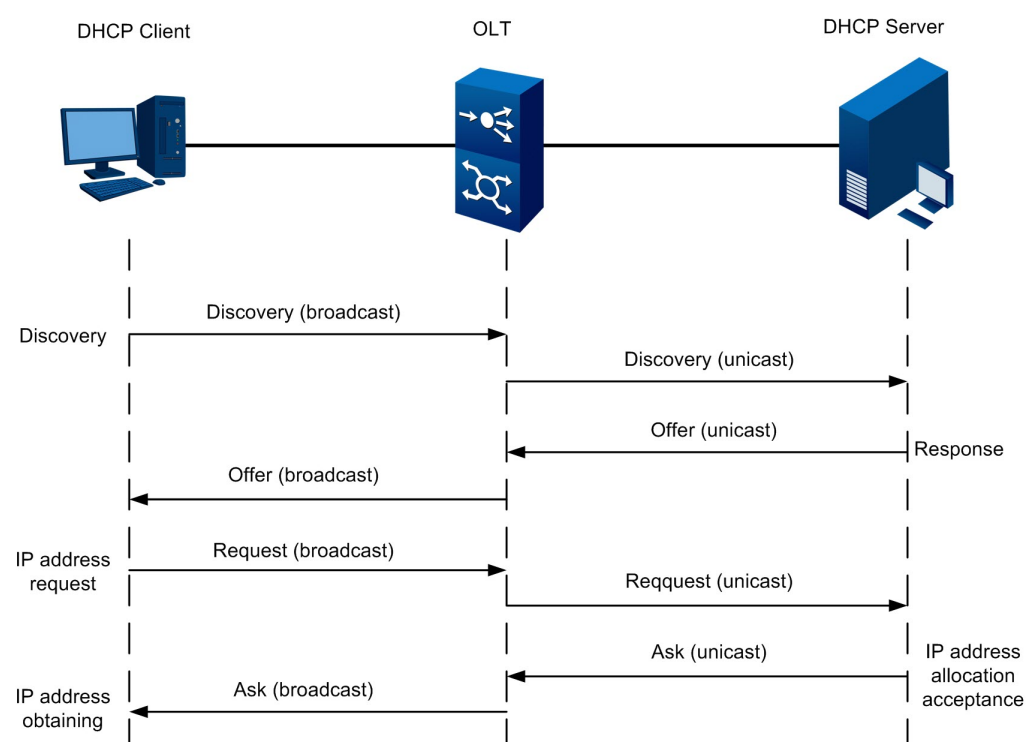
```
Admin(config-ospf) #super-vlan 2 network broadcast
```

```
Admin(config-ospf) #
```

12.3 Configuring the DHCP Function

12.3.1 Background Information

DHCP Relay allows the OLT to forward DHCP packets between DHCP clients and the DHCP server that are in different network segments. DHCP clients can therefore obtain the IP addresses dynamically allocated by the DHCP server.



If the DHCP relay feature is not supported, the DHCP protocol takes effect only when the DHCP clients and the DHCP server are in the same network segment. If they are in different network segments, each network segment requires a DHCP server, which increases deployment costs. The DHCP relay feature solves this issue. With this feature, one DHCP server can serve multiple DHCP clients in different network segments. This not only reduces deployment costs but also facilitates centralized management of the DHCP clients.

12.3.2 Configuration Rules

The rules for configuring the DHCP service for the AN6001-G16 are as follows:

- ◆ When serving as the DHCP Relay, the OLT can either be the DHCP proxy only or be both the DHCP proxy and the gateway. Under both conditions, the Super VLAN interface should be added as the Layer 3 interface to convert the users' DHCP broadcast messages into unicast messages and forward the messages to the designated DHCP server.
 - ▶ Super VLAN: a virtual routing interface, also known as VLAN aggregation. A Super VLAN contains multiple Sub VLANs.
 - ▶ Sub VLAN: a subsidiary VLAN of the Super VLAN. The relationship between the Super VLAN and the Sub VLAN is master and slave.
- ◆ The OLT can be configured with up to 16 Super VLANs, and each Super VLAN can be added with four Sub VLANs at most.
- ◆ The IP address bound to the downlink Super VLAN should be in the same network segment with the IP address of the DHCP Client which uses the DHCP proxy function of this Super VLAN.
- ◆ When the OLT serves as the DHCP proxy only, you need to configure static routing so that the DHCP request can be forwarded to the DHCP server via the gateway.
- ◆ When the DHCP Snooping function is enabled for the OLT, DHCP broadcast packets need not be processed. However, when trusted ports are configured for the DHCP Snooping, only the trusted ports can normally receive and forward the DHCP request messages, while the DHCP response messages from the untrusted ports and the untrusted DHCP request messages from users are filtered. In this way, the client end can only obtain the IP address from a legal DHCP server.
- ◆ When serving as the DHCP server, the OLT searches for undistributed IP addresses from the address pool after it receives DHCP broadcast messages from users, and then transmits PING packets to check whether these IP addresses are occupied. After confirming that the IP addresses are available, the OLT allocates them to the users.

12.3.3 Network Scenario

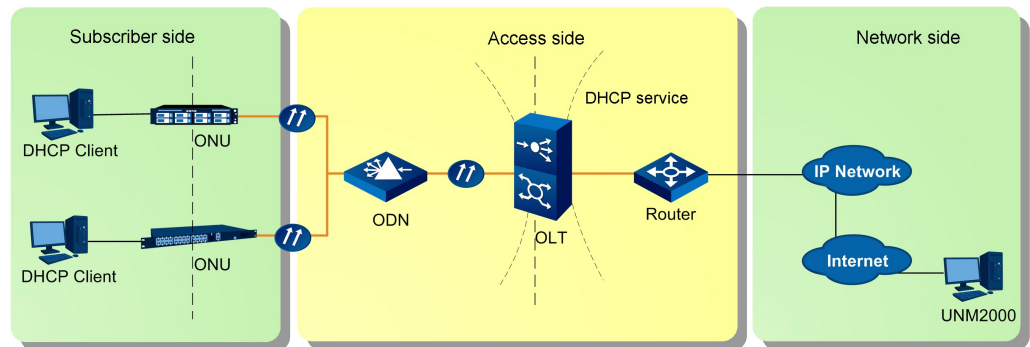
Background Information

The AN6001-G16 supports abundant DHCP functions, which can be deployed flexibly to meet varied service demands.

- ◆ When serving as the DHCP proxy only, the OLT converts the broadcast DHCP request messages received from the DHCP Client into unicast messages, and modifies the message parameters such as the source MAC address, destination MAC address, source IP address and destination IP address. After that, it forwards the messages to the DHCP server via an external gateway.
- ◆ When serving as the DHCP proxy and gateway, the OLT converts the broadcast DHCP request messages received from the DHCP Client into the unicast messages, replaces the gateway IP address of the messages with the IP address of the downlink Super VLAN, and forwards the unicast messages to the DHCP server in a different network segment.
- ◆ The OLT provides the DHCP Option 60 authentication function to enable the Option 60 character authentication for PC1 and PC2 users. Two Super VLANs are provided at the OLT and bound with the Sub VLANs. Accordingly, the authentication is implemented through the proxy forwarding and identifying characters.
- ◆ When serving as the DHCP server and having received the broadcast DHCP request messages from the DHCP client, the OLT directly allocates the IP address in the IP address pool to the user.
- ◆ After the DHCP Snooping function is enabled for it, the OLT transmits the broadcast DHCP request messages received from the DHCP client to the DHCP server, and prevents the DHCP server spoofing by filtering the response packets received from the DHCP server.

Network Diagram

The network diagram for the DHCP service carried by the AN6001-G16 is shown in the figure below.

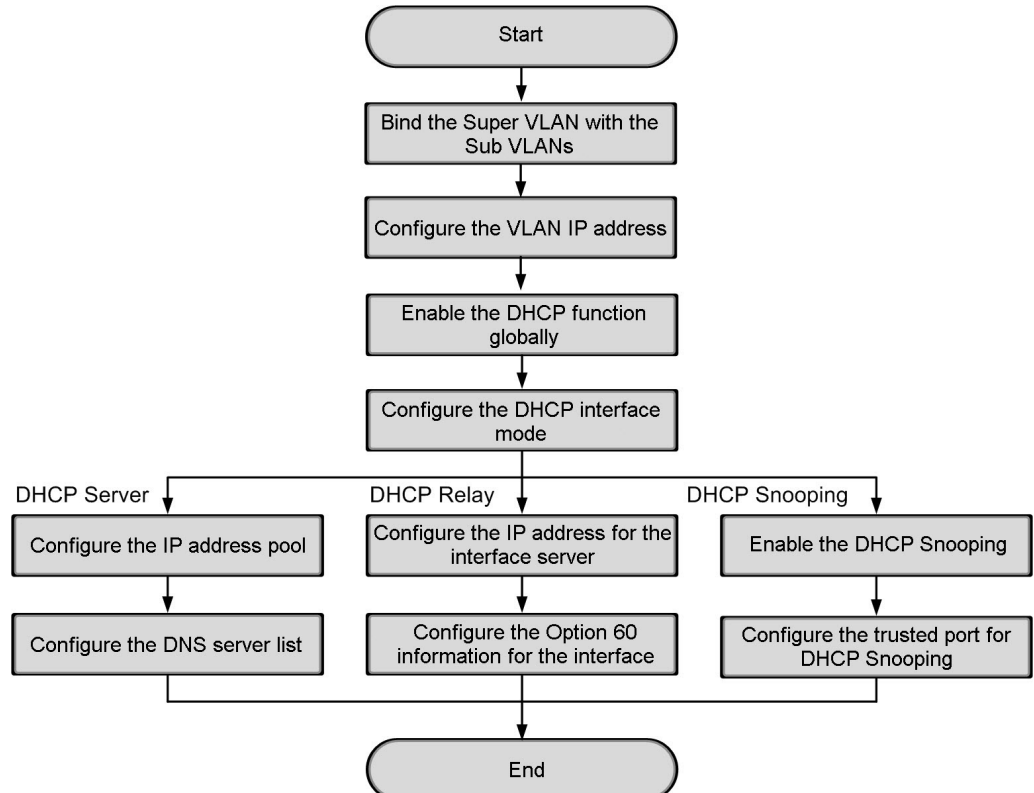


12.3.4 Configuration Flow

Prerequisites

The VLAN service channel has been created. Please refer to [Basic Configurations](#) for the creation method.

Configuration Flow



12.3.5 Binding the Super VLAN with the Sub VLANs

Command Format

Create a Super VLAN.

```
super-vlan <1 - 4095>
```

Bind the Super VLAN with the Sub VLANs.

```
super-vlan <svid> add sub-vlan <vid-begin> {<vid-end>} *1
```

Data Planning

Procedure	Parameter	Description	Attribute	Example
Creating a Super VLAN	super-vlan <1 - 4095>	The Super VLAN ID, ranging from 1 to 4095.	Mandatory	8
Binding the Super VLAN with the Sub VLANs	super-vlan <svid>	The Super VLAN ID, ranging from 1 to 4095.	Mandatory	8
	sub-vlan <vid-begin>	The starting value of the Sub VLAN ID range. The value ranges from 1 to 4085.	Mandatory	2000
	{<vid-end>} *1	The ending value of the Sub VLAN ID range. The value ranges from 1 to 4085.	Optional	2001

Example

1. Create Super VLAN 8.

```
Admin(config) #super-vlan 8
```

2. Bind Super VLAN 8 with Sub VLANs 2000 and 2001.

```
Admin(config) #super-vlan 8 add sub-vlan 2000 2001
```

```
Admin(config) #
```

12.3.6 Configuring the VLAN IP Address

Command Format

```
super-vlan <1-4095> ip <A.B.C.D> mask <A.B.C.D>
```

Planning Data

Parameter	Description	Attribute	Example
<code>super-vlan <1 - 4095></code>	The Super VLAN ID, ranging from 1 to 4095	Mandatory	8
<code>ip <A.B.C.D></code>	IP address	Mandatory	41.1.1.3
<code>mask <A.B.C.D></code>	Subnet mask	Mandatory	255.255.255.0

Example

Set the IP address of Super VLAN 8 to 41.1.1.3 and its subnet mask to 255.255.255.0.

```
Admin(config) #super-vlan 8 ip 41.1.1.3 mask 255.255.255.0
Admin(config) #
```

12.3.7 Configuring the DHCP Global Switch

Command Format

```
dhcp global [enable|disable]
```

Planning Data

Parameter	Description	Attribute	Example
<code>dhcp global [enable disable]</code>	Enables or disables the DHCP function globally.	Mandatory	enable

Example

Enable the DHCP function.

```
Admin(config-dhcp) #dhcp global enable
Admin(config-dhcp) #
```

12.3.8 Configuring the DHCP Interface Working Mode

Command Format

```
dhcp super-vlan <svlanid> mode [server|relay|disable]
```

Planning Data

Parameter	Description	Attribute	Example
super-vlan <svlanid>	The super VLAN ID	Mandatory	8
mode [server relay disable]	The DHCP mode ◆ server ◆ relay ◆ disable	Mandatory	relay

Example

Set the DHCP interface to the "relay" mode.

```
Admin(config-dhcp) #dhcp super-vlan 8 mode relay
Admin(config-dhcp) #
```

12.3.9 Configuring the DHCP Server

12.3.9.1 Configuring the IP Address Pool

Command Format

```
dhcp server ip-pool <poolid> begin-ip <ipaddr> end-ip <ipaddr> mask  
[<ipaddr>|<mask-length>] gateway <ipaddr>
```

Planning Data

Parameter	Description	Attribute	Example
ip-pool <poolid>	The address pool ID. The value ranges from 1 to 16.	Mandatory	1
begin-ip <ipaddr>	The starting IP address of the address pool.	Mandatory	192.168.1.1
end-ip <ipaddr>	The ending IP address of the address pool.	Mandatory	192.168.1.20
mask [<ipaddr> <mask-length>]	The mask of the network segments in the address pool.	Mandatory	255.255.255.0
gateway <ipaddr>	The gateway IP address.	Mandatory	192.168.1.254

Example

Configure the global address pool of the DHCP server.

```
Admin(config-dhcp) #dhcp server ip-pool 1 begin-ip 192.168.1.1 end-ip 192.168.1.20
mask 255.255.255.0 gateway 192.168.1.254
Admin(config-dhcp) #
```

12.3.9.2 Configuring the DNS Server List

Command Format

```
dhcp server ip-pool <poolid> dns-server <ipaddr>
```

Planning Data

Parameter	Description	Attribute	Example
ip-pool <poolid>	The address pool ID. The value ranges from 1 to 16.	Mandatory	1
dns-server <ipaddr>	The address of the DNS server.	Mandatory	10.19.8.10

Example

Set the DNS address of the DHCP server's global address pool 1 to 10.19.8.10.

```
Admin(config-dhcp) #dhcp server ip-pool 1 dns-server 10.19.8.10
Admin(config-dhcp) #
```

12.3.10 Configuring the DHCP Relay

12.3.10.1 Configuring the Server's Address for an Interface

Command Format

```
dhcp relay super-vlan <svlanid> server-ip <ipaddr>
```

Planning Data

Parameter	Description	Attribute	Example
super-vlan <svlanid>	The super VLAN ID.	Mandatory	8
server-ip <ipaddr>	The IP addresses of the DHCP server.	Mandatory	2.2.2.5

Example

Set the server's IP address for the interface to 2.2.2.5.

```
Admin(config-dhcp) #dhcp relay super-vlan 8 server-ip 2.2.2.5
Admin(config-dhcp) #
```

12.3.10.2 Configuring Option 60 Information for an Interface

Command Format

```
dhcp super-vlan <svlanid> relay-ip <ipaddr> option60 <str>
```

Planning Data

Parameter	Description	Attribute	Example
super-vlan <svlanid>	The configured Super VLAN ID. Configure the Layer 3 interface bound with the VLAN ID.	Mandatory	8
relay-ip <ipaddr>	The IP address of the Relay. The IP address of the Super VLAN interface.	Mandatory	41.1.1.3
option60 <str>	The content of the Option 60 information, which contains no more than 128 characters. Each Super VLAN can be configured with up to 64 Option 60 information entries.	Mandatory	aaaa

Example

Configure the DHCP Relay Option 60 information.

```
Admin(config-dhcp) #dhcp super-vlan 8 relay-ip 41.1.1.3 option60 aaaa
Admin(config-dhcp) #
```

12.3.11 Configuring DHCP Snooping

12.3.11.1 Enabling the DHCP Snooping Function

Command Format

```
dhcp snooping [enable|disable]
```

Planning Data

Parameter	Description	Attribute	Example
snooping [enable disable]	Enables / disables the DHCP Snooping function.	Mandatory	enable

Example

```
Admin(config-dhcp)#dhcp snooping enable
Admin(config-dhcp)#
```

12.3.11.2 Configuring the DHCP Snooping Trusted Port

Command Format

```
dhcp snooping {[port] <portlist> [trust|untrust]}*1 {[serv] <ipaddr>
[trust|untrust]}*1
```

Planning Data

Parameter	Description	Attribute	Example
[port] <portlist>	Uplink port No.	Mandatory	19:5
[trust untrust]	The state of being trusted / untrusted	Mandatory	trust
[serv] <ipaddr>	IP address of the server	Optional	-
[trust untrust]	The state of being trusted / untrusted	Optional	-

Example

Set the DHCP Snooping trusted port to 19:5.

```
Admin(config-dhcp)#dhcp snooping port 19:5 trust
Admin(config-dhcp)#
```

12.4 Configuring the MSTP Service

12.4.1 Background Information

In the Layer 2 switching network, a loop in the network causes infinite loop and proliferation of packets, which leads to broadcast storm and occupies all bandwidth available so that the network becomes unusable. As defined by the IEEE 802.1s, the MSTP (Multiple Spanning Tree Protocol) is compatible with STP and RSTP, and can compensate for the defects of them.

The MSTP is applied to the access network as follows:

- ◆ The MSTP features fast convergence, and allows the traffics in different VLANs to be forwarded along their own paths, so as to provide a better load balancing mechanism for redundancy links.
- ◆ The MSTP prunes a loop network into a loop-free tree network. This helps avoid infinite loop and proliferation of packets.

12.4.2 Network Scenario

Service Planning

The OLT equipment and two switches make up an MSTP network. Two spanning trees corresponding to different VLAN IDs are configured.

Network Diagram

Figure 12-1 shows the network diagram for the MSTP services.

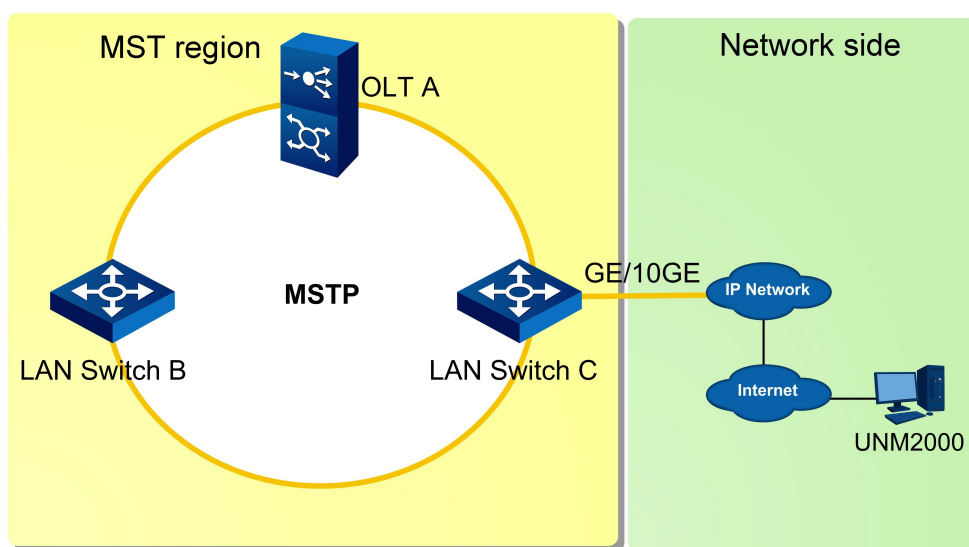


Figure 12-1 Network Diagram for the MSTP Service

A is the OLT equipment running the MSTP in the MST region; B and C are switches; and C is the root of the region.

Each MST region can have multiple spanning trees (MST), and each spanning tree corresponds to a spanning tree instance. Accordingly, an MST region may have multiple spanning tree instances (MSTI). In this example, VLAN 10 is mapped to MST1, while other VLANs are mapped to MST0.

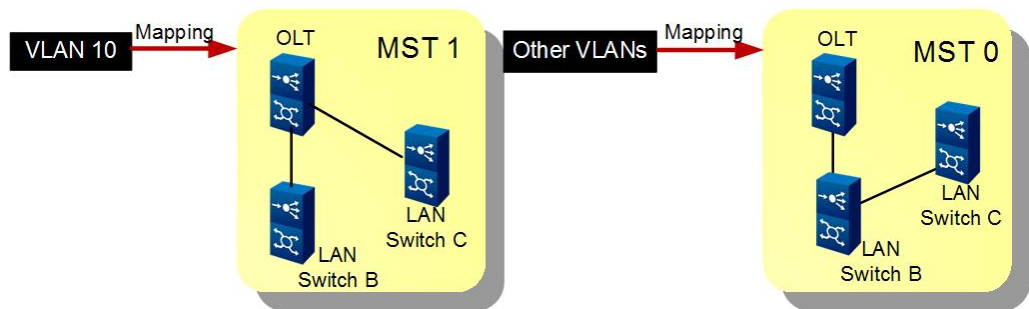


Figure 12-2 Mappings Between Spanning Trees and VLANs

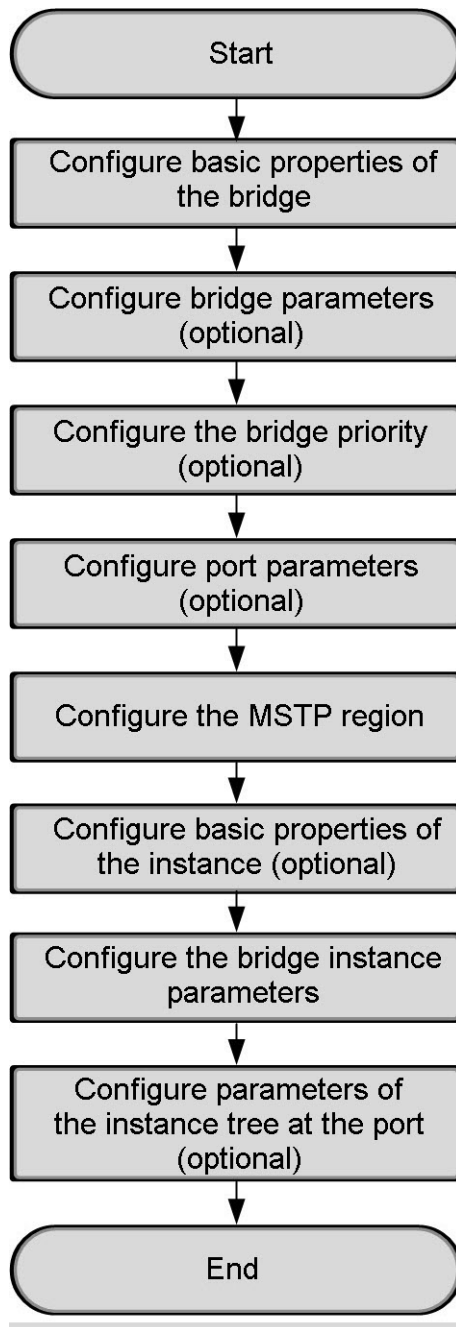
12.4.3 Configuration Flow

The VLAN service channel has been created. Please refer to [Basic Configurations](#) for the creation method.



