

GPON Multicast Settings

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Chapter 1 GPON Multicast Settings

1.1 OLT Multicast Introduction

The task of IGMP snooping is to maintain the correlation of VLAN and group address and to keep up with the change of the multicast group. The main functions of IGMP snooping include listening the IGMP packets, maintaining the map of group address and VLAN, and keeping the state of host's IGMP entity identical with that of the router's IGMP entity.

When the layer-2 device does not run IGMP snooping, the multicast data will be broadcasted at the second layer; when the layer-2 device does run IGMP snooping, the multicast data in the known multicast group will not be broadcast at the second layer, but be transmitted to a designated receiver in the second layer and the unknown multicast data will be discarded.

On the PON port, OLT will over the broadcast LLID channel transmit the multicast data to all ONUs in SCB mode.

OLTs and ONUs of support the multicast VLAN. If the multicast services need be isolated from other services on OLT, you have to plan private VLANs on OLT for multicast to make one multicast VLAN corresponds to one multicast channel or a multicast channel group (a set of multicast channels solely managed by one permission). A multicast channel is designed only for a specific multicast VLAN. The multicast flows being transmitted in the SCN channel all have carried the multicast VLAN tag. Other data flows of a user (including unicast flows and uplink IGMP packets) are destined to be transmitted to the unicast VLAN/CVLAN.

ONU establishes on the basis of the Add/Del Multicast VLAN OAM message the correlation of the UNI port and the multicast VLAN, and on the basis of IGMP snooping multicast forward-table the correlation of the UNI port and the specific multicast group.

If ONU receives the following two types of IGMP general/specific group query packets, it will drop them:

One is the IGMP general/specific group query packets without VLAN tag;

The other is the IGMP general/specific group query packets that have carried the VLAN tag but whose VLAN IDs does not belong to the configured multicast VLAN ID set of ONU.

When IEP3310/3314 receives the IGMP report packets after IGMP snooping is enabled, the VLAN in the multicast forward table is the PVID of the multicast router's port. After the router's port receives the multicast packet, IEP3310/3314 will first check the multicast forward table to confirm which member ports will be forwarded and then change the packet's VLAN tag to the multicast VLAN tag.

Additionally, ONU should under the control of OLT remove/reserve the multicast VLAN tag of the IGMP query packets. As to IGMP Group-Specific Query packets, OLT should add the multicast VLAN tag to these packets according to the multicast VLAN. As to IGMP General Query packets, they will be distributed to all multicast VLANs in the GPON system, that is, OLT will copy multiple copies of

each IGMP General Query packet, add different multicast VLAN tags and at last distribute these copies to all ONUs over the broadcast LLID.

The IGMP Proxying allows the VLAN where the multicast user is located to receive the multicast source from other VLANs. The IGMP Proxying runs on layer 2 independently without other multicast routing protocols. IGMP Proxying will be transmitted by the IGMP packets of the proxied VLAN to the proxying VLAN and maintain the hardware forward table of the multicast user of the agent VLAN according to these IGMP packets. IGMP Proxying divides different VLANs into two kinds: proxied VLANs and proxying VLANs. The downstream multicast VLANs can be set to the proxied VLANs, while the upstream multicast VLANs can be set to the proxying VLANs.

Note:

1. It is to be noted that IGMP snooping can functions normally only if there is multicast router existing for only by listening the query or report packets can IGMP snooping realize its functions. That is, a switch has to receive the IGMP query packets periodically and therefore the router age timer of IGMP snooping must be set to be bigger than the group query period of the multicast router which connects the switch. You can run **show ip mcst** command to browse the information about the multicast router in each VLAN.
2. The transmitted multicast packets must carry the VLAN tag and the VLAN tag must be same to PVID of the port which connects the multicast router.

Although IGMP Proxying is based on IGMP snooping, two are independent in application; IGMP Snooping will not be affected when IGMP Proxying is enabled or disabled, while IGMP Proxying can run only when IGMP Snooping is enabled.

