GPON OLT CLI
USER MANUAL

Version V2.0

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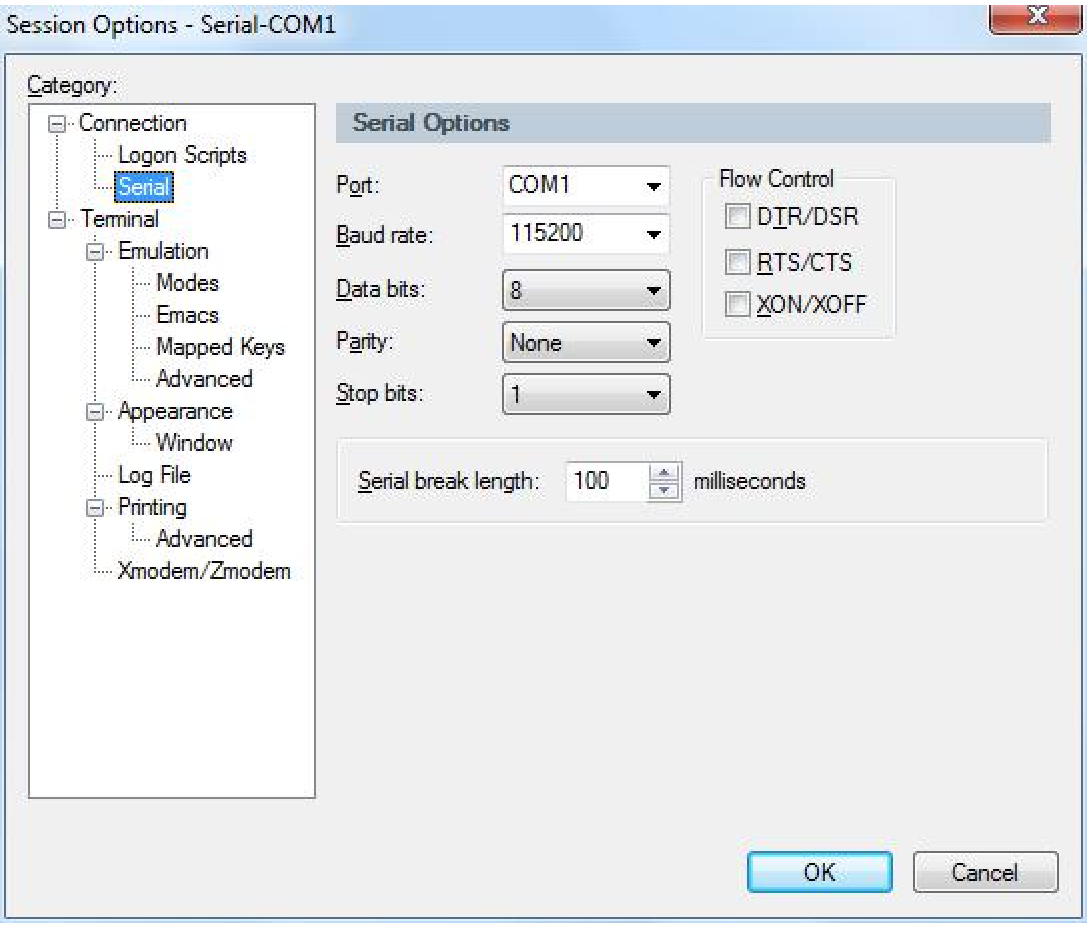
CONTENTS

1. Access OLT

You can access OLT by CLI (Command Line Interface) via console cable or telnet. This charpter introduces how to access OLT CLI via console cable.

1. Connect PC serial port or USB-to-Serial port to OLT console port by console cable.
2. Run secureCRT or other simulation tools such as Putty in the PC, and set parameters as follows.
   - Baudrate: 115200
   - Data bits: 8
   - Parity: none
   - Stop bits: 1
   - Follow control: none



Port: COM1

Baud rate: 115200

Data bits: 8

Parity: None

Stop bits: 1

Flow Control
□ DTR/DSR
□ RTS/CTS
□ XON/XOFF

Serial break length: 100 milliseconds

COM port properties

After truned on the power, there is boot information printing. After startup, press enter and input username and password to login.

Notice: *The default username and password of CLI both are admin. For example,*

Login: admin

Password: admin

gpon-olt> enable

Password: admin

gpon-olt#

Input commands to configure or check device's status. Input "?" any time you need help.

This document will introduce each command begin at next charpter.

2. Command Line Interface

2.1 Abstract

GPON OLT provides command line interface for configuration and management. The following is its specialities.

- Configure from console port.
- Input “?” any time you need help.
- Provide network test command, such as ping, for diagnosing connection.
- Provide FTP service for uploading and downloading files.
- Provide Doskey analogous function, you can execute a history command.
- Support ambiguous keywords searching, you just need to input unconflict keywords and press “tab” or “?”.

2.2 CLI Configuration Mode

GPON OLT provides three configuration modes.

- Privileged mode
- Global configuration mode
- Interface configuration mode

The following table shows specialties, commands to enter and prompts.

CLI mode	**Specialty**	**Prompt**	**Command to enter**	**Command to exit**
Privileged mode	Show configurations and execute system commands	gpon-olt#		**exit**
Global configuration mode	Configure system parameters	gpon-olt (config)#	**configure terminal**	**exit**
Interface configuration mode	Configure interface parameters	gpon-olt (config-if)#	**interface** *{interface_type slot/port}*	**exit**

2.3 CLI Specialities

2.3.1 Online Help

GPON OLT CLI provides the following online help:

- Completely help
- Partly help

You can get some help information of CLI with the help above.

(1) Input “?” to get all commands and illustrations at any configuration mode.

```
gpon-olt (config)#
    access-list          Add an access list entry.
    alarm                Specify alarm.
    banner               Set banner string
    channel-group        Etherchannel/port bundling configuration.
    clean                Specify clean operation.
    clear                Specific save syslog to flash.
    copy                 Copy configuration
    debug                System debugging functions.
    enable               Modify enable password parameters
    enable-password      Set your enable password.
    end                  Exit current mode and down to previous mode
    erase                Erase info from flash.
    event                Specify event.
    exec                 exec system cmd
    exit                 Exit current mode and down to previous mode
    fan                  Specify olt fan management.
    gateway              system manage gateway.
    help                 Description of the interactive help system
    hostname             Set system's network name
    igmp                 Global IP configuration subcommands
```

```
   interface              Select an interface to configure.

   ip                       IP information

   ipmc                     Global IP configuration subcommands

   isolate                       the  isolate  configuration  information.Set
switchport characteristics.

   l3                       set ecmp dip reg

   line                    Configure a terminal line

   list                   Print command list

   log                      Logging control

   login-password      Reset your login password.

   mac                        Configure the MAC address table.

   mc                         pim add ipmc group

   monitor                 Configure SPAN monitoring.

   no                         Negate a command or set its default.

   password                Assign the terminal connection password

   pim                        pim add ipmc group

   ping                     ping command

   profile                Select profile to configure.

   queue-scheduler    Configure egress queueing policy.

   quit                       Exit current mode and down to previous mode

   reboot                   Reboot the switch.

   save                      Specific save syslog to flash.
```

```
service          Set up miscellaneous service
set              Specify set command.
show             Show information
snmp-server      Snmp server config
spanning-tree    Config STPD information.
storm-control    Specify the storm control.
switch           switch to shell
syslog           Specific system log save level,which syslog level not less than level will save to flash.
tftp             Specify tftp download.
time             Specify system time configuration.
upgrade          Specify upgrade system.
upload           Upload file for software or user config.
user             Manage System's users.
vlan             Vlan commands.
write            Write running configuration to memory, network, or terminal
```

(2) Input “?” behind a command, it will display all key words and illustrations when this site should be a key word.

```
gpon-olt (config)# interface
  aux              aux interface.
  gpon             Specify gpon interface
```

```
    gigabitethernet          GigabitEthernet IEEE 802.3z.
    vlan                       Config vlan information.
```

(3) Input “?” behind a command, it will display description of parameters when this site should be a parameter.

```
 gpon-olt (config)# access-list
    <0-999>          IP standard access list.
    <1000-1999>    IP extended access list.
    <2000-2999>    L2 packet header access list.
    <3000-3999>    User define field access list.
    <4000-4999>    Vlan translation access list.
    <5000-5999>    Port business access list.
    <6000-6999>    Port quality of service access list.
    <7000-7999>    Port Ipmc Vlan translation of service access list.
```

(4) Input a character string end with “?”, it will display all key words that Begin at this character string.

```
 gpon-olt (config)# e
    enable                    Modify enable password parameters
    enable-password     Set your enable password.
    end                           End current mode and change to enable
 mode.
    erase                     Erase info from flash.
    event                     Specify event
    exec                  Exec system cmd
    exit                  Exit current mode and down to previous mode
```

(5) Input a command and a character string end with “?”, it will display all key words Begin at this character sring.

```
gpon-olt (config)# show ver
    version    show version command.
```

(6) Input a character string end with “Tab”, it will display completely key words that Begin at this character string when it is unique.

2.3.2 Display Specialities

GPON OLT CLI provides the following display specialities. There is a pause when the information displays a whole screen at a time. Users have two ways to choose.

Operation	function
Input <Ctrl+C>	Stop displaying and executing.
Input any key	Continue displaying next screen

2.3.3 History Commands

CLI provides Doskey analogous function. It can save history commands that executed before. Users can use direction key to invoke history command. The device can save at most ten commands.

Operation	action	result

Display history commands	**history**	Display all history commands.
Visit previous command	Up direction key “↑” or <Ctrl+P>	Display previous command if there is early history command.
Visit next command	Down direction key “↓” or <Ctrl+N>	Display next command if there is later history command.

2.3.4 Error Messages

Every command will be executed if it passes syntax check. Otherwise it will come out error message. The following table shows some frequent errors.

Error messages	**Reasons**
Unknown command	No this command
	No this key word
	Parameter type error
	Parameter out of range
Command incomplete	Command is not complete
Too many parameters	Too many parameters
Ambiguous command	Command is ambiguous

2.3.5 Edit Specialities

CLI provides basic edit function. Every command supports maxum 256 characters. The following table shows how to edit.

operation	function
Generally input	Insert character at cursor position and move cursor to right if edit buffer has enough space.
Backspace key	Delete the character in front of cursor.
Left direction key ← or <Ctrl+B>	Cursor moves one character position towards the left.
Right direction key → or <Ctrl+F>	Cursor moves one character position towards the right.
Up direction key↑or <Ctrl+P> Down direction key↓or <Ctrl+N>	Display history command.
Tab key	Input incomplete key words end with Tab key, CLI will provide partly help. If it is unique, the key word which matches what you input will be used and display in another row.

	If it should be parameter, or the key word is mismatched or matched but not unique, CLI will use what you input and display in another row.

3. OLT Management Configuration

3.1 Configure Outband Management

Port AUX is outband management port. So its IP is outband management IP.

3.1.1 Enter AUX Port Configuration Mode

Begin at privileged configuration mode, enter interface configuration mode as the following table shows.

	Command	Function
Step 1	**configure terminal**	Enter global configuration mode.
Step 2	**interface aux**	Enter AUX interface.

3.1.2 Outband Management IP address

Begin at privileged configuration mode, configure outband management IP address and mask as the following table shows.

	Command	Function
Step 1	**config terminal**	Enter global configuration mode.
Step 2	**interface aux**	Enter AUX interface.

Step 3a	**ip address** *<A.B.C.D> net-mask*	Configure IP address and mask of AUX port.
Step 3b	**no aux ip address**	Reset outband management IP to default.
Step 4	**exit**	Exit to global configuration mode.
Step 5	**show aux ip address**	Show outband management IP.
Step 6	**write**	Save configurations.

3.1.3 Outband Management IPv6 Address

Begin at privileged configuration mode, configure outband management IPv6 address and mask as the following table shows.

	Command	Function
Step 1	**config terminal**	Enter gobal configuration mode.
Step 2	**interface aux**	Enter AUX port configuration mode.
Step 3a	**ipv6 address** *<X:X::X:X> [eui-64]*	Configure IPv6 addressand prefix

		length of AUX port.
Step 3b	**no aux ipv6 address**	Delete IPv6 address of AUX port.
Step 4	**exit**	Exit to global configuration mode.
Step 5	**show aux ipv6 address**	Display AUX port cofniguraiton.
Step 6	**write**	Save configuration.

3.1.4 Show AUX Port Information

Begin at privileged configuration mode, show AUX port information as the following table shows.

	Command	**Function**
Step 1	**configure terminal**	Enter global configuration mode.
Step 2	**show interface aux**	Show AUX port information.

3.2 Configure Inband Management

This device provides inband management which can be managed from uplink port.

Begin at privileged configuration mode, configure inband management

IP address and mask as the following table shows.

	Command	**Function**
Step 1	**config terminal**	Enter global configuration mode.
Step 2	**vlan** *vlan_id*	Create VLAN.
Step 3	**exit**	Exit to global configuration mode.
Step 4	**interface vlan** *vlan_id*	Enter VLAN interface configuration mode. *vlan_id* range is 1 — 4094.
Step 5a	**ip address** *<A.B.C.D> net-mask*	Configure IP address and mask.
Step 5b	**no ip address** *<A.B.C.D>*	Delete IP address and mask.
Step 6	**exit**	Exit to global configuration mode.
Step 7	**show interface vlan** *vlan_id*	Show VLAN information.
Step 8	**write**	Save configurations.

3.3 Configure Manangement Gateway

When OLT management IP and management server are not in the same network segment, it needs to configure a gateway.

Begin at privileged configuration mode, configure management gateway as the following table shows.

	Command	Function
Step 1	**config terminal**	Enter global configuration mode.
Step 2	**ip route 0.0.0.0/0** *<A.B.C.D>*	Configure management gateway.
Step 3	**no ip route 0.0.0.0/0** *<A.B.C.D>*	Delete management gateway.
Step 4	**show ip route**	Show management gateway configuration.
Step 5	**write**	Save configurations.

3.4 Configure DNS

It can configure two DNS server

	Command	Function
Step 1	**config terminal**	Enter global configuration mode.
Step 2	**ip dns** *<A.B.C.D> {<A.B.C.D>}*	Configure DNS
Step 3	**show ip dns**	Show management gateway.
Step 4	**write**	Save configurations.

4. Port Configuration

4.1 Port Configuration

4.1.1 Enter Port Configuration Mode

Begin at privileged configuration mode, input the following commands to enter port configuration mode.

	Command	Function
Step 1	**configure terminal**	Enter global configuration mode.
Step 2	**interface** *{interface_type slot/port}*	Enter interface configuration mode.

4.1.2 Enable /Disable Port

You can use these commands to enable or disable port. The ports are enabled by default. If you want a port not to transfer data, you can shutdown it.

Begin at privileged configuration mode, enable or disable ports as the following table shows.

	Command	Function
Step 1	**configure terminal**	Enter global configuration mode.

Step 2	**interface** *{interface_type slot/port}*	Enter interface configuration mode.
Step 3a	**no shutdown**	Enable port
Step 3b	**shutdown**	Disable port.
Step 4	**exit**	Exit to gloable configuration mode.
Step 5	**show interface** *{interface_type slot/port}*	Show interface configurations.
Step 6	**write**	Save configurations.

4.1.3 Configure Port Description

This command is used to configure port description. There is no description by default.

Begin at privileged configuration mode, configure port description as the following table shows.

	Command	**Function**
Step 1	**configure terminal**	Enter global configuration mode.
Step 2	**interface** *{interface_type slot/port}*	Enter interface configuration mode.
Step 3a	**description** *<string>*	Configure port description.

Step 3b	**no description**	Delete description.
Step 4	**exit**	Exit to global configuration mode.
Step 5	**show interface** *{interface_type slot/port}*	Show interface configurations.
Step 6	**write**	Save configurations.

4.1.4 Configure Port Duplex Mode

Duplex includes full duplex and half duplex. When it works at full duplex, port can transmit and receive data at the same time; when it works at half duplex, port can only transmit or receive data at the same time. The duplex is auto by default.

Begin at privileged configuration mode, configure port duplex mode as the following table shows.

	Command	**Function**
Step 1	**configure terminal**	Enter global configuration mode.
Step 2	**interface** *{interface_type slot/port}*	Enter interface configuration mode.
Step 3a	**duplex { auto | full | half }**	Configure port duplex mode.
Step 3b	**no duplex**	Reset duplex mode to

		default.
Step 4	**exit**	Exit to global configuration mode.
Step 5	**show interface** *{interface_type slot/port}*	Show interface configurations.
Step6	**write**	Save configurations.

4.1.5 Configure Port Speed

When port speed mode is auto, the actual speed of port is determined by the automated negotiation result with opposite port. The speed is auto by default.

Begin at privileged configuration mode, configure port speed as the following table shows.

	Command	**Function**
Step 1	**configure terminal**	Enter global configuration mode.
Step 2	**interface** *{interface_type slot/port}*	Enter interface configuration mode.
Step 3a	**speed { 10 | 100 | 1000 | auto }**	Configure port speed.
Step 3b	**no speed**	Reset port speed to default.
Step 4	**exit**	Exit to global configuration

		mode.
Step 5	**show interface** *{interface_type slot/port}*	Show interface configurations.
Step 6	**write**	Save configurations.

4.1.6 Configure Port Rate Limitation

Begin at privileged configuration mode, configure port rate limitation as the following table shows.

	Command	**Function**
Step 1	**configure terminal**	Enter global configuration mode.
Step 2	**interface** *{interface_type slot/port}*	Enter interface configuration mode.
Step 3a	**line-rate {ingress | egress} bps** *value*	Configure port rate limitation. Value range: 64-1000000, it should be integral multiple of 64kbps.
Step 3b	**no line-rate {ingress | egress}**	Delete port rate limitation configurations.
Step 4	**exit**	Exit to global configuration mode.

Step 5	**show interface** *{interface_type slot/port}*	Show interface configurations.
Step6	**write**	Save configurations.

4.1.7 Configure Port VLAN Mode

Each port has three VLAN mode, access, trunk and hybrid.

Access mode is usually used for port that connects with PC or other terminals, only one VLAN can be set up. Trunk mode is usually used for port that connects with switch; one or more VLAN can be set up. Hybrid mode can be used for port that connects with PC or switch. Default VLAN mode is hybrid.

Begin at privileged configuration mode, configure port VLAN mode as the following table shows.

	Command	**Function**
Step 1	**configure terminal**	Enter global configuration mode.
Step 2	**interface** *{interface_type slot/port}*	Enter interface configuration mode.
Step 3a	**switchport mode { access | trunk | hybrid}**	Configure port VLAN mode.
Step 3b	**no switchport mode**	Reset VLAN mode to default.

Step 4	**exit**	Exit to global configuration mode.
Step 5	**show interface** *{interface_type slot/port}*	Show interface configurations.
Step 6	**write**	Save configurations.

Notice:

All VLAN configurations will lose when you change port VLAN mode.

4.1.8 Configure Hybrid Port VLAN

Hybrid port can belong to several VLAN. It can be used to connect with switch or router, and also terminal host.

Begin at privileged configuration mode, configure hybrid port VLAN as the following table shows.

	Command	**Function**
Step 1	**configure terminal**	Enter global configuration mode.
Step 2	**interface** *{interface_type slot/port}*	Enter interface configuration mode.
Step 3a	**switchport hybrid vlan** *vlan_id* **{tagged | untagged}**	Add specific VLAN to hybrid port.
Step 3b	**no switchport hybrid vlan** *vlan_id*	Remove VLAN from port.

Step 4	**exit**	Exit to global configuration mode.
Step 5	**show interface** *{interface_type slot/port}*	Show interface configurations.
Step 6	**write**	Save configurations.

Notice:

You must configure PVID for the port that if it is configured untagged mode. PVID is the same as VLAN ID. Please refer to 3.1.10.

4.1.9 Configure Trunk Port VLAN

Trunk mode port can belong to several VLAN. It is usually used to connect with switches routers.

Begin at privileged configuration mode, configure trunk port VLAN as the following table shows.

	Command	**Function**
Step 1	**configure terminal**	Enter global configuration
Step 2	**interface** *{interface_type slot/port}*	Enter interface configuration
Step 3a	**switchport trunk vlan** *vlan_id*	Add specific VLAN to trunk port. VLAN mode is tagged.
Step 3b	**no switchport trunk vlan** *vlan_id*	Remove VLAN from port.

Step 5	**exit**	Exit to global configuration mode.
Step 6	**show interface** *{interface_type slot/port}*	Show interface configurations.
Step 7	**write**	Save configurations.

Notice:

If PVID of trunk mode port is the same as VLAN ID, the VLAN will add to the port as untagged mode.

4.1.10 Configure Port PVID

Only under hybrid mode and trunk mode can set up PVID.

Begin at privileged configuration mode. Configure port PVID as the following table shows.

	Command	**Function**
Step 1	**configure terminal**	Enter global configuration.
Step 2	**interface** *{interface_type slot/port}*	Enter interface configuration mode.
Step 3a	**switchport {hybrid|trunk} pvid vlan** *vlan_id*	Configure hybrid mode or trunk mode port PVID.
Step 3b	**no switchport {hybrid|trunk} pvid**	Reset hybrid or trunk port PVID to default.
Step 4	**exit**	Exit to global

		configuration mode.
Step 5	**show interface** *{interface_type slot/port}*	Show interface configurations.
Step 6	**write**	Save configurations.

4.1.11 Configure Access Port VLAN

Only one untagged mode VLAN can be set to access port. Port's PVID is the same as VLAN ID.

Begin at privileged configuration mode, configure access port VLAN as the thable shows.

	Command	**Function**
Step 1	**configure terminal**	Enter global configuration mode.
Step 2	**interface** *{interface_type slot/port}*	Enter interface configuration mode.
Step 3a	**switchport access vlan** *vlan_id*	Configure access port VLAN.
Step 3b	**no switchport access vlan**	Reset access port VLAN to default.
Step 4	**exit**	Exit to global configuration mode.
Step 5	**show interface** *{interface_type*	Show interface

	slot/port}	configurations.
Step 6	**write**	Save configurations.

4.1.12 Configure Port Flow Control

Begin at privileged configuration mode, configure port flow control as the following table shows.

	Command	**Function**
Step 1	**configure terminal**	Enter global configuration mode.
Step 2	**interface** *{interface_type slot/port}*	Enter interface configuration mode.
Step 3a	**flowcontrol on**	Enable flow control function.
Step 3b	**no flowcontrol**	Disable flow control function.
Step 4	**exit**	Exit to global configuration mode.
Step 5	**show interface** *{interface_type slot/port}*	Show interface configurations.
Step 6	**write**	Save configurations.

4.1.13 Configure Port Broadcast Suppression

Begin at privileged configuration mode, configure port broadcast suppression as the following table shows.

	Command	Function
Step 1	**configure terminal**	Enter global configuration mode.
Step 2	**interface** *{interface_type slot/port}*	Enter interface configuration mode.
Step 3a	**storm-control broadcast bps** *value*	Configure broadcast suppression. Value range: 64-1000000, it should be integral multiple of 64kbps.
Step 3b	**no storm-control broadcast**	Remove broadcast suppression.
Step 4	**exit**	Exit global configuration mode.
Step 5	**show interface** *{interface_type slot/port}*	Show interface configurations.
Step 6	**write**	Save configurations.

4.1.14 Configure Port Multicast Suppression

Begin at privileged configuration mode, configure port multicast suppression as the following table shows.

	Command	Function
Step 1	**configure terminal**	Enter global configuration mode.
Step 2	**interface** *{interface_type slot/port}*	Enter interface configuration mode.
Step 3a	**storm-control multicast bps** *value*	Configure multicast suppression. Value range: 64-1000000, it should be integral multiple of 64kbps.
Step 3b	**no storm-control multicast**	Remove multicast suppression.
Step 4	**exit**	Exit global configuration mode.
Step 5	**show interface** *{interface_type slot/port}*	Show interface configurations.
Step 6	**write**	Save configurations.

4.1.15 Configure Port Unknown Unicast Suppression

Begin at privileged configuration mode, configure port unknown unicast suppression as the following table shows.

	Command	Function
Step 1	**configure terminal**	Enter global configuration mode.
Step 2	**interface** *{interface_type slot/port}*	Enter interface configuration mode.
Step 3a	**storm-control unicast bps** *value*	Configure unknown unicast suppression. Value range: 64-1000000, it should be integral multiple of 64kbps.
Step 3b	**no storm-control unicast**	Remove unknown unicast suppression.
Step 4	**exit**	Exit global configuration mode.
Step 5	**show interface** *{interface_type slot/port}*	Show interface configurations.
Step 6	**write**	Save configurations.

4.1.16 Configure Port Isolation

With this function, customers can add ports to a same isolation group so that these ports can be isolated among L2 and L3 steams. This will improve security of network and provide flexible networking scheme.

Begin at privileged configuration mode, configure port isolation as the following table shows.

	Command	Function
Step 1	**configure terminal**	Enter global configuration mode.
Step 2	**interface** *{interface_type slot/port}*	Enter interface configuration mode.
Step 3a	**switchport isolate**	Add port to isolation group.
Step 3b	**no switchport isolate**	Remove port from isolation group.
Step 4	**exit**	Exit to global configuration mode.
Step 5a	**show interface** *{interface_type slot/port}*	Show interface configurations.
Step 5b	**show isolate port**	Show isolation group.
Step 6	**write**	Save configurations.

4.1.17 Configure Port Loopback

Begin at privileged configuration mode, configure port loopback as the following table shows.

	Command	Function

Step 1	**configure terminal**	Enter global configuration mode.
Step 2	**interface** *{interface_type slot/port}*	Enter interface configuration mode.
Step 3	**loopback [internal | external | outside]**	Internal means cpu inner loopback. External means cpu outer loopback. Outside means external data loopback.
Step 4	**exit**	Exit to global configuration mode.

Notice:

When testing port loopback function, please disable port loopback detection. Please refer to 3.1.18.

4.1.18 Configure Port Loopback Detection

Begin at privileged configuration mode, configure port loopback detection as the following table shows.

	Command	**Function**
Step 1	**configure terminal**	Enter global configuration mode.

Step 2a	**loopback detect enable**	Enable port loopback detection.
Step 2b	**no loopback detect**	Disable port loopback detection.
Step 3	**show loopback detect**	Show port loopback detection status.
Step 4	**exit**	Exit to global configuration mode.

4.1.19 Configure Port Jumboframe

Begin at privileged configuration mode, configure jumboframe that the port can pass as the following table shows.

	Command	**Function**
Step 1	**configure terminal**	Enter global configuration mode.
Step 2	**interface** *{interface_type slot/port}*	Enter interface configuration mode.
Step 3a	**jumboframe enable**	Enable jumboframe transmission. By default, switch chipset supports transmitting maximum 1536 bytes

		frame; PON chipset supports transmitting maximum 2047 bytes frame.
Step 3b	**no jumboframe**	Disable jumboframe transmission.
Step 4	**exit**	Exit to global configuration mode.

4.1.20 Show Port Statistics

Begin at privileged configuration mode, show port statistics as the following table shows.

	Command	**Function**
Step 1	**configure terminal**	Enter global configuration mode.
Step 2	**interface** *{interface_type slot/port}*	Enter interface configuration mode.
Step 3	**show statistics**	Show port statistics.
Step 4	**exit**	Exit to global configuration mode.

4.1.21 Clean Port Statistics

Begin at privileged configuration mode, clean port statistics as the following table shows.

	Command	Function
Step 1	**configure terminal**	Enter global configuration mode.
Step 2	**show interface** *{interface_type slot/port}*	Show port statistics.
Step 3	**clean statistics**	Clean port statistics.

4.1.22 Show Interface Configurations

Operation	Command
Show interface configurations.	**Show interface** *{interface_type slot/port}*

In the system, interface gigabitethernet 0/1~0/x stands for uplink port 1~x. Interface gpon0/1~0/x stands for GPON port 1~x.