Note:

Default values are recommended for the optional configuration items.



12.4.4 Configuring Basic Properties of the Bridge

Command Format

Enable / disable the STP function.

```
stp [enable|disable]
```

```
stp port <frameid/slotid/portid> [enable|disable]
stp link-aggregation <group-id> [enable|disable]
```

Configure the STP protocol mode.

```
stp mode [mstp|rstp|stp]
```

Configure the MSTP region name.

```
stp region-name <name>
```

Planning Data

Procedure	Parameter	Description	Attribute	Example
Enabling / disabling the STP function	stp [enable disable]	The STP function switch.	Mandatory	enable
	port <frameid/slotid/portid>	Subrack No. / slot No. / PON port No.	Mandatory	1/19/1
	link-aggregation <group-id>	The Trunk group ID. The value ranges from 1 to 16.	Mandatory	1
Configuring the STP protocol mode	stp mode [mstp rstp stp]	The STP protocol mode.	Mandatory	mstp
Configuring the MSTP region name	region-name <name>	The MSTP region name. The value contains 1 to 32 characters. The default setting is the MAC address of the current equipment.	Mandatory	fiberhome

Example

1. Enable the STP globally.

```
Admin(config) #stp enable
```

2. Enable the STP for PON Port 1 in Slot 19 of Subrack 1.

```
Admin(config) #stp port 1/19/1 enable
```

3. Enable the STP for Trunk group 1.

```
Admin(config) #stp link-aggregation 1 enable
```

4. Set the STP protocol mode to MSTP.

```
Admin(config) #stp mode mstp
```

5. Set the MSTP region name to "fiberhome".

```
Admin(config) #stp region-name fiberhome
```

```
Admin(config) #
```

12.4.5 Configuring Bridge Parameters (Optional)

Command Format

```
stp timer forward-delay <time>
stp timer hello <time>
stp timer max-age <time>
stp time-factor <factor>
```

Planning Data

Procedure	Parameter	Description	Attribute	Example
Configuring the bridge parameter forward-time	forward-delay <time>	Forward delay (unit: second). The value ranges from 4 to 30.	Mandatory	20
Configuring the bridge parameter hello-time	hello <time>	The Hello message interval (unit: second). The value ranges from 1 to 10.	Mandatory	5
Configuring the bridge parameter max-age	max-age <time>	The maximum interval for root bridge messages (unit: second). The value ranges from 6 to 40.	Optional	20
Configuring the bridge parameter time-factor	time-factor <factor>	The maximum number of hops for protocol packets. The value ranges from 1 to 40.	Optional	25

Example

1. Set the bridge parameter "forward-time" to 20.

```
Admin(config) #stp timer forward-delay 20
```

2. Set the bridge parameter "hello-time" to 5.

```
Admin(config) #stp timer hello 5
```

3. Set the bridge parameter "max-age" to 20.

```
Admin(config) #stp timer max-age 20
```

4. Set the bridge parameter "time-factor" to 25.

```
Admin(config) #stp time-factor 25
```

```
Admin(config) #
```

12.4.6 Configuring the Bridge Priority (Optional)

Command Format

```
stp priority <priority-value>
```

Planning Data

Parameter	Description	Attribute	Example
priority <priority-value>	The bridge priority value. It is a multiple of 4096, ranging from 0 to 61440.	Mandatory	8192

Example

Set the bridge priority to 8192.

```
Admin(config) #stp priority 8192
Admin(config) #
```

12.4.7 Configuring Port Parameters (Optional)

Command Format

Configure the edge port of the current port.

```
stp port <frameid/slotid/portid> edged-port [enable|disable]
```

Configure the edge port of the Trunk group.

```
stp link-aggregation <group-id> edged-port [enable|disable]
```

Configure the link type of the port.

```
stp port <frameid/slotid/portid> point-to-point [enable|disable]
```

Configure the link type of the Trunk group.

```
stp link-aggregation <group-id> point-to-point [enable|disable]
```

Planning Data

Procedure	Parameter	Description	Attribute	Example
Configuring the edge port of the current port	port <frameid/slot-id/portid>	Subrack No. / slot No. / port No.	Mandatory	1/19/1
	edged-port [enable disable]	◆ enable: auto-negotiation ◆ disable: edge port The default setting is "enable" (auto-negotiation).	Mandatory	enable
Configuring the edge port of the Trunk group	link-aggregation <group-id>	The Trunk group ID. The value ranges from 1 to 16.	Mandatory	1
	edged-port [enable disable]	◆ enable: auto-negotiation ◆ disable: edge port The default setting is "enable" (auto-negotiation).	Mandatory	enable
Configuring the link type of the port	port <frameid/slot-id/portid>	Subrack No. / slot No. / port No.	Mandatory	1/19/1
	point-to-point [enable disable]	◆ enable: point-to-point ◆ disable: shared The default setting is "disable" (shared).	Mandatory	enable
Configuring the link type of the Trunk group	link-aggregation <group-id>	The Trunk group ID. The value ranges from 1 to 16.	Mandatory	1
	point-to-point [enable disable]	◆ enable: point-to-point ◆ disable: shared The default setting is "disable" (shared).	Mandatory	enable

Example

1. Configure the edge port of the current port.

```
Admin(config) #stp port 1/19/1 edged-port enable
```

2. Configure the edge port of the Trunk group.

```
Admin(config) #stp link-aggregation 1 edged-port enable
```

3. Configure the link type of the port.

```
Admin(config) #stp port 1/19/1 point-to-point enable
```

4. Configure the link type of the Trunk group.

```
Admin(config) #stp link-aggregation 1 point-to-point enable
```

```
Admin(config) #
```

12.4.8 Configuring the MST Region

Command Format

Configure the revision level of the MSTP.

```
stp revision-level <level>
```

Planning Data

Parameter	Description	Attribute	Example
revision-level <level>	The revision level of the MSTP. The value ranges from 0 to 65535.	Mandatory	100

Example

Set the revision level of the MSTP to 100.

```
Admin(config) #stp revision-level 100
```

```
Admin(config) #
```

12.4.9 Configuring Basic Properties of the Instance (Optional)

Command Format

```
stp instance <instanceid> vlan <vlanlist>
```

Data Planning

Parameter	Description	Attribute	Example
instance <instanceid>	The instance ID, ranging from 1 to 64.	Mandatory	1
vlan <vlanlist>	The VLAN ID added to the instance.	Mandatory	100

Example

Add the VLAN ID 100 to Instance 1.

```
Admin(config) #stp instance 1 vlan 100
Admin(config) #
```

12.4.10 Configuring Parameters of the Bridge Instance

Command Format

```
stp instance <instanceid> priority <priority-value>
```

Planning Data

Parameter	Description	Attribute	Example
instance <instanceid>	The instance ID, ranging from 0 to 64.	Mandatory	1
priority <priority-value>	The priority of the instance. It is an integral multiple of 4096, ranging from 0 to 61440, and the default value is 32768.	Mandatory	4096

Example

Set the priority of Instance1 to 4096.

```
Admin(config) #stp instance 1 priority 4096
Admin(config) #
```

12.4.11 Configuring Instance Tree Parameters for the Port (Optional)

Command Format

Configure the path cost of the port.

```
stp port <frameid/slotid/portid> instance <instanceid> cost <cost>
```

Configure the path cost of the Trunk group.

```
stp link-aggregation <group-id> instance <instanceid> cost <cost>
```

Configure the priority of the port.

```
stp port <frameid/slotid/portid> instance <instanceid> priority <priority>
```

Configure the priority of the Trunk group.

```
stp link-aggregation <group-id> instance <instanceid> priority <priority>
```

Data Planning

Procedure	Parameter	Description	Attribute	Example
Configuring the path cost of the port	port <frameid/slotid/portid>	The subrack number / slot number / port number.	Mandatory	1/19/1
	instance <instanceid>	The instance ID, ranging from 0 to 64.	Mandatory	1
	cost <cost>	The path cost of the port. The value ranges from 1 to 200000000, and the default value is 0.	Mandatory	2000
Configuring the path cost of the Trunk group	link-aggregation <group-id>	The Trunk group ID. The value ranges from 1 to 16.	Mandatory	1
	instance <instanceid>	The instance ID, ranging from 0 to 64.	Mandatory	1
	cost <cost>	The path cost of the port. The value ranges from 1 to 200000000, and the default value is 0.	Mandatory	2000
Configuring the priority of the port	port <frameid/slotid/portid>	The subrack number / slot number / port number.	Mandatory	1/19/1
	instance <instanceid>	The instance ID, ranging from 0 to 64.	Mandatory	1
	priority <priority>	The priority of the port. It is an integral multiple of 16, ranging from 0 to 240, and the default value is 128.	Mandatory	160
Configuring the priority of the Trunk group	link-aggregation <group-id>	The Trunk group ID. The value ranges from 1 to 16.	Mandatory	1
	instance <instanceid>	The instance ID, ranging from 0 to 64.	Mandatory	1
	priority <priority>	The priority of the port. It is an integral multiple of 16, ranging from 0 to 240, and the default value is 128.	Mandatory	160

Example

1. Configure the path cost of the port.

```
Admin(config) #stp port 1/19/1 instance 1 cost 2000
```

2. Configure the path cost of the Trunk group.

```
Admin(config) #stp link-aggregation 1 instance 1 cost 2000
```

3. Configure the priority of the port.

```
Admin(config) #stp port 1/19/1 instance 1 priority 160
```

4. Configure the priority of the Trunk group.

```
Admin(config) #stp link-aggregation 1 instance 1 priority 160
```

```
Admin(config) #
```

12.5 Configuring the LACP

12.5.1 Background Information

Link aggregation means binding two or more physical interfaces together to form a logical data link based on software configuration. The logical link has higher bandwidth and more throughput since bandwidth of the physical interfaces is combined. When a link is faulty, the service data can be automatically switched to another link, which provides higher reliability of data links. Two switches or one switch and one router can be deployed on the two ends of the link.

The LACP protocol based on the IEEE802.3ad standard is a protocol that implements dynamic link aggregation. The LACP protocol exchanges information with the far end via the link aggregation control protocol data unit (LACPDU). After being enabled with the LACP protocol, a port sends the LACPDU to notify the far end of its information such as system priority, system MAC address, port priority, port number and operation key. After receiving the information, the far end compares it with the information of other ports, and selects the ports that can be aggregated. In this way, both ends agree on the ports to join or leave a dynamic aggregation group.

The ports enabled with the LACP can work in two modes: **passive** and **active**.

- ◆ In the passive mode, the port does not send the LACPDU messages proactively. After receiving the LACP messages from the far end, the port comes into the protocol computation status.
- ◆ In the active mode, the port proactively sends the LACPDU messages to the far end, and makes LACP computations.

The LACP can be classified into static LACP and dynamic LACP in the application layer. Here we focus on the static LACP. The static LACP aggregation group is created by the user. When creating the group, the user designates some specific ports and has the LACP protocol run on them. The link aggregation group then comes into being through negotiation between these designated ports and the ports connected to them on the far end. Namely, members of an aggregation group must be limited to the designated ports. When the link at a member port is interrupted or the port is in the duplex mode, the rate parameters of the port is inconsistent with those of other ports. In this case, the member port leaves the aggregation group. When conditions are met, the port rejoins the aggregation group. To delete a member from an aggregation group, manual operation of the user is required.

12.5.2 Configuration Rules

- ◆ The AN6001-G16 supports two aggregation modes: manual aggregation and static LACP.
- ◆ Before configuring the LACP, make sure the settings of the properties such as port rate, duplex type, MTU value and uplink mode of the ports to be configured are consistent.
- ◆ Before configuring the LACP, make sure that the member ports are not configured with service VLANs.

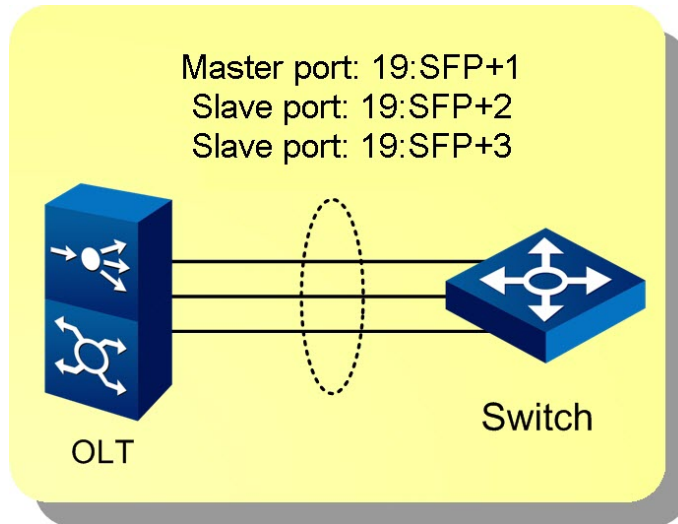
12.5.3 Network Scenario

Service Planning

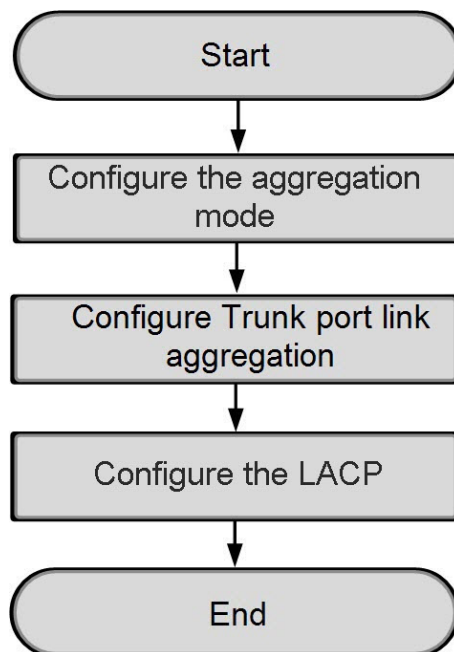
Set the three uplink ports of the OLT equipment to the member ports of the LACP protection group to enable link backup. Port 1 serves as the master port, and the other two the slave ones.

Network Diagram

The figure below shows the network for the LACP function.



12.5.4 Configuration Flow



12.5.5 Configuring the Aggregation Mode

Command Format

```
link-aggregation <frameid/slotid/portid> {[mode] [smac|dmac|sdmac|sip|
dip|sdip]}*1 {[workmode] [lacp-static]}*1
```

Planning Data

Parameter	Description	Attribute	Example
<frameid/slotid/- portid>	Subrack No. / slot No. / port No.	Mandatory	1/19/1
{[mode] [smac dmac sdmac sip dip sdip]}*1	The load balancing mode of the aggregation group ◆ smac: the source MAC address ◆ dmac: the destination MAC address ◆ sdmac: the source and destination MAC addresses ◆ sip: the source IP address ◆ dip: the destination IP address ◆ sdip: the source and destination IP addresses	Optional	smac
{[workmode] [lacp- static]}*1	Static Lacp	Optional	lacp-static

Example

Configure the static LACP aggregation mode based on the source MAC address for Port 1 in Slot 19 of Subrack 1.

```
Admin(config) #link-aggregation 1/19/1 mode smac workmode lacp-static
Admin(config) #
```

12.5.6 Configuring Trunk Port Link Aggregation

Command Format

```
link-aggregation add-member <frameid/slotid/portid> <frameid/slotid/
portid> {<frameid/slotid/portid>}*6
link-aggregation delete-member <frameid/slotid/portid> {<frameid/slotid/
portid>}*7
```

Data Planning

Parameter	Description	Attribute	Example
<frameid/slotid/- portid>	The master port. The subrack number / slot number / port number.	Mandatory	1/19/1
<frameid/slotid/- portid>	The member port. The subrack number / slot number / port number.	Mandatory	1/19/2
{<frameid/slotid/- portid>}*6	The member port. The subrack number / slot number / port number.	Optional	-

Example

1. Configure the Trunk port link aggregation, adding the master port 1/19/1 and the member port 1/19/2 to the Trunk group.

```
Admin(config) #link-aggregation add-member 1/19/1 1/19/2
```

2. Delete the Trunk group member 1/19/1. (Use this command format to delete a port)

```
Admin(config) #link-aggregation delete-member 1/19/1
```

```
Admin(config) #
```

12.5.7 Configuring the LACP

Command Format

Enable the LACP function.

```
lacp [enable|disable]
```

Configure the priority of the LACP system.

```
lacp priority <value> system
```

Configure the priority of the LACP port.

```
lacp priority <value> port <frameid/slotid/portid>
```

Configure the timer of the LACP port.

```
lacp timeout [fast|slow] port <frameid/slotid/portid>
```

Planning Data

Procedure	Parameter	Description	Attribute	Example
Enabling / disabling the LACP function	lacp [enable disable]	Enabling or disabling the LACP function globally.	Mandatory	enable
Configuring the priority of the LACP system	priority <value>	The LACP system priority. The value ranges from 0 to 65534, and the default value is 32768. The smaller is the value, the higher is the priority.	Mandatory	120
Configuring the priority of the LACP port	priority <value>	The LACP port priority. The value ranges from 0 to 65534, and the default value is 32768. The smaller is the value, the higher is the priority.	Mandatory	120
	port <frameid/slotid/portid>	Subrack No. / slot No. / port No.	Mandatory	1/19/1
Configuring the timer of the LACP port	timeout [fast slow]	◆ fast: specifies the short-period timeout mode for packet receiving of the LACP port. ◆ slow: specifies the long-period timeout mode for packet receiving of the LACP port.	Mandatory	fast
	port <frameid/slotid/portid>	Subrack No. / slot No. / port No.	Mandatory	1/19/1

Example

1. Enable the LACP function.

```
Admin(config) #lacp enable
```

2. Set the priority of the LACP system to 120.

```
Admin(config) #lacp priority 120 system
```

3. Set the priority of Port 1 in Slot 19 of Subrack 1 to 120.

```
Admin(config) #lacp priority 120 port 1/19/1
```

4. Set the timer type of Port 1 in Slot 19 of Subrack 1 to short timer.

```
Admin(config) #lacp timeout fast port 1/19/1
```

```
Admin(config) #
```

12.6 Configuring the ERPS

12.6.1 Background Information

The Ethernet Ring Protection Switching (ERPS) is an Ethernet ring protection technology defined in the ITU-T G.8032 protocol. The fast switching mechanism and universality of the protocol can protect the link efficiently and guarantee the operation quality of the service.

Components of the ERPS Ring

At the physical layer, all the equipment (such as the OLT) on the ring nodes should have the ERPS function enabled and constitute one or more physical rings to use the ERPS protocol. The ports on the ring are called ring ports. The ERPS protocol controls connection and disconnection of the ring ports to form link redundancy and handle faults.

At the logical layer, ERPS instances should be created for the equipment on the ring nodes to run the ERPS function. Besides, each ERPS ring needs to be assigned with an exclusive signaling VLAN as a channel for transmitting protocol messages (R-APS message).

Several instances can be created for a physical ring, so that the link can be used in several ERPS rings.

Port Role and Status

There are two types of ring ports on the ERPS ring: RPL owner port and common port.

- ◆ RPL owner port: Each ERPS ring has only one RPL owner port. When the link is in normal status, the port is blocked (discarded) to prevent link loops. When the link is faulty, the port is unblocked to forward service messages. When the fault is cleared, the port is blocked again, and the updated status of the port is announced to other ports.

- ◆ **Common port:** The common port forwards service messages, monitors the status of the link directly connected with it, and announces its status to the ports on other nodes. When detecting a fault, the common port triggers the ERPS link protection mechanism to enable the backup link.

The link that is disconnected as the RPL owner port is blocked becomes the ring protection link (RPL).

The ERPS ring port has two statuses:

- ◆ A port in the discarding status (being blocked) cannot forward any service messages, but can forward R-APS messages and other Ethernet link protection protocol messages (such as CFM defined in IEEE 802.3ag).
- ◆ A port in the forwarding status (being unblocked) can forward service and protocol messages normally.

R-APS Message

As defined by the ITU-T G.8032 standard, the ring automatic protection switching (R-APS) messages are used to inform the ring node equipment of the change in connection status of the links on the ring.

Message Name	Generation Time	Meaning
R-APS (SF)	When the link is faulty	SF means signal failure, indicating that the link signal is lost. The message is sent by the port detecting the link fault. When receiving the SF message, the RPL Owner node will unblock the RPL Owner port.
R-APS (NR)	When the link is normal	NR means no request, indicating that the link is normal and there is no need for requiring change of the port status.
R-APS (NR, NB)	The link returns to normal and the RPL Owner port is blocked again.	It is similar to R-APS (NR), but can only be sent by the RPL Owner port, indicating that the port is blocked again.

Timer

The ITU-T G.8032 protocol defines multiple timers, which are used as the buffer time for the protocol to control the link status changes. This helps avoid the link flapping caused when a port misjudges the link status, as a result of delay in transmitting signaling messages or fault correction.