1.2 OLT IGMP Multicast Configuration Tasks

- Enabling/Disabling IGMP Multicast
- Adding/Removing the Correlation of Multicast VLAN and Multicast IP Group
- Adding/Canceling the Static Multicast Address of VLAN
- Setting the Router Age Timer of IGMP Snooping
- Setting the Response Time Timer of IGMP Snooping
- Configuring Static Multi-vlan
- Setting the Port of the Static Multicast Router
- Enabling/Disabling IGMP-Proxy
- Setting Querier Port of OLT
- Setting the Querier Address of IGMP
- Setting the Query Counts of the Special IGMP Proxy Group
- Switching over the IGMP Multicast Mode
- Configuring Proxy-vlan of IGMP

- Configuring the Limit of igmp-snooping on the Packet Number in the Information Queue
- Configuring igmp-snooping Robust Value
- Configuring ctc-mode of igmp-snooping
- Configuring ctc-mcvlan of igmp-snooping
- Monitoring and Maintaining the IGMP Multicast

1.2.1 Enabling/Disabling IGMP Multicast

Run the following commands in global configuration mode.

Command	Purpose
ip mcst enable	Enables the multicast.
{no ip mcst ip mcst disable}	Resumes the default settings.

Note:

After IGMP snooping is enabled, when DLF occurs on multicast packets (that is, the destination address is not registered in the swap chip through the igmp-snooping), all multicast packets whose destination addresses are not registered on any port will be dropped.

1.2.2 Adding/Removing the Correlation of Multicast VLAN and Multicast IP Group

This command has two functions: one is that only the Report and Leave packets whose destination IP addresses have been added to a multicast VLAN can be received by IGMP snooping; the other one is that the VLAN tag which transforms the next multicast flow is the multicast VLAN tag. One multicast VLAN can include multiple continuous or discontinuous multicast IP addresses, while one multicast IP address can only belong to one multicast VLAN.

Run the following commands in global configuration mode.

Command	Purpose
ip mcst mc-vlan <i>vlan_id</i> range <i>A.B.C.D</i>&<1-n>	Adds the correlation of multicast VLAN and multicast IP address.
no ip mcst mc-vlan <i>vlan_id</i> [<i>range A.B.C.D</i>&<1-n>]	Deletes the correlation of multicast VLAN and multicast IP address.

1.2.3 Adding/Canceling the Static Multicast Address of VLAN

The static multicast address can make some IGMP-incompatible hosts receive the corresponding multicast packets.

Run the following commands in global configuration mode.

Command	Purpose
ip mcst vlan <i>vlan_id</i> static <i>A.B.C.D</i> interface <i>intf</i>	Adds the static multicast address of VLAN.
no ip mcst vlan <i>vlan_id</i> static <i>A.B.C.D</i> interface <i>intf</i>	Removes the static multicast address of VLAN.

Note:

1. To make the adding of the static multicast address successful, you have to set A.B.C.D in the correlation of configured multicast VLAN and multicast IP address.
2. On IEP3310/3314 OLT, you have to set the VLAN parameter in this command to be the same as the VLAN tag of the downlink multicast data.

1.2.4 Setting the Router Age Timer of IGMP Snooping

The router age timer is used to monitor whether the IGMP querier exists or not; the IGMP querier maintenance is used to maintain and manage the multicast address by sending the query packets and IGMP snooping works by independence on the communication between IGMP querier and host.

Run the following commands in global configuration mode.

Command	Purpose
ip mcst timer router-age <i>timer_value</i>	Sets the value of the router age of IGMP Snooping.
no ip mcst timer router-age	Resumes the default value of the router age of IGMP Snooping.

Note:

The settings of the timer requires to refer to the query period settings of the IGMP querier for it cannot be smaller than the query period; you are recommended to set the router age timer to the triple of the query period.

By default the router age timer is set to be 260 seconds of IGMP snooping.

1.2.5 Setting the Response Timer of IGMP Snooping

The response-time timer means the threshold time for the host to report the multicast after IGMP querier sends the query packets; if this report packet is not received after the timer ages, the switch will delete this multicast address.

Run the following commands in global configuration mode.

Command	Purpose
ip mcst timer response-time <i>timer_value</i>	Sets the value of the response time of IGMP Snooping.

no ip mcst timer response-time	Resumes the default value of the response time of IGMP Snooping.
---------------------------------------	--

Note:

The value of the timer cannot be set too small, or the multicast communication may be unstable.

By default the response time is set to be 15 seconds of IGMP snooping.