For example, display configurations of uplink port 5.

```
gpon-olt (config)# show interface gigabitethernet 0/5
  Interface gigabitEthernet0/5's information.
        GigabitEthernet0/5 current state : Down
        Hardware Type is Gigabit Ethernet, Hardware address is 0:0:0:0:0:0
```

```
The Maximum Transmit Unit is 1500
Media type is twisted pair, loopback not set
Port hardware type is 1000Base-TX
Link speed type: autonegotiation, Link duplex type: autonegotiation
Current link state: Down
Current autonegotiation mode: enable
Current link speed: 1000Mbps,   Current link mode: half-duplex
Flow Control: disable   MDIX Mode: force
The Maximum Frame Length is 1536
Broadcast storm control: 512 fps
Multicast storm control: disable
Unknow unicast storm control: 512 fps
Ingress line rate control: no limit
Egress line rate control: no limit
mac address learn state : enable, no limit
Port priority: 0
PVID: 1
Port combo mode: null
Isolate   member : yes
Port link-type: hybrid
Untagged VLAN ID:        1
Tagged VLAN ID   :     100
```

```
Last 300 seconds input:    0 packets        0 bytes
Last 300 seconds output:    0 packets        0 bytes
      Input(total):    1113473691 packets, 4081075466 bytes
           0 broadcasts, 1113473687 multicasts
      Input(normal):    1113473691 packets, 4081075466 bytes
           0 broadcasts, 1113473687 multicasts, 0 pauses
      Input:    0 input errors, 0 runts, 0 giants,    0 throttles, 4 CRC
             0 overruns, 0 aborts, 0 ignored, 0 parity errors
      Output(total): 4371 packets, 351860 bytes
           1280 broadcasts, 3091 multicasts, 0 pauses
      Output(normal): 4371 packets, 351860 bytes
           1280 broadcasts, 3091 multicasts, 0 pauses
      Output: 0 output errors,    0 underruns, 0 buffer failures
             0 aborts, 0 deferred, 0 collisions, 0 late collisions
             0 lost carrier, 0 no carrier
```

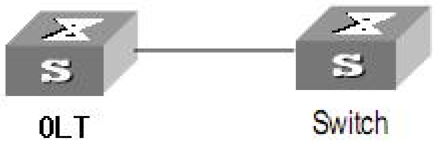
4.2 Example

Configure VLAN and broadcast suppresstion of trunk mode port.

1. Requirement

Uplink port 1 of OLT connects to switch, port mode is trunk. It can pass through VLAN 20 and VLAN 100, add VLAN tag 123 to untagged streams. Rate of broadcast streams is 64bps.

2. Framework



3. Steps

(1)Enter interface configuration mode.

```
gpon-olt (config)# interface gigabitethernet 0/1
gpon-olt (config-if-ge0/1) #
```

(2)configure port mode and add VLAN

```
gpon-olt (config-if-ge0/1) # switchport mode trunk
gpon-olt (config-if-ge0/1) # switchport trunk vlan 20
gpon-olt (config-if-ge0/1) # switchport trunk vlan 100
```

PS. The VLAN must be added first. Please refer to 5.1.1.

(3)configure port PVID

```
gpon-olt (config-if-ge0/1) # switchport trunk pvid vlan 123
```

(4)configure port broadcast suppression

```
gpon-olt (config-if-ge0/1) # storm-control broadcast pps 64
```

5. Port Aggregation Configuration

5.1 Introduction

Port aggregation is that several ports constitute an aggregation group so that it can share responsibility for traffic load in each port. When one link is broken down, the traffic will switch to another automatically to ensure traffic is unblocked. It seems that the aggregation group is the same as a port.

In an aggregation group, member ports must have the same speed, the same duplex mode and the same basic configurations. Basic configurations contain:

(1) STP configurations such as STP status, link properties (e.g. p2p port), priority, cost, message format, loopdetect status, edge port or not.

(2) QoS configurations such as rate limiting, priority mark, 802.1p priority, congestion avoidance.

(3) VLAN configurations such as VLAN ID, PVID.

(4) Port link type such as trunk mode, hybrid mode and access mode.

(5) GVRP configurations such as switch status, registration type, timer value.

5.2 Port Aggregation Configuration

5.2.1 Create Static Aggregation Group

At most 4 groups can be created. You can add 4 member ports altogether in every group and at most 4 ports will come into being aggregation at the same time.

Every group is defined as a channel group; the commands are centre on channel group.

	Command	Function
Step 1	**configure terminal**	Enter global configuration mode.
Step 2a	**channel-group** *<1-4>* **mode static**	Create static aggregation group.
Step 2b	**no channel-group** *<1-4>*	Delete static aggregation group.
Step 3	**show channel-group summary**	Show static aggregation group configuration.

5.2.2 Configure Load Balancing Policy of Group

Configuring load balancing policy includes source MAC, destination MAC, both source and destination MAC, source IP, destination IP, both source and destination IP. Default load balancing policy is based on source MAC.

	Command	Function
Step 1	**configure terminal**	Enter global configuration mode.

Step 2	**channel-group** *<1-4>* **load-balance {smac|dmac|sdmac|sip|dip|sdip }**	Specify which link is used to transmit traffic in aggregation group.
Step 3	**show channel-group summary**	Show aggregation configurations.

5.2.3 Configure Member Port of Group

	Command	**Function**
Step 1	**configure terminal**	Enter global configuration mode.
Step 2	**interface** *{interface_type slot/port}*	Enter interface configuration mode.
Step 3a	**channel-group** *<1-4>*	Add current port to specific channel group.
Step 3b	**no channel-group** *<1-4>*	Delete current port from specific channel group.
Step 4	**exit**	Exit global configuration mode.
Step 5	**show channel-group summary**	Show aggregation gourp configurations.

6. VLAN Configuration

6.1 VLAN Configuration

VLAN configuration mainly contains:

- Create/delete VLAN
- Configure/delete VLAN description
- Configure/delete IP address and mask of VLAN

6.1.1 Create/Delete VLAN

Begin at privileged configuration mode, create or delete VLAN as the following table shows.

	Command	Function
Step 1	**configure terminal**	Enter global configuration mode.
Step 2a	**vlan** *vlan_id*	Create VLAN or enter VLAN interface configuration mode. VLAN ID range is from 1 to 4094.
Step 2b	**no vlan** *vlan_id*	Delete specific VLAN.
Step 3	**exit**	Exit to global

		configuration mode.
Step 4a	**show vlan** [*vlan_id/***all**]	Show VLAN configurations. Choosing **all** means display all existed VLAN. And choosing *vlan_id* means display information of specific VLAN.
Step 4b	**show vlan**	Show information of all existed VLAN.
Step 5	**write**	Save configurations.

6.1.2 Configure/Delete VLAN Description

Begin at privileged configuration mode, configure or delete VLAN description as the following table shows.

	Command	**Function**
Step 1	**configure terminal**	Enter global configuration mode.
Step 2	**interface vlan** *vlan_id*	Create VLAN or enter VLAN infterface configuration mode.

		VLAN ID range is from 1 to 4094.
Step 3a	**description** *string*	Configure VLAN description.
Step 3b	**no description**	Delete VLAN description.
Step 4	**exit**	Exit to bloble configuration mode.
Step 5	**show interface vlan** *vlan_id*	Show VLAN interface information.
Step 6	**write**	Save configurations.

Notice:

By default, VLAN description is VLAN ID, such as " vlan 1".

6.1.3 Configure/Delete IP Address and Mask of VLAN

Begin at privileged configuration mode, configure or delete IP address and mask of VLAN as the following table shows.

	Command	**Function**
Step 1	**config terminal**	Enter global configuration mode.
Step 2	**interface vlan** *vlan_id*	Enter VLAN interface configuration mode.

		VLAN ID range is from 1 to 4094.
Step 3a	**ip address** *<A.B.C.D> net-mask*	Configure IP address and mask of VLAN.
Step 3b	**no ip address** *<A.B.C.D>*	Delete IP address and mask of VLAN.
Step 4	**exit**	Exit to global configuration mode.
Step 5	**show interface vlan** *vlan_id*	Show VLAN information.
Step 6	**write**	Save configurations.

6.2 Show VLAN Information

Input the following commands to Show VLAN information and port members.

Operation	Command
Show VLAN information	**show interface vlan**
Show VLAN port members	**show interface vlan** *vlan-id*

Example:

Show VLAN 100 port members

```
gpon-olt (config)# show in vlan 100
Vlan ID              : 100
Name                    : vlan100
```

```
Mac address        : 00:90:4c:06:a5:73

Tagged Ports       : gpon0/1

Untagged Ports : ge0/8
```

Notice:

By default, It have one vlan on system ,do not delete and edit.

```
Vlan ID              : 1

Name                    : vlan1

Mac address        : 00:90:4c:06:a5:73

Tagged Ports       :


Untagged Ports : ge0/1      ge0/2      ge0/3      ge0/4      ge0/5      ge0/6

ge0/7      ge0/8

                                   ge0/9      ge0/10    ge0/11    ge0/12

gpon0/1       gpon0/2       gpon0/3       gpon0/4       gpon0/5       gpon0/6

gpon0/7      gpon0/8
```

7. VLAN Translation/QinQ

7.1 Configure VLAN Translation/QinQ

Begin at privileged configuration mode, configure VLAN translation/QinQ as the following table shows.

	Command	Function
Step 1	**configure terminal**	Enter global configuration mode.
Step 2	**interface** *{interface_type slot/port}*	Enter interface configuration mode.
Step 3a	**dot1q-tunnel vlan-maping** *ori_vlan* **{any|** *ori_vlan_pri***}** *tra_vlani* **{any|tra_vlan_pri} {db-tag|one-tag}**	Configure VLAN translation/QinQ. db-tag means QinQ. one-tag means translation.
Step 3b	**no dot1q-tunnel vlan-maping** *ori_vlan tra_vlanid*	Delete VLAN translation/QinQ.
Step 4	**exit**	Exit to global configuration mode.
Step 5	**show vlan vlan-maping interface** *{interface_type slot/port}*	Show VLAN translation/QinQ configurations.

Step 6	**write**	Save configurations.

7.2 Example

(1)VLAN translation function

Configure GE1 VLAN translation function, CVLAN is 100, priority is 1, and translated VLAN is 200, priority is 2.

```
gpon-olt (config)# interface gigabitethernet 0/1
gpon-olt (config-if)#switchport hybrid vlan 100 tagged
gpon-olt (config-if)#switchport hybrid vlan 200 tagged
gpon-olt(config-if)# vlan-mapping 100 1 200 2 one-tagged
gpon-olt (config)#show vlan vlan-mapping interface gigabitethernet 0/1
```

(2)QinQ function

Configure GE2 QinQ function, CVLAN is 300, priority is 3, and SVLAN is 400, priority is 4.

```
gpon-olt (config)# interface gigabitethernet 0/2
gpon-olt (config-if)#switchport hybrid vlan 300 tagged
gpon-olt (config-if)#switchport hybrid vlan 400 tagged
gpon-olt (config-if)# vlan-mapping 300 3 400 4 db-tagged
gpon-olt (config)#show vlan vlan-mapping interface gigabitethernet 0/2
```

8. ARP Proxy

In order to achieve interconnection between ONU in the same PON, the devices added the ARP Proxy function.

	Command	**Function**
Step 1	**config terminal**	Enter global configuration mode.
Step 2	**interface vlan** *vlan_id*	Create vlan and enter to vlan interface
Step 3a	**ip proxy-arp**	Enable ARP Proxy
Step 3b	**no ip proxy-arp**	Disable ARP Proxy

9. MAC Address Configuration

9.1 Overview

In order to forward messages rapidly, a device need to maintain its MAC address table. MAC address table contains MAC addresses that connect with the device, ports, VLAN, type and aging status. Dynamic MAC addresses in the table are learnt by device. The proccess of learning is that: if port A receives a message, device will analyze the source MAC address (SrcMAC), and think of messages whose destination MAC address is SrcMAC can be forwarded to port A. If SrcMAC has been in the table, device will update it; if not, device will add this new address to the table.

For the messages whose destination MAC address can be found in MAC address table, they are forwarded by hardware. Otherwise, they flood to all ports. When flooded messages arrive to its destination, the destination device will respond. The device will add new MAC to the table. Then, messages with this destination MAC will be forwarded via the new table. However, when messages still can’t find its destination by flood, device will discard them and tell sender destination is unreachable.

9.2 Configure MAC Address

MAC address management includes:

- Configure MAC address table
- Configure MAC address aging time

9.2.1 Configure MAC address Table

You can add static MAC address entries, delete MAC address entries or clean MAC address table.

Begin at privileged configuration mode, configure MAC address table as the following table shows.

	Command	**Function**
Step 1	**configure terminal**	Enter global configuration mode.
Step 2a	**mac address-table static vlan** *vlan_id xxxx:xxxx:xxxx* **interface** *interface_type slot/port*	Add static MAC address entry.
Step 2b	**no mac address-table vlan** *vlan_id xxxx:xxxx:xxxx*	Delete MAC address entry.
Step 2c	**mac address-table clean**	Clean MAC address table.
Step 3	**show mac address-table**	Show MAC address table.

Step 4	**write**	Save configurations.

9.2.2 Configure MAC Address Aging Time

There is aging time in device. If device doesn’t receive any message from other devices in aging time, it will delete the MAC address from MAC table. But for static MAC in the table, aging time is not effective.

Begin at privileged configuration mode, configure MAC address aging time as the following table shows.

	Command	**Function**
Step 1	**configure terminal**	Enter global configuration mode.
Step 2	**mac address-table agingtime** *value*	Configure MAC address aging time, range is 10-1000000s. 0s means don’t aging. Default is 300s.
Step 3	**show mac address-table agingtime**	Show aging time.
Step 4	**write**	Save configurations.

9.2.3 Clean MAC Address Table

Begin at privileged configuration mode, clean MAC address table as the following table shows.

	Command	Function
Step 1	**configure terminal**	Enter global configuration mode.
Step 2	**mac address-table clean**	Clean MAC address table.

9.2.4 Configure Maximum Learnt MAC Enties of Port

Begin at privileged configuration mode, configure maximum learnt MAC entries of port as the following table shows.

	Command	Function
Step 1	**configure terminal**	Enter global configuration mode.
Step 2	**interface** *{interface_type slot/port}*	Enter interface configuration mode.
Step 3	**mac-address mac-limit** *<0-16384>*	0 means no limitation.
Step 4	**exit**	Exit to global configuration mode.

9.3 Show MAC Address Table

9.3.1 Show MAC Address Table

Begin at privileged configuration mode, show MAC address table as the following table shows.

	Command	Function
Step 1	**configure terminal**	Enter global configuration mode.
Step 2a	**show mac address-table interface** *{interface_type slot/port}*	Show MAC address table basedon Ethernet port.
Step 2b	**show mac address-table vlan** *vlan_id*	Show MAC address table based on VLAN ID.
Step 2c	**show mac address-table**	Show whole MAC address table.

9.3.2 Show MAC Address Aging Time

Begin at privileged configuration mode, show MAC address aging time as the following table shows.

	Command	Function
Step 1	**configure terminal**	Enter global configuration mode.
Step 2	**show mac address-table agingtime**	Show MAC address aging time.

10. Configure Port Mirroring

Port mirroring is to copy one or more ports’ traffic to specific port. It is usually used for network traffic analysis and diagnosis.

The device supports 4 mirroring sessions.

10.1 Configure Mirroring Destination Port

Begin at privileged configuration mode, configure mirroring destination port as the following table shows.

	Command	Function
Step 1	**configure terminal**	Enter global configuration mode.
Step 2	**monitor session** *session_number* **destination interface** *interface_type interface_num*	Confire mirroring destination port. Session number is 1~4.
Step 3	**show monitor session all**	Show mirroring configurations.
Step 4	**write**	Save configurations.

10.2 Configure Mirroring Source Port

Mirroring source port is the port we want to monitor. Data that pass through the port will be copied to mirroring destination port.

Begin at privileged configuration mode, configure mirroring source port as the following table shows.

	Command	Function
Step 1	**configure terminal**	Enter global configuration mode.
Step 2	**monitor session** *session_number* **source interface** *interface_type start_interface_num* [**-** *end_interface_num* **]** {**both|rx|tx**}	Configure mirroring source port. session_number is 1-4. **Both** means received data and transmitted data. **rx** means received data. **tx** means transmitted data.
Step 3	**show monitor session all**	Show mirroring configurations.
Step 4	**write**	Save configurations.

10.3 Delete Port Mirroring

Begin at privileged configuration mode, delete port mirroring as the following table shows.

	Command	Function
Step 1	**configure terminal**	Enter global configuration mode.
Step 2	**no monitor session** *session_number* **{[destination | source] interface** *interface_type slot/port***}**	Delete port mirroring. session_number is 1-4
Step 3	**show monitor session all**	Show mirroring configurations.

Example:

Mirror data from gpon 0/1 to uplink port 1.

gpon-olt(config)# monitor session 1 destination interface gigabitethernet 0/1

gpon-olt (config)# monitor session 1 source interface gpon 0/1 both

11. IGMP Configuration

11.1 IGMP Snooping

11.1.1 Enable/Disable IGMP Snooping

IGMP snooping is disabled by default. You should enable by the following command.

Begin at privileged configuration mode, enable/disable IGMP snooping as the following table shows.

	Command	Function
Step 1	**configure terminal**	Enter global configuration mode.
Step 2a	**ip igmp snooping enable**	Enable IGMP Snooping.
Step 2b	**no ip igmp snooping**	Disable IGMP snooping.
Step 3	**show ip igmp snooping configuration**	Show IGMP snooping configurations.
Step 4	**write**	Save configurations.

11.1.2 Configure Multicast Data Forwarding Mode

Begin at privileged configuration mode, configure multicast data forwarding mode as the following table shows.

	Command	Function

Step 1	**configure terminal**	Enter global configuration mode.
Step 2	**ip igmp snooping forward vlan** *vlan-id* **mode { flood ｜ forward ｜ strict-forward}**	Configure multicast data forwarding mode.
Step 3	**write**	Save configurations.

11.1.3 Configure Port Multicast VLAN

After add VLAN to the port, you should also configure multicast VLAN for multicast service. Begin at privileged configuration mode, configure port multicast VLAN as the following table shows.

	Command	**Function**
Step 1	**configure terminal**	Enter global configuration mode.
Step 2	**interface** *{interface_type slot/port}*	Enter interface configuration mode.
Step 3a	**ip igmp snooping user-vlan vlan_id group-vlan vlan_id { tagged | untagged }**	Configure port multicast VLAN. VLAN range is 1-4094.
Step 3b	**no ip igmp snooping group-vlan** *vlan_id*	Delete port multicast VLAN.
Step 4	**exit**	Exit to global

		configuration mode.
Step 5	**show ip igmp snooping user-vlan**	Show multicast VLAN.
Step 6	**write**	Save configurations.

11.1.4 Configure Multicast Router Port

Multicast router port is used to forward IGMP messages. Usually, uplink port is configured as multicast router port.

Begin at privileged configuration mode, configure multicast router port as the following table shows.

	Command	**Function**
Step 1	**configure terminal**	Enter global configuration mode.
Step 2a	**ip igmp snooping mrouter vlan** *vlan-id* **interface** *{interface_type slot/port}*	Configure multicast router port.
Step 2b	**no ip igmp snooping mrouter vlan** *vlan-id* **interface** *{interface_type slot/port}*	Delete multicast router port.
Step 3	**show ip igmp-snooping mrouter vlan all**	Show multicast router mode configuration.
Step 4	**write**	Save configurations.

11.1.5 Configure Static Multicast

Begin at privileged configuration mode, configure static multicast as the following table shows.

	Command	Function
Step 1	**configure terminal**	Enter global configuration mode.
Step 2a	**ip igmp snooping static vlan** *vlan-id <A.B.C.D>* **interface** *interface-id*	Configure static multicast.
Step 2b	**no ip igmp snooping static vlan** *vlan-id <A.B.C.D>* **interface** *interface-id*	Delete static multicast.
Step 3	**show ip igmp-snooping configuration**	Show IGMP configurations.
Step 4	**write**	Save configurations.

11.1.6 Configure Fast Leave

Begin at privileged configuration mode, configure fast leave as the following table shows.

	Command	Function
Step 1	**configure terminal**	Enter global

		configuration mode.
Step 2	**interface** *{interface_type slot/port}*	Enter interface configuration mode.
Step 3a	**ip igmp snooping immediate-leave**	Enable fast leave.
Step 3b	**no ip igmp snooping immediate-leave**	Disable fast leave.
Step 4	**exit**	Exit to global configuration mode.
Step 5	**show ip igmp snooping port information**	Show port IGMP information.
Step 6	**write**	Save configurations.

11.1.7 Configure Multicast Group Limit

Begin at privileged configuration mode, configure multicast group limitation as the following table shows.

	Command	**Function**
Step 1	**configure terminal**	Enter global configuration mode.
Step 2	**interface** *{interface_type slot/port}*	Enter interface configuration mode.
Step 3a	**ip igmp snooping limit** *<0-1024>*	Configure port multicast group limitation.

Step 3b	**no ip igmp snooping limit**	Reset multicast group limitation to default.
Step 4	**exit**	Exit to global configuration mode.
Step 5	**show ip igmp snooping port information**	Show port multicast information.
Step 6	**write**	Save configurations.

11.1.8 Configure Parameters of Special Query

Begin at privileged configuration mode, configure parameters of specific query as the following table shows.

	Command	**Function**
Step 1	**configure terminal**	Enter global configuration mode.
Step 2a	**ip igmp snooping lastmember-querycount** *<1-255>*	Configure specific query count. Default is 2.
Step 2b	**ip igmp snooping lastmember-queryinterval** *<1-255>*	Configure specific query interval. Default is 1s.
Step 2c	**ip igmp snooping lastmember-queryresponse** *<1-255>*	Configure specific query response time. Default is 1s.
Step 3	**show ip igmp snooping**	Show IGMP

	configuration	configurations.
Step 4	**write**	Save configurations.

11.1.9 Configure Parameters of General Query

Begin at privileged configuration mode, configure parameters of general query as the following table shows.

	Command	Function
Step 1	**configure terminal**	Enter global configuration mode.
Step 2a	**ip igmp snooping general-query-packet** *<enable|disable>*	Enable or disable general query function. Default is disable.
Step 2b	**ip igmp snooping general-query-time** *<10-255>*	Configure general query interval. Default is 126s.
Step 3	**show ip igmp snooping configuration**	Show IGMP configurations.
Step 4	**write**	Save configurations.

11.1.10 Configure Source IP of Query

Begin at privileged configuration mode, configure source IP of query message as the following table shows.

	Command	Function

Step 1	**configure terminal**	Enter global configuration mode.
Step 2	**ip igmp snooping member-query source-ip** *<A.B.C.D>*	Configure source IP of query message. Default is 1.1.1.1.
Step 3	**show ip igmp snooping configuration**	Show IGMP configurations.
Step 4	**write**	Save configurations.

11.1.11 Configure Multicast Member Aging Time

If the port doesn’t receive any report message from member in aging time, device will delete this port from group members.

Begin at privileged configuration mode, configure muticast member aging time as the following table shows.

	Command	**Function**
Step 1	**configure terminal**	Enter global configuration mode.
Step 2	**ip igmp snooping host-aging-time** *seconds*	Configure multicast port member aging time. Value range is 10-3600s, defaultis260s.
Step 3	**show ip igmp snooping**	Show IGMP

	configuration	configurations.
Step 4	**write**	Save configurations.

11.1.12 Show Multicast Gourp Information

If there is member join a group, you can use the following commands to show multicast group information.

	Command	**Function**
Step 1	**configure terminal**	Enter global configuration mode.
Step 2a	**show ip igmp snooping vlan** *[vlan-id* | **all***]*	Show multicast group information.
Step 2b	**show ip igmp snooping statistic**	Show multicast statistic.

11.1.13 Configure Multcast on PON

Include the way to process unknown-mcast and igmp

	Command	**Function**
Step 1	**configure terminal**	Enter global configuration mode
Step 2a	**ip igmp snooping mvlan** *<1-4094>* **unknown-mcast** *[forward|drop]* **igmp** *[forward|trap-to-cpu]*	Configurate the way to process mvlan and unknown multcast.

11.2 Example

This example introduces how to configure IGMP snooping function, including multicast VLAN, multicast router port and ONU LAN port, etc.

1. Requirement

In order to achieve multicast function, you should enable IGMP Snooping, configure multicast VLAN, multicast router port, and so on. The requirement contains:

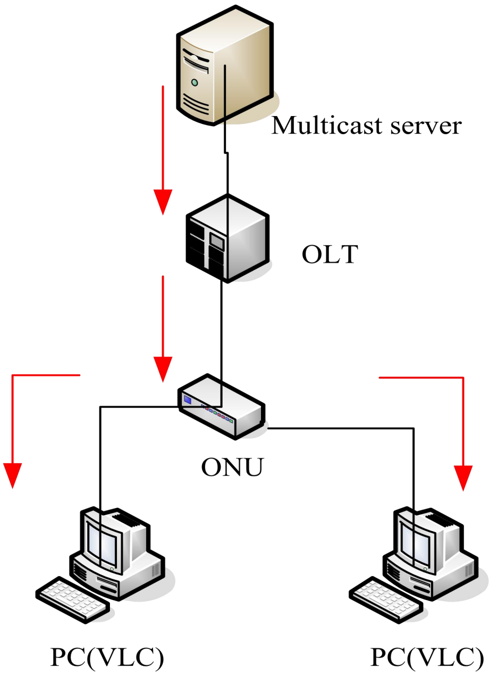
multicast is VLAN 100.

Multicast server connects to uplink port 1.

ONU connects to PON 1.

Client, such as a PC, connects to ONU LAN 1.

2. Framework



3. Steps

(1)Create VLAN

```
gpon-olt (config)# vlan 100
gpon-olt (config-vlan-100)# exit
```

(2)Configure multcast VLAN100

```
gpon-olt (config)# interface g 0/1
gpon-olt (config-if-ge0/1)# switchport hybrid vlan 100 tagged
gpon-olt (config-if-ge0/1)# exit
gpon-olt (config)# inter gpon 0/1
gpon-olt (config-pon-0/1)# switchport hybrid vlan 100 tagged
gpon-olt(config-pon-0/1)# ip igmp snooping user-vlan 100 group-vlan 100 tagged
gpon-olt(config-pon-0/1)# exit
```

(3)Enable IGMP Snooping

```
gpon-olt(config)# ip igmp snooping enable
```

(4)Configure the G0/1 to multcast router port

```
gpon-olt(config)# ip igmp snooping mrouter vlan 100 interface gigabitethernet 0/1
```

(5)Configure the multcast and igmp rule

```
gpon-olt(config)# ip igmp snooping mvlan 100 unknown-mcast drop igmp trap-to-cpu
```

(6)Configure the onu

```
gpon-olt(config)# inter gpon 0/1
```

```
gpon-olt(config-pon-0/1)# onu add 1 profile 1GE sn GPON00000031
gpon-olt(config-pon-0/1)# onu 1 tcont 1
gpon-olt(config-pon-0/1)# onu 1 gemport 1 tcont 1
gpon-olt(config-pon-0/1)# onu 1 service 1 gemport 1 vlan 100
gpon-olt(config-pon-0/1)# onu 1 service-port 1 gemport 1 uservlan 100 vlan 100
gpon-olt(config-pon-0/1)# onu 1 portvlan eth 1 mode hybrid def_vlan 100
gpon-olt(config)#ip igmp snooping mvlan 100
gpon-olt(config)#ip igmp snooping mvlan 100 receive-port gpon-onu_1/1/2:1 vport 1
gpon-olt(config)#ip igmp snooping mvlan 100 group 224.1.1.1 to 224.1.1.10 static-port gpon-onu_1/1/2:1 vport 1
```

12. ACL Configuration

12.1 Overview

In order to filter data packages, network equipments need to setup a series of rules for identifying what need to be filtered. Only matched with the rules the data packages can be filtered. ACL can achieve this function. Matched conditions of ACL rules can be source address, destination address, Ethernet type, VLAN, protocol port, and so on.

These ACL rules also can be used in other situations, such as classification of stream in QoS. An ACL rule may contain one or several sub-rules, which have different matched conditions.

This device supports the following types of ACL.

- IP Standard ACL.
- IP Extended ACL.
- ACL based on MAC address
- ACL based on port binding.
- ACL based on QoS.

Limitation of each ACL rule:

ACL type	ACL index	Maxium rules
IP Standard ACL	0-999	1000
IP Extended ACL	1000-1999	1000

ACL based on MAC address	2000-2999	1000
ACL based on port binding	5000-5999	1000
ACL based on QoS	6000-6999	1000

12.2 ACL Confiuration

ACL configuration mainly includes:

- IP Standard ACL.
- IP Extended ACL.
- ACL based on MAC address
- ACL based on port binding.
- ACL based on QoS.
- ACL rule apply to port.

12.2.1 IP Standard ACL

Begin at privileged configuration mode, configure IP standard ACL as the following table shows.

	Command	Function
Step 1	**configure terminal**	Enter global configuration mode.
Step 2	**access-list** *access-list-index*	Enter ACL configuration mode. *access-list-number* is ACL

		index. range:0-999.
Step 3a	**subset ip (permit|deny)** *<A.B.C.D>* [*net-mask*] **subset ip (permit|deny) host** *<A.B.C.D>* **subset ip [permit|deny] any**	Configure ACL rule. <A.B.C.D>: define based on source IP address and mask ACL rule. **Host**: define based on single IP address ACL rule. **Any**: define based on any source IP address ACL rule.
Step 3b	**No access-list** *access-list-index*	Delete the ACL
Step 4	**exit**	Exit to global configuration mode.
Step 5	**show access-list** [*access-list-number* | **all]**	Show ACL configurations.
Step 6	**write**	Save configurations.