The names, starting time and functions of the timers are described as follows:

Timer Name	Starting Time	Function
WTR timer	It is started when the RPL Owner port receives R-APS (NR) messages.	Reserve the buffer time, and do not block the RPL Owner port until the physical and logical statuses of all ports and links return to normal.
Guard timer	It is started when a faulty node detects that the fault is cleared.	When the guard timer is running, the port does not receive any R-APS (SF) messages from other ports. In this way, the guard timer can prevent the port from receiving or forwarding outdated R-APS (SF) messages. Receiving or forwarding of these outdated R-APS messages may result in further change of the whole link status.
Hold-off timer	It is started when a ring node is faulty.	The hold-off timer holds off the transmission of R-APS (SF) messages. In the set period, the fault is not detected by the ERPS protocol. If the fault persists at the expiration of the hold-off time, link protection is implemented based on the ERPS protocol.

12.6.2 Configuration Rules

- ◆ Only one RPL owner port needs to be configured on an ERPS ring.
- ◆ While configuring tangent rings, make sure the RPL owner port is configured on the equipment at a non-tangent point.

12.6.3 Configuring Single-Ring Single-Instance Protection

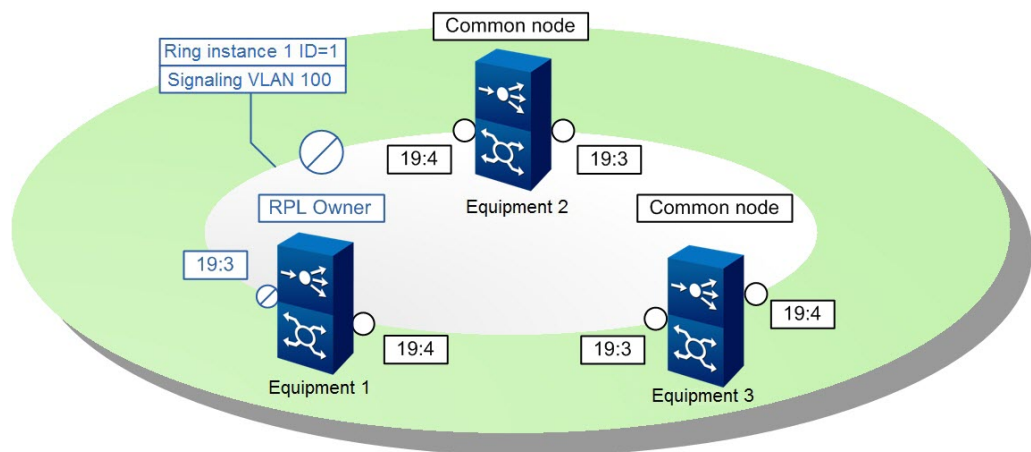
12.6.3.1 Network Scenario

Service Planning

Three OLT devices make up an ERPS protection ring. The link between Equipment 1 and 2 is an RPL link. This ERPS ring protects a single service via one ring instance. The service VLAN ID is 200, and the signaling VLAN ID on the ring is 100.

Network Diagram

The network for the single-ring single-instance ERPS is shown in the figure below.



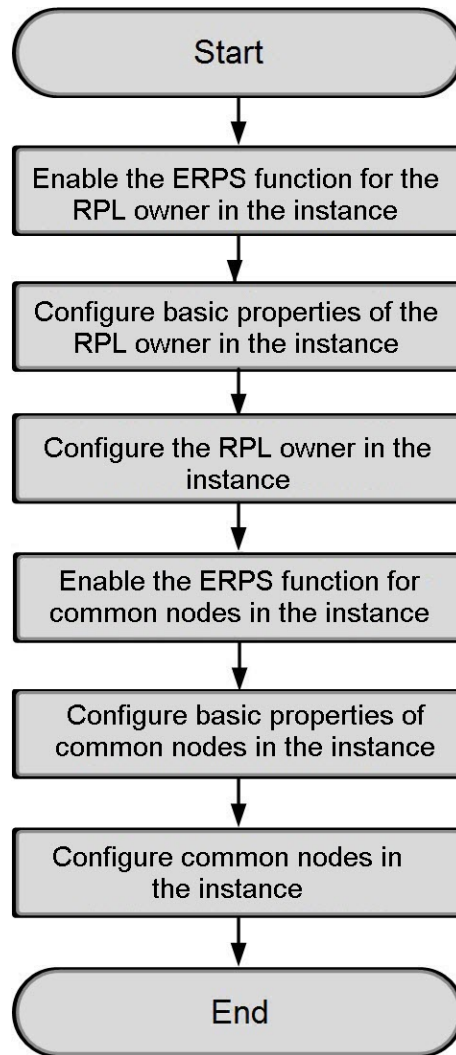
Equipment 1 serves as the RPL Owner of the ERPS ring. Port 19:3 of Equipment 1 serves as the RPL Port and is blocked.

When the network is normal, the service flow is forwarded in the direction of **Equipment 1 → Equipment 3 → Equipment 2**.

When the network between Equipment 1 and Equipment 3 is faulty, the blocked RPL port is unblocked, so that the service flow can be forwarded in the direction of **Equipment 1 → Equipment 2 → Equipment 3**. When the fault is cleared and the RPL owner has confirmed the link status, the RPL port is blocked again, and the service flow is switched back to the original direction.

12.6.3.2 Configuration Flow

The VLAN service channel has been created. Please refer to [Basic Configurations](#) for the creation method.



12.6.3.3 Enabling the ERPS Function for the RPL Owner in the Instance

Command Format

```
erps mode [enable|disable]
```

Planning Data

Parameter	Description	Attribute	Example
erps mode [enable disable]	Enables or disables the ERPS function.	Mandatory	enable

Example

Enable the ERPS function.

```
Admin(config) #erps mode enable
Admin(config) #
```

12.6.3.4 Configuring Basic Properties of the RPL Owner in the Instance

Command Format

Configure the mappings between VLANs and ERPS instances.

```
erps instance <instance-id> vlan-id <vlanid> {to <vlanid-end>} *1
```

Create an ERPS ring.

```
erps ring <ring-id>
```

Configure the roles of the nodes in the ERPS ring instance.

```
erps ring <ring-id> erps-role [common|rpl-owner]
```

Planning Data

Procedure	Parameter	Description	Attribute	Example
Configuring the mappings between the VLANs and the ERPS instance	erps instance <instance-id>	The ERPS instance ID, ranging from 1 to 64.	Mandatory	1
	vlan-id <vlanid>	The starting value of the VLAN ID range to be mapped.	Mandatory	100
	{to <vlanid-end>} *1	The ending value of the VLAN ID range.	Optional	200

Procedure	Parameter	Description	Attribute	Example
Creating an ERPS ring	ring <ring-id>	The ring ID, ranging from 1 to 239.	Mandatory	1
Configuring roles of the nodes in the ERPS ring instance	erps-role [common rpl-owner]	A node can act as the common node or RPL owner.	Mandatory	rpl-owner

Example

1. Map VLANs 100 to 200 to ERPS Instance 1.

```
Admin(config) #erps instance 1 vlan-id 100 to 200
```

2. Create an ERPS ring.

```
Admin(config) #erps ring 1
```

3. Set Equipment 1 in Ring Instance 1 to RPL owner.

```
Admin(config) #erps ring 1 erps-role rpl-owner
```

```
Admin(config) #
```

12.6.3.5 Configuring the RPL Owner in the Instance



Note:

Default values are recommended for the optional configuration items.

Command Format

Configure the signaling VLAN for the ERPS ring instance.

```
erps ring <ringid> control-vlan <vlanid>
```

Configure the management domain level. (Optional)

```
erps ring <ring-id> mel <mel>
```

Associate the ERPS ring instance with the VLAN instance.

```
erps ring <ring-id> protect-inst <value>
```

Configure the switching mode for the ERPS ring instance. (Optional)

```
erps ring <ring-id> erps-mode [revertive|nonrevertive]
```

Configure the wait-to-restore time for the ERPS ring instance. (Optional)

```
erps ring <ring-id> wrt-time <value>
```

Configure the hold-off time for the ERPS ring instance. (Optional)

```
erps ring <ring-id> holdoff-time <value>
```

Configure the guard time for the ERPS ring instance. (Optional)

```
erps ring <ring-id> guard-time <value>
```

Configure properties of the first port in the ERPS ring instance.

```
erps ring <ring-id> primary-slot <value> primary-port <value> role [common|
rpl-port]
```

Configure properties of the second port in the ERPS ring instance.

```
erps ring <ring-id> second-slot <value> second-port <value> role [common|
rpl-port]
```

Configure the virtual channel VLAN for the ERPS ring instance. (Reserved function, configuration not required currently)

```
erps ring <ring-id> virtual-vlan <value>
```

Planning Data

Procedure	Parameter	Description	Attribute	Example
Configuring the signaling VLAN for the ERPS ring instance	ring <ringid>	The ring ID.	Mandatory	1
	control-vlan <vlanid>	The signaling VLAN ID.	Mandatory	100
Configuring the management domain level	mel <mel>	The maintenance entity level. The value ranges from 0 to 7.	Mandatory	7
Associating the ERPS ring instance with the VLAN instance	protect-inst <value>	The protection instance ID. The value ranges from 1 to 64.	Mandatory	1

Procedure	Parameter	Description	Attribute	Example
Configuring the switching mode for the ERPS ring instance	erps-mode [revertive nonrevertive]	The switching mode ◆ revertive ◆ nonrevertive	Mandatory	revertive
Configuring the wait-to-restore time for the ERPS ring instance	wrt-time <value>	The wait-to-restore timer. The value ranges from 5 to 12 (unit: minute).	Mandatory	5
Configuring the hold-off time for the ERPS ring instance	holdoff-time <value>	The hold-off timer. The value ranges from 0 to 10000 (unit: millisecond).	Mandatory	1000
Configuring the guard time for the ERPS ring instance	guard-time <value>	The guard timer. The value ranges from 10 to 2000 (unit: millisecond).	Mandatory	500
Configuring properties of the first port in the ERPS ring instance	primary-slot <value>	The number of the first slot.	Mandatory	19
	primary-port <value>	The first uplink port.	Mandatory	3
	role [common rpl-port]	The role of the first port. It can be set to common port or RPL port. A ring instance can be configured with only one RPL port.	Mandatory	rpl-port
Configuring properties of the second port in the ERPS ring instance	second-slot <value>	The number of the second slot.	Mandatory	19
	second-port <value>	The second uplink port.	Mandatory	4
	role [common rpl-port]	The role of the second port. It can be set to common port or RPL port. A ring instance can be configured with only one RPL port.	Mandatory	common
Configuring the virtual channel VLAN for the ERPS ring instance	virtual-vlan <value>	The virtual channel VLAN.	Mandatory	-

Example

1. Set the signaling VLAN ID of the ERPS ring instance to 100.

```
Admin(config) #erps ring 1 control-vlan 100
```

2. Set the management domain level to 7.

```
Admin(config) #erps ring 1 mel 7
```

3. Associate the ERPS ring instance with the VLAN Instance 1.

```
Admin(config) #erps ring 1 protect-inst 1
```

4. Configure the switching mode for the ERPS ring instance.

```
Admin(config) #erps ring 1 erps-mode revertive
```

5. Set the wait-to-restore time for the ERPS ring instance to 5 minutes.

```
Admin(config) #erps ring 1 wrt-time 5
```

6. Set the hold-off time for the ERPS ring instance to 1000 ms.

```
Admin(config) #erps ring 1 holdoff-time 1000
```

7. Set the guard time for the ERPS ring instance to 500 ms.

```
Admin(config) #erps ring 1 guard-time 500
```

8. Set the first port of the RPL owner device in the ERPS ring instance to RPL port.

```
Admin(config) #erps ring 1 primary-slot 19 primary-port 3 role rpl-port
```

9. Set the second port of the RPL owner device in the ERPS ring instance to common port.

```
Admin(config) #erps ring 1 second-slot 19 second-port 4 role common
```

```
Admin(config) #
```

12.6.3.6 Enabling the ERPS Function for Common Nodes in the Instance

Command Format

```
erps mode [enable|disable]
```

Data Planning

Parameter	Description	Attribute	Example
erps mode [enable disable]	Enabling or disabling the ERPS function.	Mandatory	enable

Example

Enable the ERPS function.

```
Admin(config) #erps mode enable
```

```
Admin(config)#
```

12.6.3.7 Configuring Basic Properties of Common Nodes in the Instance

Command Format

Configure the mappings between VLANs and ERPS instances.

```
erps instance <instance-id> vlan-id <vlanid> {to <vlanid-end>} *1
```

Create an ERPS ring.

```
erps ring <ring-id>
```

Configure the roles of the nodes in the ERPS ring instance.

```
erps ring <ring-id> erps-role [common|rpl-owner]
```

Planning Data

Procedure	Parameter	Description	Attribute	Example
Configuring the mappings between the VLANs and the ERPS instance	erps instance <instance-id>	The ERPS instance ID, ranging from 1 to 64.	Mandatory	1
	vlan-id <vlanid>	The starting value of the VLAN ID range to be mapped.	Mandatory	100
	{to <vlanid-end>} *1	The ending value of the VLAN ID range.	Optional	200
Creating an ERPS ring	ring <ring-id>	The ring ID, ranging from 1 to 239.	Mandatory	1
Configuring roles of the nodes in the ERPS ring instance	erps-role [common rpl-owner]	A node can act as the common node or RPL owner.	Mandatory	common

Example

1. Map VLANs 100 to 200 to ERPS Instance 1.

```
Admin(config)#erps instance 1 vlan-id 100 to 200
```

2. Create an ERPS ring.

```
Admin(config)#erps ring 1
```

3. Set Equipment 2 and Equipment 3 in Ring Instance 1 to common nodes.

```
Admin(config) #erps ring 1 erps-role common
Admin(config) #
```

12.6.3.8 Configuring Common Nodes in the Instance



Note:

Default values are recommended for the optional configuration items.

Command Format

Configure the signaling VLAN for the ERPS ring instance.

```
erps ring <ringid> control-vlan <vlanid>
```

Configure the management domain level. (Optional)

```
erps ring <ring-id> mel <mel>
```

Associate the ERPS ring instance with the VLAN instance.

```
erps ring <ring-id> protect-inst <value>
```

Configure the switching mode for the ERPS ring instance. (Optional)

```
erps ring <ring-id> erps-mode [revertive|nonrevertive]
```

Configure the wait-to-restore time for the ERPS ring instance. (Optional)

```
erps ring <ring-id> wrt-time <value>
```

Configure the hold-off time for the ERPS ring instance. (Optional)

```
erps ring <ring-id> holdoff-time <value>
```

Configure the guard time for the ERPS ring instance. (Optional)

```
erps ring <ring-id> guard-time <value>
```

Configure properties of the first port in the ERPS ring instance.

```
erps ring <ring-id> primary-slot <value> primary-port <value> role [common |
rpl-port]
```

Configure properties of the second port in the ERPS ring instance.

```
erps ring <ring-id> second-slot <value> second-port <value> role [common |
rpl-port]
```

Configure the virtual channel VLAN for the ERPS ring instance. (Reserved function, configuration not required currently)

```
erps ring <ring-id> virtual-vlan <value>
```

Planning Data

Procedure	Parameter	Description	Attribute	Example
Configuring the signaling VLAN for the ERPS ring instance	ring <ringid>	The ring ID.	Mandatory	1
	control-vlan <vlanid>	The signaling VLAN ID.	Mandatory	100
Configuring the management domain level	mel <mel>	The maintenance entity level. The value ranges from 0 to 7.	Mandatory	7
Associating the ERPS ring instance with the VLAN instance	protect-inst <value>	The protection instance ID. The value ranges from 1 to 64.	Mandatory	1
Configuring the switching mode for the ERPS ring instance	erps-mode [revertive nonrevertive]	The switching mode. ◆ revertive ◆ nonrevertive	Mandatory	revertive
Configuring the wait-to-restore time for the ERPS ring instance	wrt-time <value>	The wait-to-restore timer. The value ranges from 5 to 12 (unit: minute).	Mandatory	5
Configuring the hold-off time for the ERPS ring instance	holdoff-time <value>	The hold-off timer. The value ranges from 0 to 10000 (unit: millisecond).	Mandatory	1000
Configuring the guard time for the ERPS ring instance	guard-time <value>	The guard timer. The value ranges from 10 to 2000 (unit: millisecond).	Mandatory	500

Procedure	Parameter	Description	Attribute	Example
Configuring properties of the first port in the ERPS ring instance	primary-slot <value>	The number of the first slot.	Mandatory	19
	primary-port <value>	The first uplink port.	Mandatory	3
	role [common rpl-port]	The role of the first port. It can be set to common port or RPL port. A ring instance can be configured with only one RPL port.	Mandatory	common
Configuring properties of the second port in the ERPS ring instance	second-slot <value>	The number of the second slot.	Mandatory	19
	second-port <value>	The second uplink port.	Mandatory	4
	role [common rpl-port]	The role of the second port. It can be set to common port or RPL port. A ring instance can be configured with only one RPL port.	Mandatory	common
Configuring the virtual channel VLAN for the ERPS ring instance	virtual-vlan <value>	The virtual channel VLAN.	Mandatory	-

Example

1. Set the signaling VLAN ID of the ERPS ring instance to 100.

```
Admin(config) #erps ring 1 control-vlan 100
```

2. Set the management domain level to 7.

```
Admin(config) #erps ring 1 mel 7
```

3. Associate the ERPS ring instance with the VLAN Instance 1.

```
Admin(config) #erps ring 1 protect-inst 1
```

4. Configure the switching mode for the ERPS ring instance.

```
Admin(config) #erps ring 1 erps-mode revertive
```

5. Set the wait-to-restore time for the ERPS ring instance to 5 minutes.

```
Admin(config) #erps ring 1 wrt-time 5
```

6. Set the hold-off time for the ERPS ring instance to 1000 ms.

```
Admin(config) #erps ring 1 holdoff-time 1000
```

7. Set the guard time for the ERPS ring instance to 500 ms.

```
Admin(config) #erps ring 1 guard-time 500
```

8. Set the first port of the common device in the ERPS ring instance to common port.

```
Admin(config)#erps ring 1 primary-slot 19 primary-port 3 role common
```

9. Set the second port of the common device in the ERPS ring instance to common port.

```
Admin(config)#erps ring 1 second-slot 19 second-port 4 role common
```

```
Admin(config)#
```

12.6.4 Configuring Single-Ring Multi-Instance Protection

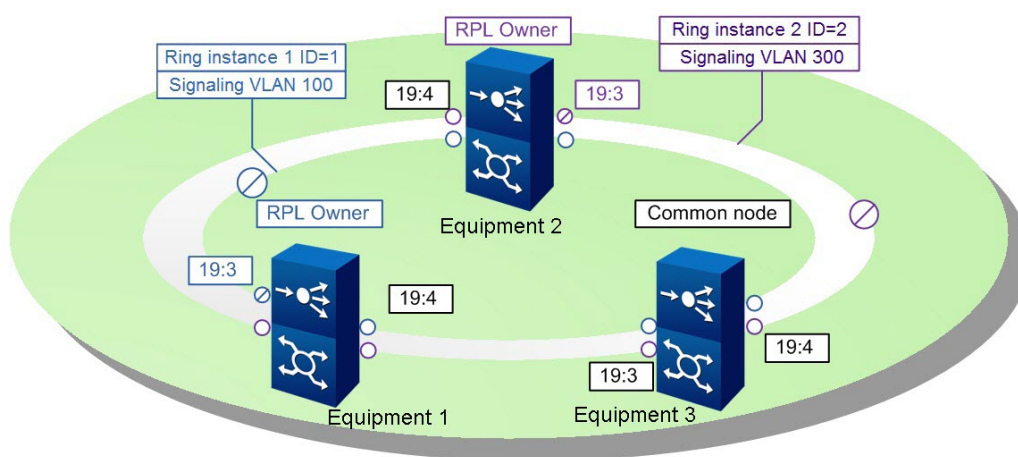
12.6.4.1 Network Scenario

Service Planning

Three OLT devices make up an ERPS protection ring. Two ERPS ring instances are created for the ring to protect different services.

Network Diagram

The network for the single-ring multi-instance ERPS is shown in the figure below.



The configuration in this example covers two parts: Ring Instance 1 and Ring Instance 2.

- ◆ Ring Instance 1 here is configured in the same way as that in the single-ring single-instance application. Equipment 1 serves as the RPL owner in Ring Instance 1; Port 19:3 serves as the RPL port and is blocked. With the signaling VLAN ID 100, Ring Instance 1 protects the service with the VLAN ID 100.

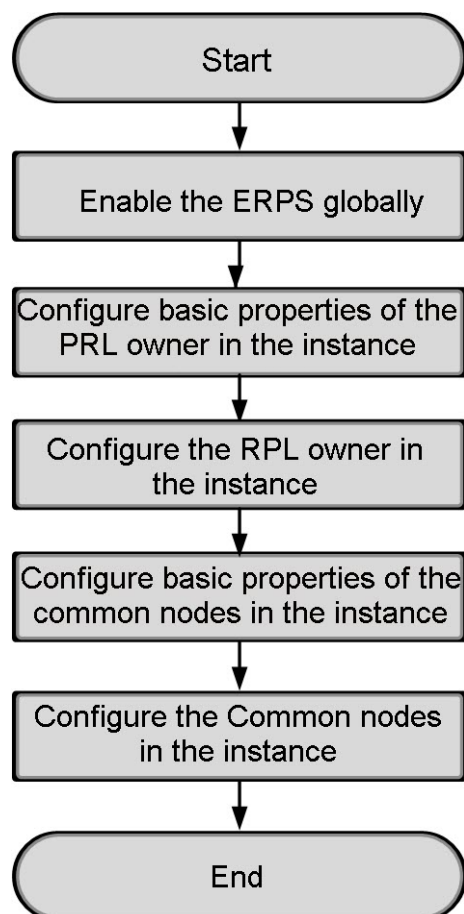
- ◆ In Ring Instance 2, Equipment 2 serves as the RPL owner; Port 19:3 servers as the RPL port and is blocked. With the signaling VLAN ID 300, Ring Instance 2 protects the service with the VLAN ID 300.

A physical port can be used in different ring instances logically. However, the role of the port is specific to ring instance. That is, the role of the port in one ring instance will not affect the role or message forwarding of the port in other ring instances.

12.6.4.2 Configuration Flow

The VLAN service channel has been created. Please refer to [Basic Configurations](#) for the creation method.