1.2.6 Configuring Static Multi-vlan

Run the following commands in global configuration mode.

Command	Purpose
ip mcst mrouter-multi-vlan <i>vlan-id</i>	Creates multi-vlan
no ip mcst mrouter-multi-vlan <i>vlan-id</i>	Deletes multi-vlan

1.2.7 Setting the Port of the Static Multicast Router

After a port is set to be a static multicast port, all the IGMP report packets and leave packets, received by OLT, will be transmitted to this port.

Run the following commands in global configuration mode.

Command	Purpose
ip mcst mrouter interface <i>inft_name</i> multi-vlan <i>vlan id</i>	Configures the static multicast router interface of IGMP-snooping and the multi-vlan belonging to the router interface
no ip mcst mrouter interface <i>inft_name</i> multi-vlan <i>vlan id</i>	Deletes the multicast router interface of IGMP-snooping

1.2.8 Enabling/Disabling IGMP-Proxy

Run the following commands in global configuration mode.

Command	Purpose
ip mcst mrouter interface <i>inft_name</i> multi-vlan <i>vlan id</i>	Configures the static multicast router interface of IGMP-snooping and the multi-vlan belonging to the router interface
no ip igmp-proxy enable	Deletes the multicast router interface of IGMP-snooping

1.2.9 Setting Querier Port of OLT

Run the following commands in global configuration mode.

Command	Purpose
ip mcst querier enable	Sets the querier port of OLT to regularly transmit the query packets outward automatically.
no ip igmp-proxy enable	Resumes the default settings of the querier port of OLT.

1.2.10 Setting the Querier Address of IGMP

Run the following commands in global configuration mode.

Command	Purpose
ip mcst querier enable	Configures queier function of OLT, automatic-forward query packets timely
{no ip mcst querier ip mcst querier disable}	Resume the default setting of querier of OLT

The default source IP address of the query packet is 10.0.0.200.

1.2.11 Setting the Query Counts of the Special IGMP Proxy Group

Run the following commands in global configuration mode.

Command	Purpose
[no] ip igmp-proxy last-member-query count <i>value</i>	Sets the query counts of the special IGMP proxy group.

The default query times of the query group is 2.

1.2.12 Switching over the IGMP Multicast Mode

Run the following commands in global configuration mode.

Command	Purpose
ip mcst mode igmp-snooping	Configures the multicast mode.
{no ip mcst mode ip mcst igmp-snooping}	Resumes the default settings.

1.2.13 Configuring Proxy-vlan of IGMP

Run the following commands in global configuration mode.

Command	Purpose
---------	---------

[no] ip mcst proxy-vlan <i>[vlan_id]</i>	Configuring proxy-vlan of IGMP, that's add the vlan symbol which the hardware list uses.
---	--

The command uses when the downlink of the upstream device such as the multicast router or the multicast server needs to configure and the flow has vlan tag, configure vlanid of proxy-vlan as vlan of the downlink stream.

1.2.14 Configuring the Limit of igmp-snooping on the Packet Number in the Information Queue

When OLT receiving excessive downstream packets, the system will become less stable owing to over-occupation of system resources. This function is used to set the max number of unprocessed packets in the module of igmp-snooping. The later received packet will be dropped once the number of unprocessed packets exceeding the max value.

Command	Purpose
ip mcst volum value	Configures the max number of igmp-snooping unprocessed packets
no ip mcst volum	Return to the default max number of igmp-snooping unprocessed packets: 512

Note:

By default the max number of igmp-snooping unprocessed packets: 512. It is recommended that the max number is no less than 512.

1.2.15 Configuring igmp-snooping Robust Value

Command	Purpose
ip mcst robust value	Configures igmp-snooping robust variable, 1-3
no ip mcst robust	Returns to the default igmp-snooping robust value: 1

Note:

By default the igmp-snooping robust variable is 1.

1.2.16 Configuring ctc-mode of igmp-snooping

Command	Purpose
ip mcst ctc-mode	Configures telecom VLAN republication mode of igmp-snooping
no ip mcst ctc-mode	Returns to the default igmp-snooping mode: igmp-snooping

1.2.17 Configuring ctc-mcvlan of igmp-snooping

Command	Purpose
ip mcst ctc-mcvlan <i>vlan_id</i>	Configures telecom multicast vlan of igmp-snooping, 1-4094
no ip mcst ctc-mcvlan	Returns to the default igmp-snooping telecom multicast vlan, that's 0.