12.2.2 IP Extended ACL

Begin at privileged configuration mode, configure IP extended ACL as the following table shows.

	Command	Function
Step 1	**configure terminal**	Enter global configration

		mode.
Step 2	**access-list** *access-list-index*	Enter ACL configuration mode. *access-list-number* is ACL index. range:1000-1999.
Step 3a	**subset protocol** {**deny** | **permit**} *protocol* { *<A.B.C.D> net-mask* {*<A.B.C.D> net-mask* | **host** *<A.B.C.D>* / **any** }[**match** {**dscp** *priority*| **precedence** *priority* | **tos** *priority*}] [**set** {**dscp** *priority*| **precedence** *priority* | **tos** *priority*}]	Configure IP extended ACL rule. Parameter *protocol* should be icmp, igmp, igrp, ip, ospf, pim, tcp, or udp, etc. it also can be replaced by protocol code 0~255.
Step 3b	**no access-list** *access-list-index*	Delete ACL
Step 4	**exit**	Exit global configuration mode.
Step 5	**show access-list** **[***access-list-number* / **all**]	Show ACL configurations.
Step 6	**write**	Save configurations.

12.2.3 ACL Based on MAC Address

Begin at privileged configuration mode, configure ACL based on MAC address as the following table shows.

	Command	Function
Step 1	**configure terminal**	Enter global configuration mode.
Step 2	**access-list** *access-list-number*	Enter ACL configuration mode. *access-list-number* is ACL index. range:2000-2999.
Step 3a	**subset ethernet** [permit|deny] [source] <xx:xx:xx:xx:xx:xx> <xx:xx:xx:xx:xx:xx> {[dest] <xx:xx:xx:xx:xx:xx> <xx:xx:xx:xx:xx:xx>}*1 {[vlan] <1-4094>}*1 {[cos] <0-7>}*1 {[ethernet-type] <XXXX> <XXXX>	Configure IP extended ACL rule.
Step 3b	**no access-list** *access-list-index*	Delete ACL
Step 4	**exit**	Exit to global configuration mode.
Step 5	**show access-list [***access-list-number* | **all]**	Show ACL configurations.
Step 6	**write**	Save configurations.

12.2.4 ACL Based on Port Binding

This type of ACL includes the other types.

Begin at privileged configuration mode, configure ACL based on port binding as the following table shows.

	Command	Function
Step 1	**configure terminal**	Enter global configuration mode.
Step 2	**access-list** *access-list-number*	Enter ACL configuration mode. *access-list-number* is ACL index. range:5000-5999;
Step 3a	**subset port-business [permit|deny] {src-ip |dest-ip | protocol | tos-dscp | src-mac | dest-mac | vlan | cos | ethernet-type | src-port | dest-port}**	Permit:Permit data stream which match the rule passing through. Deny:Do not permit data stream which match the rule passing through. src-ip : source IP address dest-ip:destination IP address protocol:IP protocol type

		tos-dscp:IP priority src-mac:source MAC address dest-mac:destination MAC address vlan:VLAN IAD cos:802.1p priority ethernet-type:ethernet type src-port:Layer 4 source port dest-port:Layer 4 destination port
Step 3b	**no access-list** *access-list-index*	Delete ACL
Step 4	**exit**	Exit to global configuration mode.
Step 5	**show access-list** *access-list-number*	Show ACL configurations.
Step 6	**write**	Save configurations.

12.2.5 ACL Based on QoS

Begin at privileged configuration mode, configure ACL based on QoS as the following table shows.

	Command	Function
Step 1	**configure terminal**	Enter global configuration mode.
Step 2	**access-list** *access-list-number*	Enter ACL configuration mode. *access-list-number* is ACL index. range:6000-6999.
Step 3a	**subset qos <0-8> <0-7> <1-12>**	<0-8>: output priority <0-7>: output queue <1-12>: rule priority
Step 3b	**subset qos {src-ip |dest-ip | protocol | tos-dscp | src-mac | dest-mac | vlan | cos | ethernet-type | src-port | dest-port}**	src-ip : source IP address dest-ip: destination IP address protocol: IP protocol type tos-dscp: IP priority src-mac: source MAC address dest-mac: destination MAC address vlan: VLAN ID cos:802.1p priority ethernet-type: Ethernet

		type src-port:Layer 4 source port dest-port:Layer 4 destination port
Step 3c	**no access-list** *access-list-number*	Deleting ACL rule. Only the ACL that have not been applied can be deleted.
Step 4	**exit**	Exit to global configuration mode.
Step 5	**show access-list** *access-list-number*	Show ACL configurations.
Step 6	**write**	Save configurations.

12.2.6 ACL Rule Apply to Port

Begin at privileged configuration mode, apply ACL rule to port as the following table shows.

	Command	**Function**
Step 1	**configure terminal**	Enter globle configuration mode.
Step 2	**interface** *{interface_type slot/port}*	Enter interface configuration mode.
Step 3a	**ip access-group** *access-list-number* **in**	Apply ACL rule to port.

Step 3b	**no ip access-group** *access-list-number* **in**	Delete ACL rule from port.
Step 4	**exit**	Exit to glogbal configuration mode.
Step 5	**show access-list** *access-list-number*	Show ACL configurations.
Step 6	**write**	Save configurations.

12.3 Example

(1)Deny specific IP address packets passing through

PON1 denies packets which source IP is 192.168.100.10 passing through.

```
gpon-olt(config)# access-list 5000
gpon-olt(config-bsn-acl-5000)# subset port-business deny src-ip 192.168.100.10 255.255.255.255
gpon-olt(config-bsn-acl-5000)# exit
gpon-olt(config)# interface gpon 0/1
gpon-olt(config-pon-0/1)# ip access-group 5000 in
```

(2)Permit specific MAC address packets passing through

PON1 permits IP packets which source MAC is b8:97:5a:72:37:8d passing through.

```
gpon-olt(config)#access-list 2000
gpon-olt(config-eth-acl-2000)# subset ethernet deny  ethernet-type
```

```
0800 ffff
gpon-olt(config-eth-acl-2000)#exit
gpon-olt(config)# access-list 2001
gpon-olt(config-eth-acl-2001)# subset ethernet permit source b8:97:5a:72:37:8d ff:ff:ff:ff:ff:ff
gpon-olt(config-eth-acl-2001) # exit
gpon-olt(config)# interface gpon 0/1
gpon-olt(config-pon-0/1)# ip access-group 2000 in
gpon-olt(config-pon-0/1)# ip access-group 2001 in
gpon-olt(config-pon-0/1)#exit
```

13. QoS Configuration

13.1 Configure Queue Scheduling Mode

Queue scheduling mode contains strict priority, weighted round robin and hybrid mode. This device supports 8 queues altogether.

Begin at privileged configuration mode, configure queue scheduling mode as the following table shows.

	Command	**Function**
Step 1	**configure terminal**	Enter global configuration mode.
Step 2a	**queue-scheduler strict-priority**	Configure strict priority scheduling mode.
Step 2b	**queue-scheduler wrr** [*queue0 queue1 queue2 queue3 queue4 queue5 queue6 queue7*]	Configure weighted round robin scheduling mode. *Queue*x is weight of queue x, range is 1-127. By default, weights of queue 0~7 are 1, 1, 2, 2, 4, 4, 8, 8.
Step 2c	**queue-scheduler sp-wrr [***queue0*	Configure hybrid

	queue1 queue2 queue3 queue4 queue5 queue6 queue7]	scheduling mode. *Queue*x is weight of queue x, range is 0-127. If it is set to be 0, the queue is strict priority queue. By default, weights of queue 0~7 are 1, 1, 2, 2, 4, 4, 8, 8.
Step 3	**show queue-scheduler**	Show queue scheduling configurations.
Step 4	**write**	Save configurations.

13.2 Configure Queue Mapping

Begin at privileged configuration mode, configure queue mapping as the following table shows.

	Command	**Function**
Step 1	**configure terminal**	Enter global configuration mode.
Step 2	**queue-scheduler tc** *priority* **queue** *queue*	Configure mapping relation between queues and priority.

		By default, priority 0~7 maps to queue 0~7 respectively.
Step 3	**show queue-scheduler priority mapping**	Show queue mapping.
Step 4	**write**	Save configurations.

14. STP Configuration

14.1 STP Default Settings

STP default settings:

Speciality	**Default value**
Enable status	STP disabled
Bridge priority	32768
STP port priority	128
STP port cost	10-Gigabit Ethernet :2 Gigabit Ethernet :4 Fast Ethernet :19 Ethernet :100
Hello time	2s
Forward delay time	15s
Maxmum aging time	20s
Mode	RSTP

14.2 Cofigure STP

STP configurations mainly contain:

- Enable device’s STP function.
- Enable port’s STP function.

- Configure STP mode.
- Configure bridge priority of device.
- Configure forward delay of device.
- Configure hello time of device.
- Configure max age of designated device.
- Configure priority of designated port.
- Configure path cost of designated port.

14.2.1 Enable STP Function

Begin at privileged configuration mode, enable device's STP function as the following table shows.

	Command	Function
Step 1	**configure terminal**	Enter global configuration mode.
Step 2a	**spanning-tree on**	Enable device's STP function. By default, STP function is disabled.
Step 2b	**no spanning-tree**	Disable device's STP function.
Step 3	**show spanning-tree**	Show STP configurations.
Step 4	**write**	Save configurations.

14.2.2 Enable Port STP

In order to work flexibly, you can disable some specific ports' STP function.

Begin at privileged configuration mode, enable port's STP function as the following table shows.

	Command	Function
Step 1	**configure terminal**	Enter global configuration mode.
Step 2	**interface** *{interface_type slot/port}*	Enter interface configuration mode.
Step 3a	**spanning-tree on**	Enable port's STP function.
Step 3b	**no spanning-tree on**	Disable port's STP function.
Step 4	**exit**	Exit to global configuration mode.
Step 5	**show spanning-tree interface** *{interface_type slot/port}*	Show port's STP configurations.
Step 6	**write**	Save configurations.

14.2.3 Configure Bridge Priority

Device's bridge priority decides if it will be selected as root of spanning tree.

Begin at privileged configuration mode, configure device's bridge prority as the following table shows.

	Command	Function
Step 1	**configure terminal**	Enter global configuration mode.
Step 2	**spanning-tree priority** *bridge-priority*	Configure device's bridge priority. Priority range is 0~65535, default is 32768.
Step 3	**show spanning-tree**	Show STP configurations.
Step 4	**write**	Save configurations.

14.2.4 Configure Forward Delay

Network will recompute spanning tree when there is link down in network. Construction of spanning tree will be changed too. But the new STP PDU can't go the rounds of network. In this case, a temporary loop will come out if the new root port and designated port forward data immediately. So, STP adopts state transition mechanism. Before re-forwarding data, root port and designated port will undergo an intermediate state. After forward delay time out in the intermediate state, the new STP PDU have gone the rounds of network, then root port and designated port begin to forward data.

Begin at privileged configuration mode, configure device's forward delay as the following table shows.

	Command	Function
Step 1	**configure terminal**	Enter global configuration mode.
Step 2	**spanning-tree forward-time** *seconds*	Configure device's forward delay. bridge-priority range is 4~30, default is 15.
Step 3	**show spanning-tree**	Show STP configurations.
Step 4	**write**	Save configurations.

Forward Delay has something to do with that how big the network is. Generally, the bigger the network, the longer forward delay should be configured. If forward delay is too small, there may be temporary redundant path; while it is too big, network will take more time to resume connectivity. We suggest using default value if you have no idea about this.

Notice:

Hello time, forward delay and maximum age are time parameters of root device. These three parameters should meet the following formula, otherwise, the network will not stable.

2 × (forward-delay —1) >= maximum-agemaximum-age >= 2 × (hello + 1)

The unit of “1” in formula is second.

14.2.5 Configure Hello Time

Network Bridge will send hello message to other surrounding network bridge at regular intervals for verifying link connectivity. A suitable hello time can ensure a device find link failure in time and not occupy more network resource. If hello time is too big, device will be in mistake for link failure when loss packets. Then network device recomputes spanning tree. While if too small, network device sends repeated STP PDU frequently. This will increase device’s load and waste network resource.

Begin at privileged configuration mode, configure device’s hello time as the following table shows.

	Command	Function
Step 1	**configure terminal**	Enter global configuration mode.

Step 2	**spanning-tree hellotime** *seconds*	Configure device’s hello time. Hello time range is 1~10, default is 2.
Step 3	**show spanning-tree**	Show STP configurations.
Step 4	**write**	Save configurations.

14.2.6 Configure Max Aging Time

Max age time is maximum life time of configuration message. When message age is biger than maximum age, configuration message will be discarded.

Begin at privileged configuration mode, configure maximum age as the following table shows.

	Command	**Function**
Step 1	**configure terminal**	Enter global configuration mode.
Step 2	**spanning-tree max-age** *seconds*	Configure maximum age of device. max age range is 6-40, default is 20.
Step 3	**show spanning-tree**	Show STP

		configurations.
Step 4	**write**	Save configurations.

14.2.7 Configure Priority of Designated Port

Port priority decides whether it can be selected as root port or not. On equal conditions, the higher priority port will be selected as root port. Generally, the priority value is smaller, the port has higher priority. If all ports' priority value are the same, their priority decided by their port index.

Begin at privileged configuration mode, configure priority of designated port as the following table shows.

	Command	**Function**
Step 1	**configure terminal**	Enter global configuration mode.
Step 2	**interface** *{interface_type slot/port}*	Enter interface configuration mode.
Step 3	**spanning-tree port-priority** *priority*	Configure priority of designated port. priority range is 1-255, default is 128.
Step 4	**exit**	Exit to global configuration mode.

Step 5	**show spanning-tree interface** *{interface_type slot/port}*	Show port STP configurations.
Step 6	**write**	Save configurations.

14.2.8 Configure Path Cost of Designated Port

Path Cost is related to the speed of the link connected to the port. On the STP switch, a port can be configured with different path costs.

Begin at privileged configuration mode, configure path cost of designated port as the following table shows.

	Command	**Function**
Step 1	**configure terminal**	Enter global configuration mode.
Step 2	**interface** *{interface_type slot/port}*	Enter interface configuration mode.
Step 3	**spanning-tree cost** *value*	Configure path cost of designated port. Path cost range is 1-65535, default is auto.
Step 4	**exit**	Exit to global configuration mode.
Step 5	**show spanning-tree interface** *{interface_type slot/port}*	Show port STP configurations.

Step 6	**write**	Save configurations.

14.2.9 Configure Edge Port

The port which connects with terminal host is Edge Port. In process of spanning tree recomputation, edge port can transfer to forwarding status derectly so that it can reduce transfer time. Because RSTP can't detect whether the port is edge port or not, if the port doesn't connect with switch, you'd better configure it as edge port. But when the port connects with a switch, RSTP can detect and configure it as non-edge port. By default, all ports are configured as non-edged port.

Begin at privileged configuration mode, configure edge port as the following table shows.

	Command	**Function**
Step 1	**configure terminal**	Enter global configuration mode.
Step 2	**interface** *{interface_type slot/port}*	Enter interface configuration mode.
Step 3a	**spanning-tree operedge**	Configure port as an edge port.
Step 3b	**no spanning-tree operedge**	Reset spanning tree port to default.
Step 4	**exit**	Exit to global

		configuration mode.
Step 5	**show spanning-tree interface** *{interface_type slot/port}*	Show port STP configurations.
Step 6	**write**	Save configurations.

14.2.10 Configure Point to Point Mode

Point to point mode is usually the link which connects with switches. For the ports connected with the point-to-point link, upon some port role conditions met, they can transit to forwarding state fast through transmitting synchronization packet, thereby reducing the unnecessary forwarding delay.

Begin at privileged configuration mode, configure port to connect with point to point link as the following table shows.

	Command	**Function**
Step 1	**configure terminal**	Enter global configuration mode.
Step 2	**interface** *{interface_type slot/port}*	Enter interface configuration mode.
Step 3a	**spanning-tree point-to-point**	Configure a port as point to point port. By default, all ports are configured as point to

		point ports.
Step 3b	**no spanning-tree point-to-point**	Not to configure a port as point to point port.
Step 4	**exit**	Exit to global configuration mode.
Step 5	**show spanning-tree interface** *{interface_type slot/port}*	Show port STP configurations.
Step 6	**write**	Save configurations.

14.3 Show STP Information

After configuring, use the following commands to show STP information.

Command	**Function**
show spanning-tree	Show STP configurations and running status.
show spanning-tree interface *{interface_type slot/port}*	Show STP configurations and running status of a port.

15. DHCP Management Configuration

15.1 Configure DHCP Server

Now, larger and larger number of IP address are needed to allocate .DHCP (Dynamic Host configuration Protocol) is created to solve this problem .It concludes DHCP Server and DHCP Client.Requested by client, IP address are allocated by the server.Configure DHCP Server as the following table show:

	Command	**Function**
Step 1	**config terminal**	Enter global configuration mode.
Step 2a	**dhcp-server [enable | disable]**	Disable the DHCP server function
Step 2b	**dhcp-server [dns1 | dns2 | dns3 | wins]** <A.B.C.D>	Configure DHCP's DNS and WINS Server
Step 2c	**dhcp-server startip A.B.C.D endip A.B.C.D**	Configure DHCP IP address pool
Step 2d	**dhcp-server subnet A.B.C.D**	Configure DHCP mask
Step 2e	**dhcp-server gateway A.B.C.D**	Configure DHCP gateway
Step 2f	**dhcp-server interface vlan <1-4095>**	Add the VLAN to the DHCP Server（If want DHCP server

		successful， need to configure the vlan interface IP address）
Step 2g	**dhcp-server leasetime** *leasetime*	Configure IP address leasetime
Step 3a	**show dhcp-server**	Show DHCP server configuration
Step 3d	**show dhcp-server lease**	Show DHCP Server allocate IP address
Step 4	**copy running-config startup-config**	Save the configuration

15.2 Configure DHCP Relay

Because the DHCP receiving need to broadcast, so the server and the client should be in the same network.The DHCP relay can save this issue effective. Configure DHCP relay as the following table show:

1.Single DHCP relay configuration：

	Command	**Function**
Step 1	**config terminal**	Enter global configuration mode.
Step 2	**interface vlan** *vlan_id*	Add VLAN and enter VLAN

		interface configuration *vlan_id(*1—4094)；
Step 3	**dhcp relay A.B.C.D**	Configure the DHP relay server IP address ,and enable the DHCP relay
Step 3b	**no dhcp relay A.B.C.D**	Delete DHCP relay
Step 4	**exit**	Exit to global configuration mode
Step 5	**show dhcp-relay configure**	Show the DHCP relay configuration。
Step 6	**copy running-config startup-config**	Save the configuration

2. Multiple DHCP relay configuration：

	Command	**Function**
Step 1	**config terminal**	Enter global configuration mode.
Step 2	**dhcp-server group <groupname>**	Add a DHCP server group，and enter group configuration mode.
Step 3a	**dhcp-server A.B.C.D**	Add the DHCP server to the group.

Step 3b	**no dhcp-server A.B.C.D**	Delete DHCP server
Step 4	**exit**	Exit to the global configuration mode
Step 5	**interface vlan** *vlan_id*	Add a VLAN and enter to VLAN interface configuration *vlan_id(*1—4094)；
Step 6a	**dhcp relay server-select <groupname>**	Select DHCP server group 。
Step 6b	**no dhcp relay server-select <groupname>**	Delete the DHCP server group。
Step 7	**exit**	Exit to global configuration mode
Step 8	**show dhcp-relay configure**	Sow DHCP relay configuration.
Step 9	**copy running-config startup-config**	Save the configuration.

15.3 Configure DHCP Snooping

To prevent the DHCP message attacking and protect you network to get a useful IP address.DHCP Snooping is used for do that.Configure DHCP

Snooping as the following table show:

A.DHCP Snooping enable/disable

	Command	**Function**
Step 1	**config terminal**	Enter global configuration mode.
Step 2	**dhcp-snooping （enable|disable）**	Enable/disable DHCP Snoopin.（DHCP Snooping enable，can not open dhcp server and dhcp relay）
Step 3a	**dhcp-snooping vlan <1-4095> …**	Configure DHCP Snooping vlan list
Step3b	**no dhcp-snooping vlan <1-4095>…**	Delete DHCP Snooping vlan list
Step 4	**exit**	Exit to global configuration mode.
Step 5	**show dhcp-snooping configuration**	Show DHCP Snooping configuration。
Step 6	**copy running-config startup-config**	Save configuration.

B.Configure DHCP Snooping option82

	Command	Function
Step 1	**config terminal**	Enter global configuration mode.
Step 2	**dhcp-snooping information option (enable|disable)**	Enable/disable DHCP Snooping option82.
Step 3	**dhcp-snooping information strategy （drop|keep|replease）**	Deil with the message with option82，drop、keep and replace.
Step 4	**exit**	Exit to global configuration mode.
Step 5	**show dhcp-snooping configuration**	Show DHCP Snooping configuration.
Step 6	**copy running-config startup-config**	Save configuration.

C.Configure DHCP Snooping binding list

	Command	Function
Step 1	**config terminal**	Enter global configuration mode.
Step 2	**dhcp-snooping binding HHHH:HHHH:HHHH vlan**	Add the static DHCP binding list.

	<1-4095> A.B.C.D interface {*interface_type slot/port}* **lease <60-1000000>**	
	no dhcp-snooping binding HHHH:HHHH:HHHH	Delete MAC binding list.
	no dhcp-snooping binding (all|static|dynamic)	Delete DHCP binding list.can delete all、static、dynamic .
Step 3	**dhcp-snooping binding delete-time <1-3600>**	Configure the biding list aging time and delete time.
Step 4	**exit**	Exit to global configuration mode
Step 5	**show dhcp-snooping configuration**	Show DHCP Snooping configuration.
Step 6	**copy running-config startup-config**	Save configuration.

D.Configure DHCP Snooping port

	Command	**Function**
Step 1	**config terminal**	Enter global configuration mode.

Step 2	**interface {***interface_type slot/port}*	Enter the interface configuration
Step 3a	**dhcp-snooping (trust|untrust)**	Configure the trust/untrust port. All the port are untrust in default.
Step 3b	**dhcp-snooping information circuit-id string <string>**	Configure the option82的circuit-id value.
Step 3c	**no dhcp-snooping information circuit-id string <string>**	Delete the option82 circuit-id value ， and load default.
Step 3d	**dhcp-snooping information remote-id string <string>**	Configure option82remote-id value.
Step 3e	**no dhcp-snooping information remote-idstring <string>**	Delete option82 remote-id value，load default value.
Step 3f	**dhcp-snooping limit rate <0-4096>**	Configure the port max speed of receiving the DHCP packet. It doesn't limit by default.
Step 3e	**no dhcp-snooping limit rate**	No limit speed.
Step 4	**exit**	Exit to the global configuration mode
Step 5a	**dhcp-snooping errdisable**	Configure whether the port

	recovery （enable|disable）	get down when the DHCP packetreceiving speed larger then the limit speed .The default is disable.
Step 5b	**dhcp-snooping errdisable recovery interval <3-3600>**	Configure the time when the port recovery after getting down
Step 6	**show dhcp-snooping configuration**	Show DHCP Snooping configuration.
Step 7	**copy running-config startup-config**	Save configuration.

16. L3 Route Configuration

16.1 L3 Route Configuration

16.1.1 Hardware Router Table

	Command	Function
Step 1	**configure terminal**	Enter global configuration mode.
Step 2a	**show l3 defip route**	Show hardware subnet routing information.
Step 2b	**show l3 hostroute**	Show hardware host routing information.
Step 2c	**show l3 interface**	Show interface information

16.1.2 Static Route

Static route is usually used in a simple network. This device supports maximum 512 static route rules.

	Command	Function
Step 1	**configure terminal**	Enter global configuration mode.
Step 2a	**ip route** *A.B.C.D* *A.B.C.D*	Add static route rule.

	A.B.C.D	
Step 2b	**ip route** *A.B.C.D/M A.B.C.D*	Add static route rule.
Step 3a	**no ip route** *A.B.C.D A.B.C.D A.B.C.D*	Delete static route rule.
Setp 3b	**no ip route** *A.B.C.D/M A.B.C.D*	Delete static route rule.
Step 4	**show ip route**	Show route rules.

16.1.3 Key Chain

Key management is a method of controlling the authentication key used by a routing protocol. Not all protocols can use key management. The authentication key is available for EIGRP and RIP version 2. Authentication must be enabled before managing the authentication key. See the appropriate protocol section for how to enable authentication for this protocol. To manage an authentication key, you need to define a keychain that identifies the keys that belong to the keychain. Each key has its own key identifier, which is stored locally. The key identifier and the combination associated with the message uniquely identify the use of the authentication algorithm and the MD5 authentication key. Multiple keys can be configured. Only one authentication package is sent, no matter how many valid keys exist. The software checks key figures from lowest to highest order and uses the first valid key it encounters.

Command	**Function**

Step 1	**configure terminal**	Enter global configuration mode.
Step 2	**key chain** key_chain_name	Configure the key chain and enter the key chain configuration mode.
Step 3	**key** key_number	Configure the key identifier，key_number range 0- 2147483647。
Step 4	**key-string** < key_string>	Configure the authentication key.
Step 5	**exit**	Exit to the global configuration mode.
Step 6	**write**	Save configuration.

To remove the key chain entry, use the command **no key chain**;To delete a key identifier, use the command **no key**;To delete the key, use the command **no key-string**.

16.2 RIP

16.2.1 RIP Overview

RIP (routing information protocol) is a simple internal gateway protocol. RIP is a routing protocol based on D-V algorithm. Hop Count is used to represent metrics. The hop count is the number of routers a datagram must pass to reach the destination. RIP considers that the path with the lowest number of hops is the optimal path, and the maximum number of hops supported is 15. If 16RIP is set, the network is unreachable. Therefore, RIP can only be adapted to small networks.

16.2.2 RIP Configuration

RIP configuration includes:

- Configure RIP basic parameters
- Configure RIP authentication
- Configure RIP Split Horizon

16.2.2.1 RIP Basic Configuration

To configure RIP, you enable RIP routing for a network and optionally configure other parameters.

Beginning in privileged EXEC mode, follow these steps to enable and configure RIP:

	Command	**Function**
Step 1	**configure terminal**	Enter global configuration mode.
Step 2	**router rip**	Enable a RIP routing process, and enter router configuration

		mode.
Step 3	**network** ip-address/masklen	Associate a network with a RIP routing process. You can specify multiple network commands. RIP routing updates are sent and received through interfaces only on these networks.
Step 4	**neighbor** rip-address	(Optional) Define a neighboring router with which to exchange routing information. This step allows routing updates from RIP (normally a broadcast protocol) to reach nonbroadcast networks.
Step 5	**offset-list**(access-list number| name) (**in|out**) **metric**<0-16>**vlan**<1-4094>	(Optional) Apply an offset list to routing metrics to increase

		incoming and outgoing metrics to routes learned through RIP. You can limit the offset list with an access list or an interface.
Step 6	**timers basic** update timeout garbage	(Optional) Adjust routing protocol timers. Valid ranges for all timers are 0 to 4294967295 seconds. •update—Time between sending routing updates. The default is 30 seconds. •invalid—Time after which a route is declared invalid. The default is 180 seconds. •holddown—Time before a route is removed from the

		routing table. The default is 180 seconds. •flush—Amount of time for which routing updates are postponed. The default is 240 seconds.
Step 7	**version**(1|2)	(Optional) Configure the switch to receive and send only RIP Version 1 or RIP version 2 packets. By default, the switch receives Version 1 and 2 but sends only Version 1. You can also use the interface commands ip rip {send | receive} version 1 | 2 | 1 2} to control what versions are used for sending and receiving on

		interfaces.
Step 8	**Redistribute** (kernel|connected|ospf|static) {metric <0-16>}	(Optional) redistribute routes from kernel 、connect、ospf and static.
Step 9	**distance**<1-255>	(Optional) Configure RIP protocol distance. Default 120.
Step 10	**exit**	Return to privileged EXEC mode.
Step 11	**show ip rip status**	Showing RIP current status. About the RIP timer, filter list,version,interface information.
Step 12	**show ip rip**	Showing RIP route information.
Step 13	**write**	Save configurations.

If you want to disable RIP routing, use the command **no router rip** in global configuration mode.

If you want to cancel the interface RIP process, you can use the command **no network ip-address/masklen** in RIP configuration mode.