The figure below illustrates the flow of configuring an instance in the single-ring multi-instance application.



12.6.4.3 Enabling the ERPS Globally

Command Format

```
erps mode [enable|disable]
```

Planning Data

Parameter	Description	Attribute	Example
erps mode [enable disable]	Enables or disables the ERPS function.	Mandatory	enable

Example

Enable the ERPS function.

```
Admin(config) #erps mode enable
Admin(config) #
```

12.6.4.4 Configuring Basic Properties of the RPL Owner in Instance One

Command Format

Configure the mappings between VLANs and ERPS instances.

```
erps instance <instance-id> vlan-id <vlanid> {to <vlanid-end>} *1
```

Create an ERPS ring.

```
erps ring <ring-id>
```

Configure the roles of the nodes in the ERPS ring instance.

```
erps ring <ring-id> erps-role [common|rpl-owner]
```

Planning Data

Procedure	Parameter	Description	Attribute	Example
Configuring the mappings between the VLANs and the ERPS instance	erps instance <instance-id>	The ERPS instance ID, ranging from 1 to 64.	Mandatory	1
	vlan-id <vlanid>	The starting value of the VLAN ID range to be mapped.	Mandatory	100

Procedure	Parameter	Description	Attribute	Example
	{to <vlanid-end>} *1	The ending value of the VLAN ID range.	Optional	-
Creating an ERPS ring	ring <ring-id>	The ring ID, ranging from 1 to 239.	Mandatory	1
Configuring roles of the nodes in the ERPS ring instance	erps-role [common rpl-owner]	A node can act as the common node or RPL owner.	Mandatory	rpl-owner

Example

1. Map the VLAN 100 to ERPS Instance 1.
Admin(config) #**erps instance 1 vlan-id 100**
2. Create an ERPS ring.
Admin(config) #**erps ring 1**
3. Set Equipment 1 in Ring Instance 1 to RPL owner.
Admin(config) #**erps ring 1 erps-role rpl-owner**
Admin(config) #

12.6.4.5 Configuring the RPL Owner in Instance One



Note:

Default values are recommended for the optional configuration items.

Command Format

Configure the signaling VLAN for the ERPS ring instance.

```
erps ring <ringid> control-vlan <vlanid>
```

Configure the management domain level. (Optional)

```
erps ring <ring-id> mel <mel>
```

Associate the ERPS ring instance with the VLAN instance.

```
erps ring <ring-id> protect-inst <value>
```

Configure the switching mode for the ERPS ring instance. (Optional)

```
erps ring <ring-id> erps-mode [revertive|nonrevertive]
```

Configure the wait-to-restore time for the ERPS ring instance. (Optional)

```
erps ring <ring-id> wrt-time <value>
```

Configure the hold-off time for the ERPS ring instance. (Optional)

```
erps ring <ring-id> holdoff-time <value>
```

Configure the guard time for the ERPS ring instance. (Optional)

```
erps ring <ring-id> guard-time <value>
```

Configure properties of the first port in the ERPS ring instance.

```
erps ring <ring-id> primary-slot <value> primary-port <value> role [common|  
rpl-port]
```

Configure properties of the second port in the ERPS ring instance.

```
erps ring <ring-id> second-slot <value> second-port <value> role [common|  
rpl-port]
```

Configure the virtual channel VLAN for the ERPS ring instance. (Reserved function, configuration not required currently)

```
erps ring <ring-id> virtual-vlan <value>
```

Planning Data

Procedure	Parameter	Description	Attribute	Example
Configuring the signaling VLAN for the ERPS ring instance	ring <ringid>	The ring ID.	Mandatory	1
	control-vlan <vlanid>	The signaling VLAN ID.	Mandatory	100
Configuring the management domain level	mel <mel>	The maintenance entity level. The value ranges from 0 to 7.	Mandatory	7
Associating the ERPS ring instance with the VLAN instance	protect-inst <value>	The protection instance. The value ranges from 1 to 64.	Mandatory	1

Procedure	Parameter	Description	Attribute	Example
Configuring the switching mode for the ERPS ring instance	erps-mode [revertive nonrevertive]	The switching mode. ◆ revertive ◆ nonrevertive	Mandatory	revertive
Configuring the wait-to-restore time for the ERPS ring instance	wrt-time <value>	The wait-to-restore timer. The value ranges from 5 to 12 (unit: minute).	Mandatory	5
Configuring the hold-off time for the ERPS ring instance	holdoff-time <value>	The hold-off timer. The value ranges from 0 to 10000 (unit: millisecond).	Mandatory	1000
Configuring the guard time for the ERPS ring instance	guard-time <value>	The guard timer. The value ranges from 10 to 2000 (unit: millisecond).	Mandatory	500
Configuring properties of the first port in the ERPS ring instance	primary-slot <value>	The number of the first slot.	Mandatory	19
	primary-port <value>	The first uplink port.	Mandatory	3
	role [common rpl-port]	The role of the first port. It can be set to common port or RPL port. A ring instance can be configured with only one RPL port.	Mandatory	rpl-port
Configuring properties of the second port in the ERPS ring instance	second-slot <value>	The number of the second slot.	Mandatory	19
	second-port <value>	The second uplink port.	Mandatory	4
	role [common rpl-port]	The role of the second port. It can be set to common port or RPL port. A ring instance can be configured with only one RPL port.	Mandatory	common
Configuring the virtual channel VLAN for the ERPS ring instance	virtual-vlan <value>	The virtual channel VLAN.	Mandatory	-

Example

1. Set the signaling VLAN ID of the ERPS ring instance to 100.

```
Admin(config) #erps ring 1 control-vlan 100
```

2. Set the management domain level to 7.

```
Admin(config) #erps ring 1 mel 7
```

3. Associate the ERPS ring instance with the VLAN Instance 1.

```
Admin(config) #erps ring 1 protect-inst 1
```

4. Configure the switching mode for the ERPS ring instance.

```
Admin(config) #erps ring 1 erps-mode revertive
```

5. Set the wait-to-restore time for the ERPS ring instance to 5 minutes.

```
Admin(config) #erps ring 1 wrt-time 5
```

6. Set the hold-off time for the ERPS ring instance to 1000 ms.

```
Admin(config) #erps ring 1 holdoff-time 1000
```

7. Set the guard time for the ERPS ring instance to 500 ms.

```
Admin(config) #erps ring 1 guard-time 500
```

8. Set the first port of the RPL owner device in the ERPS ring instance to RPL port.

```
Admin(config) #erps ring 1 primary-slot 19 primary-port 3 role rpl-port
```

9. Set the second port of the RPL owner device in the ERPS ring instance to common port.

```
Admin(config) #erps ring 1 second-slot 19 second-port 4 role common
```

12.6.4.6 Configuring Basic Properties of Common Nodes in Instance One

Command Format

Configure the mappings between VLANs and ERPS instances.

```
erps instance <instance-id> vlan-id <vlanid> {to <vlanid-end>} *1
```

Create an ERPS ring.

```
erps ring <ring-id>
```

Configure the roles of the nodes in the ERPS ring instance.

```
erps ring <ring-id> erps-role [common|rpl-owner]
```

Planning Data

Procedure	Parameter	Description	Attribute	Example
Configuring the mappings between the VLANs and the ERPS instance	erps instance <instance-id>	The ERPS instance ID, ranging from 1 to 64.	Mandatory	1
	vlan-id <vlanid>	The starting value of the VLAN ID range to be mapped.	Mandatory	100
	{to <vlanid-end>} *1	The ending value of the VLAN ID range.	Optional	-
Creating an ERPS ring	ring <ring-id>	The ring ID, ranging from 1 to 239.	Mandatory	1
Configuring roles of the nodes in the ERPS ring instance	erps-role [common rpl-owner]	The node can act as a common node or RPL owner.	Mandatory	common

Example

1. Map the VLAN 100 to ERPS Instance 1.

```
Admin(config) #erps instance 1 vlan-id 100
```

2. Create an ERPS ring.

```
Admin(config) #erps ring 1
```

3. Set Equipment 2 and Equipment 3 in Ring Instance 1 to common nodes.

```
Admin(config) #erps ring 1 erps-role common
```

```
Admin(config) #
```

12.6.4.7 Configuring Common Nodes in Instance One



Note:

Default values are recommended for the optional configuration items.

Command Format

Configure the signaling VLAN for the ERPS ring instance.

```
erps ring <ringid> control-vlan <vlanid>
```

Configure the management domain level. (Optional)

```
erps ring <ring-id> mel <mel>
```

Associate the ERPS ring instance with the VLAN instance.

```
erps ring <ring-id> protect-inst <value>
```

Configure the switching mode for the ERPS ring instance. (Optional)

```
erps ring <ring-id> erps-mode [revertive|nonrevertive]
```

Configure the wait-to-restore time for the ERPS ring instance. (Optional)

```
erps ring <ring-id> wrt-time <value>
```

Configure the hold-off time for the ERPS ring instance. (Optional)

```
erps ring <ring-id> holdoff-time <value>
```

Configure the guard time for the ERPS ring instance. (Optional)

```
erps ring <ring-id> guard-time <value>
```

Configure properties of the first port in the ERPS ring instance.

```
erps ring <ring-id> primary-slot <value> primary-port <value> role [common|  
rpl-port]
```

Configure properties of the second port in the ERPS ring instance.

```
erps ring <ring-id> second-slot <value> second-port <value> role [common|  
rpl-port]
```

Configure the virtual channel VLAN for the ERPS ring instance. (Reserved function, configuration not required currently)

```
erps ring <ring-id> virtual-vlan <value>
```

Planning Data

Procedure	Parameter	Description	Attribute	Example
Configuring the signaling VLAN for the ERPS ring instance	ring <ringid>	The ring ID.	Mandatory	1
	control-vlan <vlanid>	The signaling VLAN ID.	Mandatory	100

Procedure	Parameter	Description	Attribute	Example
Configuring the management domain level	mel <mel>	The maintenance entity level. The value ranges from 0 to 7.	Mandatory	7
Associating the ERPS ring instance with the VLAN instance	protect-inst <value>	The protection instance. The value ranges from 1 to 64.	Mandatory	1
Configuring the switching mode for the ERPS ring instance	erps-mode [revertive nonrevertive]	The switching mode. ◆ revertive ◆ nonrevertive	Mandatory	revertive
Configuring the wait-to-restore time for the ERPS ring instance	wrt-time <value>	The wait-to-restore timer. The value ranges from 5 to 12 (unit: minute).	Mandatory	5
Configuring the hold-off time for the ERPS ring instance	holdoff-time <value>	The hold-off timer. The value ranges from 0 to 10000 (unit: millisecond).	Mandatory	1000
Configuring the guard time for the ERPS ring instance	guard-time <value>	The guard timer. The value ranges from 10 to 2000 (unit: millisecond).	Mandatory	500
Configuring properties of the first port in the ERPS ring instance	primary-slot <value>	The number of the first slot.	Mandatory	19
	primary-port <value>	The first uplink port.	Mandatory	3
	role [common rpl-port]	The role of the first port. It can be set to common port or RPL port. A ring instance can be configured with only one RPL port.	Mandatory	common
Configuring properties of the second port in the ERPS ring instance	second-slot <value>	The number of the second slot.	Mandatory	19
	second-port <value>	The second uplink port.	Mandatory	4
	role [common rpl-port]	The role of the second port. It can be set to common port or RPL port. A ring instance can be configured with only one RPL port.	Mandatory	common
Configuring the virtual channel VLAN for the ERPS ring instance	virtual-vlan <value>	The virtual channel VLAN.	Mandatory	-

Example

1. Set the signaling VLAN ID of the ERPS ring instance to 100.
`Admin(config) #erps ring 1 control-vlan 100`
2. Set the management domain level to 7.
`Admin(config) #erps ring 1 mel 7`
3. Associate the ERPS ring instance with the VLAN Instance 1.
`Admin(config) #erps ring 1 protect-inst 1`
4. Configure the switching mode for the ERPS ring instance.
`Admin(config) #erps ring 1 erps-mode revertive`
5. Set the wait-to-restore time for the ERPS ring instance to 5 minutes.
`Admin(config) #erps ring 1 wrt-time 5`
6. Set the hold-off time for the ERPS ring instance to 1000 ms.
`Admin(config) #erps ring 1 holdoff-time 1000`
7. Set the guard time for the ERPS ring instance to 500 ms.
`Admin(config) #erps ring 1 guard-time 500`
8. Set the first port of the common device in the ERPS ring instance to common port.
`Admin(config) #erps ring 1 primary-slot 19 primary-port 3 role common`
9. Set the second port of the common device in the ERPS ring instance to common port.
`Admin(config) #erps ring 1 second-slot 19 second-port 4 role common`

12.6.4.8 Configuring Basic Properties of the RPL Owner in Instance Two

Command Format

Configure the mappings between VLANs and ERPS instances.

```
erps instance <instance-id> vlan-id <vlanid> {to <vlanid-end>} *1
```

Create an ERPS ring.

```
erps ring <ring-id>
```

Configure the roles of the nodes in the ERPS ring instance.

```
erps ring <ring-id> erps-role [common|rpl-owner]
```

Planning Data

Procedure	Parameter	Description	Attribute	Example
Configuring the mappings between the VLANs and the ERPS instance	erps instance <instance-id>	The ERPS instance ID, ranging from 1 to 64.	Mandatory	2
	vlan-id <vlanid>	The starting value of the VLAN ID range to be mapped.	Mandatory	300
	{to <vlanid-end>} *1	The ending value of the VLAN ID range.	Optional	-
Creating an ERPS ring	ring <ring-id>	The ring ID, ranging from 1 to 239.	Mandatory	1
Configuring roles of the nodes in the ERPS ring instance	erps-role [common rpl-owner]	A node can act as the common node or RPL owner.	Mandatory	rpl-owner

Example

1. Map the VLAN 300 to ERPS Instance 2.

```
Admin(config) #erps instance 2 vlan-id 300
```

2. Create an ERPS ring.

```
Admin(config) #erps ring 1
```

3. Set Equipment 2 in Ring Instance 2 to RPL owner.

```
Admin(config) #erps ring 1 erps-role rpl-owner
```

```
Admin(config) #
```

12.6.4.9 Configuring the RPL Owner in Instance Two



Note:

Default values are recommended for the optional configuration items.

Command Format

Configure the signaling VLAN for the ERPS ring instance.

```
erps ring <ringid> control-vlan <vlanid>
```

Configure the management domain level. (Optional)

```
erps ring <ring-id> mel <mel>
```

Associate the ERPS ring instance with the VLAN instance.

```
erps ring <ring-id> protect-inst <value>
```

Configure the switching mode for the ERPS ring instance. (Optional)

```
erps ring <ring-id> erps-mode [revertive|nonrevertive]
```

Configure the wait-to-restore time for the ERPS ring instance. (Optional)

```
erps ring <ring-id> wrt-time <value>
```

Configure the hold-off time for the ERPS ring instance. (Optional)

```
erps ring <ring-id> holdoff-time <value>
```

Configure the guard time for the ERPS ring instance. (Optional)

```
erps ring <ring-id> guard-time <value>
```

Configure properties of the first port in the ERPS ring instance.

```
erps ring <ring-id> primary-slot <value> primary-port <value> role [common|  
rpl-port]
```

Configure properties of the second port in the ERPS ring instance.

```
erps ring <ring-id> second-slot <value> second-port <value> role [common|  
rpl-port]
```

Configure the virtual channel VLAN for the ERPS ring instance. (Reserved function, configuration not required currently)

```
erps ring <ring-id> virtual-vlan <value>
```

Planning Data

Procedure	Parameter	Description	Attribute	Example
Configuring the signaling VLAN for the ERPS ring instance	ring <ringid>	The ring ID.	Mandatory	1
	control-vlan <vlanid>	The signaling VLAN ID.	Mandatory	300

Procedure	Parameter	Description	Attribute	Example
Configuring the management domain level	mel <mel>	The maintenance entity level. The value ranges from 0 to 7.	Mandatory	7
Associating the ERPS ring instance with the VLAN instance	protect-inst <value>	The protection instance. The value ranges from 1 to 64.	Mandatory	2
Configuring the switching mode for the ERPS ring instance	erps-mode [revertive nonrevertive]	The switching mode. ◆ revertive ◆ nonrevertive	Mandatory	revertive
Configuring the wait-to-restore time for the ERPS ring instance	wrt-time <value>	The wait-to-restore timer. The value ranges from 5 to 12 (unit: minute).	Mandatory	5
Configuring the hold-off time for the ERPS ring instance	holdoff-time <value>	The hold-off timer. The value ranges from 0 to 10000 (unit: millisecond).	Mandatory	1000
Configuring the guard time for the ERPS ring instance	guard-time <value>	The guard timer. The value ranges from 10 to 2000 (unit: millisecond).	Mandatory	500
Configuring properties of the first port in the ERPS ring instance	primary-slot <value>	The number of the first slot.	Mandatory	19
	primary-port <value>	The first uplink port.	Mandatory	3
	role [common rpl-port]	The role of the first port. It can be set to common port or RPL port. A ring instance can be configured with only one RPL port.	Mandatory	rpl-port
Configuring properties of the second port in the ERPS ring instance	second-slot <value>	The number of the second slot.	Mandatory	19
	second-port <value>	The second uplink port.	Mandatory	4
	role [common rpl-port]	The role of the second port. It can be set to common port or RPL port. A ring instance can be configured with only one RPL port.	Mandatory	common
Configuring the virtual channel VLAN for the ERPS ring instance	virtual-vlan <value>	The virtual channel VLAN	Mandatory	-

Example

1. Set the signaling VLAN ID of the ERPS ring instance to 300.
`Admin(config) #erps ring 1 control-vlan 300`
2. Set the management domain level to 7.
`Admin(config) #erps ring 1 mel 7`
3. Associate the ERPS ring instance with the VLAN Instance 2.
`Admin(config) #erps ring 1 protect-inst 2`
4. Configure the switching mode for the ERPS ring instance.
`Admin(config) #erps ring 1 erps-mode revertive`
5. Set the wait-to-restore time for the ERPS ring instance to 5 minutes.
`Admin(config) #erps ring 1 wrt-time 5`
6. Set the hold-off time for the ERPS ring instance to 1000 ms.
`Admin(config) #erps ring 1 holdoff-time 1000`
7. Set the guard time for the ERPS ring instance to 500 ms.
`Admin(config) #erps ring 1 guard-time 500`
8. Set the first port of the RPL owner device in the ERPS ring instance to RPL port.
`Admin(config) #erps ring 1 primary-slot 19 primary-port 3 role rpl-port`
9. Set the second port of the RPL owner device in the ERPS ring instance to common port.
`Admin(config) #erps ring 1 second-slot 19 second-port 4 role common`

12.6.4.10 Configuring Basic Properties of Common Nodes in Instance Two

Command Format

Configure the mappings between VLANs and ERPS instances.

```
erps instance <instance-id> vlan-id <vlanid> {to <vlanid-end>} *1
```

Create an ERPS ring.

```
erps ring <ring-id>
```

Configure the roles of the nodes in the ERPS ring instance.

```
erps ring <ring-id> erps-role [common|rpl-owner]
```

Planning Data

Procedure	Parameter	Description	Attribute	Example
Configuring the mappings between the VLANs and the ERPS instance	erps instance <instance-id>	The ERPS instance ID, ranging from 1 to 64.	Mandatory	2
	vlan-id <vlanid>	The starting value of the VLAN ID range to be mapped.	Mandatory	300
	{to <vlanid-end>} *1	The ending value of the VLAN ID range	Optional	-
Creating an ERPS ring	ring <ring-id>	The ring ID, ranging from 1 to 239.	Mandatory	1
Configuring roles of the nodes in the ERPS ring instance	erps-role [common rpl-owner]	A node can act as the common node or RPL owner.	Mandatory	common

Example

1. Map the VLAN 300 to ERPS Instance 2.
Admin(config) #**erps instance 2 vlan-id 300**
2. Create an ERPS ring.
Admin(config) #**erps ring 1**
3. Set Equipment 1 and Equipment 3 in Ring Instance 2 to common nodes.
Admin(config) #**erps ring 1 erps-role common**
Admin(config) #

12.6.4.11 Configuring Common Nodes in Instance Two



Note:

Default values are recommended for the optional configuration items.

Command Format

Configure the signaling VLAN for the ERPS ring instance.

```
erps ring <ringid> control-vlan <vlanid>
```

Configure the management domain level. (Optional)

```
erps ring <ring-id> mel <mel>
```

Associate the ERPS ring instance with the VLAN instance.

```
erps ring <ring-id> protect-inst <value>
```

Configure the switching mode for the ERPS ring instance. (Optional)

```
erps ring <ring-id> erps-mode [revertive|nonrevertive]
```

Configure the wait-to-restore time for the ERPS ring instance. (Optional)

```
erps ring <ring-id> wrt-time <value>
```

Configure the hold-off time for the ERPS ring instance. (Optional)

```
erps ring <ring-id> holdoff-time <value>
```

Configure the guard time for the ERPS ring instance. (Optional)

```
erps ring <ring-id> guard-time <value>
```

Configure properties of the first port in the ERPS ring instance.

```
erps ring <ring-id> primary-slot <value> primary-port <value> role [common|  
rpl-port]
```

Configure properties of the second port in the ERPS ring instance.

```
erps ring <ring-id> second-slot <value> second-port <value> role [common|  
rpl-port]
```

Configure the virtual channel VLAN for the ERPS ring instance. (Reserved function, configuration not required currently)

```
erps ring <ring-id> virtual-vlan <value>
```

Planning Data

Procedure	Parameter	Description	Attribute	Example
Configuring the signaling VLAN for the ERPS ring instance	ring <ringid>	The ring ID.	Mandatory	1
	control-vlan <vlanid>	The signaling VLAN ID.	Mandatory	300

Procedure	Parameter	Description	Attribute	Example
Configuring the management domain level	mel <mel>	The maintenance entity level. The value ranges from 0 to 7.	Mandatory	7
Associating the ERPS ring instance with the VLAN instance	protect-inst <value>	The protection instance. The value ranges from 1 to 64.	Mandatory	2
Configuring the switching mode for the ERPS ring instance	erps-mode [revertive nonrevertive]	The switching mode. ◆ revertive ◆ nonrevertive	Mandatory	revertive
Configuring the wait-to-restore time for the ERPS ring instance	wrt-time <value>	The wait-to-restore timer. The value ranges from 5 to 12 (unit: minute).	Mandatory	5
Configuring the hold-off time for the ERPS ring instance	holdoff-time <value>	The hold-off timer. The value ranges from 0 to 10000 (unit: millisecond).	Mandatory	1000
Configuring the guard time for the ERPS ring instance	guard-time <value>	The guard timer. The value ranges from 10 to 2000 (unit: millisecond).	Mandatory	500
Configuring properties of the first port in the ERPS ring instance	primary-slot <value>	The number of the first slot.	Mandatory	19
	primary-port <value>	The first uplink port.	Mandatory	3
	role [common rpl-port]	The role of the first port. It can be set to common port or RPL port. A ring instance can be configured with only one RPL port.	Mandatory	common
Configuring properties of the second port in the ERPS ring instance	second-slot <value>	The number of the second slot.	Mandatory	19
	second-port <value>	The second uplink port.	Mandatory	4
	role [common rpl-port]	The role of the second port. It can be set to common port or RPL port. A ring instance can be configured with only one RPL port.	Mandatory	common
Configuring the virtual channel VLAN for the ERPS ring instance	virtual-vlan <value>	The virtual channel VLAN.	Mandatory	-

Example

1. Set the signaling VLAN ID of the ERPS ring instance to 300.

```
Admin(config) #erps ring 1 control-vlan 300
```

2. Set the management domain level to 7.

```
Admin(config) #erps ring 1 mel 7
```

3. Associate the ERPS ring instance with the VLAN Instance 2.

```
Admin(config) #erps ring 1 protect-inst 2
```

4. Configure the switching mode for the ERPS ring instance.

```
Admin(config) #erps ring 1 erps-mode revertive
```

5. Set the wait-to-restore time for the ERPS ring instance to 5 minutes.

```
Admin(config) #erps ring 1 wrt-time 5
```

6. Set the hold-off time for the ERPS ring instance to 1000 ms.

```
Admin(config) #erps ring 1 holdoff-time 1000
```

7. Set the guard time for the ERPS ring instance to 500 ms.

```
Admin(config) #erps ring 1 guard-time 500
```

8. Set the first port of the common device in the ERPS ring instance to common port.

```
Admin(config) #erps ring 1 primary-slot 19 primary-port 3 role common
```

9. Set the second port of the common device in the ERPS ring instance to common port.

```
Admin(config) #erps ring 1 second-slot 19 second-port 4 role common
```

12.6.5 Configuring Tangent Ring Protection

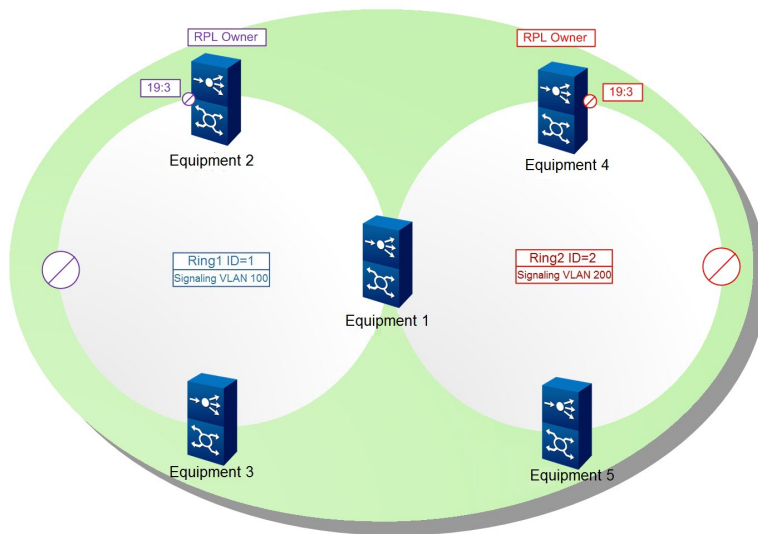
12.6.5.1 Network Scenario

Service Planning

Five OLT devices constitute two tangent ERPS protection rings, and each ring corresponds to an ERPS instance. The two instances protect different services.

Network Diagram

The figure below shows the network for the tangent-ring ERPS.



The configuration in this example covers three parts: the equipment at the non-tangent points of Ring 1 (including Equipment 2 and 3), the equipment at the non-tangent points of Ring 2 (including Equipment 4 and 5), and the equipment at the tangent point (Equipment 1).

- ◆ Ring 1: Equipment 2 acts as the RPL Owner, and Port 19:3 as the RPL port and is blocked. With the signaling VLAN ID 100 and the ring ID 1, the ring protects the service with the VLAN ID 1000.
- ◆ Ring 2: Equipment 4 acts as the RPL owner, and Port 19:3 as the RPL port and is blocked. With the signaling VLAN ID 200 and the ring ID 2, the ring protects the service with the VLAN ID 2000.
- ◆ Equipment at the tangent point: Equipment 1 acts as the tangent point of the two rings. Two instances need to be created for the equipment to correspond to the signaling transmission for the two rings respectively.

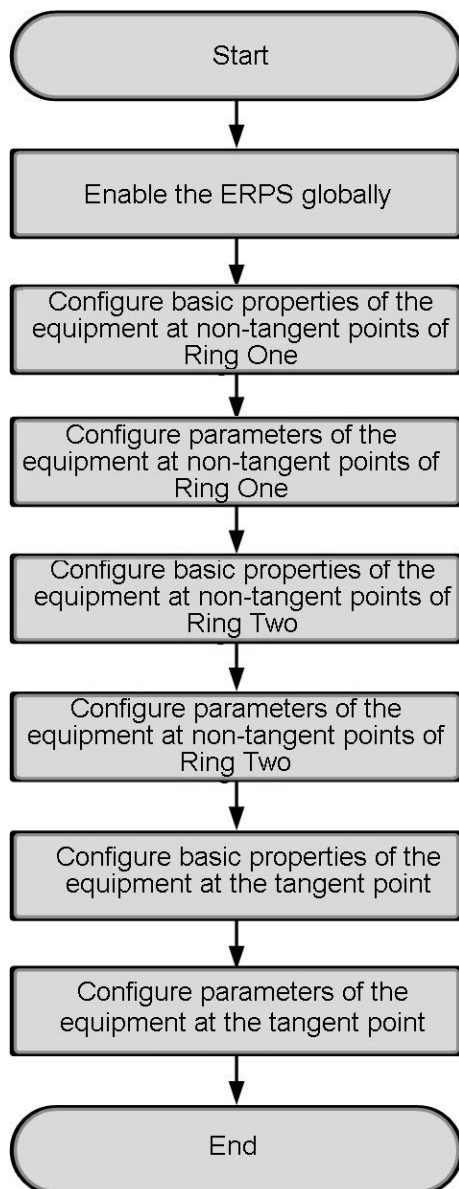
The table below describes the mappings between the ERPS instances created for the equipment and the rings in the example.

Equipment Name	Equipment Role	Ring Corresponding to Instance 1	Ring Corresponding to Instance 2
Equipment 1	Equipment at the tangent point	Ring 1	Ring 2
Equipment 2	RPL owner of Ring 1	Ring 1	N/A
Equipment 3	Common node of Ring 1	Ring 1	N/A

Equipment Name	Equipment Role	Ring Corresponding to Instance 1	Ring Corresponding to Instance 2
Equipment 4	RPL owner of Ring 2	N/A	Ring 2
Equipment 5	Common node of Ring 2	N/A	Ring 2

12.6.5.2 Configuration Flow

The VLAN service channel has been created. Please refer to [Basic Configurations](#) for the creation method.



12.6.5.3 Enabling the ERPS Globally

Command Format

```
erps mode [enable|disable]
```

Planning Data

Parameter	Description	Attribute	Example
erps mode [enable disable]	Enables or disables the ERPS function.	Mandatory	enable

Example

Enable the ERPS function.

```
Admin(config) #erps mode enable
Admin(config) #
```

12.6.5.4 Configuring Basic Properties of the Equipment at Non-Tangent Points of Ring One

Command Format

Configure the mappings between VLANs and ERPS instances.

```
erps instance <instance-id> vlan-id <vlanid> {to <vlanid-end>} *1
```

Planning Data

Parameter	Description	Attribute	Example
erps instance <instance-id>	The ERPS instance ID, ranging from 1 to 64.	Mandatory	1
vlan-id <vlanid>	The starting value of the VLAN ID range to be mapped.	Mandatory	100, 1000
{to <vlanid-end>} *1	The ending value of the VLAN ID range.	Optional	-

Example

Map VLANs 100 and 1000 to ERPS Instance 1.

```
Admin(config) #erps instance 1 vlan-id 100
```

```
Admin(config) #erps instance 1 vlan-id 1000
```

```
Admin(config) #
```

12.6.5.5 Configuring Parameters of the Equipment at Non-Tangent Points of Ring One



Note:

Default values are recommended for the optional configuration items.

Command Format

Create an ERPS ring.

```
erps ring <ring-id>
```

Configure the roles of the nodes in the ERPS ring instance.

```
erps ring <ring-id> erps-role [common|rpl-owner]
```

Configure the signaling VLAN for the ERPS ring instance.

```
erps ring <ringid> control-vlan <vlanid>
```

Configure the management domain level. (Optional)

```
erps ring <ring-id> mel <mel>
```

Associate the ERPS ring instance with the VLAN instance.

```
erps ring <ring-id> protect-inst <value>
```

Configure the switching mode for the ERPS ring instance. (Optional)

```
erps ring <ring-id> erps-mode [revertive|nonrevertive]
```

Configure the wait-to-restore time for the ERPS ring instance. (Optional)

```
erps ring <ring-id> wrt-time <value>
```

Configure the hold-off time for the ERPS ring instance. (Optional)

```
erps ring <ring-id> holdoff-time <value>
```

Configure the guard time for the ERPS ring instance. (Optional)

```
erps ring <ring-id> guard-time <value>
```

Configure properties of the first port in the ERPS ring instance.

```
erps ring <ring-id> primary-slot <value> primary-port <value> role [common|
rpl-port]
```

Configure properties of the second port in the ERPS ring instance.

```
erps ring <ring-id> second-slot <value> second-port <value> role [common|
rpl-port]
```

Configure the virtual channel VLAN for the ERPS ring instance. (Reserved function, configuration not required currently)

```
erps ring <ring-id> virtual-vlan <value>
```

Planning Data

Procedure	Parameter	Description	Attribute	Example	
				Equipment 2	Equipment 3
Creating an ERPS ring	ring <ring-id>	The ring ID.	Mandatory	1	1
Configuring roles of the nodes in the ERPS ring instance	erps-role [common rpl-owner]	A node can act as the common node or RPL owner.	Mandatory	rpl-owner	common
Configuring the signaling VLAN for the ERPS ring instance	ring <ringid>	The ring ID.	Mandatory	1	1
	control-vlan <vlanid>	The signaling VLAN ID.	Mandatory	100	100
Configuring the management domain level	mel <mel>	The maintenance entity level. The value ranges from 0 to 7.	Mandatory	7	7
Associating the ERPS ring instance with the VLAN instance	protect-inst <value>	The protection instance. The value ranges from 1 to 64.	Mandatory	1	1

Procedure	Parameter	Description	Attribute	Example	
				Equipment 2	Equipment 3
Configuring the switching mode for the ERPS ring instance	erps-mode [revertive] nonrevertive]	The switching mode. ◆ revertive ◆ nonrevertive	Mandatory	revertive	revertive
Configuring the wait-to-restore time for the ERPS ring instance	wrt-time <value>	The wait-to-restore timer. The value ranges from 5 to 12 (unit: minute).	Mandatory	5	5
Configuring the hold-off time for the ERPS ring instance	holdoff-time <value>	The hold-off timer. The value ranges from 0 to 10000 (unit: millisecond).	Mandatory	1000	1000
Configuring the guard time for the ERPS ring instance	guard-time <value>	The guard timer. The value ranges from 10 to 2000 (unit: millisecond).	Mandatory	500	500
Configuring properties of the first port in the ERPS ring instance	primary-slot <value>	The number of the first slot.	Mandatory	19	19
	primary-port <value>	The first uplink port.	Mandatory	3	3
	role [common] rpl-port]	The role of the first port. It can be set to common port or RPL port. A ring instance can be configured with only one RPL port.	Mandatory	rpl-port	common
Configuring properties of the second port in the ERPS ring instance	second-slot <value>	The number of the second slot.	Mandatory	19	19
	second-port <value>	The second uplink port.	Mandatory	4	4
	role [common] rpl-port]	The role of the second port. It can be set to common port or RPL port. A ring instance can be configured with only one RPL port.	Mandatory	common	common
Configuring the virtual channel VLAN for the ERPS ring instance	virtual-vlan <value>	The virtual channel VLAN.	Mandatory	-	-

Example

1. Create an ERPS ring.

```
Admin(config) #erps ring 1
```

2. Set Equipment 2 to RPL owner and Equipment 3 to common node in the ERPS ring instance.

```
Admin(config) #erps ring 1 erps-role rpl-owner
```

```
Admin(config) #erps ring 1 erps-role common
```

```
Admin(config) #
```

3. Set the signaling VLAN ID of the ERPS ring instance to 100.

```
Admin(config) #erps ring 1 control-vlan 100
```

4. Set the management domain level to 7.

```
Admin(config) #erps ring 1 mel 7
```

5. Associate the ERPS ring instance with the VLAN Instance 1.

```
Admin(config) #erps ring 1 protect-inst 1
```

6. Configure the switching mode for the ERPS ring instance.

```
Admin(config) #erps ring 1 erps-mode revertive
```

7. Set the wait-to-restore time for the ERPS ring instance to 5 minutes.

```
Admin(config) #erps ring 1 wrt-time 5
```

8. Set the hold-off time for the ERPS ring instance to 1000 ms.

```
Admin(config) #erps ring 1 holdoff-time 1000
```

9. Set the guard time for the ERPS ring instance to 500 ms.

```
Admin(config) #erps ring 1 guard-time 500
```

10. Set the first port of Equipment 2 to RPL port and the first port of Equipment 3 to common port in the ERPS ring instance.

```
Admin(config) #erps ring 1 primary-slot 19 primary-port 3 role rpl-port
```

```
Admin(config) #erps ring 1 primary-slot 19 primary-port 3 role common
```

11. Set the second port of Equipment 2 and Equipment 3 to common port in the ERPS ring instance.

```
Admin(config) #erps ring 1 second-slot 19 second-port 4 role common
```

```
Admin(config) #
```

12.6.5.6 Configuring Basic Properties of the Equipment at Non-Tangent Points of Ring Two

Command Format

Configure the mappings between VLANs and ERPS instances.

```
erps instance <instance-id> vlan-id <vlanid> {to <vlanid-end>} *1
```

Planning Data

Parameter	Description	Attribute	Example
erps instance <instance-id>	The ERPS instance ID, ranging from 1 to 64.	Mandatory	2
vlan-id <vlanid>	The starting value of the VLAN ID range to be mapped.	Mandatory	200, 2000
{to <vlanid-end>} *1	The ending value of the VLAN ID range.	Optional	-

Example

Map VLANs 200 and 2000 to ERPS Instance 2.

```
Admin(config) #erps instance 2 vlan-id 200
Admin(config) #erps instance 2 vlan-id 2000
Admin(config) #
```

12.6.5.7 Configuring Parameters for the Equipment at Non-Tangent Points of Ring Two



Note:

Default values are recommended for the optional configuration items.

Command Format

Create an ERPS ring.

```
erps ring <ring-id>
```

Configure the roles of the nodes in the ERPS ring instance.

```
erps ring <ring-id> erps-role [common|rpl-owner]
```

Configure the signaling VLAN for the ERPS ring instance.

```
erps ring <ringid> control-vlan <vlanid>
```

Configure the management domain level. (Optional)

```
erps ring <ring-id> mel <mel>
```

Associate the ERPS ring instance with the VLAN instance.

```
erps ring <ring-id> protect-inst <value>
```

Configure the switching mode for the ERPS ring instance. (Optional)

```
erps ring <ring-id> erps-mode [revertive|nonrevertive]
```

Configure the wait-to-restore time for the ERPS ring instance. (Optional)

```
erps ring <ring-id> wrt-time <value>
```

Configure the hold-off time for the ERPS ring instance. (Optional)

```
erps ring <ring-id> holdoff-time <value>
```

Configure the guard time for the ERPS ring instance. (Optional)

```
erps ring <ring-id> guard-time <value>
```

Configure properties of the first port in the ERPS ring instance.

```
erps ring <ring-id> primary-slot <value> primary-port <value> role [common|  
rpl-port]
```

Configure properties of the second port in the ERPS ring instance.

```
erps ring <ring-id> second-slot <value> second-port <value> role [common|  
rpl-port]
```

Configure the virtual channel VLAN for the ERPS ring instance. (Reserved function, configuration not required currently)

```
erps ring <ring-id> virtual-vlan <value>
```

Planning Data

Procedure	Parameter	Description	Attribute	Example	
				Equipment 4	Equipment 5
Creating an ERPS ring	ring <ring-id>	The ring ID.	Mandatory	2	2
Configuring roles of the nodes in the ERPS ring instance	erps-role [common rpl-owner]	The node can act as a common node or RPL owner.	Mandatory	rpl-owner	common
Configuring the signaling VLAN for the ERPS ring instance	ring <ringid>	The ring ID.	Mandatory	2	2
	control-vlan <vlanid>	The signaling VLAN ID.	Mandatory	200	200
Configuring the management domain level	mel <mel>	The maintenance entity level. The value ranges from 0 to 7.	Mandatory	7	7
Associating the ERPS ring instance with the VLAN instance	protect-inst <value>	The protection instance. The value ranges from 1 to 64.	Mandatory	2	2
Configuring the switching mode for the ERPS ring instance	erps-mode [revertive nonrevertive]	The switching mode. ◆ revertive ◆ nonrevertive	Mandatory	revertive	revertive
Configuring the wait-to-restore time for the ERPS ring instance	wrt-time <value>	The wait-to-restore timer. The value ranges from 5 to 12 (unit: minute).	Mandatory	5	5
Configuring the hold-off time for the ERPS ring instance	holdoff-time <value>	The hold-off timer. The value ranges from 0 to 10000 (unit: millisecond).	Mandatory	1000	1000
Configuring the guard time for the ERPS ring instance	guard-time <value>	The guard timer. The value ranges from 10 to 2000 (unit: millisecond).	Mandatory	500	500

Procedure	Parameter	Description	Attribute	Example	
				Equipment 4	Equipment 5
Configuring properties of the first port in the ERPS ring instance	primary-slot <value>	The number of the first slot.	Mandatory	19	19
	primary-port <value>	The first uplink port.	Mandatory	3	3
	role [common rpl-port]	The role of the first port. It can be set to common port or RPL port. A ring instance can be configured with only one RPL port.	Mandatory	rpl-port	common
Configuring properties of the second port in the ERPS ring instance	second-slot <value>	The number of the second slot.	Mandatory	19	19
	second-port <value>	The second uplink port.	Mandatory	4	4
	role [common rpl-port]	The role of the second port. It can be set to common port or RPL port. A ring instance can be configured with only one RPL port.	Mandatory	common	common
Configuring the virtual channel VLAN for the ERPS ring instance	virtual-vlan <value>	The virtual channel VLAN.	Mandatory	-	-

Example

1. Create an ERPS ring.

```
Admin(config) #erps ring 2
```

2. Set Equipment 4 to RPL owner and Equipment 5 to common node in the ERPS ring instance.

```
Admin(config) #erps ring 2 erps-role rpl-owner
```

```
Admin(config) #erps ring 2 erps-role common
```

```
Admin(config) #
```

3. Set the signaling VLAN ID of the ERPS ring instance to 200.

```
Admin(config) #erps ring 2 control-vlan 200
```

- Set the management domain level to 7.

```
Admin(config) #erps ring 2 mel 7
```

- Associate the ERPS ring instance with the VLAN Instance 2.

```
Admin(config) #erps ring 2 protect-inst 2
```

- Configure the switching mode for the ERPS ring instance.

```
Admin(config) #erps ring 2 erps-mode revertive
```

- Set the wait-to-restore time for the ERPS ring instance to 5 minutes.

```
Admin(config) #erps ring 2 wrt-time 5
```

- Set the hold-off time for the ERPS ring instance to 1000 ms.

```
Admin(config) #erps ring 2 holdoff-time 1000
```

- Set the guard time for the ERPS ring instance to 500 ms.

```
Admin(config) #erps ring 2 guard-time 500
```

- Set the first port of Equipment 4 to RPL port and the first port of Equipment 5 to common port in the ERPS ring instance.

```
Admin(config) #erps ring 2 primary-slot 19 primary-port 3 role rpl-port
```

```
Admin(config) #erps ring 2 primary-slot 19 primary-port 3 role common
```

- Set the second port of Equipment 4 and Equipment 5 to common port in the ERPS ring instance.

```
Admin(config) #erps ring 2 second-slot 19 second-port 4 role common
```

```
Admin(config) #
```

12.6.5.8 Configuring Basic Properties of the Equipment at the Tangent Point

Command Format

Configure the mappings between VLANs and ERPS instances.

```
erps instance <instance-id> vlan-id <vlanid> {to <vlanid-end>} *1
```

Planning Data

Parameter	Description	Attribute	Example	
			Ring 1	Ring 2
erps instance <instance-id>	The ERPS instance ID, ranging from 1 to 64.	Mandatory	1	2

Parameter	Description	Attribute	Example	
			Ring 1	Ring 2
<code>vlan-id <vlanid></code>	The starting value of the VLAN ID range to be mapped.	Mandatory	100, 1000	200, 2000
<code>{to <vlanid-end>}*1</code>	The ending value of the VLAN ID range.	Optional	-	-

Example

1. Map VLANs 100 and 1000 to ERPS Instance 1.

```
Admin(config) #erps instance 1 vlan-id 100
```

```
Admin(config) #erps instance 1 vlan-id 1000
```

2. Map VLANs 200 and 2000 to ERPS Instance 2.

```
Admin(config) #erps instance 2 vlan-id 200
```

```
Admin(config) #erps instance 2 vlan-id 2000
```

```
Admin(config) #
```

12.6.5.9 Configuring Parameters of the Equipment at the Tangent Point



Note:

Default values are recommended for the optional configuration items.