If you want to restore the default timer value, you can use the command

no timers basic in RIP configuration mode.

16.2.2.2 RIPv2 Authentication

RIP version 1 does not support authentication. If you are sending and receiving RIP Version 2 packets, you can enable RIP authentication on an interface. The key chain determines the set of keys that can be used on the interface. If a key chain is not configured, no authentication is performed, not even the default.

The OLT supports two modes of authentication on interfaces for which RIP authentication is enabled: plain text and MD5. The default is plain text.

Beginning in privileged EXEC mode, follow these steps to configure RIP authentication on an interface:

	Command	Function
Step 1	**configure terminal**	Enter global configuration mode.
Step 2	**Interface vlan** vlan_id	Enter interface configuration mode, and specify the interface to configure.
Step 3	**ip rip authentication mode** (md5| text)	Configure the interface to use plain text

		authentication (the default) or MD5 digest authentication.
Step 4a	**ip rip authentication key-chain**< line>	Enable RIP authentication for MD5.
Step 4b	**ip rip authentication string**< line>	Enable RIP authentication for plain text.
Step 5	**exit**	Return to privileged EXEC mode.
Step 6	**show ip rip status**	Showing RIP current status. About the RIP timer, filter list,version,interface information.
Step 7	**show ip rip**	Showing RIP route information.
Step 8	**write**	Save configurations.

To restore clear text authentication, use the command **no ip rip authentication mode** interface configuration. To prevent authentication, use the command **no ip rip authentication key-chain** interface configuration.

16.2.2.3 Split Horizon

Routers connected to broadcast-type IP networks and using distance-vector routing protocols normally use the split-horizon mechanism to reduce the possibility of routing loops. Split horizon blocks information about routes from being advertised by a router on any interface from which that information originated. This feature usually optimizes communication among multiple routers, especially when links are broken.

Beginning in privileged EXEC mode, follow these steps to set an interface to configuring split horizon on the interface:

	Command	Function
Step 1	**configure terminal**	Enter global configuration mode.
Step 2	**Interface vlan** vlan_id	Enter interface configuration mode, and specify the interface to configure.
Step 3	**ip rip split-horizon**	Enable split horizon. Default enable.
Step 5	**exit**	Return to privileged

		EXEC mode.
Step 6	**show ip rip status**	Showing RIP current status. About the RIP timer, filter list,version,interface information.
Step 7	**show ip rip**	Showing RIP route information.
Step 8	**write**	Save configurations.

To disable split horizon, use the **no ip rip split-horizon** interface configuration command.

16.2.2.4 RIP v1/2 Compatible Configuration

	Command	**Function**
Step 1	**configure terminal**	Enter global configuration mode.
Step 2	**Interface vlan** vlan_id	Enter interface configuration mode, and specify the interface to configure.
Step 3	**ip rip receive version**（1|2）（1|2）	Configure receive v1 or

		v2 or v1 and v2.
Step 4	**ip rip send version**（1|2）（1|2）	Configure send v1 or v2 or v1 and v2.
Step 5	exit	Return to privileged EXEC mode.
Step 6	**show ip rip status**	Showing RIP current status. About the RIP timer, filter list,version,interface information.
Step 7	**show ip rip**	Showing RIP route information.
Step 8	**write**	Save configurations.

16.2.3 RIP Configuration Example

16.2.3.1 RIP General Configuration

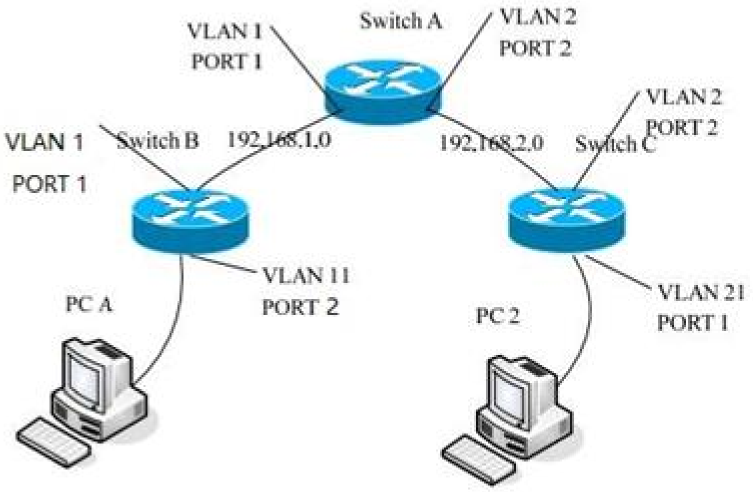
1. Networking requirements

A small company office network needs to be able to communicate between any two nodes, and the network size is relatively small. Need equipment

Automatically adapt to network topology changes and reduce manual maintenance workload.

According to the user requirements and the user network environment, the RIP routing protocol is selected to implement interworking between user networks.

2. Networking topology



Configuration:

Switch A :VLAN 1 192.168.1.1, VLAN 2 192.168.2.1

```
interface vlan 1
ip address 192.168.1.1/24
exit
interface vlan 2
ip address 192.168.2.1/24
exit
interface gigabitethernet 0/1
```

```
switchport access vlan 1
interface gigabitethernet 0/2
switchport access vlan 2
```

Enable RIP and run RIP in the VLAN interface

```
network 192.168.1.0/24
network 192.168.2.0/24
```

/**

Switch B:(Similar to switch A)

```
interface vlan 1
ip address 192.168.1.2/24
exit

interface vlan 11
ip address 192.168.11.2/24
exit

interface gigabitethernet 0/1
switchport access vlan 1


interface gigabitethernet 0/2
```

```
switchport access vlan 11

router rip
network 192.168.11.0/24
network 192.168.1.0/24

/*********************************************************
Switch C:
interface vlan 1
ip address 192.168.21.3/24
exit

interface vlan 2
ip address 192.168.2.3/24
exit

interface gigabitethernet 0/1
switchport access vlan 21

interface gigabitethernet 0/2
switchport access vlan 2
```

```
router rip
network 192.168.21.0/24
network 192.168.2.0/24
```

16.2.3.2 RIP Offset-list Configuration

Connect switch A and switch B

Switch A:

```
configure terminal
ip access-list 5 permit 192.168.3.0 0.0.0.0

interface vlan 1
ip adderss 192.168.1.1/24
exit

interface vlan 2
ip adderss 192.168.2.1/24
exit

router rip
offset-list 5 in 3 vlan 1                //offset-list check the entry notification
and add 3 to the item metrics that satisfy the list.networke
192.168.1.0/24
```

```
networke 192.168.2.0/24
```

Switch B:

```
configure terminal
access-list 5 permit 192.168.3.0 0.0.0.0         // Define the access list to determine which routes to match
interface vlan 1
ip adderss 192.168.1.2/24


interface vlan 3
ip adderss 192.168.3.1/24
exit


router rip
networke 192.168.1.0/24
networke 192.168.3.0/24
```

After configure offset-list,we can type command **show ip rip** in switch A,it show the route table 192.168.3.0 metric is 4, If not set offset-list,the metric is 2.

16.2.3.3 RIPv2 Authentication

RIPv2 protocol supports MD5 and t text authentication,the same topology as above.

The configuration of Switch A and Switch B

```
configure terminal
key chain test                  // Configure a keychain called test
key 1                           // The only key on this keychain is "key 1"
key-string  admin               // It contains an authentication password “admin”
exit
exit

interface vlan 1
ip rip authentication key-chain test
ip rip authentication mode md5

interface vlan 2
ip rip authentication key-chain test
ip rip authentication mode md5
```

the result:

Type command **show ip rip** in Switch A

It will show route table 192.168.2.0, not show route table 192.168.23.0.

Type command **show ip rip** in Switch B

It only show route table 192.168.12.0.

If Swith A and Switch B are not the same authentication mode, they can't obtain route table each other.

16.3 OSPF

16.3.1 OSPF Overview

Open Shortest Path First (OSPF) is a link state-based interior gateway protocol developed by the IETF organization. Currently using version 2 (RFC2328), its features are as follows:

- Adaptable to a wide range of networks - supporting networks of all sizes and supporting up to hundreds of routers.
- Fast convergence——sends the update packet immediately after the topology of the network changes, so that the change is synchronized in the autonomous system.
- No loopback——Because OSPF uses the shortest path tree algorithm to calculate routes based on the collected link state, the algorithm itself ensures that loopback routes are not generated.
- Area division——allows the network of the autonomous system to be divided into areas for management, and the routing information transmitted between the areas is further abstracted, thereby reducing the occupied network bandwidth.
- Equivalent routing——supports multiple equal-cost routes to the same destination address.

- Route grading——Use four different types of routes, in order of priority: intra-area routes, inter-area routes, first-class external routes, and second-type external routes.
- Supports authentication——supports interface-based packet authentication to ensure the security of route calculation.
- Multicast transmission——Protocol packets are sent in multicast mode.

16.3.2 OSPF Configuration

16.3.2.1 OSPF Basic Configuration

Enabling OSPF requires that you create an OSPF routing process, specify the range of IP addresses to be associated with the routing process, and assign area IDs to be associated with that range.

Beginning in privileged EXEC mode, follow these steps to enable OSPF:

	Command	**Function**
Step 1	**configure terminal**	Enter global configuration mode.
Step 2	**router ospf**	Enable OSPF routing, and enter router configuration mode.
Step 3	**router-id** A.B.C.D	(Optional)Configure

		router id.
Step 4	**network** A.B.C.D/M **area** (A.B.C.D|<0-4294967295>)	Define an interface on which OSPF runs and the area ID for that interface. The area ID can be a decimal value or an IP address.
Step 5	**exit**	Return to privileged EXEC mode.
Step 6	**write**	Save configurations.

To terminate an OSPF routing process, use the **no router ospf global** configuration command.

16.3.2.2 Configure OSPF Interface

	Command	Function
Step 1	**configure terminal**	Enter global configuration mode.
Step 2	**interface vlan** vlan_id	Enter interface configuration mode, and specify the Layer 3 interface to configure.
Step 3	**ip ospf cost** <1-65535>	(Optional) Explicitly

		specify the cost of sending a packet on the interface.
Step 4	**ip ospf retransmit-interval** seconds	(Optional) Specify the number of seconds between link state advertisement transmissions. The range is 1 to 65535 seconds. The default is 5 seconds.
Step 5	**ip ospf transmit-delay** seconds	(Optional) Set the estimated number of seconds to wait before sending a link state update packet. The range is 1 to 65535 seconds. The default is 1 second.
Step 6	**ip ospf priority** number	(Optional) Set priority to help determine the OSPF designated router

		for a network. The range is from 0 to 255. The default is 1.
Step 7	**ip ospf hello-interva**l seconds	(Optional) Set the number of seconds between hello packets sent on an OSPF interface. The value must be the same for all nodes on a network. The range is 1 to 65535 seconds. The default is 10 seconds.
Step 8	**ip ospf dead-interval** seconds	(Optional) Set the number of seconds after the last device hello packet was seen before its neighbors declare the OSPF router to be down. The value must be the same for all nodes on a network.

		The range is 1 to 65535 seconds. The default is 4 times the hello interval.
Step 9	**ip ospf authentication-key** auth_key	(Optional) Assign a password to be used by neighboring OSPF routers. The password can be any string of keyboard-entered characters up to 8 bytes in length. All neighboring routers on the same network must have the same password to exchange OSPF information.
Step 10	**ip ospf message-digest-key** keyid **md5** key	(Optional) Enable MDS authentication. •keyid—An identifier from 1 to 255. •key—An alphanumeric password of up to 16

		bytes.
Step 11	**ip ospf authentication**	Enable ospf authentication.
Step 12	**ip ospf authentication message-digest**	Enable ospf MD5 authentication.
Step 13	**exit**	Return to privileged EXEC mode.
Step 14	**show ip ospf interface** [interface-name]	Display OSPF-related interface information.
Step 15	**write**	Save configurations.

16.3.2.3 Configure OSPF Area Parameters

You can optionally configure several OSPF area parameters. These parameters include authentication for password-based protection against unauthorized access to an area, stub areas, and not-so-stubby-areas (NSSAs). Stub areas are areas into which information on external routes is not sent. Instead, the area border router (ABR) generates a default external route into the stub area for destinations outside the autonomous system (AS). An NSSA does not flood all LSAs from the core into the area, but can import AS external routes within the area by redistribution.

Route summarization is the consolidation of advertised addresses into a single summary route to be advertised by other areas. If network numbers are contiguous, you can use the area range router configuration command to configure the ABR to advertise a summary route that covers all networks in the range.

Beginning in privileged EXEC mode, follow these steps to configure area parameters:

	Command	**Function**
Step 1	**configure terminal**	Enter global configuration mode.
Step 2	**router ospf**	Enable OSPF routing, and enter router configuration mode.
Step 3	**area** area-id **authentication**	(Optional) Allow password-based protection against unauthorized access to the identified area. The identifier can be either a decimal value or an IP address.
Step 4	**area** area-id **authentication message-digest**	(Optional) Enable MD5 authentication on the

		area.
Step 5	**area** area-id **stub**[no-summary]	(Optional) Define an area as a stub area. The no-summary keyword prevents an ABR from sending summary link advertisements into the stub area.
Step 6	**area** area-id **nssa**[no-summary]	(Optional) Defines an area as a not-so-stubby-area. Every router within the same area must agree that the area is NSSA. Select one of these keywords: •no-summary—Select to not send summary LSAs into the NSSA.
Step 7	**area** area-id **range** address/masklen	(Optional) Specify an address range for which a single route is

		advertised. Use this command only with area border routers.
Step 8	**exit**	Return to privileged EXEC mode.
Step 9	**show running ip ospf**	Display OSPF running-config information.
Step 10	**show ip ospf database**	Display lists of information related to the OSPF database for a specific router.
Step 11	**write**	Save configurations.

16.3.2.4 OSPF Protocol Creates Default Routes

By default, an OSPF router in a normal OSPF area does not generate a default route even if it has a default route. When the default route in the network is generated by other routing processes, the router must advertise the default route to the entire OSPF autonomous domain. The implementation method is to manually configure the ASBR to generate a default route. After the configuration is complete, the router generates a default ASE LSA (Type 5 LSA) and advertises it to the entire OSPF autonomous domain.

	Command	Function
Step 1	**configure terminal**	Enter global configuration mode.
Step 2	**router ospf**	Enter OSPFconfigure mode.
Step 3	**default-information originate {[always]}*1 {[metric]** <0-16777214>}*1 {[**metric-type**] (1|2)}*1 {[**route-map**] <WORD>}***1**	Configure default route
Step 4	**exit**	Returen global configuration mode.

16.3.2.5 Show OSPF Configurate Information

	Command	Function
Step 1	**configure terminal**	Enter global configuration mode.
Step 2	**show ip ospf database** [router] [self-originate] **show ip ospf database**[router] [adv-router	Display lists of information related to the

	[ip-address]] **show ip ospf database** [network] [self-originate] **show ip ospf database**[network] [adv-router [ip-address]] **show ip ospf database**[summary] [self-originate] **show ip ospf database**[summary] [adv-router [ip-address]] **show ip ospf database**[asbr-summary] [self-originate] **show ip ospf database**[asbr-summary] [adv-router [ip-address]] **show ip ospf database**[external] [self-originate] **show ip ospf database**[external] [adv-router [ip-address]]	OSPF database.
Step 3	**show ip ospf route**	Display lists of information related to the OSPF route.
Step 4	**show ip ospf interface**[interface-name]	Display

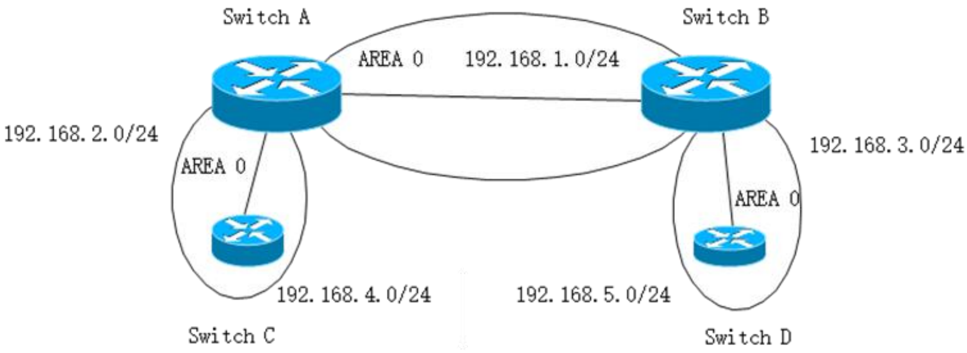
		OSPF-related interface information.
Step 5	**show ip ospf neighbor**	Display OSPF interface neighbor information.

16.3.3 OSPF Configuration Example

16.3.3.1 Intra-area Routing

1. Purposes: Test OSPF intra-area route learning

2. Networking topology



3. Configuration

Switch A create 2 VLAN interface,vlan1 ip 192.168.1.1/24, vlan2 ip 192.168.2.1/24

interface vlan 1

ip address 192.168.1.1/24

```
exit

interface vlan 2
ip address 192.168.2.1/24
exit

interface gigabitethernet 0/1
switchport access vlan 1

interface gigabitethernet 0/2
switchport access vlan 2
```

Enable ospf ，and configure these two network segments to run the ospf protocol.

```
router ospf
router-id 1.1.1.1
network 192.168.1.0/24 area 0
network 192.168.2.0/24 area 0
```

Switch B，Switch C，Switch D configuration is similar to Switch A.

4. Test result

Switch A route table:192.168.4.0 and 192.168.5.0

Switch B route table:192.168.4.0 and 192.168.5.0

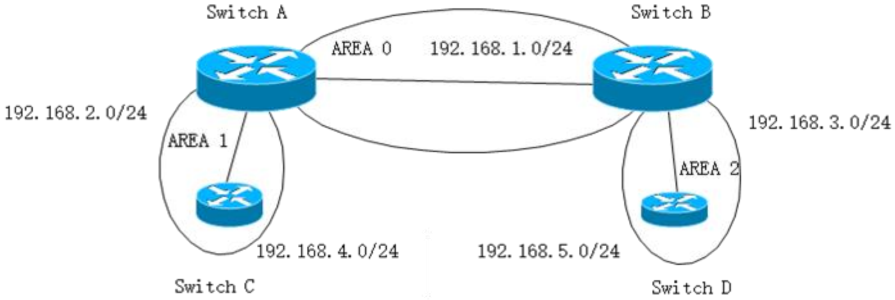
Switch C route table:192.168.1.0 and 192.168.5.0

Switch D route table:192.168.1.0 and 192.168.4.0

16.3.3.2 OSPF Inter-area Routing

1. Purposes: Test OSPF inter-area route learning

2. Networking topology



3. Configuration

Switch A create 2 VLAN interface,vlan1 and vlan2， ip address 192.168.1.1/24，area 0 and 192.168.2.1/24, area 1。

Switch B， create 2 VLAN interface， vlan1 and vlan3， ip address 192.168.1.2/24，area 0 and 192.168.3.1/24, area 2。

Switch C， create 2 VLAN interface， vlan2 and vlan4， ip address 192.168.2.2/24，area 1 and 192.168.4.1/24, area 1。

Switch D create 2 VLAN interface， vlan3 and vlan5， ip address 192.168.3.2/24，area 2 and 192.168.5.1/24, area 2。

The configuration process refers to the route test configuration in the OSPF area.

Test result

Switch A route table： 192.168.4.0 and 192.168.5.0；

Switch B route table： 192.168.4.0 and 192.168.5.0；

Switch C route table： 192.168.1.0 and 192.168.5.0；

Switch D route table： 192.168.1.0 and 192.168.4.0.

16.3.3.3 OSPF Route Convergence

1.Purpose: Test OSPF route convergence speed

2.Networking Topology and configuration

Refer to OSPF intra-area route test and OSPF inter-area route test.

Test process

a. intra-area route are converged. Refer to the OSPF intra-area route test to disconnect 192.168.4.0/24 of Switch C.

b. intra-area route are converged. Refer to the OSPF intra-area route test to reconnect 192.168.4.0/24 of Switch C.

c. inter-area route are converged. Refer to the OSPF inter-area route test to disconnect 192.168.4.0/24 of Switch C.

d. inter-area route are converged. Refer to the OSPF inter-area route test to reconnect 192.168.4.0/24 of Switch C

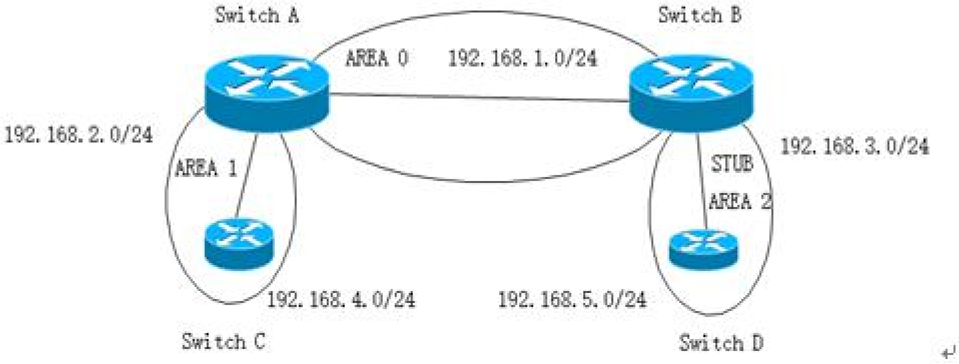
Test result:

Check whether the time of deleting and adding the 192.168.4.0 network segment entries on Switch A, Switch B, and Switch D is the same as the configuration.

16.3.3.4 OSPF Stub Area

1.Purpose: Test OSPF stub area function.

2.Networking Topology



3.Configuration

Set the interconnection between Switch B and Switch D as STUB AREA by referring to the OSPF inter-area route test configuration.

Switch B:

```
router ospf

area 2 stub
```

Switch D:

```
router ospf

area 2 stub
```

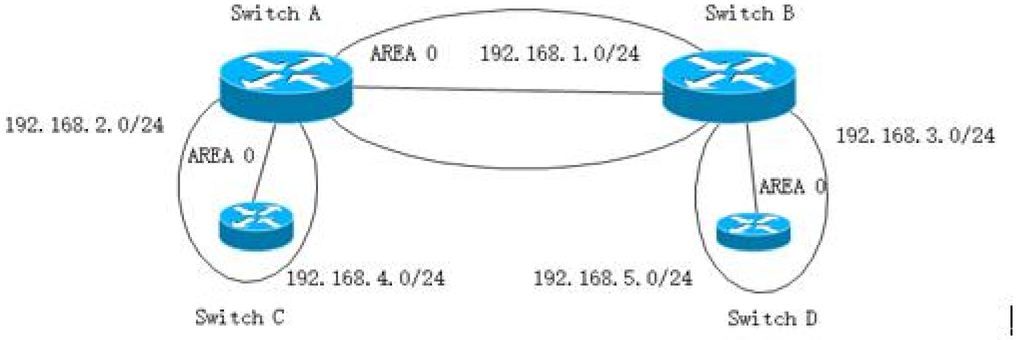
Test result:

After the OSPF inter-area route test is performed, the routing information of Switch A, Switch B, and Switch C is unchanged. The routing table of Switch D adds the default route to the original route entry. The next hop is Switch B.

16.3.3.5 OSPF Route Aggregation

1.Purpose: Test the route aggregation function.

2.Networking topology



3.Configuration

Refer to OSPF intra-area routing configuration.

Switch B learn route aggregation in area 2.

Switch B:

```
gpon-olt(config)# router ospf
gpon-olt (config-router-ospf)# area 2 range 10.1.0.0/16
```

```
Switch C
interface vlan 200
ip address 10.1.1.1/24

interface vlan 201
ip address 10.1.2.1/24

router ospf
network 10.1.1.0/24 area 2
network 10.1.2.0/24 area 2
```

4.Test result

Before configure route aggregation in SwitchB, Switch A show route 10.1.1.1/24 and 10.1.2.1/24 .After configure route aggregation in SwitchB, only route 10.1.0.0/16 can be seen in SwitchA.

Before aggregation Switch A	172.16.0.0/24 is subnetted, 2 subnets O 172.16.1.0 [110/2] via 192.168.2.2, 00:00:02, Vlan2 O 172.16.2.0 [110/2] via 192.168.2.2, 00:00:02, Vlan2 O 192.168.4.0/24 [110/2] via 192.168.2.2, 00:00:02, Vlan2 O IA 192.168.5.0/24 [110/3] via 192.168.1.2, 00:00:02,

	Vlan1 10.0.0.0/24 is subnetted, 2 subnets O IA 10.1.2.0 [110/3] via 192.168.1.2, 00:00:02, Vlan1 O IA 10.1.1.0 [110/3] via 192.168.1.2, 00:00:02, Vlan1 C 192.168.1.0/24 is directly connected, Vlan1 C 192.168.2.0/24 is directly connected, Vlan2 O IA 192.168.3.0/24 [110/2] via 192.168.1.2, 00:00:03, Vlan1
After aggregation Switch A	172.16.0.0/16 is variably subnetted, 3 subnets, 2 masks O 172.16.0.0/16 is a summary, 00:01:47, Null0 O 172.16.1.0/24 [110/2] via 192.168.2.2, 00:01:47, Vlan2 O 172.16.2.0/24 [110/2] via 192.168.2.2, 00:01:47, Vlan2 O 192.168.4.0/24 [110/2] via 192.168.2.2, 00:01:47, Vlan2 O IA 192.168.5.0/24 [110/3] via 192.168.1.2, 00:01:47, Vlan1 10.0.0.0/16 is subnetted, 1 subnets O IA 10.1.0.0 [110/3] via 192.168.1.2, 00:00:16, Vlan1 C 192.168.1.0/24 is directly connected, Vlan1 C 192.168.2.0/24 is directly connected, Vlan2 O IA 192.168.3.0/24 [110/2] via 192.168.1.2, 00:01:47, Vlan1

16.4 Manipulate Routing Updates

This section describes direct route redistribution for different routing protocols. Methods for controlling routing information sent between different routing protocols include: using a distribution list, using a routing map, and modifying management distances

16.4.1 Route IP List

16.4.1.1 Configure Access-List

Access lists are typically used to control user data flow, but access lists do not affect the data flow generated by the current router. There is an implicit deny any statement at the end. Access-List lists are available in standard and extended formats:

1. The standard index has a value range of 1-99, 1300-1999, and only controls the source ip;

2. Extended index value range: 100-199, 2000-2699, control source ip and destination ip

	Command	**Function**
Step 1	**configure terminal**	Enter global configuration mode.
Step 2a	**ip access-list** access_list_index {**permit**|**deny**} <A.B.C.D>	Define a standard access-list,

	<wildcard_mask> **ip access-list** access_list_index {**permit**|**deny**} host <A.B.C.D> **ip access-list** access_list_index {**permit**|**deny**} **any**	access_list_index ranges from 1-99 to 1300-1999, < A.B.C.D. > < wildcard_mask > defines standard IP access based on the source IP address or mask; Host defines standard IP access based on a single source IP address; Any standard IP access based on any source IP address;
Step 2b	**ip access-list** access_list_index {**permit**|**deny**} <A.B.C.D> <wildcard_mask> {<A.B.C.D> < wildcard_mask> | host <A.B.C.D> | any}	Define an extended access-list, access_list_index ranges from 100-199 to 2000-2699,

	ip access-list access_list_index {**permit**|**deny**} host <A.B.C.D> {<A.B.C.D> <wildcard_mask> | host <A.B.C.D> | any}
	ip access-list access_list_index {**permit**|**deny**} any {<A.B.C.D> <wildcard_mask> | host <A.B.C.D> | any}
		< A.B.C.D. > < wildcard_mask > defines extended IP access based on the source IP address or mask;
		Host defines extended IP access based on a single source IP address;
		Any extended IP access based on any source IP address;

	no ip access-list access_list_index	Delete access-list
Step 3	**exit**	Return to privileged EXEC mode.
Step 4	**show ip access-list**	Show access-list information
Step 5	**write**	Save configurations.

To delete access list, command： **no ip access-list** access_list_index

16.4.1.2 Configure Prefix List

Prefix lists are similar to access lists, and the benefits of prefix lists include improved performance when loading and finding large lists, incremental update support, and greater flexibility.Filtering through the prefix list requires matching the routing prefix to the prefix listed in the prefix list, just as matching the access list.When there is a match, use routing.

By default, serial Numbers are generated automatically and incremented by 5.If automatic sequence number generation is disabled, you must specify a sequence number for each entry.You do not need to specify a serial number when deleting a configuration item.