Command Format

Create an ERPS ring.

```
erps ring <ring-id>
```

Configure the roles of the nodes in the ERPS ring instance.

```
erps ring <ring-id> erps-role [common|rpl-owner]
```

Configure the signaling VLAN for the ERPS ring instance.

```
erps ring <ringid> control-vlan <vlanid>
```

Configure the management domain level. (Optional)

```
erps ring <ring-id> mel <mel>
```

Associate the ERPS ring instance with the VLAN instance.

```
erps ring <ring-id> protect-inst <value>
```

Configure the switching mode for the ERPS ring instance. (Optional)

```
erps ring <ring-id> erps-mode [revertive|nonrevertive]
```

Configure the wait-to-restore time for the ERPS ring instance. (Optional)

```
erps ring <ring-id> wrt-time <value>
```

Configure the hold-off time for the ERPS ring instance. (Optional)

```
erps ring <ring-id> holdoff-time <value>
```

Configure the guard time for the ERPS ring instance. (Optional)

```
erps ring <ring-id> guard-time <value>
```

Configure properties of the first port in the ERPS ring instance.

```
erps ring <ring-id> primary-slot <value> primary-port <value> role [common|  
rpl-port]
```

Configure properties of the second port in the ERPS ring instance.

```
erps ring <ring-id> second-slot <value> second-port <value> role [common|  
rpl-port]
```

Configure the virtual channel VLAN for the ERPS ring instance. (Reserved function, configuration not required currently)

```
erps ring <ring-id> virtual-vlan <value>
```

Planning Data

Procedure	Parameter	Description	Attribute	Example	
				Ring 1	Ring 2
Creating an ERPS ring	ring <ring-id>	The ring ID.	Mandatory	1	2

Procedure	Parameter	Description	Attribute	Example	
				Ring 1	Ring 2
Configuring roles of the nodes in the ERPS ring instance	erps-role [common rpl-owner]	The node can act as a common node or RPL owner.	Mandatory	common	common
Configuring the signaling VLAN for the ERPS ring instance	ring <ringid>	The ring ID.	Mandatory	1	2
	control-vlan <vlanid>	The signaling VLAN ID.	Mandatory	100	200
Configuring the management domain level	mel <mel>	The maintenance entity level. The value ranges from 0 to 7.	Mandatory	7	7
Associating the ERPS ring instance with the VLAN instance	protect-inst <value>	The protection instance. The value ranges from 1 to 64.	Mandatory	1	2
Configuring the switching mode for the ERPS ring instance	erps-mode [revertive nonrevertive]	The switching mode. ◆ revertive ◆ nonrevertive	Mandatory	revertive	revertive
Configuring the wait-to-restore time for the ERPS ring instance	wrt-time <value>	The wait-to-restore timer. The value ranges from 5 to 12 (unit: minute).	Mandatory	5	5
Configuring the hold-off time for the ERPS ring instance	holdoff-time <value>	The hold-off timer. The value ranges from 0 to 10000 (unit: millisecond).	Mandatory	1000	1000
Configuring the guard time for the ERPS ring instance	guard-time <value>	The guard timer. The value ranges from 10 to 2000 (unit: millisecond).	Mandatory	500	500
Configuring properties of the first port in the ERPS ring instance	primary-slot <value>	No. of the first slot.	Mandatory	19	19
	primary-port <value>	The first uplink port.	Mandatory	3	3
	role [common rpl-port]	The role of the first port. It can be set to common port or RPL port. A ring instance can be configured with only one RPL port.	Mandatory	common	common

Procedure	Parameter	Description	Attribute	Example	
				Ring 1	Ring 2
Configuring properties of the second port in the ERPS ring instance	second-slot <value>	The number of the second slot.	Mandatory	19	19
	second-port <value>	The second uplink port.	Mandatory	4	4
	role [common rpl-port]	The role of the second port. It can be set to common port or RPL port. A ring instance can be configured with only one RPL port.	Mandatory	common	common
Configuring the virtual channel VLAN for the ERPS ring instance	virtual-vlan <value>	The virtual channel VLAN.	Mandatory	-	-

Example

1. Create the ERPS ring for Equipment 1.

```
Admin(config) #erps ring 1
```

```
Admin(config) #erps ring 2
```

2. Set Equipment 1 to common node in the ERPS ring instances 1 and 2.

```
Admin(config) #erps ring 1 erps-role common
```

```
Admin(config) #erps ring 2 erps-role common
```

3. Set the signaling VLAN ID to 100 for the ERPS ring instance 1, and 200 for the ERPS ring instance 2.

```
Admin(config) #erps ring 1 control-vlan 100
```

```
Admin(config) #erps ring 2 control-vlan 200
```

4. Set the management domain level to 7 for the ERPS ring instances 1 and 2.

```
Admin(config) #erps ring 1 mel 7
```

```
Admin(config) #erps ring 2 mel 7
```

5. Associate the ERPS ring instance 1 with the VLAN instance 1, and associate the ERPS ring instance 2 with the VLAN instance 2.

```
Admin(config) #erps ring 1 protect-inst 1
```

```
Admin(config) #erps ring 2 protect-inst 2
```

6. Configure the switching mode for the ERPS ring instances 1 and 2.

```
Admin(config) #erps ring 1 erps-mode revertive
```

```
Admin(config) #erps ring 2 erps-mode revertive
```

7. Set the wait-to-restore time to 5 minutes for the ERPS ring instances 1 and 2.

```
Admin(config) #erps ring 1 wrt-time 5
```

```
Admin(config) #erps ring 2 wrt-time 5
```

8. Set the hold-off time to 1000 ms for the ERPS ring instances 1 and 2.

```
Admin(config) #erps ring 1 holdoff-time 1000
```

```
Admin(config) #erps ring 2 holdoff-time 1000
```

9. Set the guard time to 500 ms for the ERPS ring instances 1 and 2.

```
Admin(config) #erps ring 1 guard-time 500
```

```
Admin(config) #erps ring 2 guard-time 500
```

10. Set the first port of Equipment 1 to common port for the ERPS ring instances 1 and 2.

```
Admin(config) #erps ring 1 primary-slot 19 primary-port 3 role common
```

```
Admin(config) #erps ring 2 primary-slot 19 primary-port 3 role common
```

11. Set the second port of Equipment 1 to common port for the ERPS ring instances 1 and 2.

```
Admin(config) #erps ring 1 second-slot 19 second-port 4 role common
```

```
Admin(config) #erps ring 2 second-slot 19 second-port 4 role common
```

```
Admin(config) #
```

13 **Configuring Traffic Classification**

- ☒ Background Information
- ☒ Configuration Rules
- ☒ Configuration Example for Traffic Classification Based on the L4 Source Port
- ☒ Configuration Example for Traffic Classification Based on the SVLAN

13.1 Background Information

Traffic classification refers to classification of packets according to their features and certain rules to differentiate the services, process the services in different ways, and provide different quality of services. For example, to provide Internet, voice and IPTV services for the same user, you need to classify the service packets into three service flows.

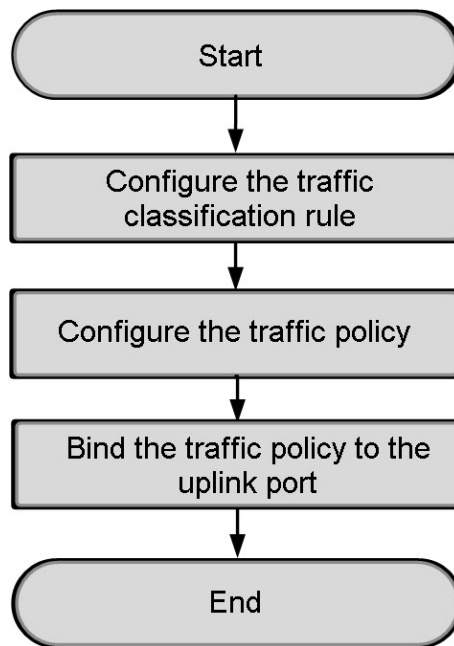
13.2 Configuration Rules

Configure the traffic classification rules. When a traffic flow complies with the configured rules, the equipment reacts according to the set rules.

- ◆ When the traffic classification object is an uplink port, only the downlink traffic policy and downlink rule are valid.
- ◆ When the traffic classification object is a main card port, only the uplink traffic policy and uplink rule are valid.
- ◆ When the traffic classification object is an ONU port, both the uplink and downlink traffic policies and the uplink and downlink rules are valid.

13.3 Configuration Example for Traffic Classification Based on the L4 Source Port

13.3.1 Configuration Flow



13.3.2 Configuring the Traffic Classification Rules

Command Format

```
flow-rule-profile add <name> { [id] <id> } *1 { [src-mac|dst-mac|src-ipv4-  
addr|dst-ipv4-addr|vlan|eth-type|ip-protocol-type|cos|tos-dscp|l4-src-  
port|l4-dst-port|ttl|vlan|ip-ver|traff-class|traff-label|ipv6-next-  
header] [range|value_mask|equal|not_equal|exist_match|not_exist_match]  
<value1> [<value2>|null] } *8
```

Data Planning

Parameter	Description	Attribute	Example
<code>flow-rule-profile add <name></code>	The rule name.	Mandatory	rule0
<code>{[id] <id>}*1</code>	The rule ID. Specify the ID of the rule profile to be added. If this parameter is not configured, the system will assign a profile ID automatically. The value ranges from 1 to 256.	Optional	8
<code>[src-mac dst-mac src-ipv4-addr dst-ipv4-addr svlan eth-type ip-protocol-type cos tos-dscp l4-src-port l4-dst-port ttl cvlan ip-ver traff-class traff-label ipv6-next-header]</code>	The rule domain type. This parameter is used to set the rule type. You can select one from the following list of rule types: ◆ src-mac: based on the source MAC address ◆ dst-mac: based on the destination MAC address ◆ src-ipv4-addr: based on the source IPv4 address ◆ dst-ipv4-addr: based on the destination IPv4 address ◆ svlan: based on the SVLAN ◆ eth-type: based on the Ethernet type ◆ ip-protocol-type: based on the IP protocol type ◆ cos: based on the Ethernet priority ◆ tos-dscp: based on TOS/DSCP ◆ l4-src-port: based on the L4 source port number ◆ l4-dst-port: based on the L4 destination port number ◆ ttl: based on the TTL ◆ cvlan: based on the CVLAN ◆ ip-ver: based on the IP version number ◆ traff-class: based on the IPv6 traffic classification ◆ traff-label: based on the IPv6 traffic label ◆ ipv6-next-header: based on the IPv6 next header	Optional	l4-src-port

Parameter	Description	Attribute	Example
[range value_mask equal not_equal exist_match not_exist_match]	The matching type. This parameter is used to set the logical conditions for rule matching. You can select one from the following list of matching types: ◆ equal: equal to ◆ not_equal: not equal to ◆ exist_match: existing means matching ◆ not_exist_match: not existing means matching ◆ value_mask: value plus mask ◆ range: range	Optional	equal
<value1>	The rule domain value for rule matching.	Optional	3
[<value2> null]	The rule domain value 2 for rule matching. When the matching type is set to "range" or "value_mask", this parameter cannot be set to "null". For other matching types, this parameter should be set to "null".	Optional	null

Example

Configure a traffic rule profile with the profile ID 8. Configure one rule (at most eight rules can be configured) for the profile, setting the rule name to rule0, the rule type to "l4-src-port" (based on the L4 source port number), the matching type to "equal", the rule domain value to "3", and the rule domain value 2 to "null".

```
Admin(config) #flow-rule-profile add rule0 id 8 l4-src-port equal 3 null
```

13.3.3 Configuring the Traffic Policy

Command Format

```
flow-policy-profile add <name> {[id] <id>}*1 {[pri] <1-12>}*1 {[acl]
[enable|disable]}*1 {[forward] [enable|disable]}*1 {[re-cos] [enable|
disable]}*1 {[cos] <0-7>}*1 {[re-dscp] [enable|disable]}*1 {[dscp] <0-63>}
*1 {[re-traffic] [enable|disable]}*1 {[traffic] <traffic>}*1 {[re-queue] [enable|
disable]}*1 {[queue] <0-7>}*1 {[re-port] [enable|disable]}*1 {[rdport]
<port>}*1 {[flow-mirr] [enable|disable]}*1 {[mirrport] <port>}*1 {[rate-
limit] [enable|disable]}*1 {[cir] <cir>}*1 {[cbs] <cbs>}*1 {[ebs] <ebs>}*1
{[pir] <pir>}*1 {[re-vlan] [enable|disable]}*1 {[vlanact] [add|tras]}*1
{[vid] <1-4095>}*1
```

Data Planning

Parameter	Description	Attribute	Example
flow-policy-profile add <name>	The name of the policy profile.	Mandatory	policy5
{ [id] <id>*1	The ID of the policy profile.	Optional	8
{ [pri] <1-12>*1	The policy priority level, ranging from 1 to 12. The value "1" stands for the lowest priority level, and "12" the highest one.	Optional	3
{ [acl] [enable disable]}*1	The ACL function switch.	Optional	enable
{ [forward] [enable disable]}*1	The forwarding flag. Configure this item according to the network planning of the operator. It cannot be configured when the ACL function is disabled. ◆ enable: Only the traffic matching the set rule is forwarded, while other traffics are discarded. ◆ disable: The traffic matching the rule is discarded, while other traffics are forwarded.	Optional	enable
{ [re-cos] [enable disable]}*1	The CoS remarking flag. It is used to enable or disable the remarking function. The default setting is "disable".	Optional	-
{ [cos] <0-7>*1	The priority label. The value ranges from 0 to 7. This parameter cannot be configured when the CoS remarking flag is set to "disable".	Optional	-
{ [re-dscp] [enable disable]}*1	The DSCP remarking flag. The default setting is "disable".	Optional	-
{ [dscp] <0-63>*1	The DSCP. The value ranges from 0 to 63, and the default value is 0. This parameter cannot be configured when DSCP remarking is disabled.	Optional	-
{ [re-traff] [enable disable]}*1	The re-marking traffic class switch. The default setting is "disable".	Optional	-
{ [traff] <traff>*1	The communication classification. The value ranges from 0 to 255, and the default value is 0. This parameter cannot be configured when re-marking traffic class is disabled.	Optional	-
{ [re-queue] [enable disable]}*1	The queue mapping function switch. The default setting is "disable".	Optional	-
{ [queue] <0-7>*1	The queues mapped. The value ranges from 0 to 7, and the default value is 0. This parameter cannot be configured when queue mapping is disabled.	Optional	-

Parameter	Description	Attribute	Example
{[re-port] [enable disable]}*1	The port re-direction function switch. The ID of the policy profile should be configured before this parameter is set. Otherwise, this function is disabled.	Optional	-
{[rdport] <port>}*1	The R port number. The value ranges from 13 to 18, corresponding to uplink ports 19:1 to 19:6 respectively.	Optional	-
{[flow-mirr] [enable disable]}*1	The port mirroring function switch. The ID of the policy profile should be configured before this parameter is set. Otherwise, this function is disabled.	Optional	-
{[mirrport] <port>}*1	The M port number. The value ranges from 13 to 18, corresponding to uplink ports 19:1 to 19:6 respectively.	Optional	-
{[rate-limit] [enable disable]}*1	The rate limit switch. The default setting is "disable".	Optional	-
{[cir] <cir>}*1	The committed information rate (unit: kbit/s). The value ranges from 0 to 2147483647, and the default value is 0. This parameter cannot be configured when the rate limit is disabled.	Optional	-
{[cbs] <cbs>}*1	The committed burst size (unit: Byte). The value ranges from 0 to 2147483647, and the default value is 0. This parameter cannot be configured when the rate limit is disabled.	Optional	-
{[ebs] <ebs>}*1	The excess burst size (unit: Byte). The value ranges from 0 to 2147483647, and the default value is 0. This parameter cannot be configured when the rate limit is disabled.	Optional	-
{[pir] <pir>}*1	The peak information rate (unit: kbit/s). The value ranges from 0 to 2147483647, and the default value is 0. This parameter cannot be configured when the rate limit is disabled.	Optional	-
{[re-vlan] [enable disable]}*1	The VLAN remarking function switch.	Optional	-
{[vlanact] [add tras]}*1	The VLAN action. ◆ add: adding ◆ tras: translation	Optional	-
{[vid] <1-4095>}*1	The VLAN value.	Optional	-

Example

Configure a traffic policy profile with the name policy5, the ID 8, and the priority 3. Enable the ACL, set the forwarding flag to "enable" (forward the traffics matching the rules and discard those that do not match), and use default settings for all the other policy items.

```
Admin(config) #flow-policy-profile add policy5 id 8 pri 3 acl enable forward enable
Admin(config) #
```

13.3.4 Binding the Traffic Policy to an Uplink Port

Command Format

```
flow-policy <frameid/slotid/portid> {policy-profile <policy-profile-id>
rule-profile <rule-profile-id>} *8
```

Planning Data

Parameter	Description	Attribute	Example
<frameid/slotid/-portid>	The subrack No. / slot No. / port No.	Mandatory	1/19/1
policy-profile <policy-profile-id>	The ID of the traffic policy profile	Optional	8
rule-profile <rule-profile-id>	The ID of the traffic rule profile	Optional	8

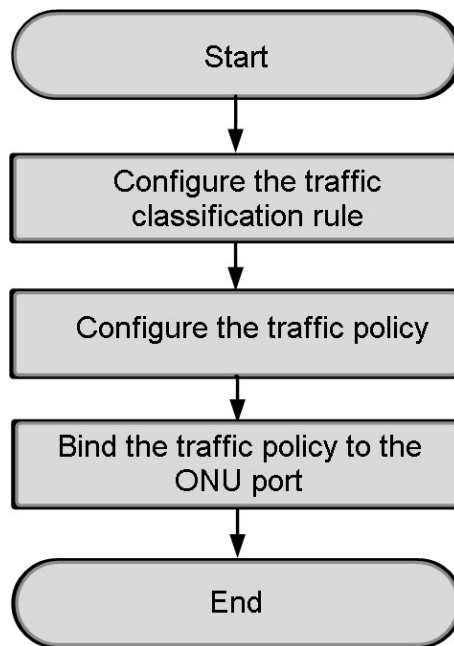
Example

Bind the traffic policy to Port 1 in Slot 19 of Subrack 1, setting the traffic policy profile ID to 8 and the traffic rule profile ID to 8.

```
Admin(config) #flow-policy 1/19/1 policy-profile 8 rule-profile 8
Admin(config) #
```

13.4 Configuration Example for Traffic Classification Based on the SVLAN

13.4.1 Configuration Flow



13.4.2 Configuring the Traffic Classification Rules

Command Format

```
flow-rule-profile add <name> { [id] <id> } *1 { [src-mac|dst-mac|src-ipv4-  
addr|dst-ipv4-addr|svlan|eth-type|ip-protocol-type|cos|tos-dscp|l4-src-  
port|l4-dst-port|ttl|cvlan|ip-ver|traff-class|traff-label|ipv6-next-  
header] [range|value_mask|equal|not_equal|exist_match|not_exist_match]  
<value1> [<value2>|null] } *8
```

Data Planning

Parameter	Description	Attribute	Example
<code>flow-rule-profile add <name></code>	The rule name.	Mandatory	rule1
<code>{[id] <id>}*1</code>	The rule ID. Specify the ID of the rule profile to be added. If this parameter is not configured, the system will assign a profile ID automatically. The value ranges from 1 to 256.	Optional	8
<code>[src-mac dst-mac src-ipv4-addr dst-ipv4-addr svlan eth-type ip-protocol-type cos tos-dscp l4-src-port l4-dst-port ttl cvlan ip-ver traff-class traff-label ipv6-next-header]</code>	The rule domain type. This parameter is used to set the rule type. You can select one from the following list of rule types: ◆ src-mac: based on the source MAC address ◆ dst-mac: based on the destination MAC address ◆ src-ipv4-addr: based on the source IPv4 address ◆ dst-ipv4-addr: based on the destination IPv4 address ◆ svlan: based on the SVLAN ◆ eth-type: based on the Ethernet type ◆ ip-protocol-type: based on the IP protocol type ◆ cos: based on the Ethernet priority ◆ tos-dscp: based on TOS/DSCP ◆ l4-src-port: based on the L4 source port number ◆ l4-dst-port: based on the L4 destination port number ◆ ttl: based on the TTL ◆ cvlan: based on the CVLAN ◆ ip-ver: based on the IP version number ◆ traff-class: based on the IPv6 traffic classification ◆ traff-label: based on the IPv6 traffic label ◆ ipv6-next-header: based on the IPv6 next header	Optional	svlan

Parameter	Description	Attribute	Example
[range value_mask equal not_equal exist_match not_exist_match]	The matching type. This parameter is used to set the logical conditions for rule matching. You can select one from the following list of matching types: ◆ equal: equal to ◆ not_equal: not equal to ◆ exist_match: existing means matching ◆ not_exist_match: not existing means matching ◆ value_mask: value plus mask ◆ range: range	Optional	equal
<value1>	The rule domain value for rule matching.	Optional	300
[<value2> null]	The rule domain value 2 for rule matching. When the matching type is set to "range" or "value_mask", this parameter cannot be set to "null". For other matching types, this parameter should be set to "null".	Optional	null

Example

Configure a traffic rule profile, specifying the profile ID to 8. Configure one rule (at most eight rules can be configured) for the profile, setting the rule name to "rule1", the rule type to "svlan (based on the SVLAN)", the matching type to "equal", the rule domain value to "300", and the rule domain value 2 to "null".

```
Admin(config) #flow-rule-profile add rule1 id8 svlan equal 300 null
```

13.4.3 Configuring the Traffic Policy

Command Format

```
flow-policy-profile add <name> {[id] <id>}*1 {[pri] <1-12>}*1 {[acl]
[enable|disable]}*1 {[forward] [enable|disable]}*1 {[re-cos] [enable|
disable]}*1 {[cos] <0-7>}*1 {[re-dscp] [enable|disable]}*1 {[dscp] <0-63>}
*1 {[re-traffic] [enable|disable]}*1 {[traffic] <traffic>}*1 {[re-queue] [enable|
disable]}*1 {[queue] <0-7>}*1 {[re-port] [enable|disable]}*1 {[rdport]
<port>}*1 {[flow-mirr] [enable|disable]}*1 {[mirrport] <port>}*1 {[rate-
limit] [enable|disable]}*1 {[cir] <cir>}*1 {[cbs] <cbs>}*1 {[ebs] <ebs>}*1
{[pir] <pir>}*1 {[re-vlan] [enable|disable]}*1 {[vlanact] [add|tras]}*1
{[vid] <1-4095>}*1
```