The Prefix-List is identified by the Prefix List name, which can contain multiple table items.Each table item, in the form of a network prefix, specifies a matching range independently and is identified by a sequence_num.Sequence_num indicates the order in which matching checks are performed in the Prefix-List.Each table item has a "or" relationship, and during the match, the route checks sequence_num in ascending order for each table item identified by sequence_num.As long as one of the table items satisfies the condition, this means that the Prefix-List filter (which does not enter the match of the next table item) is passed.

	Command	Function
Step 1	**configure terminal**	Enter global configuration mode.
Step 2a	**ip prefix-list** prefix_list_name [seq sequence_num] {permit|deny} <A.B.C.D/M> [ge ge_value] [le le_value] ip prefix-list prefix_list_name [seq sequence_num] {permit|deny} any	Create a list of prefixes with optional serial Numbers to deny or allow access to matching conditions. The sequence_num range is 1-4294967295; The ge_value range is 0-32; The range of le_value is 0-32; Ge and le values specify the range of prefix lengths to match, and the specified ge values and values must satisfy: Prefix_len < ge_value < le_value < 32.
Step 2b	**no ip prefix-list** prefix_list_name	Delete prefix-list
Step 3	**exit**	Return to privileged EXEC

		mode.
Step 4	**show ip prefix-list** [detail | summary]	Show ip prefix-list information.
Step 5	**write**	Save configurations.

To remove the prefix list and all its entries, use the commsnd **no IP prefix-list** prefix_list_name .

The keywords ge and le are optional and are used to specify the range of prefix lengths to match, which must satisfy the condition: length < ge-value < le-value <=32.

1. IP prefix-list 2 permit 2.2.2.2.0/24 /(match the first 24 bits: 2.2.*, mask must be 24 bits)

2. IP prefix-list 2 permit 2.2.2.2.2/24 ge 25 le 30 //(match the first 24 bits :2.2.2.*, mask must be 25-30 bits)

3. IP prefix-list 2 permit 2.2.2.2/24 le 32 /(match the first 24 bits :2.2.2.*, mask must be 24-32 bits)

4. IP prefix-list 2 permit 2.2.2.2.2/24 ge 26 /(match the first 24 bits :2.2.2.*, mask must be 26-32 bits)

5. IP prefix-list 3 permit 0.0.0.0.0.0/0 le 32 /(matches all)

16.4.2 Route Redistribution

Redistribution refers to the ability of boundary routers connected to different routing selection domains to exchange and notify routing selection information between different routing selection domains (autonomous systems).Redistribution is always outward, and the router performing the redistribution does not modify its routing selection table.Router configuration command:**default-metric** is used to specify the seed metric values for all redistribution routes. Specify the seed metric values in a redistribute, for which you can use the option metric or routing mapping table.

Manage distance.When using routing redistribution, it may occasionally be necessary to modify the protocol's administrative distance to make it a priority.

Seed measurements.When routing redistribution occurs, metrics must be specified for the rerouting route.This measure, called the seed measure or default measure, is defined during the redistribution configuration.After specifying the seed measure for the redistribute route, the measure will increase normally within the autonomous system.The only exception is the OSPF E2 routing, which keeps the initial value regardless of how far it is propagated within the autonomic system.

Default seed measurements.RIP, IGRP, and EIGRP default to treat the seed metric value 0 as infinity.An infinite number of measurements indicate to the router that the reroute is unreachable and therefore should not be notified.Therefore, when rerouting the route to RIP, IGRP, and EIGRP, it is necessary to manually specify its seed measurement value, otherwise the rerouting route will not be notified.In OSPF, the redistributed routing defaults to 2 classes (E2), with a measurement value of 20.Except for the redistributed BGP routing, which defaults to 2 classes and measures 1.

Redistribute technology.Bidirectional redistribute: redistribute all routes between two routing selection processes.One-way redistribution: a default route is passed to a routing selection protocol, and only the network that is known through the routing protocol is passed to the other routing selection protocols.

Passive interface: on OSPF routers, allocation of passive - interface is used to make a specific interface can't accept that sends hello packets, also cannot form a neighbor relationship, using scene: 1: make a specific router interface does not participate in the process of routing protocol 2: without any neighbor relationship was established through a particular interface at the same time, also can notice of these interfaces are routing.

16.4.2.1 RIP Route Redistribution

	Command	Function
Step 1	**configure terminal**	Enter global configuration mode.
Step 2	**router rip**	Start RIP and enter RIP configuration mode
Step 3	**distance** <1-255>	Set the administrative distance, default is 120.
Step 4	**default-metric** <1-16>	Default measurement
Step 5	**redistribute** (kernel|connected|static|ospf) {**metric** <0-16>}*__1__ {route-map <map-tag>}*__1__	Inter-protocol routing redistribution, including direct connection, kernel, ospf protocol, static routing information to rip protocol.Let rip be published.
Step 6	**passive-interface** <IFNAME> {A.B.C.D}*1	Configure the passive interface
Step 7	**offset-list** (<access-list>) (**in**|**out**) <0-16> {vlan <1-4094>}*__1__	Used to adjust measurements

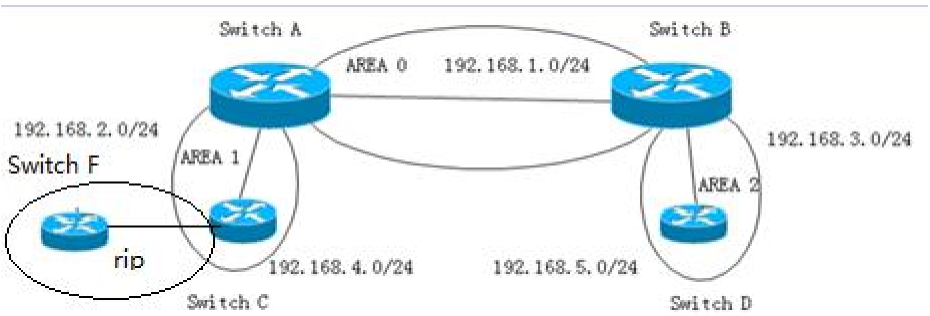
Step 8	**show running-config**	Show running-config information

16.4.2.2 OSPF Route Redistribution

	Command	Function
Step 1	**configure terminal**	Enter global configuration mode.
Step 2	**router ospf**	Start ospf and enter ospf configuration mode
Step 3	**distance** <1-255>	Set the administrative distance, default is 110.
Step 4	**default-metric** <0-16777214>	Used to specify the seed metric values for all redistribution routes
Step 5	**redistribute** (kernel|connected|ospf|static) {**metric** <0-16>} {route-map <map-tag>}***1**	Inter-protocol routing redistribution, including redistribution of direct connection, kernel, ospf protocol, static routing information to rip protocol.Get the ospf protocol out there.

Step 6	**passive-interface** <IFNAME> {A.B.C.D}*1	Configure the passive interface
Step 7	**show running-config**	Show running-config information

Example:



Configuration	Result

switch c:
router ospf
  router-id 3.3.3.3
  network 192.168.2.3/24 area 1
  redistribute connected metric 30(10)
  redistribute rip metric 30(10)
	When configured with metric of 30 on switch c，
	On switch a： O E2 192.168.4.0/24 [110/30] via 192.168.2.3, 01:01:27,Vlan2
	When configured with metric of 10 on switch c，
	On switch a： O E2 192.168.4.0/24 [110/10] via 192.168.2.3, 01:01:27, Vlan2

16.4.3 Distribution List Control Routing Updates

A distribute-list distribution list is a tool used to control routing updates, filtering only routing information, not LSA.Therefore, it is suitable for distance vector routing protocols, such as RIP and EIGRP.Like the OSPF link state routing protocol, the IN direction (which affects local routing tables but is present IN LSDB), the OUT direction does not work.But local originating routes can be filtered because of reroute routing, not LSA delivery.The distribute-list out command filters routing selection updates from outbound routing updates from the interface or specifies routing selection updates for routing selection protocols;The istribute-list in command filters routing selection updates coming in from the specified interface.

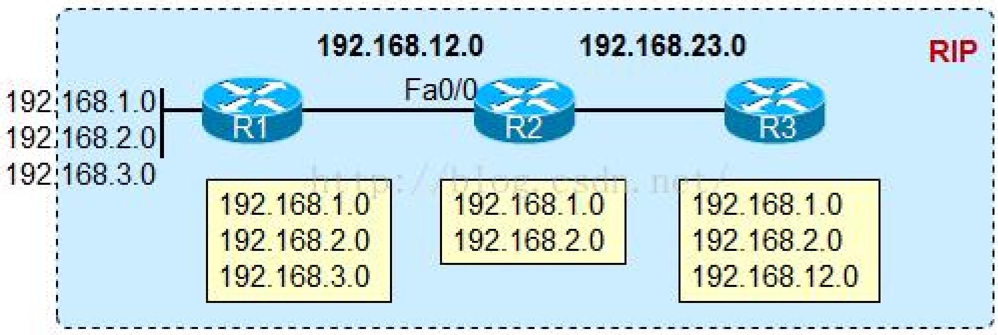
16.4.3.1 Distance Vector Routing Protocol RIP

Between routers, routing information is passed, and the distribution list has absolute control over routing information. Therefore, if it is in the direction, by deploying the distribution list, the specific route can be filtered, so that the local routing routing table of the distribution list is changed, and when the local router updates the routing information to the downstream router, the actually updated content is An entry that is affected by the distribution list.

At the same time in the out direction, there is no problem.

	Command	Function
Step 1	**configure terminal**	Enter global configuration mode..
Step 2	**router rip**	Start RIP and enter RIP configuration mode
Step 3	**distribute-list** <access-list> **(in|out) {<ifname>}*1**	Filter routing using the access control list
Step 4	**distribute-list prefix** <prefix-list> **(in|out) {**<WORD>**}*1**	Filter routing using prefix lists
Step 5	**show running-config**	Show running-config information

Configuration example 1 (in a single routing protocol environment-RIP)



Initially, R3 was able to learn the three loopback routes of R1, as well as the 192.168.12.0/24 routes.Now we don't want R3 to learn 192.168.3.0/24 routing, so we can configure R2 as follows:

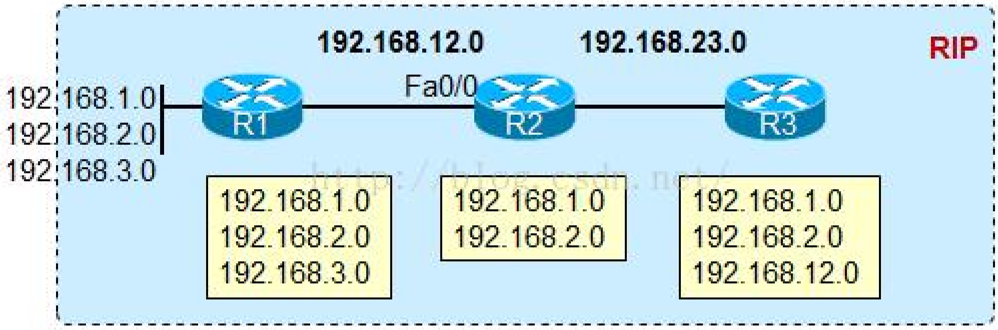
```
R2(config)# access-list 1 deny 192.168.3.0
R2(config)# access-list 1 permit any
```

R2 (config) # router rip

R2(config-router)# redistribute -list 1 out ethv0.3

Of course, in - oriented distribution lists can have the same effect in R3.

Configuration example 2 (in a single routing protocol environment-RIP)



In R2, if the following configuration is made:

R2(config)# access-list 1 deny 192.168.3.0

R2(config)# access-list 1 permit any

R2 (config) # router rip

R2(config-router)# redistribute -list 1 in ethv0.3

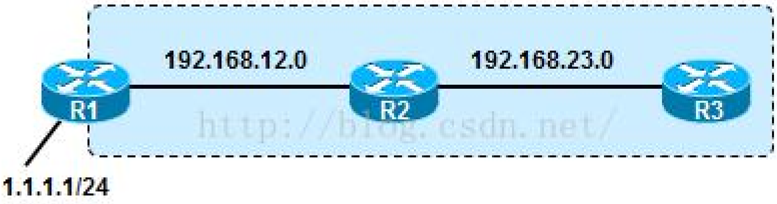
So, first of all, R2's own routing table will change, and 3.0's routing will be filtered out, and R3, the downstream RIP router, won't learn 3.0.

16.4.3.2 Link State Routing Protocol OSPF

Note that for a link-state routing protocol such as OSPF, the messages transmitted between routers are no longer routing information, but LSAs, and the distribution list cannot filter LSAs. Therefore, to deploy the distribution list in the link state protocol, you need to be aware of:

In the in direction, the distribution list can only filter the route when the LSA is received locally. When the route is generated, the router's own routing table that implements the distribution list will be affected by the distribution list (but the local LSDB still has the LSA), and The router still sends the LSAs in the LSADB to the neighbors. Therefore, the locally filtered routes and neighbors still exist.

In the outbound direction, the distribution list can only work on the ASBR that performs the route redistribution action, and can only work on externally imported routes. Because OSPF performs re-release, in fact, these external routes are introduced in the form of routes, so the distribution list can work normally in this case, but if it is not a local originating external route, or an internal OSPF route, out direction The distribution list is at a loss.



For example, redistribute directly into OSPF on R1, and use the outbound distribution list to filter out the 1.1.1.0 external route. However, R1 re-posts the incoming route. If the outbound distribution list on R2 attempts to block R3 from accepting the route or LSA, it cannot, because this is not a locally originated external route.

OSPF distribution list command:

	Command	Function
Step 1	**configure terminal**	Enter global configuration mode..
Step 2	**router ospf**	Start ospf and enter ospf configuration mode
Step 3	**distribute-list** <access-list> **out (kernel|connected|static|rip)**	Use the access control list for redistribution
Step 4	**show running-config**	Show running-config information

Configuration example 1--OSPF out directional distribution list in a single routing protocol environment

Distribution list, deployed in a link state routing protocol such as OSPF, can only be used if the out direction is used.

Pictured above, deployed on R1, R1 use redistribute direct way to introduce these three exterior routing and then out the direction of the distribution list, will be deployed on R1, and have effect on the three routing.

```
R1(config)# access-list 1 deny 192.168.3.0
R1(config)# access-list 1 permit any
R1 # router ospf (config)
R1 (config - the router) # redistribute connected subnets
```

```
R1(config-router)# network 192.168.12.1 255.255.255.0 area 0
R1 (config - the router) # distribute - list out 1
```

After the above configuration is implemented, R1 will filter out the 3.0 routing.

Configure example 2 -- deploy the distribution list when republished between protocols

RIP redistributes into OSPF

Case 1

R2 is configured as follows:

```
Access - the list 1 permit 1.1.1.0
The router ospf
Redistribute rip metric 10 subnets
Distribute - list 1 out rip
```

What this command means here is that only 1.1.1.0 is allowed out of the reroute from the RIP routing protocol (to the OSPF protocol, there is no direction, as long as the interface running the OSPF)

In R3, there are only 1.1.1.0 routes

Case 2

Open loopback interface 2.2.2.2/24 on R2, R2 reissues RIP into OSPF and reissues direct access to OSPF

```
Access - the list 1 permit 1.1.1.0
```

The router ospf

Redistribute connected subnets

Redistribute rip metric 10 subnets

Network 192.168.23.0 0.0.255 area 0

Distribute - list out 1

// there are only 1.1.1.0 routes in R3, that is, the command redistribute -list 1 out here works for all routes injected from outside into the OSPF, and only 1.1.0 routes survive.The source of continuous routing is direct connection routing, or RIP.

Case 3

Open loopback interface 2.2.2.2/24 on R2, R2 reissues RIP into OSPF and reissues direct access to OSPF

Access - the list 1 permit 1.1.1.0

The router ospf

Redistribute connected subnets

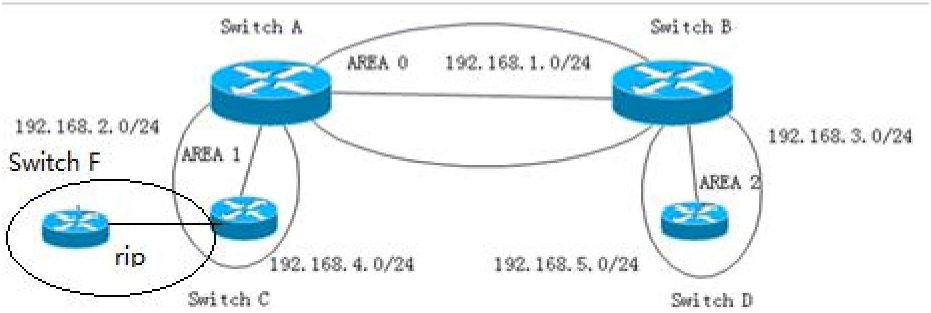
Redistribute rip metric 10 subnets

Distribute - list 1 out rip

// R3 has routing in the routing table: 1.1.1.0, 2.2.0, 192.168.12.0

// that is, the routing other than 1.1.1.0 that was re-published from RIP was blocked and the local direct connection port was republished

Configuration example 3:



Configuration	Result
Configure switch c: ip access-list 1 deny 192.168.6.0 0.0.0.255 ip access-list 1 permit any router ospf ospf router-id 3.3.3.3 redistribute connected metric 30 redistribute rip metric 30 network 192.168.2.3/24 area 0.0.0.1 distribute-list 1 out rip	Result: Switch b: Unable to learn 192.168.6.0 segment of switch f; Learned 192.168.7.0 segment of switch f;

16.4.4 Routing Maps to Control Routing Updates

16.4.4.1 Configure Route Map

Route Map can be used for route redistribution and policy routing, and is often used in BGP. Policy routing is actually a complex static route. The static route is based on the destination address of the packet and forwarded to the specified next hop route. Policy routing can provide multiple types of filtering and classification.

The Switch can run multiple routing protocols simultaneously, which can redistribute information from one routing protocol to another. For example, you can instruct conversion to re-read IGRP-derived routes by using RIP or by re-reading static routes using IGRP. Reassigning information from one routing protocol to another applies to all supported IP-based routing protocols.

By defining a route map between two domains, it is possible to conditionally control the redistribution of routes between routing domains. Match and set the Route Map configuration command to define the conditional part of the roadmap. The Match command specifies that a standard must be matched; the Set command specifies the action that will be taken if the route update satisfies the conditions defined by the matching command. Although redistribution is a protocol-independent feature, some matching and setting Route Map configuration commands are specific to a particular protocol.

One or more matching commands and one or more Set commands follow a Route Map command. If there is no matching command, all match. If there is no command set, nothing is done except for the match. Therefore, you need at least one match or setup command.

Like the access list, there is an implicit deny any statement at the end of the route map. The result of this statement depends on the purpose of the route map.

	Command	Function
Step 1	**configure terminal**	Enter global configuration mode.
Step 2	**route-map** map_name **[permit|deny]** sequence_number	Configure a route-map and enter the route-map configuration mode.
Step 3	**match ip address** access_list_number	Matching the specified access-list, the range of access_list_number is 1-2699, where 1-99 and 1300-1999 are standard access-list, and 100-199 and 2000-2699 are extended access-list.
Step 4	**match ip address prefix-list** prefix_list_name	Match the specified prefix-list.
Step 5	**match ip next-hop** access_list_number	Matching the next hop routing address through

		the specified access-list, the access_list_number range is 1-2699, where 1-99 and 1300-1999 are standard access-list, 100-199 and 2000-2699 are extended access-list.
Step 6	**match ip next-hop prefix-list** prefix_list_name	Match the next hop routing address through the specified prefix-list.
Step 7	**match interface** interface_name	Matches the routing of the next outgoing interface that is one of the specified interfaces
Step 8	**match metric** metric_value	Matching the specified routing metrics, metric_value ranges from 0-4294967295.
Step 9	**match tag** tag_value	Matches the specified routing tag, and the tag_value range is 1-4294967295.

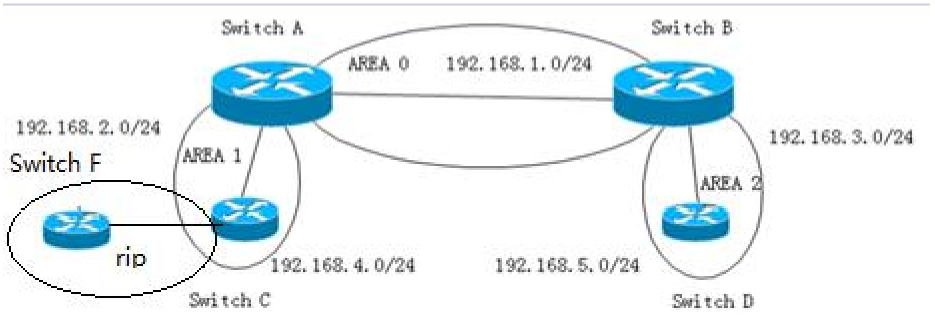
Step 10	**set metric** metric_value	Set the metrics for the reroute routing, and metric_value ranges from 0-4294967295.
Step 11	**set metric-type** metric_type	Sets the measurement value type for the redistributed routing.
Step 12	**set tag** tag_value	Sets the tag for the redistributed routing.
Step 13	**set ip next-hop** metric_value	Specifies the measure of the next hop of forwarding.
Step 14	**exit**	Return to privileged EXEC mode.
Step 15	**show route-map**	Show route-map information
Step 16	**write**	Save configurations.

To delete a route-map entry, use the command **no route-map map_name**.Delete the match entry and use the command **no match**.Delete a set entry, using the command **no set**.

16.4.4.2 Link Status Routing Protocol OSPF

	Command	**Function**
Step 1	**configure terminal**	Enter global configuration mode.
Step 2	**router ospf**	Start ospf and enter ospf configuration mode
Step 3	**redistribute (kernel|connected|ospf|static)** {metric <0-16777214>} {metric-type (1|2)} {route-map <WORD>}	Redistribute direct connection, kernel, ospf protocol, static routing information to rip protocol.Get the ospf protocol out there.
Step 4	**show running-config**	Show running-config information

For example



Configuration	Result

switch c: ip access-list 1 permit 192.168.6.0 0.0.0.255 ip access-list 2 permit 192.168.7.0 0.0.0.255 ip prefix-list 1 seq 5 permit 192.168.6.0/24 ip prefix-list 2 seq 5 permit 192.168.7.0/24 route-map test1 permit 10 match ip address 1 set metric 300 set metric-type type-1 ! route-map test1 permit 30 match ip address 2 set metric 500 ! route-map test2 permit 20 match ip address 2 set metric 500 !	1）switch c execute：redistribute rip route-map test1 switch b result ============ OSPF external routing table =========== N E1 192.168.6.0/24 [302] tag: 0 via 192.168.1.1, ethv0.1 N E2 192.168.7.0/24 [2/500] tag: 0 via 192.168.1.1, ethv0.1 2）switch c execute：redistribute rip route-map test2 switch b result N E2 192.168.7.0/24 [2/500] tag: 0 via 192.168.1.1, ethv0.1 3）switch c execute：redistribute rip route-map test3

route-map test3 permit 40 match ip address prefix-list 1 set metric 400 ! route-map test3 permit 50 match ip address prefix-list 2 set metric 600 !	switch b result N E2 192.168.6.0/24 [2/400] tag: 0 via 192.168.1.1, ethv0.1 N E2 192.168.7.0/24 [2/600] tag: 0 via 192.168.1.1, ethv0.1

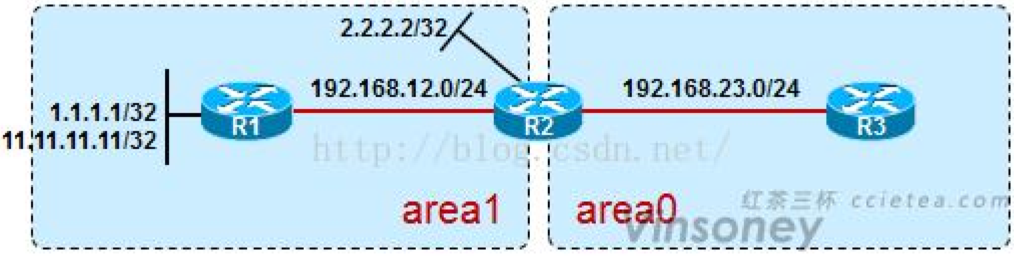
16.4.5 Prefix Lists to Filter Routing

Methods of OSPF filtering LSA: area filter-list prefix; **only those three types of LSA produced from the ABR can be filtered.**

	Command	Function
Step 1	**configure terminal**	Enter global configuration mode.
Step 2	**router ospf**	Enter the OSPF configuration mode.
Step 3	**area** area-id **filter-list** prefix <prefix> (in|out)	Configure the list of prefixes within the region.

Step 4	**exit**	Return to privileged EXEC mode.

Filter three types of LSA on ABR.



By default, R3 can learn the inter-area routes of 1.1.1.1, 11.11.11.11, 2.2.2.2, and 192.168.12.0.These routes are calculated by R3, which collects and calculates "three LSA classes injected from R2 into area0".So what if we don't want R3 to learn the 11.11.11.11/32 route?

```
ip prefix-list 100 deny 11.11.11.11/32
ip prefix-list 100 permit 0.0.0.0/0 le 32
!
router ospf
 area 0 filter-list prefix 100 in
```

The above command means that the prefix list filter is executed when three classes of LSA are injected from other regions into the area0 region.If it's area1 filter-list prefix 100 out, this command means to perform the prefix filter when injecting 3 classes of LSA from area1 into all other areas.

Note that when we deploy on ABR filtering scheme of this three kinds of LSA, able to filter only those generated from the three kinds of ABR LSA, above area0 by default in the flood of 1.1.1.1, 11.11.11.11, 2.2.2.2, 192.168.12.0 routing of these three kind of LSA are produced from R2, so can be filtered by prefix list.

17IPv6

17.2 VLAN IPv6 Address

Begin at privileged configuration mode, configure or delete IPv6 address and prefix of VLAN as the following table shows.

	Command	**Function**
Step 1	**config terminal**	Enter global configuration mode.
Step 2	**interface vlan** *vlan_id*	enter VLAN interface configuration *vlan_id* range:1~4094
Step 3a	**ipv6 address** *<X:X::X:X/M> [eui-64]*	Configure the IPv6 address and prefix length of the vlan interface. By default, the interface automatically generates a link-local address. **Eui-64**, which is an optional parameter, is used to automatically fill the low 64-bit of IPv6 address according to the eui-64

		specification.
	ipv6 address *<X:X::X:X>* ***link-local***	Configure the IPv6 link-local address of the vlan interface.
Step 3b	**no ipv6 address** *<X:X::X:X/M>*	Delete specified IPv6 address of VLAN interface.
	no ipv6 address	Delete all IPv6 addresses of the VLAN interface.
	no ipv6 address *<X:X::X:X>* ***link-local***	Restore the default link-local address of VLAN interface.
Step 4	**exit**	Exit to global configuration mode.
Step 5	**show interface vlan** *vlan_id*	Verify the configuration information.
Step 6	**write**	Save configurations.

17.3 IPv6 Static Neighbour

The neighbor items are the neighbor information of the device in the link range. The device neighbor items can be created dynamically through the neighbor request message NS and the neighbor advertisement message NA; it also can be created manually.

The device identifies a static neighbor item uniquely based on the IPv6 address of the neighboring node and the interface number that connected to the neighboring node.

When you delete a static neighbor item corresponding to a VLAN interface, you only need to specify the VLAN interface.

	Command	Function
Step 1	**configure terminal**	Enter global configuration mode.
Step 2	**ipv6 neighbor** *<X:X::X:X>* **vlan** *vlan_id <HHHH: HHHH:HHHH>*	Add a static item to the neighbor discovery table, you must specify the network interface and link layer address.
Setp 3	**no ipv6 neighbor** *<X:X::X:X>* **vlan** *vlan_id*	Delete the specified item of the neighbor discovery table.
Step 4	**show ipv6 neighbors**	Show the neighbor items in the current neighbor discovery table.

17.4 IPv6 SLAAC

An IPv6 address consists of two parts: prefix and interface ID. A big feature of IPv6 is that it supports plug and play. IPv6 address stateless autoconfiguration means that the node configures an IPv6 address automatically based on the information assigned by the router discovery/prefix discovery. Router discovery/prefix discovery means that when a node is connected to an IPv6 link, it can discover the local router, obtain the neighbor router information and the prefix of the network, and other configuration parameters from the received RA message but not by Dynamic Host Configuration Protocol (DHCPv6).

The device can obtain the IPv6 address prefix which carried in the RA message (Router-Advertisement, ICMPv6 Type 134), and generate the interface ID automatically through the interface, so as to get a completed 128-bit IPv6 address. By default, the RA message is sent once every 600s. The device can also send an RS (router solicit, ICMPv6 Type = 133) message to obtain the prefix.

Parameter Discovery: A node can discover the parameters of the link it is connected to, such as the MTU of the link and the hop limit.

17.4.1 IPv6 SLAAC Work Processes

The router discovery/prefix discovery is implemented by router solicitation message RS and router advertisement message RA. The specific process is as follows:

(1) When the node starts up, it sends a request to the router through RS message, requesting the prefix and other configuration information for

the configuration of the node.

(2) The router responds a RA message, which includes the prefix information option (the router also sends the RA message periodically). The prefix information option includes not only the prefix information of IPv6 address but also the preferred lifetime and valid lifetime of the prefix. After receiving the periodical RA message, the node will update the preferred lifetime and valid lifetime of the prefix based on the message.

(3) The node configures IPv6 address and other information of the interface automatically by using the prefix and other configuration parameters in the RA message responded by the router. During the valid lifetime, the automatically generated address can be used normally; after the valid lifetime expired, the automatically generated address will be deleted.

17.4.2 IPv6 SLAAC Configuration

Begin at privileged configuration mode, configure or delete IPv6 address and prefix of VLAN as the following table shows.

	Command	**Function**
Step 1	**configure terminal**	Enter global configuration mode.
Step 2	**interface vlan** *vlan_id*	Enter VLAN interface

		configuration. *vlan_id* range: 1-4094.
Step 3	**no ipv6 nd suppress-ra**	Disable RA message suppression. The interface sends RA messages periodically (default 600S). By default, RA message suppression is enabled.
	ipv6 nd suppress-ra	Enable RA message suppression.
Setp 4a	**ipv6 nd ra-interval** *<1-1800>*	Configure the interval for sending RA messages in second. The minimum value is 1s and the maximum value is 1800s. The default is 600s.
Step 4b	**ipv6 nd ra-interval msec** *<70-1800000>*	Configure the interval for sending RA messages in millisecond. The minimum value is 70ms and the maximum value is 1800000ms. The default is 600000ms.
Step 5	**ipv6 nd ra-lifetime** *<0-9000>*	Configure the lifetime of the RA message. The minimum value is 0s and the maximum value is 9000s. The default is 1800s.

Step 6	**ipv6 nd reachable-time** *<1-3600000>*	Specify the reachability interval of a new neighbor. It is used to detect neighbors that are unreachable in the neighbor discovery table. The minimum value is 1s and the maximum value is 3600000s. The default is 0s.
Step 7	**ipv6 nd home-agent-config-flag**	The set/unset flag in IPv6 router advertisement message is used to indicate to the host that the router acts as a home agent and includes the home agent option. It is not set by default.
Step 8	**ipv6 nd home-agent-preference** *<0-65535>*	When the local proxy configuration flag is set, this value indicates the host proxy preference. The default value 0 indicates the lowest priority.
Step 9	**ipv6 nd home-agent-lifetime** *<0-65520>*	When the local proxy configuration flag is set, this value indicates the host agent lifetime.

		The default value is 0.
Step 10	**ipv6 nd adv-interval-option**	Advertisement Interval option indicates the maximum time (in milliseconds) between consecutive unsolicited router advertisements.
Step 11	**ipv6 nd managed-config-flag**	This flag bit indicates which automatic configuration mode is used to obtain the IPv6 address. When the M bit is set to 1, the device that received this RA message will use the configuration protocol (such as DHCPv6) to obtain an IPv6 address. By default, this flag bit is 0.
Step 12	**ipv6 nd other-config-flag**	This flag bit indicates which mode is used to configure other configuration information (such as DNS, domain name, etc.) except IPv6 address. When the O bit is set to 1, the device that received this RA message will use the

		configuration protocol (such as DHCPv6) to obtain configuration information except IPv6 address. By default, this flag bit is 0.
Step 13	**ipv6 nd prefix** *<X:X::X:X/M>* **[valid-lifetime][preferred-lifetime]** **[off-link]** **[no-autoconfig]** **[router-address]**	Configure the parameters of the prefix declared on the network interface; **Valid-lifetime:** The length of time (in seconds) that the prefix is valid. The value *infinite* means infinity. Range: <0-4294967295| infinite> Default: 2592000 **Preferred-lifetime:** The preferred length of time (in seconds) for the prefix. Range: <0-4294967295| infinite> Default: 604800 **off-link:** Indicates that the link or link attribute does not declare a prefix. **no-autoconfig**: Indicates to the device on the link that the specified prefix cannot be used for

		IPv6 autoconfiguration. **router-address**: The R flag indicates to the host on the local link that the specified prefix contains the full IPv6 address.
Step 14	**ipv6 nd router-preference (high|medium|low)**	Set router preferences.
Step 15	**ipv6 nd mtu <1-65535>**	Configure the interface MTU. MTU range: 1-65535. The default is 0.

17.4.3 Example(pending)

17.5 DHCPv6

17.5.1 DHCPv6 Overview

DHCPv6 (Dynamic Host Configuration Protocol for IPv6) is a protocol designed for IPv6 addressing schemes that assigns IPv6 prefixes, IPv6 addresses, and other network configuration parameters to hosts.

Compared with other IPv6 address allocation methods (manual configuration, stateless autoconfiguration through network prefix in router advertisement messages, etc.), DHCPv6 has the following advantages:

- Not only IPv6 addresses, but also IPv6 prefixes can be assigned to facilitate automatic configuration and management of the whole network.
- Better control of address allocation. Not only can DHCPv6 record the address/prefix assigned to the host, but it can also assign a specific address/prefix to a specific host for network management.
- In addition to the IPv6 prefix and IPv6 address, it can also assign network configuration parameters such as DNS server and domain name to the host.

17.5.1.1 DHCPv6 Network Composition

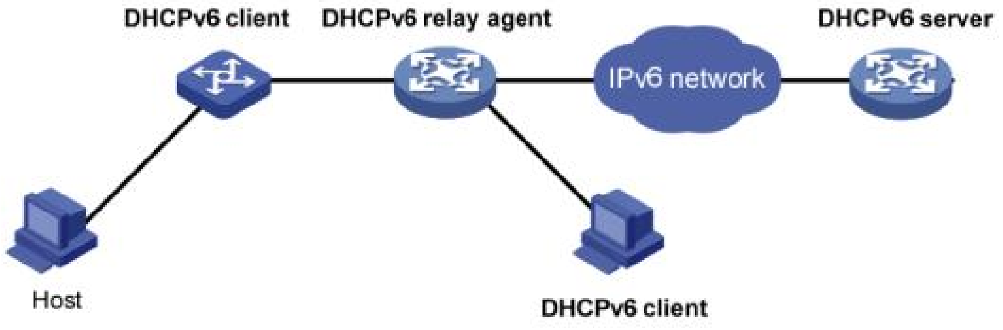


Figure 1： DHCPv6 network Composition

As shown in figure 1, the DHCPv6 networking includes the following three roles:

DHCPv6 client: A device that dynamically obtains IPv6 addresses, IPv6 prefixes, or other network configuration parameters.

DHCPv6 server: A device responsible for assigning IPv6 addresses, IPv6 prefixes, and other network configuration parameters to DHCPv6 clients. A DHCPv6 server can not only assign an IPv6 address to a DHCPv6 client, but also assign an IPv6 prefix to it. As shown in figure 1, after the DHCPv6 server assigns an IPv6 prefix to the DHCPv6 client, the DHCPv6 client sends an RA message containing the prefix information to the network, so that hosts on the network automatically configure an IPv6 address based on the prefix.

DHCPv6 relay: The DHCPv6 client communicates with the DHCPv6 server through the link-local multicast address to obtain IPv6 addresses and other network configuration parameters. If the server and the client are not on the same link, you need to forward packets through the DHCPv6 relay. This prevents the DHCPv6 server from being deployed on each link. This saves costs and facilitates centralized management.

17.5.1.2 DHCPv6 DUID Configuration

The server uses the DUID (DHCP Unique Identifier) to identify different clients, and the client uses the DUID to identify the server. The contents of the client and server DUID are carried in the Client Identifier and Server Identifier options in the DHCPv6 message. The format of the two options is the same. The value of the option-code field is used to distinguish between the Client Identifier and the Server Identifier option.

The minimum length is 12 bytes (96 bits) and the maximum length is 20 bytes (160 bits). The actual length depends on its type. The server compares the DUID to its database and sends the configuration data (address, lease, DNS server, etc.) to the client.

	Command	Function
Step 1	**configure terminal**	Enter global configuration mode.
Step 2	**duid** {**duid-llt|duid-ll|duid-en** *<1-4294967295>* **|duid-uuid** *<word>*}	Configure DUID.
Step 3	**show ipv6 dhcp duid**	Display DUID configuration.
Setp 4	**write**	Save configuration.

17.5.2 DHCPv6 Server

17.5.2.1 DHCPv6 Address/Prefix Allocation Process

The process of assigning addresses/prefixes to clients by the DHCPv6 server is divided into two categories:

- Quickly allocation process with two messages exchanging.
- Allocation process with four messages exchanging.

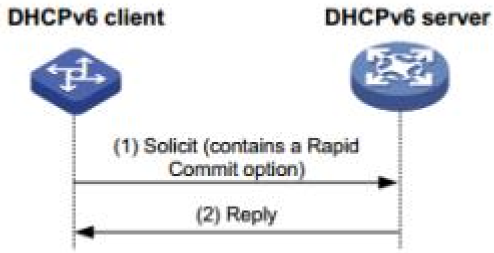


Figure 2：Quickly allocation process with two messages exchanging

As shown in figure 2, the address/prefix quick assignment process is:

(1) The DHCPv6 client carries the Rapid Commit option in the sent Solicit message, indicating that the client wants the server to quickly assign an address/prefix and network configuration parameters to it;

(2) If the DHCPv6 server supports the fast allocation process, it directly returns a Reply message to assign the IPv6 address/prefix and other network configuration parameters to the client. If the DHCPv6 server does not support the fast assignment process, the client is assigned an IPv6 address/prefix and other network configuration parameters using an assignment process that interacts with four messages.

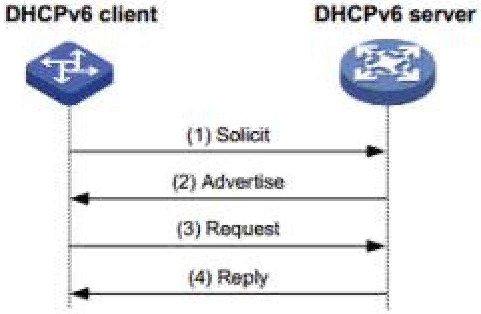


Figure 3：Allocation process with four messages exchanging

Step	Message type	Description
(1)	Solicit	The DHCPv6 client sends the message

		requesting the DHCPv6 server to assign an IPv6 address/prefix and network configuration parameters to it.
(2)	Advertise	If the Rapid Commit option is not carried in the Solicit message, or the Rapid Commit option is carried in the Solicit message, but the server does not support the fast allocation process, the DHCPv6 server replies to the message, notifying the client of the address/prefix and network configuration parameters that can be assigned to it.
(3)	Request	If the DHCPv6 client receives Advertise messages from multiple servers, it selects one of the servers according to the order in which the messages are received, the server priority, etc., and sends a Request message to the server, requesting the server to confirm the address/prefix. And network configuration parameters
(4)	Reply	The DHCPv6 server replies to the message, confirming that the address/prefix and network configuration parameters are assigned to the

		client.

17.5.2.2 DHCPv6 Server Lease Renewal Process

The IPv6 address/prefix assigned to the client by the DHCPv6 server has a certain lease term. The rental period is determined by the valid life period (Valid Lifetime). After the lease time of the address/prefix reaches the valid lifetime, the DHCPv6 client can no longer use the address/prefix. If the DHCPv6 client wishes to continue using the address/prefix before the valid lifetime expires, the address/prefix lease needs to be updated.

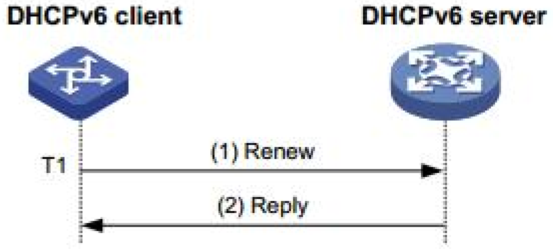


Figure 4： Update address/prefix lease by renew

As shown in Figure 4, when the address/prefix lease time arrival time T1 (the recommended value is half of the preferred lifetime Preferred Lifetime), the DHCPv6 client unicasts the Renew message to the DHCPv6 server that assigns the address/prefix to it. Update the address/prefix lease. If the client can continue to use the address/prefix, the DHCPv6 server responds with a successful Reply packet, informing the DHCPv6 client that the address/prefix lease has been successfully updated; if the address/prefix cannot be reassigned to the client, The DHCPv6 server responds with a Reply packet that failed to renew, notifying the client that it cannot obtain a new lease.

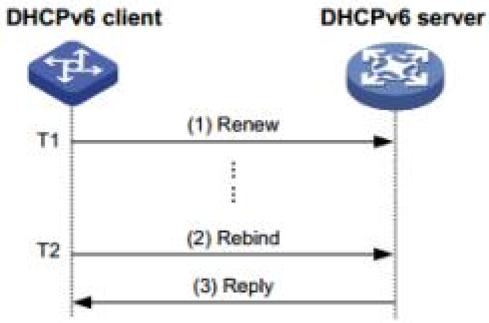


Figure 5： Update address/prefix lease by rebind

As shown in Figure 5, if Renew is sent to update the lease at T1, but the response packet from the DHCPv6 server is not received, the DHCPv6 client will send all DHCPv6 to T2 (recommended value is 0.8 times of the preferred lifetime). The server multicasts the Rebind message and requests to update the lease. If the client can continue to use the address/prefix, the DHCPv6 server responds with a successful Reply message, informing the DHCPv6 client that the address/prefix lease has been successfully updated; if the address/prefix cannot be reassigned to the client, The DHCPv6 server responds to the Reply packet with the renewal failure, notifying the client that the new lease cannot be obtained. If the DHCPv6 client does not receive the response packet from the server, the client stops using the address/prefix after the valid lifetime expires.

17.5.2.3 DHCPv6 Server Stateless Configuration

The DHCPv6 server can assign additional network configuration parameters to clients that already have an IPv6 address/prefix. This process is called a DHCPv6 stateless configuration.

After the DHCPv6 client successfully obtains an IPv6 address through the stateless auto-configuration function, the M flag (Managed address configuration flag) in the RA (Router Advertisement, Router Advertisement) packet is 0. If the other stateful configuration flag (1), the DHCPv6 client automatically starts the DHCPv6 stateless configuration function to obtain other network configuration parameters except the address/prefix.

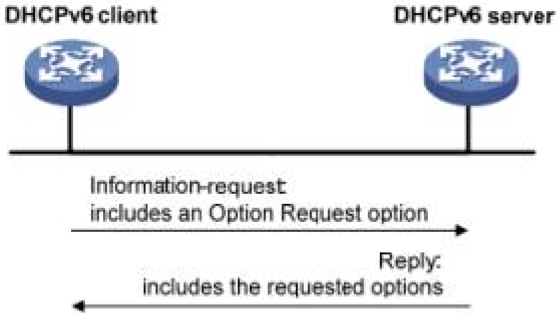

DHCPv6 client
DHCPv6 server
Information-request:
includes an Option Request option
Reply:
includes the requested options

Figure 6： DHCPv6 stateless configuration process

As shown in Figure 6, the specific process of DHCPv6 stateless configuration is as follows:

(1) The client sends an Information-request packet to the DHCPv6 server in multicast mode. The packet carries the Option Request option to specify the configuration parameters that the client needs to obtain from the server.

(2) After receiving the Information-request packet, the server allocates network configuration parameters to the client and sends a

Reply packet to the client to return the network configuration parameters to the client.

(3) The client provides the information provided in the Reply packet. If the configuration parameter is the same as the one specified in the Reply message, the network configuration is performed according to the parameters provided in the Reply packet. Otherwise, the parameter is ignored. If multiple Reply packets are received, the client selects the first reply packet and completes the stateless configuration of the client according to the parameters provided in the packet.

17.5.2.4 DHCPv6 Server Configurations

Begin at privileged configuration mode, configure DHCPv6 server as the following table shows.

	Command	**Function**
Step 1	**configure terminal**	Enter global configuration mode.
Step 2	**ipv6 dhcp pool** *pool_name*	Configure an IPv6 DHCP address pool.
Step 3	**prefix-delegation** *<X:X::X:X/M>* *<X:X::X:X/M>* **[lifetime** *<60-4294967295|infinite>*	Configure prefix delegation and its lifetime.

	*<60-4294967295|infinite>***]**	
Setp 4	**address prefix** *<X:X::X:X/M>* **[lifetime** *<60-4294967295|infinite> <60-4294967295|infinite>***]**	Configure IPv6 address prdfix and its lifetime.
Step 5	**dns-sever** *<X:X::X:X>*	Configure the DNS server IPv6 address.
Step 6	**domain-name** *<WORD>*	Configure domain name.
Step 7	**nis address** *<X:X::X:X>*	Configuring the NIS server IPv6 address.
Step 8	**nis domain-name** *<WORD>*	Configuring the NIS server domain name.
Step 9	**nisp address** *<X:X::X:X>*	Configure the NISP server IPv6 address.
Step 10	**nisp domain-name** *<WORD>*	Configure the NISP server domain name.
Step 11	**ntp address** *<X:X::X:X>*	Configure the NTP server IPv6 address.
Step 12	**sip address** *<X:X::X:X>*	Configure the SIP server IPv6 address.
Step 13	**sip domain-name** *<WORD>*	Configure the SIP server

		domain name.
Step 14	**bcmcs address** *<X:X::X:X>*	Configuring the BCMCS server IPv6 address.
Step 15	**bcmcs domain-name** *<WORD>*	Configure the BCMCS server domain name.
Step 16	**exit**	Exit to global configuration mode.
Step 17	**interface vlan** *vlan_id*	Add VLAN and enter VLAN interface configuration. vlan_id(1—4094)；
Step 18	**ipv6 dhcp server** *pool_name* **[preference** *<0-255 >***] [allow-hint] [rapid-commit]**	Configure and enable the DHCPv6 server address of the network segment on the interface.
Step 19	**exit**	Exit to global configuration mode.
Step 20	**show ipv6 dhcp pool**	View DHCPv6 address pool information..
Step 21	**show ipv6 dhcp interface [vlan** *<1-4094>***]**	Show information about the device DHCPv6

		interface
Step 22	**show ipv6 dhcp binding**	View the address binding information of the DHCPv6 address pool.
Step 23	**write**	Save configurations.

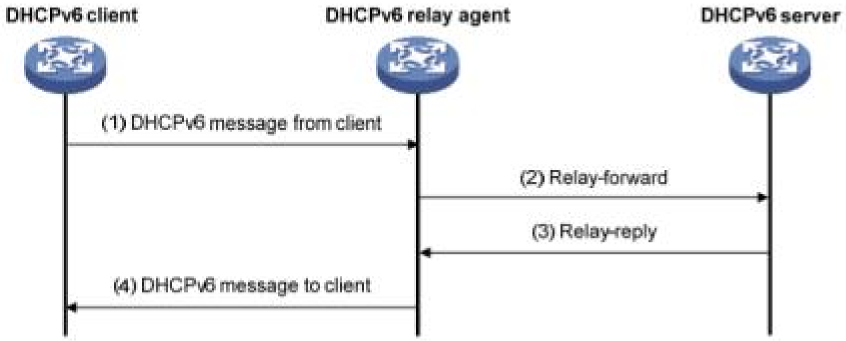
17.5.2.5 Example(pending)

17.5.3 DHCPv6 Relay

17.5.3.1 DHCPv6 Relay Work Processes

During the process of obtaining the IPv6 address/prefix and other network configuration parameters dynamically through the DHCPv6 relay, the DHCPv6 client and the DHCPv6 server are processed in the same way as when the DHCPv6 relay is not processed.

DHCPv6 relay forwarding process：



(1) The DHCPv6 client sends a request to the multicast address FF02::1:2 of all DHCPv6 servers and relays;

(2) After receiving the request, the DHCPv6 relay encapsulates the relay-forward packet in the relay message option and sends the relay-forward packet to the DHCPv6 server.

(3) The DHCPv6 server parses the client's request from the relay-forward packet, selects the IPv6 address and other parameters for the client, constructs a response message, and encapsulates the response message in the relay message option of the Relay-reply message. Send the Relay-reply message to the DHCPv6 relay.

(4) The DHCPv6 relay resolves the response from the server to the DHCPv6 client from the relay-reply packet. The DHCPv6 client performs network configuration based on the IPv6 address/prefix and other parameters assigned by the DHCPv6 server.

17.5.3.2 DHCPv6 Relay Configuration

Begin at privileged configuration mode, configure DHCPv6 relay as the following table shows.

	Command	Function
Step 1	**configure terminal**	Enter global configuration mode.
Step 2	**interface vlan** *vlan_id*	Add VLAN and enter VLAN interface configuration *vlan_id(*1-4094)；
Step 3	**ipv6 dhcp relay destination** <*X:X::X:X*>	Configure the DHCPv6 relay server address on the network segment of the interface and enable the DHCPv6 relay service.
Setp 4	**exit**	Exit to global configuration mode.
Step 5	**show ipv6 dhcp interface**	Show information about the device DHCPv6 interface.
Step 6	**write**	Save configurations.

17.5.3.3 DHCPv6 Relay Option 37 Configuration

Begin at privileged configuration mode, configure DHCPv6 relay option 37 as the following table shows.

Step 1	**configure terminal**	Enter global configuration mode.
	ipv6 dhcp relay remote-id option	Enable relay support option 38 option function
Step 2	**interface vlan** *vlan_id*	Add VLAN and enter VLAN interface configuration.vlan_id(1-4094)；
Step 3	**ipv6 dhcp relay remote-id** <*WORD*>	Configure the remote-id value of the custom option37.
	show ipv6 dhcp relay option	Display configuration information about trunk related options.
Setp 4	**exit**	Exit to global configuration mode.
Step 5	**write**	Save configurations.

17.5.3.4 DHCPv6 Relay Option 38 Configuration

Begin at privileged configuration mode, configure DHCPv6 relay option 38 as the following table shows.

	Command	Function
Step 1	**configure terminal**	Enter global configuration mode.
	ipv6 dhcp relay subscriber-id option	Enable relay support option 38 option function
Step 2	**interface vlan** *vlan_id*	Add VLAN and enter VLAN interface configuration.vlan_id(1-4094)；
Step 3	**ipv6 dhcp relay subscriber-id** <*WORD*>	Configure the custom subscriber-id value of option38.
	show ipv6 dhcp relay option	Display configuration information about trunk related options.
Setp 4	**exit**	Exit to global configuration mode.

Step 5	**write**	Save configurations.

17.5.3.5 Example(pending)

17.6 IPv6 Route

17.6.1 IPv6 Static Route Configuration

IPv6 Static Routes Introduction

A static route is a special type of route that is manually configured by an administrator. When the network structure is relatively simple, you only need to configure a static route to make the network work normally. Static routes cannot automatically adapt to changes in network topology. After the network fails or the topology changes, the configuration must be manually modified by the network administrator. IPv6 static routes are similar to IPv4 static routes and are suitable for some IPv6 networks with simple structures.

Default Routes Introduction

The IPv6 default route is the route used when the router does not find a matching IPv6 routing entry. There are two ways to generate IPv6 default routes:

➢ The first type is manually configured by the network administrator. The function address specified during configuration is ::/0 (prefix length is 0).

- The second type is dynamic routing protocol generation (such as OSPFv3, IPv6 IS-IS, and RIPng). Routers with strong routing capabilities advertise IPv6 default routes to other routers. Other routers generate pointers to them in their routing tables. The default route of the router.

	Command	Function
Step 1	**configure terminal**	Enter global configuration mode.
Step 2	**ipv6 route** *<X:X::X:X/M> <X:X::X:X>*	Add a static route.
Setp 3	**no ipv6 route** *<X:X::X:X/M> <X:X::X:X>*	Delete static route.
Step 4	**show ipv6 route**	Show current routing configuration

17.6.2 View IPv6 Hardware Routing Information

	Command	Function
Step 1	**configure terminal**	Enter global configuration mode.
Step 2a	**show ipv6 l3 defip route**	View IPv6 hardware subnet routing

		information.
Step 2b	**show ipv6 l3 hostroute**	View IPv6 hardware host routing information.
Step 2c	**show l3 interface**	View interface information.

17.7 IPv6 Connectivity Test

Ping6 is mainly used to check network connectivity and host reachability for IPv6.

	Command	**Function**
Step 1	**configure terminal**	Enter global configuration mode.
Step 2	**ping6** *<X:X::X:X>* **[-i** *vlan <1-4094>***]** **[-s** *<packetsize>***]**	Packetize: The length of the packet to be sent, in bytes. Ping the link local address to specify the interface.

18PON Management

18.2 Show PON Port Info and Optical Power

18.2.1 Show Pon Port Statistics

	Command	Function
Step 1	**configure terminal**	Enter global configuration mode.
Step 2	**interface gpon** *slot/port*	Enter PON interface configuration mode.
Step 3	**show pon statistics**	Show PON port statistics.

18.2.2 Show PON Port Optical Power

Optical module parameters contain transmit optical power, receive optical power, temperature, voltage and bias current. These 5 parameters decide whether the optical module can work normal or not. Any of them is abnormal may cause ONU deregister or lose packets.

Begin at privileged configuration mode, show PON port optical module parameters as the following table shows.

	Command	Function
Step 1	**configure terminal**	Enter global configuration mode.
Step 2	**interface gpon** *slot/port*	Enter PON interface configuration mode.
Step 3	**show pon optical transceiver**	Show pon optical parameters.

18.2.3 Show ONU Optical Transceiver

	Command	Function
Step 1	**configure terminal**	Enter global configuration mode.
Step 2	**interface gpon** *slot/port*	Enter PON interface configuration mode.
Step 3	**show pon onu [<1-128>|all] rx-power**	Show ONU optical transceiver

18.3 PON Port Configuration

18.3.1 Enable/Disable PON

Begin at privileged configuration mode, enable or disable PON port as the following table shows.

	Command	Function
Step 1	**configure terminal**	Enter global configuration mode.
Step 2	**interface gpon** *slot/port*	Enter PON interface configuration mode.
Step 3a	**Shutdown**	Disable pon port
Step 3b	**No shutdown**	Enable pon port
Step 4	**show pon info**	Show pon info

17.1 ONU auto-learn configuration

打开或者关闭 PON 口的 ONU 自动授权功能。

	Command	Function
Step 1	**configure terminal**	Enter global configuration mode.
Step 2	**interface gpon** *slot/port*	Enter PON interface configuration mode.
Step 3a	**onu auto-learn** *{default-onu-profile <profile_name>}*1*	Enable the auto-learn function.It support to select onu profile.will bind the default profile if not select.
Step 3b	**no onu auto-learn**	Disable the auto-learn
Step 4	**show onu auto-learn**	Show the auto-learn

Note: After the ONU is auto-learned, there will be ONU connected to this PON port. The OLT will check whether there is equipment ID in the auto-binding list. If the equipment ID of this ONU is in the auto-binding list, the ONU uses the information of auto-binding list to register.

19ONU Management

19.2 ONU Basic Configuration

19.2.1 Show Auto-find ONU

	Command	Function
Step 1	**configure terminal**	Enter global configuration mode.
Step 2	**interface gpon** *slot/port*	Enter PON interface configuration mode.
Step 3	**Show onu auto-find**	Show auto-find ONU
	show onu auto-find *{[detail-info]}*1*	Show auto-find ONU detail info

19.2.2 ONU Automatic Authorize

OLT can enable/disable automatic authorized mode. ONU will authorized automatically when ONU online

	Command	Function
Step 1	**configure terminal**	Enter global configuration mode.

Step 2	**interface gpon** *slot/port*	Enter PON interface configuration mode.
Step 3	**onu auto-learn** *{default-onu-profile <profile_name>}*1*	Enable/disable auto-auth
Step 4	**Show onu auto-learn**	Show auto-learn

19.2.3 Show ONU Authorized Info

	Command	**Function**
Step 1	**configure terminal**	Enter global configuration mode.
Step 2	**interface gpon** *slot/port*	Enter PON interface configuration mode.
Step 3	**Show onuinfo [<1-128>]*1**	Show ONU authorized info

19.2.4 Show ONU Authorized Detail-info

It can show ONU Vendor ID, Version, SN, product Code……

	Command	**Function**
Step 1	**configure terminal**	Enter global

		configuration mode.
Step 2	**interface gpon** *slot/port*	Enter PON interface configuration mode.
Step 3	**Show onu detail-info {<1-128>}*1**	Show a onu detail-info or can select a range

19.2.5 Activate|Deactivate ONU

ONU will online/offline when you activate/deactivate ONU

	Command	**Function**
Step 1	**configure terminal**	Enter global configuration mode.
Step 2	**interface gpon** *slot/port*	Enter PON interface configuration mode.
Step 3a	**onu** *[all|<1-128] [activate|deactivate]*	Activate/deactivate ONU on pon port

19.2.6 ONU Authorization

Command	**Function**

Step 1	**configure terminal**	Enter global configuration mode.
Step 2	**interface gpon** *slot/port*	Enter PON interface configuration mode.
Step 3a	**onu add <1-128> profile <onu_profile_name> [hpw|loid+hpw|loid+pw|loid|pw |sn+hpw|sn+pw|sn]**	Authorize ONU

19.2.7 Configure ONU Description String

	Command	Function
Step 1	**configure terminal**	Enter global configuration mode.
Step 2	**interface gpon** *slot/port*	Enter PON interface configuration mode.
Step 3	**onu** *<onuid>* **description** *<string>*	Add description string to ONU.
Step 4	**show onu** *<onuid>* **description**	Show ONU description.