Data Planning

Parameter	Description	Attribute	Example
flow-policy-profile add <name>	The name of the policy profile.	Mandatory	policy5
{ [id] <id>*1	The ID of the policy profile.	Optional	8
{ [pri] <1-12>*1	The policy priority level, ranging from 1 to 12. The value "1" stands for the lowest priority level, and "12" the highest one.	Optional	3
{ [acl] [enable disable]}*1	The ACL function switch.	Optional	enable
{ [forward] [enable disable]}*1	The forwarding flag. Configure this item according to the network planning of the operator. It cannot be configured when the ACL function is disabled. ◆ enable: Only the traffic matching the set rule is forwarded, while other traffics are discarded. ◆ disable: The traffic matching the rule is discarded, while other traffics are forwarded.	Optional	enable
{ [re-cos] [enable disable]}*1	The CoS remarking flag. It is used to enable or disable the remarking function. The default setting is "disable".	Optional	-
{ [cos] <0-7>*1	The priority label. The value ranges from 0 to 7. This parameter cannot be configured when the CoS remarking flag is set to "disable".	Optional	-
{ [re-dscp] [enable disable]}*1	The DSCP remarking flag. The default setting is "disable".	Optional	-
{ [dscp] <0-63>*1	The DSCP. The value ranges from 0 to 63, and the default value is 0. This parameter cannot be configured when DSCP remarking is disabled.	Optional	-
{ [re-traff] [enable disable]}*1	The re-marking traffic class switch. The default setting is "disable".	Optional	-
{ [traff] <traff>*1	The communication classification. The value ranges from 0 to 255, and the default value is 0. This parameter cannot be configured when re-marking traffic class is disabled.	Optional	-
{ [re-queue] [enable disable]}*1	The queue mapping function switch. The default setting is "disable".	Optional	-
{ [queue] <0-7>*1	The queues mapped. The value ranges from 0 to 7, and the default value is 0. This parameter cannot be configured when queue mapping is disabled.	Optional	-

Parameter	Description	Attribute	Example
{[re-port] [enable disable]}*1	The port re-direction function switch. The ID of the policy profile should be configured before this parameter is set. Otherwise, this function is disabled.	Optional	-
{[rdport] <port>}*1	The R port number. The value ranges from 13 to 18, corresponding to uplink ports 19:1 to 19:6 respectively.	Optional	-
{[flow-mirr] [enable disable]}*1	The port mirroring function switch. The ID of the policy profile should be configured before this parameter is set. Otherwise, this function is disabled.	Optional	-
{[mirrport] <port>}*1	The M port number. The value ranges from 13 to 18, corresponding to uplink ports 19:1 to 19:6 respectively.	Optional	-
{[rate-limit] [enable disable]}*1	The rate limit switch. The default setting is "disable".	Optional	-
{[cir] <cir>}*1	The committed information rate (unit: kbit/s). The value ranges from 0 to 2147483647, and the default value is 0. This parameter cannot be configured when the rate limit is disabled.	Optional	-
{[cbs] <cbs>}*1	The committed burst size (unit: Byte). The value ranges from 0 to 2147483647, and the default value is 0. This parameter cannot be configured when the rate limit is disabled.	Optional	-
{[ebs] <ebs>}*1	The excess burst size (unit: Byte). The value ranges from 0 to 2147483647, and the default value is 0. This parameter cannot be configured when the rate limit is disabled.	Optional	-
{[pir] <pir>}*1	The peak information rate (unit: kbit/s). The value ranges from 0 to 2147483647, and the default value is 0. This parameter cannot be configured when the rate limit is disabled.	Optional	-
{[re-vlan] [enable disable]}*1	The VLAN remarking function switch.	Optional	-
{[vlanact] [add tras]}*1	The VLAN action. ◆ add: adding ◆ tras: translation	Optional	-
{[vid] <1-4095>}*1	The VLAN value.	Optional	-

Example

Configure a traffic policy profile with the name policy5, the ID 8, and the priority 3. Enable the ACL, set the forwarding flag to "enable" (forward the traffics matching the rules and discard those that do not match), and use default settings for all the other policy items.

```
Admin(config) #flow-policy-profile add policy5 id 8 pri 3 acl enable forward enable
Admin(config) #
```

13.4.4 Binding the Traffic Policy to an ONU Port

Command Format

```
onu flow-policy-profile <onuid> port <portno> {upstream-profile
<uppolicyprf> downstream-profile <downpolicyprf> upstream-rule-profile
<upruleprf> downstream-rule-profile <downruleprf>}*8
```

Planning Data

Parameter	Description	Attribute	Example
<onuid>	The ONU authorization number, ranging from 1 to 128.	Mandatory	1
port <portno>	The port number, ranging from 1 to 32.	Mandatory	1
upstream-profile <uppolicyprf>	The uplink traffic policy profile ID.	Optional	8
downstream-profile <downpolicyprf>	The downlink traffic policy profile ID.	Optional	8
upstream-rule-profile <upruleprf>	The uplink traffic rule profile ID.	Optional	8
downstream-rule-profile <downruleprf>	The downlink traffic rule profile ID.	Optional	8

Example

Bind the traffic policy to Port 1 of ONU 1 connected to Port 1 in Slot 1 of Subrack 1, setting the uplink and downlink traffic policy profile IDs as well as the uplink and downlink traffic rule profile IDs to "8".

```
Admin(config-if-pon-1/1/1) #onu flow-policy-profile 1 port 1 upstream-profile 8
downstream-profile 8 upstream-rule-profile 8 downstream-rule-profile 8
Admin(config-if-pon-1/1/1) #
```

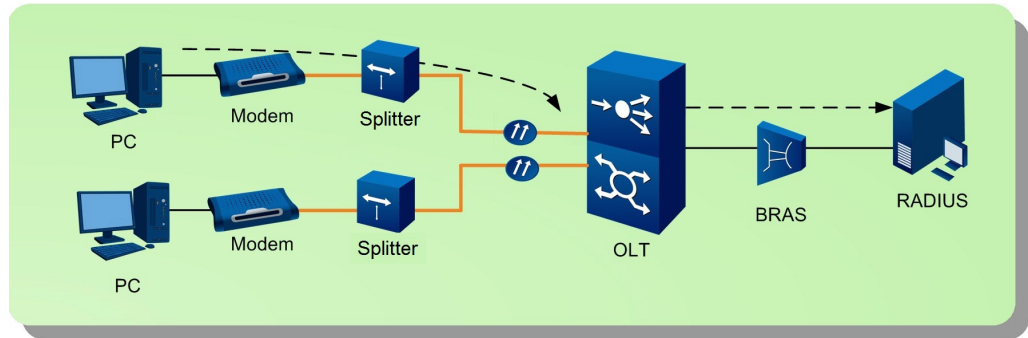
14

Configuring Subscriber Line Identifiers

- ☒ Background Information
- ☒ Configuration Rules
- ☒ Example of Configuring Subscriber Line Identifiers

14.1 Background Information

The figure below illustrates the signal flow of subscriber line identifiers.



1. The OLT system captures specific messages (DHCP DISCOVER, DHCP REQUEST, PADI and PADR) in the uplink direction and adds the line identifier information to the messages based on the configured format. The identifier information is the physical information of the subscribers sending the messages.
2. The OLT equipment forwards the messages inserted with the identifier information to the broadband remote access server (BRAS). After receiving the messages, the BRAS adds the line information to the messages and forward them to the remote authorization dial-in user service (RADIUS) server.
3. The RADIUS server performs the authentication, authorization and accounting (AAA) function based on the identifier information.

14.2 Configuration Rules

See below for details about custom line identifiers.

- ◆ The system defines some custom identifier variables. You can use these variables in different combinations to enhance flexibility of the identification function. Table 14-1 lists the custom identifier variables defined by the system.

Table 14-1 Custom Identifier Variables

Identifier	Meaning	Identifier	Meaning
%s	User outer VLAN	%o	ONU authorization No.
%c	User inner VLAN	%n	ONU type
%a	Access node identifier	%T	MDU ONU slot No.

Table 14-1 Custom Identifier Variables (Continued)

Identifier	Meaning	Identifier	Meaning
%r	Rack No. of the access node	%M	MDU ONU sub-slot No.
%f	Subrack No. of the access node	%P	MDU ONU UNI port No.
%S	Slot No. of the access node	%t	ONU user port type
%p	PON port No. of the access node	%X	Port VPI or SVLAN
%m	ONU identifier (MAC) of the access node	%x	Port VCI or CVLAN
%u	Uplink port type	%l	IAD IP address
%L	Service card type	%A	IAD MAC address
%O	IP address of the OLT management VLAN	%B	Access type: OLT, DSL or LAN

◆ The custom format is subject to the following restrictions.

- ▶ In the custom format, a variable identifier must be separated from the subsequent character string or variable by a delimiter. The delimiter should be one of the characters listed in Table 14-2.

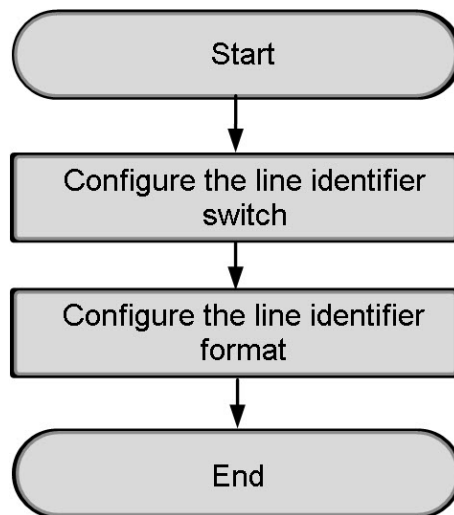
Table 14-2 List of Delimiters

Delimiter	Meaning
	Space
.	Decimal point
/	Slash
;	Semicolon
:	Colon
{	Open curly bracket
}	Close curly bracket
<	Open angle bracket
>	Close angle bracket
[	Open square bracket
]	Close square bracket

- ▶ The character string in the custom format should contain no more than 256 characters.
- ▶ The aforesaid delimiters are not allowed in the values of variables.

14.3 Example of Configuring Subscriber Line Identifiers

14.3.1 Configuration Flow



14.3.2 Configuring the Line Identifier Switch

Command Format

Enable or disable the DHCP Option 82 function.

```
dhcp option82 [enable|disable]
```

Enable or disable the PPPoE Plus function.

```
pppoe-plus [enable|disable]
```

Enable or disable the DHCP Option18 / Option37 function.

```
dhcp [option18|option37] [enable|disable]
```

Planning Data

Procedure	Parameter	Description	Attribute	Example
Enabling or disabling the DHCP Option 82 function	dhcp option82 [enable disable]	- enable: Enable the function. - disable: Disable the function.	Mandatory	enable
Enabling or disabling the PPPoE Plus function	pppoe-plus [enable disable]	- enable: Enable the function. - disable: Disable the function.	Mandatory	disable
Enabling or disabling the DHCP Option18 / Option37 function	[option18 option37]	- option18: the Option18 service - option37: the Option37 service	Mandatory	option18
	[enable disable]	- enable - disable	Mandatory	enable

Example

1. Enable the DHCP Option 82 function.

```
Admin(config) #dhcp option82 enable
```

2. Disable the PPPoE Plus function.

```
Admin(config) #pppoe-plus disable
```

3. Enable the DHCP Option 18 function.

```
Admin(config) #dhcp option18 enable
```

```
Admin(config) #
```

14.3.3 Configuring the Line Identifier Format

Command Format

```
line [circuit-id|remote-id] format [<format-str>|ctc|cnc]
```

Planning Data

Parameter	Description	Attribute	Example		
[circuit-id remote-id]	◆ circuit-id: the line identifier format ◆ remote-id: the remote end identifier format	Mandatory	circuit-id	circuit-id	remote-id
format [<format-str> ctc cnc]	◆ <format-str>: the custom format ◆ ctc: the CTC format, which means the standard of China Telecom Corporation ◆ cnc: the CNC format, which means the standard of China Netcom Corporation	Mandatory	ctc	/%a.%b.%L/%_fiber-home	/%a.%b.%L/%_fiber-home

Example

1. Set the line identifier format to "ctc".

```
Admin(config) #line circuit-id format ctc
```

2. Set the line identifier to the custom format "/%a.%b.%L/%_fiberhome".

```
Admin(config) #line circuit-id format /%a.%b.%L/%_fiberhome
```

```
Format accepted.
```

```
Admin(config) #
```

3. Set the remote end identifier format to "/%a.%b.%L/%_fiberhome".

```
Admin(config) #line remote-id format /%a.%b.%L/%_fiberhome
```

```
Admin(config) #
```

15 **Configuring TACACS+**

- ☒ Background Information
- ☒ Configuration Flow
- ☒ Configuring Information about the TACACS+ Server
- ☒ Configuring the Authentication Mode
- ☒ Configuring the Authorization Mode
- ☒ Configuring the Accounting Mode

15.1 Background Information

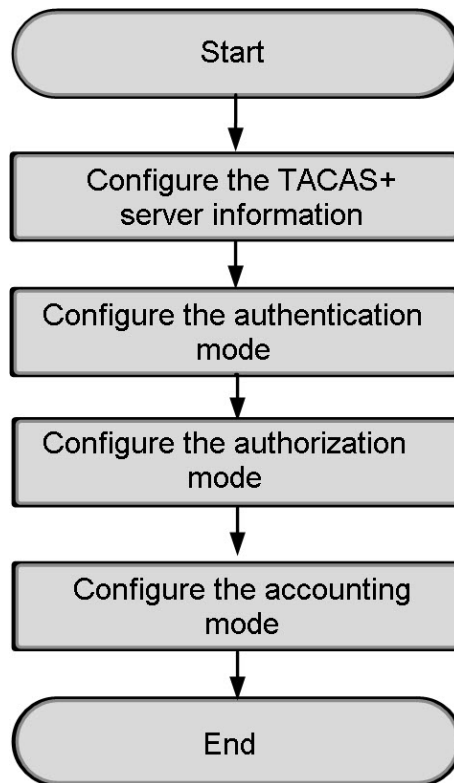
The TACACS+ (Terminal Access Controller Access-Control System Plus) protocol is a user access control protocol based on the C-S mode. The protocol is mainly used for user authentication, authorization and accounting (i.e., the AAA function). The protocol is based on TCP for service transmission and uses Port 49 for communication.

The AAA function is a network security management mechanism integrating three functions: authentication, authorization and accounting. The following describes each function in details.

- ◆ Authentication: confirms whether the user's identity is valid.
- ◆ Authorization: assigns varied access authorities to different users, restricting the operations and services available to them.
- ◆ Accounting: records the user operation information such as the types of services used by the user, the destination address of the access, the access duration and the flow statistics, and calculates the charges based on the aforesaid records.

In the aforesaid application, the OLT serves as the access equipment to allow the communication between the user and the TACACS+ server. It authenticates, authorizes and accounts the user access according to the user information on the TACACS+ server to enable user access control based on the TACACS+ protocol.

15.2 Configuration Flow



15.3 Configuring Information about the TACACS+ Server

Command Format

```
tacacs-server host <A.B.C.D> [key|port|timeout] <value>
```

Planning Data

Parameter	Description	Attribute	Example		
host <A.B.C.D>	The destination IP address of IP messages.	Mandatory	10.10.10.10	10.10.10.10	10.10.10.10
[key port timeout]	◆ key: the encrypted key for interaction with the server. The key contains 0 to 255 characters. ◆ port: the port for interaction with the server. The value ranges from 1 to 65535. ◆ timeout: the timeout period for establishing connection with the server. The value ranges from 3 to 10 seconds.	Mandatory	port	key	timeout
<value>	Value	Mandatory	49	123	10

Example

1. Configure the TACACS+ sever, setting its IP address to 10.10.10.10 and the interaction port to 49.

```
Admin(config-aaa)#tacacs-server host 10.10.10.10 port 49
server_ip:10.10.10.10
Admin(config-aaa)#
```

2. Configure the TACACS+ sever, setting its IP address to 10.10.10.10 and the key to 123.

```
Admin(config-aaa)#tacacs-server host 10.10.10.10 key 123
server_ip:10.10.10.10
Admin(config-aaa)#
```

3. Configure the TACACS+ sever, setting its IP address to 10.10.10.10 and the timeout period to 10 seconds.

```
Admin(config-aaa)#tacacs-server host 10.10.10.10 timeout 10
server_ip:10.10.10.10
Admin(config-aaa)#
```

15.4 Configuring the Authentication Mode

Command Format

```
aaa authentication-mode [local|radius|tacacs]
```

Planning Data

Parameter	Description	Attribute	Example
[local radius tacacs]	◆ local: the local authentication mode ◆ radius: the RADIUS authentication mode ◆ tacacs: the TACACS authentication mode	Mandatory	tacacs

Example

Set the authentication mode to TACACS.

```
Admin(config-aaa) #aaa authentication-mode tacacs
Admin(config-aaa) #
```

15.5 Configuring the Authorization Mode

Command Format

Configure the user authorization mode.

```
aaa authorization-mode [none|tacacs]
```

Configure the command line authorization mode.

```
aaa authorization-mode command [none|tacacs]
```

Planning Data

Procedure	Parameter	Description	Attribute	Example
Configuring the user authorization mode	[none tacacs]	◆ none: the non-authorization mode ◆ tacas: the TACACS authorization mode	Mandatory	tacacs
Configuring the command line authorization mode	command [none tacacs]	◆ none: the non-authorization mode ◆ tacas: the TACACS authorization mode	Mandatory	tacacs

Example

1. Set the user authorization mode to TACACS.

```
Admin(config-aaa) #aaa authorization-mode tacacs
```

2. Set the command line authorization mode to TACACS.

```
Admin(config-aaa) #aaa authorization-mode command tacacs
```

```
Admin(config-aaa)#
```

15.6 Configuring the Accounting Mode

Command Format

Configure the user accounting mode.

```
aaa accounting-mode [none|radius|tacacs]
```

Configure the command line accounting mode.

```
aaa accounting-mode command [none|tacacs]
```

Planning Data

Procedure	Parameter	Description	Attribute	Example
Configuring the user accounting mode	[none radius tacacs]	◆ none: the non-accounting mode ◆ radius: the RADIUS accounting mode ◆ tacacs: the TACACS accounting mode	Mandatory	tacacs
Configuring the command line accounting mode	command [none tacacs]	◆ none: the non-accounting mode ◆ tacacs: the TACACS accounting mode	Mandatory	tacacs

Example

1. Set the user accounting mode to TACACS.

```
Admin(config-aaa)#aaa accounting-mode tacacs
```

2. Set the command line accounting mode to TACACS.

```
Admin(config-aaa)#aaa accounting-mode command tacacs
```

```
Admin(config-aaa)#
```

16 Configuring RADIUS

- ☒ Background Information
- ☒ Configuration Flow
- ☒ Configuring the RADIUS Authentication Mode
- ☒ Configuring the RADIUS Authentication Information

16.1 Background Information

The OLT equipment serves as the RADIUS client end to provide access service for remote access users and enables their interaction with the RADIUS server. The RADIUS server stores the identity and authorization information of the users and records their access operations to provide the user authentication, authorization and accounting (AAA) services.

Generally, when the RADIUS server authenticates a user, the equipment proxy authentication functions such as NAS are used. The RADIUS client and server authenticate the interactive information between them by sharing the key. The user password is transmitted over the network in the form of cipher text which enhances the security. The RADIUS protocol combines the authentication and authorization processes. Namely, the response messages carry the authorization information as well.

The interaction procedures are as follows:

1. The user enters the user name and password.
2. The RADIUS client end, based on the user name and password obtained, sends the access-request packets to the RADIUS server.
3. The RADIUS server compares the user information received with the information stored in the user database. If the authentication succeeds, the RADIUS server sends the user's authority information to the RADIUS client end via the access-accept packets. If the authentication fails, the RADIUS server returns the access-reject response packets.
4. The RADIUS client end accepts or rejects the user based on the authentication result received. If the user is accepted, the RADIUS client end sends the accounting-request packets to the RADIUS server for starting accounting, and the "status-type" becomes "start".
5. The RADIUS server returns the accounting-response packets for starting accounting.
6. The RADIUS client end sends the accounting-request packets to the RADIUS server for stopping accounting, and the "status-type" becomes "stop".
7. The RADIUS server returns the accounting-response packets for stopping accounting.

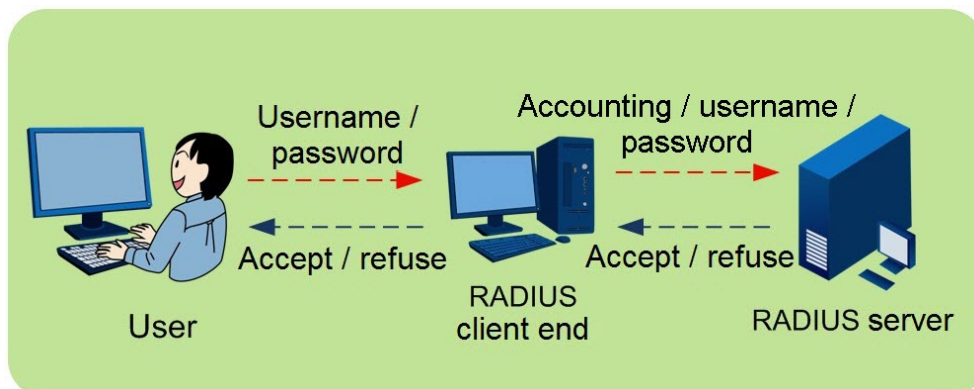
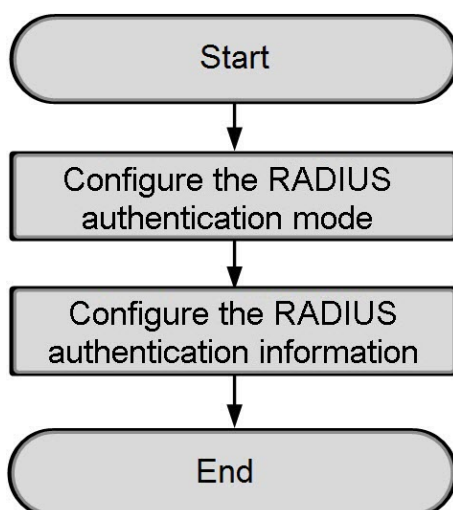


Figure 16-1 Principle of RADIUS Protocol Interaction

16.2 Configuration Flow



16.3 Configuring the RADIUS Authentication Mode

Command Format

```
aaa authentication-mode [local|radius|tacacs]
```

Planning Data

Parameter	Description	Attribute	Example
[local radius tacacs]	◆ local: the local authentication mode ◆ radius: the RADIUS authentication mode ◆ tacacs: the TACACS authentication mode	Mandatory	radius

Example

Set the authentication mode to RADIUS.

```
Admin(config-aaa)#aaa authentication-mode radius
Admin(config-aaa)#
```

16.4 Configuring the RADIUS Authentication Information

Command Format

```
radius server ip-address <ipaddr> [key|auth-port|acct-port|timeout|
retransmit] <value>
```

Data Planning

Parameter	Description	Attribute	Example
ip-address <ipaddr>	The IP address of the RADIUS authentication server.	Mandatory	10.1.1.1
key	The key.	Mandatory	123456
auth-port	The port number of the authentication server, ranging from 1 to 65535.	Optional	1812
acct-port	The port number of the accounting server, ranging from 1 to 65535.	Optional	1813
timeout	The timeout period (second), ranging from 3 to 10.	Optional	10
retransmit	The retransmission times, ranging from 1 to 5.	Optional	1

Example

1. Configure the IP address of the RADIUS authentication server to 10.1.1.1 and the key to 123456.

```
Admin(config)#radius server ip-address 10.1.1.1 key 123456
```

2. Configure the IP address of the RADIUS authentication server to 10.1.1.1 and the authentication server port to 1812.

```
Admin(config) #radius server ip-address 10.1.1.1 auth-port 1812
```

3. Configure the IP address of the RADIUS authentication server to 10.1.1.1 and the port of the accounting server to 1813.

```
Admin(config) #radius server ip-address 10.1.1.1 acct-port 1813
```

4. Configure the IP address of the RADIUS authentication server to 10.1.1.1 and the timeout period to 10 seconds.

```
Admin(config) #radius server ip-address 10.1.1.1 timeout 10
```

5. Configure the IP address of the RADIUS authentication server to 10.1.1.1 and the retransmission times to 1.

```
Admin(config) #radius server ip-address 10.1.1.1 retransmit 1
```

```
Admin(config) #
```

17 **Configuring Environment Monitoring and Discharge Test**

- ☒ Configuring Environment Monitoring
- ☒ Configuring the Discharge Test

17.1 Configuring Environment Monitoring

17.1.1 Configuring Environment Monitoring Parameters

Command Format

Configure the environment monitoring parameters.

```
hcu bat-cap <batcap> sound-sw [enable|disable] bat-coef <batcoef> bat-fill
<batfill> bat-limit <batlimit> bat-cir <batcir> bat-time <battime> bat-stop
<batstop> temp-coef <tempcoef> bat-bas <batbas> bat-adjust <batadjust> bat-
temp <battemp> com-float <comfloat> com-equal <comqueal> com-num <comnum>
bat-vol <batvol> load-vol <loadvol> rect-cur <rectcur> batdis2vol
<batdisvol> batdis2time <batdistime> batdis2cap <batdiscap>
```

View the environment monitoring parameters.

```
show hcu config
```

Planning Data

Parameter	Description	Attribute	Example
bat-cap <batcap>	Battery capacity (AH). The value ranges from 0 to 100.	Mandatory	100
sound-sw [enable disable]	Alarm sound switch. ◆ enable ◆ disable	Mandatory	disable
bat-coef <batcoef>	Battery recharge coefficient (× 0.1). The value ranges from 0 to 9999.	Mandatory	10
bat-fill <batfill>	Battery charge threshold value (× 0.1). The value ranges from 0 to 9999.	Mandatory	20
bat-limit <batlimit>	Battery charge limiting current (× 0.1 A). The value ranges from 0 to 9999.	Mandatory	30
bat-cir <batcir>	Battery charge circle (× 0.1 H). The value ranges from 0 to 9999.	Mandatory	30
bat-time <battime>	Battery charge time (× 0.1 H). The value ranges from 0 to 9999.	Mandatory	10
bat-stop <batstop>	Battery stop-charge time (× 0.1 H). The value ranges from 0 to 9999.	Mandatory	20
temp-coef <tempcoef>	Battery temperature compensation coefficient (× 0.1). The value ranges from 0 to 9999.	Mandatory	100

Parameter	Description	Attribute	Example
bat-bas <batbas>	Battery charge reference temperature ($\times 0.1^{\circ}\text{C}$). The value ranges from 0 to 390.	Mandatory	200
bat-adjust <batadjust>	Charge voltage adjustment rate ($\times 0.1$). The value ranges from 0 to 9999.	Mandatory	200
bat-temp <battemp>	Charge temperature adjustment rate ($\times 0.1$). The value ranges from 0 to 9999.	Mandatory	3000
com-float <comfloat>	Floating charge voltage for the rectifier module ($\times 0.1\text{ V}$). The value ranges from 430 to 560.	Mandatory	560
com-equal <comqueal>	Equalized charge voltage for the rectifier module ($\times 0.1\text{ V}$). The value ranges from 430 to 570.	Mandatory	570
com-num <comnum>	Number of the rectifier modules. The value ranges from 0 to 4.	Mandatory	2
bat-vol <batvol>	Battery cut-off voltage ($\times 0.1\text{ V}$). The value ranges from 400 to 520.	Mandatory	470
load-vol <loadvol>	Load cut-off voltage ($\times 0.1\text{ V}$). The value ranges from 400 to 560.	Mandatory	500
rect-cur <rectcur>	Limiting current for the rectifier module ($\times 0.1\text{ A}$). The value ranges from 20 to 550.	Mandatory	400
batdis2vol <batdisvol>	Voltage for the battery switching from discharge to equalized charge ($\times 0.1\text{ V}$). The value ranges from 430 to 510.	Mandatory	430
batdis2time <batdistime>	Time for the battery switching from discharge to equalized charge (min). The value ranges from 300 to 600.	Mandatory	320
batdis2cap <batdiscap>	Capacity for the battery switching from discharge to equalized charge ($\times 0.1\%$). The value ranges from 100 to 900.	Mandatory	600

Example

1. Configure the environment monitoring parameters.

```
Admin(config)#hcu bat-cap 100 sound-sw disable bat-coef 10 bat-fill 20 bat-limit 30 bat-
cir 30 bat-time 10 bat-stop 20 temp-coef 100 bat-bas 200 bat-adjust 200 bat-temp 3000 com-
float 560 com-equal 570 com-num 2 bat-vol 470 load-vol 500 rect-cur 400 batdis2vol 430
batdis2time 320 batdis2cap 600
Set hcu config para success!
Admin(config)#
```

2. View the environment monitoring parameters.

```
Admin(config)#show hcu config
```

```
Show hcu parameter config begin:
battery capacity = 100.0 %
sound alarm switch = disable
batteryfill back coefficient value = 1.0
batteryfill value = 2.0
batteryfill limit current value = 3.0
batteryfill circle value = 3.0
batteryfill time value = 1.0
batteryfill stop time = 2.0
temperature compensate coefficient = 10.0
batteryfill basic temperature = 20.0
batteryfill voltage adjust rate = 20.0
batteryfill temperature adjust rate = 300.0
communte float charge voltage = 56.0
communte equal charge voltage = 57.0
communte number = 2
battery switch voltage = 47.0
load switch voltage = 50.0
rect limit current = 40.0
battery discharge 2 equal charge voltage = 43.0
battery discharge 2 equal charge time = 32.0
battery discharge 2 equal charge capacity = 60.0
finished
Admin(config)#
```

17.1.2 Configuring the Charging Mode

Command Format

```
hcu charging-mode [float|equal]
```

Planning Data

Parameter	Description	Attribute	Example
charging-mode [float equal]	Charging mode ◆ float: floating charge ◆ equal: equalized charge	Mandatory	float

Example

Set the charging mode to floating charge.

```
Admin(config)#hcu charging-mode float
Set hcu charging mode float success!
Admin(config)#
```

17.1.3 Enabling the Rectifier Module

Command Format

```
hcu rectifier <rectno> [enable|disable]
```

Planning Data

Parameter	Description	Attribute	Example
rectifier <rectno>	Number of the rectifier modules. The value ranges from 1 to 4.	Mandatory	1
[enable disable]	State of being enabled / disabled. ◆ enable ◆ disable	Mandatory	enable

Example

Enable the No. 1 rectifier module.

```
Admin(config)#hcu rectifier 1 enable
Set rect 1 switch enable success!
Admin(config)#
```

17.1.4 Checking the HCU Device Status

Command Format

```
show hcu power-supply-status
```

Example

```
Admin(config)#show hcu power-supply-status
show HCU power supply status begin!
Power Supply Status = Rectifier module supply
charging mode = float
HCU format = AN4802
SN number = 201408290001
Contactor status: none
```

```
Software version: 0.1
Hardware version: 2.0
ModuleNO 1 Rectifier format EPA30 enable
ModuleNO 2 not exist
ModuleNO 3 not exist
ModuleNO 4 not exist
finished!
Admin(config)#
```

Result Description

Parameter	Description
Power Supply Status	Power supply status
charging mode	Charging mode
HCU format	HCU model number
SN number	Sequence number
Contactor status	Current status of the contactor
Software version	Software version
Hardware version	Hardware version

17.1.5 Checking the Instant Performance of the HCU Card

Command Format

```
show hcu card
```

Example

```
Admin(config)#show hcu card
DC_voltage = 56.0 V
total_load_current = 0.0 A
total_battery_current = 0.0 A
system_temp = 25.0 Celsius
system_humidity = 30.0 %rh
AC_voltage_S = 0.0 V
AC_voltage_T = 0.0 V
AC_current = 0.0 A
AC_frequency = 0.0 Hz
total_output_current = 0.1 A
battery_temp = 25.0 Celsius
battery_voltage = 0.0 V
```

```

battery_humidity = 0.0 %rh
AC_voltage_R = 218.8 V
battery_capacity = 0.0 %
storage battery status: Float charge
show HCU card enviromental parameter finished!
Admin(config)#

```

Result Description

Parameter	Description
DC_voltage	DC voltage (V)
total_load_current	Total load current (A)
total_battery_current	Total battery current (A)
system_temp	System temperature (°C)
system_humidity	Relative humidity (%RH)
AC_voltage_R	R-phase AC voltage (V)
AC_voltage_S	S-phase AC voltage (V)
AC_voltage_T	T-phase AC voltage (V)
AC_current	AC current (A)
AC_frequency	AC frequency (HZ)
total_output_current	Total system output current (A)
battery_temp	Battery temperature (°C)
battery_voltage	Battery voltage (V)
battery_humidity	Battery humidity (%RH)
battery_capacity	Battery capacity (%)
storage battery status	Storage battery status

17.1.6 Checking the Instant Performance of the Rectifier Module

Command Format

```
show hcu rectifier <rectno>
```

Planning Data

Parameter	Description	Attribute	Example
rectifier <rectno>	Number of the rectifier module. The value ranges from 1 to 4.	Mandatory	1

Example

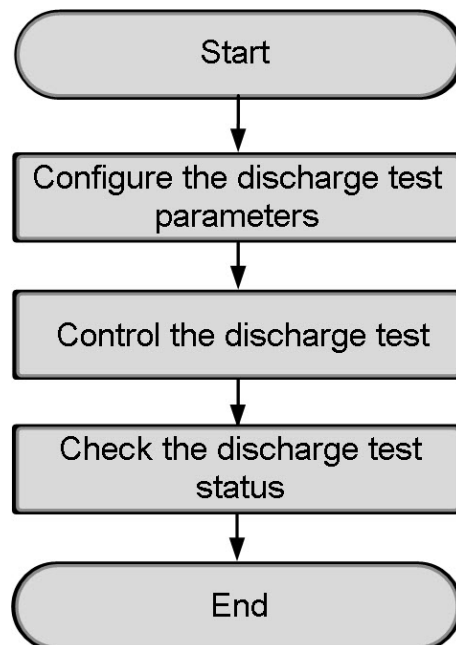
```
Admin(config)#show hcu rectifier 1
show HCU rectifier 1 enviromental parameter begin!
rect_voltage = 55.7 V
rect_current = 0.1 A
rect_temp = 39.0 Celsius
show HCU rectifier 1 enviromental parameter finished!
Admin(config)#
```

Result Description

Parameter	Description
rect_voltage	Voltage of the rectifier module (V)
rect_current	Current of the rectifier module (A)
rect_temp	Temperature of the rectifier module (°C)

17.2 Configuring the Discharge Test

17.2.1 Configuration Flow



17.2.2 Configuring the Discharge Test Parameters

Command Format

```
hcu discharge vol <voltage> time <timing>
```

Planning Data

Parameter	Description	Attribute	Example
vol <voltage>	Voltage at the end of discharge ($\times 0.1$ V). The value ranges from 450 to 520.	Mandatory	482
time <timing>	Discharge time (in minutes). The value ranges from 1 to 300.	Mandatory	10

Example

Set the voltage at the end of discharge to 48.2 V and the discharge time to 10 minutes.

```
Admin(config) #hcu discharge vol 482 time 10
Set discharging test para voltage 48.2 V time 10 minute success!
Admin(config) #
```

17.2.3 Controlling the Discharge Test

Command Format

```
hcu discharge [start|end]
```

Planning Data

Parameter	Description	Attribute	Example
discharge [start end]	Discharge control ◆ start ◆ end	Mandatory	start

Example

Start the discharge test.

```
Admin(config) #hcu discharge start
Set discharging test status Start success!
```

```
Admin(config)#
```

17.2.4 Checking the Discharge Test Status

Command Format

```
show hcu discharge-test-control
```

Example

```
Admin(config)#show hcu discharge-test-control  
show HCU Discharge test control!  
Discharge end voltage : 48.2 V  
Discharge time : 10 minute  
status : End  
finished!  
Admin(config)#
```

Result Description

Parameter	Description
Discharge end voltage	Voltage at the end of discharge (V)
Discharge time	Discharge time (in minutes)
status	Discharge test status

18 Detecting the Optical Power

- ☒ Background Information
- ☒ Viewing the Information about the Optical Module at the PON Port
- ☒ Viewing Optical Module Parameters of the ONU

18.1 Background Information

GPON Optical Module

Item	Specification	
Module code	2.5/1.25G-20km-GPON OLT-SFP (CLASS C+)	2.5/1.25G-20km-GPON OLT-SFP (CLASS C++)
Optical module type	CLASS C+	CLASS C++
Output optical power	4 dBm to 7 dBm (room temperature)	5.5 dBm to 10 dBm (room temperature)

18.2 Viewing the Information about the Optical Module at the PON Port

Command Format

```
show optical info
```

Example

View the information about the optical module at PON Port 15 in Slot 1 of Subrack 1.

```
Admin(config-if-pon-1/1/15)#show optical info
----- PON OPTIC MODULE PAR INFO -----
NAME VALUE UNIT
-----
TYPE : 20 (KM)
TEMPERATURE : 31.37 ('C)
VOLTAGE : 3.28 (V)
BIAS CURRENT : 29.71 (mA)
SEND POWER : 6.68 (Dbm)

ONU_NO RECV_POWER , ITEM=3
1 -16.19 (Dbm)
2 -14.63 (Dbm)
3 -16.45 (Dbm)
Admin(config-if-pon-1/1/15)#
```

Result Description

Parameter	Description
TYPE	The type of the optical module
TEMPERATURE	The temperature of the optical module
VOLTAGE	The voltage of the optical module
BIAS CURRENT	The bias current of the optical module
SEND POWER	The Tx optical power of the optical module
ONU_NO	The authorization number of the ONU under the PON port
RECV_POWER	The Rx optical power of the optical module

18.3 Viewing Optical Module Parameters of the ONU

Command Format

```
show onu optical-info <onuid>
```

Planning Data

Parameter	Description	Attribute	Example
<onuid>	ONU authorization No.	Mandatory	1

Example

```
Admin(config-if-pon-1/1/15)#show onu optical-info 1
----- ONU OPTIC MODULE PAR INFO 1.15.1-----
NAME VALUE UNIT
-----
TYPE : 20 (KM)
TEMPERATURE : 40.91 ('C)
VOLTAGE : 3.32 (V)
BIAS CURRENT : 12.64 (mA)
SEND POWER : 2.06 (Dbm)
RECV POWER : -20.21 (Dbm)
OLT RECV POWER : -16.19 (Dbm)
Admin(config-if-pon-1/1/15)#
```

Result Description

Parameter	Description
TYPE	The type of the optical module
TEMPERATURE	The temperature of the optical module
VOLTAGE	The voltage of the optical module
BIAS CURRENT	The bias current of the optical module
SEND POWER	The Tx optical power of the optical module
RECV POWER	The Rx optical power of the optical module
OLT RECV POWER	The Rx optical power of the OLT

19 **Commands for Upgrading the Equipment**

- ☒ Commands for Upgrading Cards
- ☒ Commands for Upgrading ONUs
- ☒ Uploading the Configuration Data

19.1 Commands for Upgrading Cards

Command Format

```
load program [system|config|script|ver-file|boot|patch|cpld] <filename>
[tftp|ftp|sftp] <ipaddr> {<username> <password>} *1
```

Planning Data

Parameter	Description	Attribute	Example
[system config script ver-file boot patch cpld]	The file type ◆ system: the system image file ◆ config: the configuration file ◆ script: the batch command line file ◆ ver_file: the version file ◆ boot: the system boot file ◆ patch: the system patch file ◆ cpld: the system cpld file	Mandatory	system
<filename>	The file name	Mandatory	hb_hsoa_1000_tst.bin
[tftp ftp sftp]	The FTP protocol type	Mandatory	ftp
<ipaddr>	The IP address of the FTP server	Mandatory	3.3.3.100
{<username> <password>} *1	The username and password of the FTP server	Optional	1, 1

Example

Upgrade the system image file for the main control service card. The IP address of the FTP server is 3.3.3.100, the user name is 1, the password is 1, and the file name is hb_hsoa_1000_tst.bin.

```
Admin(config) #load program system hb_hsoa_1000_tst.bin ftp 3.3.3.100 1 1
```

19.2 Commands for Upgrading ONUs

Command Format

```
load onu-program <frameid/slotid/portid> <onulist> <filename> [tftp|ftp|sftp] <ipaddr> {<username> <password>} *1
```

Planning Data

Parameter	Description	Attribute	Example
<frameid/slotid/-portid>	The subrack No. / slot No. / port No.	Mandatory	1/1/1
<onulist>	The ONU authorization No.	Mandatory	1
<filename>	The file name	Mandatory	gpop.gz
[tftp ftp sftp]	The FTP protocol type	Mandatory	ftp
<ipaddr>	The IP address of the FTP server	Mandatory	3.3.3.100
{<username> <password>}*1	The username and password of the FTP server	Optional	1, 1

Example

Upgrade the file for ONU 1 under PON Port 1 in Slot 1 of Subrack 1. The IP address of the FTP server is 3.3.3.100, the user name is 1, the password is 1, and the FTP file name is gpop.gz.

```
Admin(config) #load onu-program 1/1/1 1 gpop.gz ftp 3.3.3.100 1 1
Admin(config) #
```

19.3 Uploading the Configuration Data

Command Format

```
upload program [system|config|showrun|igmplog|syslog|ver_file|patch]
<filename> [ftp|sftp|tftp] <server_ipaddr> {<username> <password>}*1
```

Planning Data

Parameter	Description	Attribute	Example
[system config showrun igmplog syslog ver_file patch]	The file type. ◆ system: the system image file ◆ config: the configuration file ◆ showrun: the running configuration file ◆ igmplog: the multicast log file ◆ syslog: the system log file ◆ ver_file: the version file ◆ patch: the system patch file	Mandatory	config
<filename>	The file name.	Mandatory	hb_hsoa_1000_tst.bin

Parameter	Description	Attribute	Example
[ftp sftp tftp]	The FTP protocol type.	Mandatory	ftp
<server_ipaddr>	The IP address of the FTP server.	Mandatory	3.3.3.100
{<username> <password>} *1	The username and password of the FTP server.	Optional	1, 1

Example

Export the configuration file in the Flash to the FTP server with the IP address 3.3.3.100. Set the server user name to 1, password to 1, and system file name to "hb_hsoa_1000_tst.bin".

```
Admin(config)#upload program config hb_hsoa_1000_tst.bin ftp 3.3.3.100 1 1
Admin(config)#
```

Product Documentation Customer Satisfaction Survey

Thank you for reading and using the product documentation provided by FiberHome. Please take a moment to complete this survey. Your answers will help us to improve the documentation and better suit your needs. Your responses will be confidential and given serious consideration. The personal information requested is used for no other purposes than to respond to your feedback.

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Phone Number	
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To help us better understand your needs, please focus your answers on a single documentation or a complete documentation set.

Documentation Name	
Code and Version	

Usage of the product documentation:

1. How often do you use the documentation?

☐ Frequently ☐ Rarely ☐ Never ☐ Other (please specify) _____

2. When do you use the documentation?

☐ in starting up a project ☐ in installing the product ☐ in daily maintenance ☐ in trouble shooting ☐ Other (please specify) _____

3. What is the percentage of the operations on the product for which you can get instruction from the documentation?

☐ 100% ☐ 80% ☐ 50% ☐ 0% ☐ Other (please specify) _____

4. Are you satisfied with the promptness with which we update the documentation?

☐ Satisfied ☐ Unsatisfied (your advice) _____

5. Which documentation form do you prefer?

☐ Print edition ☐ Electronic edition ☐ Other (please specify) _____

Quality of the product documentation:

1. Is the information organized and presented clearly?

☐ Very ☐ Somewhat ☐ Not at all (your advice) _____

2. How do you like the language style of the documentation?

☐ Good ☐ Normal ☐ Poor (please specify) _____

3. Are any contents in the documentation inconsistent with the product?

4. Is the information complete in the documentation?

☐ Yes

☐ No (Please specify) _____

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7. Which parts of the documentation are you satisfied with?

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12. Additional comments about our documentation or suggestions on how we can improve:

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