19.3 ONU Remote Configuration

19.3.1 Show ONU SFP Info

	Command	Function
Step 1	**configure terminal**	Enter global configuration mode.
Step 2	**interface gpon** *slot/port*	Enter PON interface configuration mode.
Step 3	**show onu** *<1-128>* **optical-info**	Show onu SFP info

19.3.2 Upgrade ONU

Only ONU had authorized on OLT, ONU can upgrade.

	Command	Function
Step 1	**configure terminal**	Enter global configuration mode.
Step 2	**upgrade load image** *<filename> <A.B.C.D>*	Configure ONU firmware name and TFTP server.
Step 3	**upgrade select pon** *<pon_num> {<onuid_list>}*1*	Select ONU. ONU ID format is 1-2.

Step 4	**upgrade start** *[download|active|commit|mix]*	Download ONU firmware and save in memory, and then update ONU.
Step 5	**upgrade stop**	Delete the firmware in memory,and detele the upgrader info
Step 6	**show upgrade** *[status|info| onu-version] {pon <1-8> <onu_list>}*1*	Show the upgrade status,upgrade info and firmware info

Notice:

1. DO NOT turn power off when updating. After finishing update, OLT will inform ONU if updated successfully and reset ONU with the new firmware.

2. After ONU updated and restarted, OLT will send commit command to confirm the new version.

3. Please delete the firmware and upgrade settings by command **upgrade onu stop**.

4. Display ONU upgrade progress by command **show upgrade onu status**.

5. Display ONU upgrade settings by command **show upgrade onu info**.

6. Stop upgrading ONU by command **upgrade onu stop**.

19.3.3 Auto-upgrade ONU

OLT will compared equipment id with onu info, if they are consistent, will start to upgrade

	Command	Function
Step 1	**configure terminal**	Enter global configuration mode.
Step 2	**auto-upgrade onu equipment_id** *<string>* **version** *<string>* **image** *<filename> <A.B.C.D>*	Configure the onu equipment, id , version ,file name ,file address
Step 3	**no auto-upgrade onu equipment_id** *<string>*	Delete the onu equipment
Step 4	**show auto-upgrade** *[status|config]*	Show the auto-upgrade

19.3.4 Reboot ONU

Reboot the ONU which had authorized

Command	Function

Step 1	**configure terminal**	Enter global configuration mode.
Step 2	**interface gpon** *slot/port*	Enter PON interface configuration mode.
Step 3a	**onu** *[all|<1-128>* **reboot**	Reboot one of ONU or all of onu on PON

19.3.5 TCONT Configuration

Create/modify a TCONT, and bind to DBA profile.

	Command	Function
Step 1	**configure terminal**	Enter global configuration mode.
Step 2	**interface gpon** *slot/port*	Enter PON interface configuration mode.
Step 3a	**onu** *<1-128>* **tcont** *<1-255> {[name] <string>}*1 {[dba] <string>}*1*	Configure ONU TCONT and dba you had created.
Step 3b	**no onu** *<1-128>* **tcont** *<1-255>*	Delete TCONT
Step 4	**show onu** *<onuid>* **tcont**	Show ONU TCONT

19.3.6 GEMPORT Configuration

	Command	Function
Step 1	**configure terminal**	Enter global configuration mode.
Step 2	**interface gpon** *slot/port*	Enter PON interface configuration mode.
Step 3a	**onu** *<1-128>* **gemport** *<1-255> [tcont] <1-255> {[gemport_name] <gemport_name>}*1 {[portid] <129-4095>}*1 {[queue] <0-7>}*1*	Configure GEMPORT to bind a TCONT. And can select portid and queue id
Step 3b	**onu** *<1-128>* **gemport** *<1-255> [traffic-limit]* **upstream** *<dba_name>* **downstream** *<dba_name>*	Configure GEMPORT to bind a traffic limit profile
Step 3c	**onu** *<1-128>* **gemport** *<1-255> [state] [enable|disable]*	Enable/disable gemport。
Step 3d	**onu** *<1-128>* **gemport** *<1-255> [down-queue-map-id] <0-7>* **up-queue-map-id** *<0-3>*	Configure GEMPORT up/down queue
Step 3e	**onu** *<1-128>* **gemport** *<1-255>*	Configure GEMPORT

	encrypt *[disable|enable]* *{[downstream|bidirection]}*1*	encrypt
Step 4	**no onu** *<1-128>* **gemport** *<1-255>*	Delete ONU GEMPORT
Step 5	**show onu** *<onuid>* **gemport**	Show ONU GEMPORT configuration

19.3.7 ONU Service Configuration

	Command	**Function**
Step 1	**configure terminal**	Enter global configuration mode.
Step 2	**interface gpon** *slot/port*	Enter PON interface configuration mode.
Step 3a	**onu** *<1-128>* **service** *<service_name>* **gemport** *<1-255>* *[vlan] <vlan_list> {[iphost] <1-255>}*1 {[ethuni] lan <1-32>}*1 {[cos] <cos_list>}*1*	Configure ONU service with vlan
Step 3b	**onu** *<1-128>* **service** *<service_name>* **gemport** *<1-255>* *[untag] {[ethuni]* **lan** *<1-32>}*1*	Configure ONU service without vlan

	*{[iphost] <1-255>}*1*	
Step 4	**no onu** *<1-128>* **service** *<service_name>*	Delete ONU service

19.3.8 Service-port Configuration

Configure the service-port .

	Command	Function
Step 1	**configure terminal**	Enter global configuration mode.
Step 2	**interface gpon** *slot/port*	Enter PON interface configuration mode.
Step 3a	**onu** *<1-128>* **service-port** *<1-128>* **gemport** *<1-128>* **uservlan** *<1-4094> {[to] <1-4094>}*1 transparent*	Configure the vlan transparent mode
Step 3b	**onu** *<1-128>* **service-port** *<1-128>* **gemport** *<1-128>* **uservlan** *<1-4094> [user_priority] <0-7> [vlan] <1-4094> {[new_cos] <0-7>}*1*	Configure the vlan translate mode
Step 3c	**onu** *<1-128>* **service-port** *<1-128>* **gemport** *<1-128>* **uservlan**	Configure the vlan translate mode and

	<1-4094> [vlan] <1-4094> {[new_cos] <0-7>}*1 {[svlan] <1-4094>}*1 {[new_scos] <0-7>}*1	QinQ
Step 3d	**onu** <1-128> **service-port** <1-128> **gemport** <1-128> **uservlan** <1-4094> [user_etype] [pppoe|ipoe] [vlan] <1-4094> {[new_cos] <0-7>}*1 {[svlan] <1-4094>}*1 {[new_scos] <0-7>}*1	Configure the vlan translate mode and QinQ.can select the type of packets
Step 3e	**onu** <1-128> **service-port** <1-128> **gemport** <1-128> **uservlan** <1-4094> [user_etype] [user_define] <eth_type> [vlan] <1-4094> {[new_cos] <0-7>}*1 {[svlan] <1-4094>}*1 {[new_scos] <0-7>}*1	Configure the vlan translate mode and QinQ.can select the type that user define.
Step 3f	**onu** <1-128> **service-port** <1-128> **gemport** <1-128> **uservlan untag** [user_etype] [user_define] <eth_type> [vlan] <1-4094> {[new_cos] <0-7>}*1 {[svlan] <1-4094>}*1 {[new_scos] <0-7>}*1	Configure the vlan untagged mode, can configure QinQ and type that user define.

Step 3g	**onu** *<1-128>* **service-port** *<1-128>* **gemport** *<1-128>* **uservlan untag** *[vlan] <1-4094> {[new_cos] <0-7>}*1 {[svlan] <1-4094>}*1 {[new_scos] <0-7>}*1*	Configure the vlan untagged mode,can configure QinQ
Step 4	**onu** *<1-128>* **service-port** *<1-128>* **admin-status** *[enable|disable]*	Enable/disable service-port
Step 5	**onu** *<1-128>* **service-port** *<1-128>* **description** *<desc>*	Configure the service-port description
Step 6	**no onu** *<1-128>* **service-port** *<1-128>*	Delete the service-port

19.3.9 ONU UNI Configuration

Include LAN, VEIP, IPHOST

	Command	**Function**
Step 1	**configure terminal**	Enter global configuration mode.
Step 2	**interface gpon** *slot/port*	Enter PON interface configuration mode.

Step 3a	**onu** *<1-128>* **portvlan** *[eth|wifi|veip] <1-32> [mode] [transparent]*	Configure the UNI mode is transparent
Step 3b	**onu** *<1-128>* **portvlan** *[eth|wifi|veip] <1-32> [mode] [trunk]*	Configure the UNI mode is trunk
Step 3c	**onu** *<1-128>* **portvlan** *[eth|wifi|veip] <1-32> [mode] [tag]* **vlan** *<1-4094> {pri <0-7>}*1*	Configure the UNI mode is access and bind a vlan
Step 3d	**onu** *<1-128>* **portvlan** *[eth|wifi|veip] <1-32> [mode] [hybrid]* **def_vlan** *<1-4094> {def_pri <0-7>}*1*	Configure the UNI mode is hybrid and bind a vlan
Step 3e	**onu** *<1-128>* **portvlan** *[eth|wifi|veip] <1-32> [vlan] <vlan_list>*	Configure the list of UNI vlan
Step 3f	**onu** *<1-128>* **portvlan** *[eth|wifi|veip] <1-32> [translate] [vlan] <1-4094> [cvlan] <1-4094> {[cvlan_pri] <0-7>}*1 [svlan] <1-4094> {[svlan_pri] <0-7>}*1*	Configure the UNI mode is translate

19.3.10 ONU FEC Configuration

Enable/disable ONU FEC

	Command	Function
Step 1	**configure terminal**	Enter global configuration mode.
Step 2	**interface gpon** *slot/port*	Enter PON interface configuration mode.
Step 3	**onu** *<1-128>* **fec** *[enable|disable]*	Enable/disable ONU FEC

19.3.11 Show ONU Service

	Command	Function
Step 1	**configure terminal**	Enter global configuration mode.
Step 2	**interface gpon** *slot/port*	Enter PON interface configuration mode.
Step 3	**show running-config onu** *{<1-128>} *1*	Show ONU Service

19.3.12 Show ONU Capability

	Command	Function
Step 1	**configure terminal**	Enter global configuration mode.
Step 2	**interface gpon** *slot/port*	Enter PON interface configuration mode.
Step 3	**show onu** *[<1-128>|all]* **capability**	Show ONU capability

19.4 ONU Remote Port Configuration

19.4.1 ONU Port Enable|Disable

	Command	Function
Step 1	**configure terminal**	Enter global configuration mode.
Step 2	**interface gpon** *slot/port*	Enter PON interface configuration mode.
Step 3	**onu** *<1-128>* **eth** *<1-32> {[state] [disable|enable]}*1*	Disable/enable port

19.4.2 ONU Port Autonegotiation

	Command	Function
Step 1	**configure terminal**	Enter global configuration mode.

Step 2	**interface gpon** *slot/port*	Enter PON interface configuration mode.
Step 3	**onu** *<1-128>* **eth** *<1-32> {[speed] [auto|full-10|full-100|full-1000|half-10|half-100]}*1*	ONU port autonegotiation

19.4.3 ONU Port Flow Control Configuration

Begin at privileged configuration mode, configure ONU port flow control as the following table shows.

	Command	**Function**
Step 1	**configure terminal**	Enter global configuration mode.
Step 2	**interface gpon** *slot/port*	Enter PON interface configuration mode.
Step 3	**onu** *<onuid>* **eth** *<port-num> {[pause-time] <0-65535>}*1*	Configure flow control

19.4.4 Multicast VLAN Configuration

Command	**Function**

Step 1	**configure terminal**	Enter global configuration mode.
Step 2	**interface gpon** *slot/port*	Enter PON interface configuration mode.
Step 3a	**onu** *<1-128>* **mvlan** *<vlanList>*	Add a multicast vlan
Step 3b	**no onu** *<1-128>* **mvlan** *[all|<vlanList>]*	Delete multicast vlan

19.4.5 Configure ONU Iphost

	Command	**Function**
Step 1	**configure terminal**	Enter global configuration mode.
Step 2	**interface gpon** *slot/port*	Enter PON interface configuration mode.
Step 3a	**onu** *<1-128>* **iphost** *<1-255> [id] <desc>*	Configure iphost descible
Step 3b	**onu** *<1-128>* **iphost** *<1-255> [dhcp]*	Configure to dhcp mode
Step 3c	**onu** *<1-128>* **iphost** *<1-255> [static-ip] <A.B.C.D> <A.B.C.D>*	Configure to static mode,and subnet,GW

	*{<A.B.C.D>}*1*	
Step 3d	**onu** *<1-128>* **iphost** *<1-255>* *[primary-dns]* *<A.B.C.D>* *{second-dns <A.B.C.D>}*1*	Configure the dns
Step 3e	**no onu** *<1-128>* **iphost** *<1-255>*	Delte the iphost configuration

19.4.6 ONU Port Multicast Tag-strip Configuration

	Command	**Function**
Step 1	**configure terminal**	Enter global configuration mode.
Step 2	**interface gpon** *slot/port*	Enter PON interface configuration mode.
Step 3a	**onu *<1-128>* mvlan *[tag-strip]* eth *<1-32>***	Configure the multicast tag-strip
Step 3b	**no onu** *<1-128>* **mvlan** *[tag-strip]* **eth** *<1-32>*	Delete the configuration

19.4.7 Example for SFU

1GE ONU with vlan 100. Uplink DBA mode: assured 10M, maximum 20M. Gemport 1 with downlink 20M.

1. Create a onu profile with 1 eth port

```
Profile onu name 1GE_SFU
Port eth 1
Commit
Exit
```

2. Create a dba profile with assured 10M max 20M

```
Profile dba name 20M
Type 3 assured 10240 maximum 20480
Exit
```

3. Create a traffic profile to limit the downlink speed

```
Profile traffic name DN_20M
Sir 20480 pir 20480
Exit
```

4. Register onu and configure the service

```
Interface gpon 0/1
Show onu auto-find
Onu add 1 profile 1GE_SFU sn GPON00000031
Onu 1 tcont 1 dba 20M
Onu 1 gemport 1 tcont 1
Onu 1 gemport 1 traffic-limit upstream default downstream DN_20M
Onu 1 service 1 gemport 1 vlan 100
Onu 1 service-port 1 gemport 1 user-vlan 100 vlan 100
Onu 1 portvlan eth 1 mode tag vlan 100
```

5. Create vlan 100

```
Vlan 100
Exit
```

6. Bind the vlan to uplink port

```
Interface gigabitethernet 0/10
Switchport hybrid pvid vlan 100
```

19.4.8 Example for HGU

4FE ONU with vlan 41 and vlan 46. Uplink DBA mode: assured 10M, maximum 20M. Gemport 1 with downlink 20M. vlan 46 is for tr069 , DBA mode: fixed 2M

1. Create a onu profile with 1 veip port

```
Profile onu name HGU
Port veip 1
```

```
Commit
Exit
```

2. Create a dba profile

```
Profile dba name 20M
Type 3 assured 10240 maximum 20480
Exit
Profile dba name 2M
Type 1 fixed 2048
Exit
```

3. Create a traffic profile to limit the downlink speed

```
Profile traffic name DN_20M
Sir 20480 pir 20480
Exit
```

4. register onu and configure the service

```
Interface gpon 0/1
Show onu auto-find
Onu add 1 profile HGU sn GPON000000AB
Onu 1 tcont 1 dba 20M
Onu 1 tcont 2 dba 2M
```

```
    Onu 1 gemport 1 tcont 1
    Onu 1 gemport 1 traffic-limit upstream default downstream DN_20M
    Onu 1 service HSI gemport 1 vlan 41
    Onu 1 service-port 1 gemport 1 user-vlan 41 vlan 41
    Onu 1 gemport 2 tcont 2
    Onu 1 service TR69 gemport 2 vlan 46
    Onu 1 service-port 2 gemport 2 user-vlan 46 vlan 46
    Onu 1 portvlan veip 1 mode transparent
```

5. Create vlan 41 and 46, bind to uplink port

```
Vlan 41
Exit
Vlan 46
Exit
  Interface gigabitethernet 0/10
  Switchport mode trunk
  Switchport trunk vlan 41
  Switchport trunk vlan 46
```

6. Login to onu webinterface, create two WAN connection,one is internet with vlan41; another one is tr069 with vlan46

19.5 Rogue-onu Configuration

We called this rogue ONT which does not follow the assigned timestamp to send up the optical signal.

Rogue ONT mainly divided into the following two types:

1) The long Lighting rogue ont: ONT is lighting (glowing at any moment).

2) Luminous rogue ont: Lighting in OLT non allocation of the timestamp, may be light in advance, or delay to turn off and so on.

19.5.1 Rogue-onu-detect

	Command	**Function**
Step 1	**configure terminal**	Enter global configuration mode.
Step 2	**rogue-onu-detect** *[enable|disable]* **locate** *[enable|disable]* **auto-shutdown** *[enable|disable]*	Enable/disable detect/locate/auto-shudown function
Step 3	**show rogue-onu-detect config**	Show the configuration
Step 4	**show rogue-onu-detect info pon** *<1-8>*	Show the result

19.5.2 Rogue-onu status

	Command	Function
Step 1	**configure terminal**	Enter global configuration mode.
Step 2	**rogue-onu-state pon** *<1-8>* **onu** *<1-128> [on|off|shutdown]* **duration** *[forever|<1-255>]*	Configure the rogue-onu online/offline/shutdown and duration time
Step 3	**show rogue-onu-detect config**	Show the configuration

20ONU Template Management

20.2 Summary of ONU Template

Template under “config” node, the operation steps are as follows:

1.Create a template

profile [onu|dba|traffic|line|srv|voip|alarm] {id <1-32767>}*1 {name <string>}*1

2.Through profile_id into the corresponding template node

profile [onu|dba|traffic|line|srv|voip|alarm] {id <1-32767>}*1 {name <string>}*1

3.Modify the template parameters

modify …

4.Exit template node

exit

5.Binding template to an onu equipment

Interface gpon *slot/port*

onu add 1 profile <string>

onu <onuid> profile [line|srv] <string>

6.Query onu equipment binding template

Interface gpon slot/port

show profile [onu|dba|traffic|line|srv|voip|alarm] {id <1-32767>}*1 {name <string>}*1

7. query template configuration information

Show profile [onu|dba|traffic|line|srv|voip|alarm] {id <1-32767>}*1 {name <string>}*1 used-info

20.3 ONU Template Configuration

The ONU template is used for onu authorization, and each ONU must specify only one ONU template when authorizated. The ONU template specifies the capability of this ONU.

	Command	Function
Step 1	**configure terminal**	Enter global configuration mode.
Step 2	**profile onu** *{id <1-32767>}*1 {name <string>}*1*	Create or enter the onu profile you had created before.
Step 3a	**tcont-num** *<1-255>* **gemport-num** *<1-255>*	Configure the onu support max tcont and gemport.
Step 3b	**switch-num** *<1-255>* **flow-num** *<1-255>*	Configure the onu support max switch and flow
Step 3c	**port-num** *{[eth] <0-64>}*1 {[pots]*	Configure the onu

	<0-64>}*1 {[iphost] <0-255>}*1 {[ipv6host] <0-255>}*1 {[veip] <0-127>}*1	support eth/pots/iphost/ipv6host/veip
Step 3d	**service-ability n:1** _[yes|no]_ **1:p** _[yes|no]_ **1:m** _[yes|no]_	Capability profile
Step 4	**commit**	Commit the profile.only enter “commit”can submit the setting
Step 5	**exit**	

20.4 DBA Template Configuation

The default system will have an id 0 dba template, this template parameters cannot be modified, all onu when create the default binding in the template.Each ONU must bind a dba template.

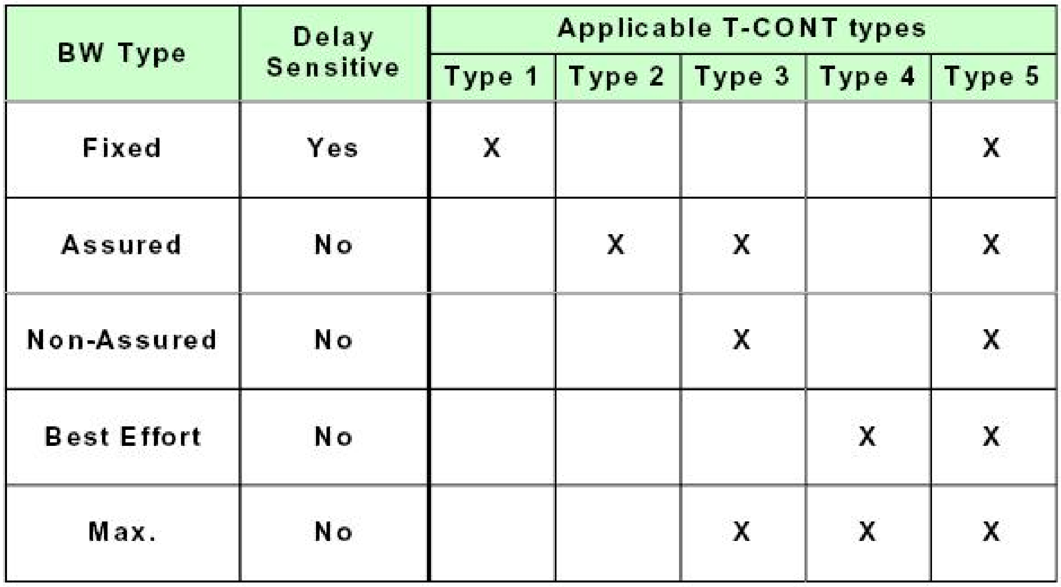
It have 5 dba filre:

Typr1: fix, integral

Type2: assure, integral

Type5: fix, assure, max, integral

Fix<=assure<=max.



BW Type	Delay Sensitive	Applicable T-CONT types				
		Type 1	Type 2	Type 3	Type 4	Type 5
Fixed	Yes	X				X
Assured	No		X	X		X
Non-Assured	No			X		X
Best Effort	No				X	X
Max.	No			X	X	X

	Command	Function
Step 1	**configure terminal**	Enter global configuration mode.
Step 2	**profile dba** *{id <1-32767>}*1 {name <string>}*1*	Create/modify a dba profile
Step 3a	**type** *[1]* **fixed** *<64-2488320>*	Configure type 1 with fixed
Step 3b	**type** *[2]* **assured** *<64-2488320>*	Configure type 2 with assured
Step 3c	**type** *[3]* **assured** *<64-2488320>* **maximum** *<64-2488320>*	Configure type 3 with assured and maximum
Step 3d	**type** *[4]* **maximum** *<64-2488320> {[priority] <1-4>}*1 {[weight] <1-1000>}*1*	Configure type 4 with maximum

Step 3e	**type** *[5]* **fixed** *<64-2488320>* **assured** *<64-2488320>* **maximum** *<64-2488320> {[priority] <1-4>}*1 {[weight] <1-1000>}*1*	Configure type 5 with fixed, assured, maximum.

20.5 Traffic Template Configuation

The default system will have an id 0 traffic template, this template parameters cannot be modified, all GEMPORT when create the default binding in the template.Each GEMPORT must bind a traffic template.。

parameter	Detail	Range
Sir	sustained information rate	0-10000000kbps
Pir	Peak information rate	64-10000000kbps
Cbs	Committed Burst Size	0-1023kbytes
pbs	Peak Burst Size	0-1023kbytes

	Command	**Function**
Step 1	**configure terminal**	Enter global configuration mode.
Step 2	**profile traffic** *{id <1-32767>}*1 {name <string>}*1*	Creat/modify a traffic profile

Step 3	**sir** *<0-10000000>* **pir** *<64-10000000> {cbs <0-1023> pbs <0-1023>}*1*	Configure the sir and pri, cbs and pbs is selectable.
Step 4	**Exit**	Exit

20.6 Line Template Configuation

The default system will have an id 0 LINE template, this template parameters cannot be modified,

	Command	Function
Step 1	**configure terminal**	Enter global configuration mode.
Step 2	**profile line** *{id <1-32767>}*1 {name <string>}*1*	Create/modify a line profile
Step 3a	**tcont** *<1-255> {[name] <string>}*1 {[dba] <string>}*1*	Bind a tcont profile
Step 4a	**gemport** *<1-255> [tcont] <1-255> {[gemport_name] <gemport_name>}*1 {[portid] <129-4095>}*1 {[queue] <0-7>}*1*	Bind a gemport profile
Step 4b	**gemport** *<1-255> [encrypt] [enable|disable]*	Enable/disable the gemport encrypt.by

		default, is enable
Step 4c	**gemport** <1-255> [state] [enable|disable]	Enable/disable the gemport state
Step 4d	**gemport** <1-255> [traffic-limit] **upstream** <dba_name> **downstream** <dba_name>	Bind a up/downstream limit to gemport
Step 5a	**service** <service_name> **gemport** <1-255> [vlan] <vlan_list> {[iphost] <1-255>}*1 {[ethuni] lan <1-32>}*1 {[cos] <cos_list>}*1	Bind a gemport which with vlan to service
Step 5b	**service** <service_name> **gemport** <1-255> [untag] {[ethuni] lan <1-32>}*1 {[iphost] <1-255>}*1	Bind a gemport without vlan to service
Step 5c	**mvlan** <vlanlist>	Create the multicast vlan
Step 6a	**service-port** <1-128> **gemport** <1-128> **uservlan** <1-4094> {[to] <1-4094>}*1 transparent	Configure the vlan mode to transparent
Step 6b	**service-port** <1-128> **gemport** <1-128> **uservlan** <1-4094> [user_priority] <0-7> [vlan] <1-4094> {[new_cos] <0-7>}*1	Configure the vlan mode to translate

Step 6c	**service-port** *<1-128>* **gemport** *<1-128>* **uservlan** *<1-4094> [vlan] <1-4094> {[new_cos] <0-7>}*1 {[svlan] <1-4094>}*1 {[new_scos] <0-7>}*1*	Configure the vlan mode to translate,QinQ
Step 6d	**service-port** *<1-128>* **gemport** *<1-128>* **uservlan** *<1-4094> [user_etype] [pppoe|ipoe] [vlan] <1-4094> {[new_cos] <0-7>}*1 {[svlan] <1-4094>}*1 {[new_scos] <0-7>}*1*	Configure the vlan mode to translate,QinQ,can select the type of data
Step 6e	**service-port** *<1-128>* **gemport** *<1-128>* **uservlan** *<1-4094> [user_etype] [user_define] <eth_type> [vlan] <1-4094> {[new_cos] <0-7>}*1 {[svlan] <1-4094>}*1 {[new_scos] <0-7>}*1*	Configure the vlan mode to translate,QinQ,can select the type that user define
Step 6f	**service-port** *<1-128>* **gemport** *<1-128>* **uservlan untag** *[user_etype] [user_define] <eth_type> [vlan] <1-4094> {[new_cos] <0-7>}*1 {[svlan]*	Configure the vlan mode to untag,QinQ,can select the type that user define

	*<1-4094>}*1 {[new_scos] <0-7>}*1*	
Step 6g	**service-port** *<1-128>* **gemport** *<1-128>* **uservlan untag** *[vlan] <1-4094> {[new_cos] <0-7>}*1 {[svlan] <1-4094>}*1 {[new_scos] <0-7>}*1*	Configure the vlan mode to untag,QinQ
Step 6h	**service-port** *<1-128>* **admin-status** *[enable|disable]*	Enable/disable service-port
Step 6I	**service-port** *<1-128>* **description** *<desc>*	Add the service-port description
Step 7	**no onu** *<1-128>* **service-port** *<1-128>*	Delete the service-port
Step 8	**no mvlan** *[all|<vlanlist>]*	Delete the multicast vlan
Step 9	**no tcont** *<1-255>*	Delete the tcont
Step 10	**no gemport** *<1-255>*	Delete the gemport
Step 11	**no service** *<service_name>*	Delete the service
Step 12	**commit**	Commit the configuration
Step 13	**Exit**	Exit

20.7 Service Template Configuation

The default system will have an id 0 SRV template, this template parameters cannot be modified

	Command	Function
Step 1	**configure terminal**	Enter global configuration mode.
Step 2	**profile srv** *{id <1-32767>}*1 {name <string>}*1*	Create/modify sre profile
Step 3a	**portvlan** *[eth|wifi|veip] <1-32> [mode] [transparent]*	Configure portvlan mode to transparent
Step 3b	**portvlan** *[eth|wifi|veip] <1-32> [mode] [trunk]*	Configure portvlan mode to trunk
	portvlan *[eth|wifi|veip] <1-32> [mode] [tag] vlan <1-4094> {pri <0-7>}*1*	Configure portvlan mode to tag,and configure pri
	portvlan *[eth|wifi|veip] <1-32> [mode] [hybrid] def_vlan <1-4094> {def_pri <0-7>}*1*	Configure portvlan mode to hybrid
	portvlan *[eth|wifi|veip] <1-32> [translate] [vlan] <1-4094> [cvlan]*	Configure portvlan mode to translate

	*<1-4094> {[cvlan_pri] <0-7>}*1 [svlan] <1-4094> {[svlan_pri] <0-7>}*1*	
Step 4a	**mvlan** *[tag-strip]* **eth** *<1-32>*	Configure the lan port to untag mode
Step 4b	**no mvlan** *[tag-strip]* **eth** *<1-32>*	Delete the the lan port to untag mode
Step 5a	**iphost** *<1-255> [id] <desc>*	Configure the iphost description
Step 5b	**iphost** *<1-255> [dhcp]*	Configure the iphost to dhcp mode
Step 5c	**iphost** *<1-255> [static-ip] <A.B.C.D> <A.B.C.D> {<A.B.C.D>}*1*	Configure the iphost to static mode.
Step 5d	**iphost** *<1-255> [primary-dns] <A.B.C.D> {second-dns <A.B.C.D>}*1*	Configure the DNS
Step 5e	**no iphost** *<1-255>*	Delete the iphost setting
Step 6	**Commit**	Commit the configuration
Step 7	**Exit**	Exit

20.8 Alarm Threshold Template Configuration

Alarm threshold only can be configured by template. Begin at privileged configuration mode, configure alarm threshold template as the following table shows.

	Command	Function
Step 1	**configure terminal**	Enter global configuration mode.
Step 2	**profile alarm** *{id <1-32767>}*1 {name <string>}*1*	Create or enter a profile
Step 3a	**sf-sd-threshold sf** *<3-8>* **sd** *<4-10>*	Configure the range of sf and sd
Step 3b	**rx-optical low** *<-27~-8>* **upper** *<-27~-8>*	Configure the range of rx-optical
Step 3c	**Tx-optical low <0-5> upper <0-5>**	Configure the range of tx-optical
Step 4	**Commit**	Commit the configuration
Step 5	**Exit**	Exit

20.9 Show/Delete Profile Configuration

	Command	Function
Step 1	**configure terminal**	Enter global configuration mode.
Step 2	**no profile {dba|srv|voip|alarm} id** *<1-32767>*	Delete profile
Step 3a	**show profile {dba|srv|voip|alarm} all|id** *<0-65535>* **}**	Show profile
Step 3b	**show profile {dba|srv|voip|alarm} id** *<0-65535>* **bind**	Show the onu which binding profile

21ONU Auto-learn Configuration

21.2 ONU Auto-learn

	Command	Function
Step 1	**configure terminal**	Enter global configuration mode.
Step 2	**onu auto-learn bind onu-profile** *<equipid> <onu_profile>*	Bind the equipment id with onu profile
Step 3	**onu auto-learn bind** *(line-profile|srv-profile|alarm-profile) <equipid> <profile_name>*	Bind the onu equipment with line/srv/alarm profile
Step 4	**no onu auto-learn bind onu-profile** *<equipid>*	Delete the binding setting
Step 5	**no onu auto-learn bind** *(line-profile|srv-profile|alarm-profile) <equipid>*	Delete the binding setting
Step 6	**show onu auto-learn bind** *{[onu-profile|line-profile|srv-profile|alarm-profile]}*1*	Show the equipment and profile

21.3 Enable Auto-learn

	Command	Function
Step 1	**configure terminal**	Enter global configuration mode.
Step 2	**interface gpon** *slot/port*	Enter Gpon interface
Step 3a	**onu auto-learn** *{default-onu-profile <profile_name>}*1*	Enable auto-learn and select a profile.
Step 3b	**no onu auto-learn**	Disable auto-learn
Step 4	**show onu auto-learn**	Show auto-learn configuration

22System Management

22.2 Configuration Management

22.2.1 Save Configurations

After modified the configurations, you should same them so that these configurations can take effect next time it restarts. Use the following commands to save configurations.

	Command	**Function**
Step 1	**configure terminal**	Enter global configuration mode.
Step 2	**write**	Save configurations.

22.2.2 Erase Configurations

If you need to reset to factory default, you can use the following commands to erase all configurations. After erased, the device will reboot automatically.

	Command	**Function**
Step 1	**configure terminal**	Enter global configuration mode.
Step 2	**erase startup-config**	Erase all configurations.

22.2.3 Show Startup Configurations

Use the following command to display the configurations you have saved.

	Command	Function
Step 1	**configure terminal**	Enter global configuration mode.
Step 2	**show startup-config**	Show configuration

22.2.4 Show Running Configurations

Use the following commands to display running configurations. These running configurations may not be saved in flash.

	Command	Function
Step 1	**configure terminal**	Enter global configuration mode.
Step 2	**show running-config**	Show running configurations.

22.2.5 Upload/Download Configuration File

Use the following commands to upload configuration file to PC and download configuration file to device.

	Command	Function
Step 1	**configure terminal**	Enter global

		configuration mode.
Step 2	**debug mode**	Enter debug node
Step 3a	**upload tftp configuration** *<filename> <A.B.C.D>*	filename is Upgrade file A.B.C.D is TFTP server IP
Step 3b	**download tftp configuration** *<filename> <A.B.C.D>*	filename is Upgrade file A.B.C.D is TFTP server IP

22.3 Check System Information

22.3.1 Check System Running Information

Use the following commands to view system information.

Command	**Function**
show sys arp	Show ARP table
show sys cpu	Show CPU information
show sys cpu-usage	Show CPU usage rate
show sys mem	Show system memory
show sys ps	Show system process
show top	Show CPU utilization
show task	Showthread name

22.3.2 Check Version Information

Use the following commands to check version information which includes hardware version, software version, software created time and so on.

	Command	Function
Step 1	**configure terminal**	Enter global configuration mode.
Step 2	**show version**	Show version information.

22.3.3 Check System Running Time

Use the following command to show system running time after turned power on.

	Command	Function
Step 1	**configure terminal**	Enter global configuration mode.
Step 2	**show sys running-time**	Show system running time.

22.4 System Basic Configurations

22.4.1 Configure System Name

Use the following command to modify system name. This modification will take effect immediately. You will see it in command prompt prefix.

Begin at privileged configuration mode,configure system name as the following table shows.

	Command	Function

Step 1	**configure terminal**	Enter global configuration mode.
Step 2	**hostname** *<name>*	Configure system name. It must start with alphabet.
Step 3	**hostname default**	Restore default

22.4.2 Configure Terminal Display Attribute

This command is used to configure display line number when access by console port or telnet.

Begin at privileged configuration mode, configure terminal display attribure as the followingtable shows.

	Command	**Function**
Step 1	**configure terminal**	Enter global configuration mode.
Step 2	**terminal length** *value*	Configure display line number. Value range is 0-512.

22.4.3 Configure Terminal Time-out Value

Use the following commands to configure terminal time-out value. Default value is 10 minutes.

	Command	Function
Step 1	**configure terminal**	Enter global configuration mode.
Step 2	**line vty**	Enter line node
Step 3a	**exec-timeout** *<min> [<second>]*	Set the command-line timeout
Step 3b	**no exec-timeout**	Set the command-line timeout to default
Step 4	**show exec-timeout**	Show the command-line timeout

22.5 System Basic Operations

22.5.1 Upgrade System

Use the following command to upgrade the equipment.

	Command	Function
Step 1	**configure terminal**	Enter global configuration mode.
Step 2b	**download tftp image** *<filename> <A.B.C.D>*	Update firmware with header.

22.5.2 Network Connectivity Test

Use **ping** command to check network connectivity.

	Command	Function
Step 1	**configure terminal**	Enter global configuration mode.
Step 2	**ping** [**-s** *<packetsize>*] *<A.B.C.D>*	*Packetsize* is test packet length, unit is byte.

22.5.3 Reboot System

Use the following command to reboot system.

	Command	Function
Step 1	**configure terminal**	Enter global configuration mode.
Step 2	**reboot**	Reboot system.

22.5.4 Telnet

You can telent to system via outband or inband management IP. The default outband management IP is 192.168.8.100.

Command	Function
telnet 192.168.200	Telnet to application layer of system. Login name and passwork

	both are **admin**.
telnet 192.168.200 2223	Telnet to kernel of system. Login name is **default**.
gpon-olt(config)#**switch**	Telnet to kernel of system. Login name is **default**.

22.5.5 Configure RTC System Time

Use the following command to configure RTC system time.

	Command	Function
Step 1	**configure terminal**	Enter global configuration mode.
Step 2	**time set year** *<2000-2099>* **month** *<1-12>* **day** *<1-31>* **hour** *<0-23>* **minute** *<0-59>* **second** *<0-59>*	Configure the RTC clock
Step 3	**show time**	Show the system time

22.5.6 NTP Client

Device will update the time auto when you enable the NTP

Command	Function

Step 1	**configure terminal**	Enter global configuration mode.
Step 2	**ntp server <ip_or_domain>**	Configure the NTP server and enable it
Step 3	**no ntp server**	Disable the NTP server
Step 4	**show time**	Show the system time

22.5.7 Timezone Configuration

	Command	**Function**
Step 1	**configure terminal**	Enter global configuration mode.
Step 2	**time zone <-12-12>**	Configure the timezone
Step 3	**show sys timezone**	Show the timezone

22.5.8 Fan Control

Use the following command to control fan running attribute.

	Command	**Function**
Step 1	**configure terminal**	Enter global configuration mode.
Step 2	**fan temperature** *<20-80>*	Configure Temperature

		of the fan
Step 3	**fan mode [open|close|auto]**	Configure the fan open mode
Step 4	**show fan**	Show the fan configuration and current equipment temperature

22.6 Debug Information

22.6.1 Enable/Disable CPU Debug Information

Use the following commands to enable or disable CPU debug information.

	Command	**Function**
Step 1	**configure terminal**	Enter global configuration mode.
Step 2	**debug mode**	Enter debug node.
Step 3	**system debug {rx|tx} {on|off}**	On|off : enable or disable CPU debug. Rx: CPU receives packets. Tx: CPU transmits

	packets.

22.6.2 Enable/Disable Functional Module Debug Information

Use the following commands to enable or disable function module debug information.

	Command	Function
Step 1	**configure terminal**	Enter global configuration mode.
Step 2	**debug mode**	Enter debug node.
Step 3	**system debug {acl|timer|port|mac|vlan|vt| igmp|cfp|qos} {on|off}**	On|off : enable or disable function module debug information.

23User Management

23.2 User Privilege

There are two privileges for user, administrator user and normal user.

Normal user is a read-only user, only can view system information but not user information, configurations. Administrator user can view all information and configure all parameters.

23.3 Default User

By default, there is a administrator user **admin**, and password is **admin** too. Default user can't be deleted, modified, but you can modify its password.

23.4 Add User Account

	Command	Function
Step 1	**configure terminal**	Enter global configuration mode.
Step 2	**user add** *user-name* **login-password** *login-password*	Add new user account.
Step 3	**user role** *user-name* **{admin | normal enable-password**	Specify user role. New user is a normal

	enable-password}	privilege user.

23.5 Show User Account List

	Command	Function
Step 1	**configure terminal**	Enter global configuration mode.
Step 2	**user list**	Show user account list.

23.6 Delete User Account

	Command	Function
Step 1	**configure terminal**	Enter global configuration mode.
Step 2	**user delete** *username*	Delete user account.

23.7 Modify Password

Every user can modify its own password while administrator user can modify other users' password. Modify password as the following table shows.

	Command	Function
Step 1	**configure terminal**	Enter global configuration mode.
Step 2	**user login-password** *user-name*	Configure user's login

	<CR> Input new login password for user abc please. New Password: Confirm Password:	password.
Step 3	**user enable-password** *user-name* <CR> Input new enable password for user abc please. New Password: Confirm Password:	Configure user’s configuration mode password.

24SNMP Configuration

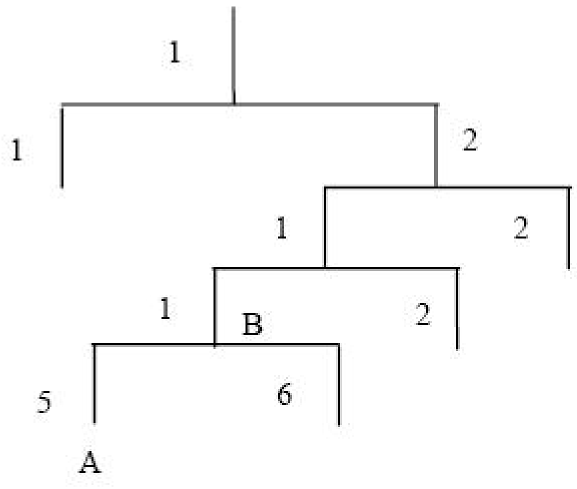
24.2 SNMP Introduction

SNMP (Simple Network Management Protocol) is an extensive network management protocol at the moment. It is an industrial standard which is adopted and come into use for transmitting management information between two devices. Network administrator can search information, modify information, troubleshoot, diagnose fault, plan capacity and generate resports. SNMP adopts polling mechanism and provides basic functions, especially fits small, fast and low cost conditions. It is based on transport layer protocol UDP.

There are two parts of SNMP, NMS (Network Management Station) and agent. NMS is a station that runs client program, and agent is a server program that runs in device. NMS can send GetRequest, GetNextRequest and SetRequest messages to agent. Then agent will execute read or write command and respond to NMS. Agent also sends trap messages to NMS when device is abnormal.

24.3 SNMP Version and MIB

In order to mark device’s management variable uniquely, SNMP identifies management object by hierarchical structure name scheme. The set of objects is like a tree, which the node stands for management object, shown as the following picture.



MIB(Management Information Base), a set of device's variable definition, is used to describe the tree's hierarchical structure. For the management object B in above picture, we can use a string of numbers {1.2.1.1} to describe it uniquely. This string of numbers is Object Identifier.

GPON OLT supports SNMP V1, V2C and V3. Common MIB shows in the following table.

MIB attribute	MIB content	Refer to
Public MIB	MIB II based on TCP/IP	RFC1213
	RMON MIB	RFC2819
	Ethernet MIB	RFC2665
Private MIB	VLAN MIB	
	Device management	
	Interface management	

24.4 SNMP Configuration

24.4.1 Configure Community

Begin at privileged configuration mode, configure community as the following table shows.

	Command	Function
Step 1	**config terminal**	Enter global configuration mode.
Step 2	**snmp-server community** *<word>* **[ro| rw]**	Configure SNMP community strings;
Step 3	**show snmp-server community**	Show the SNMP community configuration
Step 4	**exit**	From the global configuration mode to return to the privileged user configuration mode
Step 5	**write**	Save the configuration

24.4.2 Configure Trap Server Address

Use the following command to configure or remove the Trap messages of the target host IP address. Begin at privileged configuration mode, Configure Trap the target host address as the following table shows.

	Command	**Function**
Step 1	**config terminal**	Enter global configuration mode.
Step 2a	**snmp-server host <***A.B.C.D* **>{udp-port** *<1-65535>***}*1 {version [1|2c]}*1 {community** *<WORD>***}***1	Configure the Trap the target host address. Configure the community string value
Step 2b	**no snmp-server host** < *A.B.C.D* > **version 1|2c|3** *community*	Delete trap target host address.
Step 3a	**snmp-server enable traps snmp**	Enable SNMP traps function
Step 3b	**no snmp-server enable traps snmp**	Delete SNMP traps function
Step 4	**show snmp-server targetaddress**	Check the SNMP trap configuration
Step 5	**write**	Save the configuration

24.4.3 Configure Contact Information

Begin at privileged configuration mode, Configure contact infromation as the following table shows.

	Command	Function
Step 1	**config terminal**	Enter global configuration mode.
Step 2	**snmp-server contact** *<line>*	Configure contact string value
Step 3	**show snmp-server contact**	Check the SNMP contact configuration.
Step 4	**write**	Save the configuration.

24.4.4 Configure Location Information

Begin at privileged configuration mode, Configure location information as the following table shows.

	Command	Function
Step 1	**config terminal**	Enter global configuration mode
Step 2	**snmp-server location** *<line>*	Configure location string value
Step 3	**show snmp-server location**	Check the SNMP location configuration.
Step 4	**write**	Save the configuration.

25Alarm and Event Management

25.2 Alarm and Event Introduction

If you enable alarm report, it will trigger alarm events when system occured error or did some important operations. The alarm information will be saved in a buffer; you can execute some commands such as show syslog to display. All the alarms can be sent to specific servier.

Alarms include fault alarm and recovery alarm. Fault alarm will not disappear until the fault is repaired and the alarm is cleared.

Events include running envents and secury events, are notifications which generate and inform administrators under a normal condition. The difference between event and alarm is that event generates under a normal condition while alarm generates under an abnormal condition.

Command “show alarm-event information” is used to show description, level, type and class of all alarms and events.

25.3 Alarm Management

Alarm severity level includes critical, major, minor and warning. Corresponding level in system log are alerts, critical, major and warnings.

Alarm type includes device alarm, communication alarm and disposing alarm.

➢ Device alarm contains low temperature, high temperature, CPU usage, memory usage, fan, PON, optical power and so on.

- Communication alarm contains port up/down, loopback, PON deregister, PON register failed, PON los, ONU deregister, illegal ONU register, ONU authorized failed, ONU MAC conflication, ONU LOID conflication, ONU link los, ONU dying gasp, ONU link fault, ONU link events, ONU extended OAM notification and so on.
- Dispoing alarm contains upgrade failed, upload configuration file failed, download configuration file failed and so on.

25.3.1 System Alarms

System alarms show the performance and security of system. The following table shows the system alarm list.

System alarm	Reason	Default
temp-high	Device temperature higher than threshold.	disable
temp-low	Device temperature lower than threshold.	disable
cpu-usage-high	CPU usage higher than threshold.	disable
mem-usage-high	Memory usage higher than threshold.	disable
fan	Fan switch.	disable
download-file-failed	Download file failed	enable
upload-file-failed	Upload file failed.	enable

upgrade-file-failed	Upgrade firmware failed.	enable
port-updown	Port link up and link down.	enable
port-loopback	Port loopback.	disable

	Command	Function
Step 1	**configure terminal**	Enter global configuration mode.
Step 2a	**alarm {temp-high|temp-low| cpu-usage-high|mem-usage-high} disable**	Disable system alarm report.
Step 2b	**alarm {temp-high|temp-low| cpu-usage-high| mem-usage-high} enable** *<alarm-value> <clear-value>*	Enable system alarm report and configure system alarm threshold. alarm-value: alarm threshold. clear-value: clear threshold.
Step 2c	**alarm {fan|port-updown|port-loopback | register-failed|deregister}{enable |disable}**	Enable or disable system alarm report.

Step 3	**show alarm configuration**	Show system alarm configurations.

25.3.2 PON Alarms

Get rid of the issue caused by PON port or fiber by monitoring PON alarms, ensure PON works well. The following table shows PON alarm list.

PON alarm	Reason	Default
pon-txpower-high	PON port transmitting power higher than threshold.	enable
pon-txpower-low	PON port transmitting power lower than threshold.	enable
pon-txbias-high	PON port bias current higher than threshold.	enable
pon-txbias-low	PON port bias current lower than threshold.	enable
pon-vcc-high	PON port voltage higher than threshold.	enable
pon-vcc-low	PON port voltage lower than threshold.	enable
pon-temp-high	PON port temperature higher than threshold.	enable
pon-temp-low	PON port temperature lower than threshold.	enable
pon-los	Fiber unconnected or link fault.	enable

deregister	PON deregister.	disable
register-failed	PON register failed.	enable

Configure global PON alarm as the following table shows.

	Command	Function
Step 1	**configure terminal**	Enter global configuration mode.
Step 2a	**alarm {pon-register-failed|pon-deregister} {enable|disable}**	Enable or disable PON alarm report.
Step 2a	**alarm {pon-txpower-high| pon-txpower-low|pon-txbias-high | pon-txbias-low|pon-vcc-high| pon-vcc-low|pon-temp-high| pon-temp-low| pon-los} {enable|disable}**	Enable or disable PON port alarm report.
Step 3	**show alarm configuration**	Show alarm configurations.

Configure PON port alarm as the following table shows. Before this, you must enable global PON alarm. By default, global PON alarm is enabled, the alarms will be record in system log.

	Command	Function
Step 1	**configure terminal**	Enter global

		configuration mode.
Step 2	**interface gpon** *slot/port*	Enter PON interface configuration mode.
Step 3a	**alarm pon optical {tx_power_high| tx_power_low|tx_bias_high|tx_bias_low| vcc_high |vcc_low | temp_high|temp_low} disable**	Disable PON port alarm report.
Step 3b	**alarm pon optica {tx_power_high| tx_power_low |tx_bias_high |tx_bias_low| vcc_high |vcc_low | temp_high|temp_low} enable** *<alarm-value> <clear-value>*	Enable PON port alarm report and configure alarm parameters. alarm-value: alarm threshold. clear-value: clear threshold.
Step 4	**show alarm pon optical configuration**	Show PON port alarm configurations.

25.3.3 ONU Alarms

ONU alarms also can help administrator to get rid of some ONU fault. The following table shows ONU alarm list.

ONU alarm	Reason	Default

onu-deregister	ONU deregister	enable
onu-link-lost	ONU fiber unconnected or link fault.	disable
onu-illegal-register	Illegal ONU register.	enable
onu-auth-failed	ONU LOID authorized failed in auto authorization mode or failed caused by packets loss.	enable
onu-mac-conflict	Current PON port exist MAC conflict with authorized ONU in the system.	enable
onu-loid-conflict	Current PON port exist LOID conflict with authorized ONU in the system.	enable
onu-critical-event	ONU critical link event.	enable
onu-dying-gasp	ONU power down.	enable
onu-link-fault	ONU link fault.	enable
onu-link-event	ONU link event	disable
onu-event-notific	ONU extended OAM notification	enable

	Command	**Function**
Step 1	**configure terminal**	Enter global configuration mode.
Step 2	**alarm {onu-deregister|onu-link-lost|**	Enable or disable ONU alarm report.

	onu-illegal-register|onu-auth-failed| onu-mac-conflict|onu-loid-conflict| onu-critical-event|onu-dying-gasp | onu-link-fault|onu-link-event| onu-event-notific}
	{enable|disable}	

Step 3	**show alarm configuration**	Show system alarm configurations.

25.4 Event Management

Event severity level includes critical, major, minor and warning. Corresponding level in system log are alerts, critical, major, warnings. Event type includes device event, communication event and diposing event.

- Device event contains device reboot, PON event and so on.
- Communication event contains PON register, PON los recovery, ONU register, ONU find, ONU authorized successful, ONU deregister successful and so on.
- Disposing event contains save configuration event, erase configuration event, download configuration file successful, upload

configuration file successful, ungrade successful and so on.

25.4.1 System Events

System events are mainly used to monitor performation and security of system, ensure system works well.

System event	Reason	Default
reset	Device reset.	disable
config-save	Save configuration.	enable
config-erase	Erase configuration.	enable
download-file-success	Download file successful.	enable
upload-file-success	Upload file successful.	enable
upgrade-file-success	Upgrade firmware successful.	enable

	Command	Function
Step 1	**configure terminal**	Enter global configuration mode.
Step 2a	**event reset {enable|disable}**	Enable or disable system event report.
Step 3	**show event configuration**	Show system event configurations.

25.4.2 PON Events

Get rid of the issue caused by PON port or fiber by monitoring PON events, ensure PON works well. The following table shows PON event list.

PON event	Reason	Default
pon-register	PON register.	disable
pon-los-recovery	PON los recovery.	enable

	Command	Function
Step 1	**configure terminal**	Enter global configuration mode.
Step 2	**event {pon-register|pon-los-recovery} {enable|disable}**	Enble or disable PON event report.
Step 3	**show event configuration**	Show system event configurations.

25.4.3 ONU Events

ONU events also can help administrator to get rid of some ONU fault. The following table shows ONU event list.

ONU event	Reason	Default
onu-register	ONU register.	enable

onu-link-discover	ONU discover.	disable
onu-auth-success	OLT authorizes ONU successful.	enable
onu-deauth-success	OLT deauthorizes ONU successful.	disable

	Command	**Function**
Step 1	**configure terminal**	Enter global configuration mode.
Step 2b	**event {onu-register|onu-link-discover|onu-auth-success|onu-deauth-success} {enable|disable}**	Enable or disable ONU event report.
Step 3	**show event configuration**	Show system event configuration.

26System Log

26.2 System Log Introduction

System log is mainly used to record running condition and user operant behavior of the whole system. It is helpful for administrator to know and monitor system working condition, record abnormal information. System log comes from all the running module of system. Log system gather, manage, save and display the information. It can be shown in the deivce when you need to debug or check system status, and also can be sent to a server for long-term running status and operation tracking.

26.2.1 Log Type

System log has five types:

- Abnormal information log

  Abnormal information log mainly records the abnormal phenomenon of each module, such as abnormal response, inside state machine error, key process execute error and so on.

- Alarm log

  Alarm log mainly records the information from alarm module. Critical alarm, major alarm, minor alarm and warning are corresponding with alerts, critical, major, warnings log level respectively.

- Event log

Event log mainly records the information from event module. Critical event, major event, minor event and warning are corresponding with alerts, critical, major, warnings log level respectively.

- Operation log

  Operation log mainly records the informations from CLI and SNMP.

- Debug log

  Debug log mainly records the information from networking debugging, such as received IGMP messages, RSTP BPDU messages, state machine skip and so on.

26.2.2 System Log Level

Syslog information level reference:

Log level	Log contrast
7:emergencies	Abnormal log
6:alerts	Alarm/event log(urgent) Abnormal log
5:critical	Alarm/event log(major) Abnormal log
4:major	Alarm/event log(minor) Abnormal log
3:warnings	Alarm/event log(warning)

	Abnormal log
2:notifications	Operation log
1:informational	Operation log
0:debugging	Debug log

26.3 Configure System Log

26.3.1 Show System Log

	Command	Function
Step 1	**configure terminal**	Enter global configuration mode.
Step 2	**Show syslog [level {debug|info|notice| warning|major|critical|alert|emerg}]**	Show all system log or log of specific level.

26.3.2 Clear System Log

	Command	Function
Step 1	**configure terminal**	Enter global configuration mode.
Step 2	**Clear syslog [level**	Clear all system log or

	{debug|info|notice|warning|major|critical|alert|emerg}]	log of specific level.

26.3.3 Configure System Log Server

	Command	Function
Step 1	**configure terminal**	Enter global configuration mode.
Step 2a	**syslog server ip** *<A.B.C.D>* **port** *<1-65535>*	Configure system log server IP and port.
Step 2b	**no syslog server**	Delete system log server configuration.
Step 3	**show syslog server**	Show system log server configuration.

26.3.4 Configure Save Level of System Log

	Command	Function
Step 1	**configure terminal**	Enter global configuration mode.
Step 2	**syslog flash level {debug|info|notice|warning|major|critical|alert|em**	System log will be saved to flash if it is higher than you set.

	erg}	
Step 3	**show syslog flash level**	Show system log level in flash.

26.3.5 Save System Log to Flash

	Command	Function
Step 1	**configure terminal**	Enter global configuration mode.
Step 2	**save syslog flash**	Save system log to flash.

26.3.6 Clear System Log in Flash

	Command	Function
Step 1	**configure terminal**	Enter global configuration mode.
Step 2	**clear syslog flash**	Clear system log in flash.

26.3.7 Upload System Log

	Command	Function
Step 1	**configure terminal**	Enter global configuration mode.
Step 2	**upload tftp syslog** *<filename> <A.B.C.D>*	Upload system log to local host byTFTP.