1.2.18 Monitoring and Maintaining the IGMP Multicast

Run the following commands in EXEC mode:

Command	Purpose
show ip mcst	Displays the information about IGMP-snooping configuration.
show ip mcst timer	Displays the information about the IGMP-snooping clock.
show ip mcst groups	Displays the information about the multicast group of IGMP-snooping.
show ip mcst groups source	Displays the filter information of IGMP-snooping multicast group source.
show ip mcst statistics	Displays the information about IGMP-snooping statistics.
[no] debug ip mcst [packet timer event error]	Enables/disables the print switch of IGMP snooping packet/timer debug/event/error. If the specific debug switch is not designated, all the debug switches will be enabled or disabled.

The following shows the information about IGMP-snooping running:

```

OLT #show ip mcst

Global multicast configuration:
-----
Globally enable      : Enabled
Multicast mode      : IGMP Snooping
Dif-frames filtering : Enabled
Querier              : Disabled
Querier address     : 10.0.0.200
Router age          : 260 s
Response time       : 15 s

Router Port List:
-----

```

```
G1/1(querier);
```

```
OLT #
```

Display multicast group information of IGMP-snooping:

```
OLT #show ip mcst groups
```

```
Total Multicast Group Numbers: 2048
```

```
Total Multicast Group Counts: 5
```

Vlan Group	Type	Port(s)
1 225.0.0.1	LEARNING	GPON0/4:2
1 225.0.0.2	LEARNING	GPON0/4:2
1 225.0.0.3	LEARNING	GPON0/4:2
1 225.0.0.4	LEARNING	GPON0/4:2
1 225.0.0.5	LEARNING	GPON0/4:2

```
OLT #
```

Display IGMP-snooping multicast group source filter information:

```
OLT#show ip mcst groups source
```

```
Total Group Counts: 5
```

```
vlan: 1, group(L): 225.0.0.1, filter_mode = NULL
```

```
source Port(s-static, I-learning)
```

```
vlan: 1, group(L): 225.0.0.2, filter_mode = NULL
```

```
source Port(s-static, I-learning)
```

```
vlan: 1, group(L): 225.0.0.3, filter_mode = NULL
```

```
source Port(s-static, I-learning)
```

```

vlan: 1, group(L): 225.0.0.4, filter_mode = NULL
source          Port(s-static, I-learning)
-----

```

```

vlan: 1, group(L): 225.0.0.5, filter_mode = NULL
source          Port(s-static, I-learning)
-----

```

Display IGMP-snooping timer:

```
OLT#show ip mcst timers
```

```
Querier on port G1/1: 258
```

```
vlan 2 multicast address 0100.5e01.0101 response time : 13
```

```
OLT#
```

```
Querier on port G1/1: 251 Means the timeout period of the router.
```

```
vlan 2 multicast address 0100.5e01.0101 response time: Means the time from receiving the last
multicast query packet to now; if there is no response on the host when the timer is time out, the
port will be deleted.
```

Display statistics of IGMP-snooping:

```
OLT#show ip mcst statistics
```

```

v1_packets:0      IGMP v1 number of packets
v2_packets:6      IGMP v2 number of packets
v3_packets:0      IGMP v3 number of packets
general_query_packets:5  general query of number of packets
special_query_packets:0  special query of number of packets
join_packets:6    Report number of packets
leave_packets:0   Leave number of packets
err_packets:0     Error number of packets

```

Debug IGMP-snooping packet information:

```
OLT#debug ip mcst packet
```

```
May 13 05:28:18 MCST: Receive IGMPv2 query from G1/1, diID=331, source ip
addr=10.0.0.200, group=0.0.0.0. the type, port, source and destination IP address of the received
packet
```

```
May 13 05:28:18 MCST: Flood packet from G1/1 to vlan 2 downstream.
```

Debug IGMP-snooping packet timer:

```
OLT#debug ip mcst timer
```

```
OLT#May 13 05:35:22 [MCST] TIMER: Vlan 2 multicast group 225.1.1.1 response time restart,
initvalue = 15.
```

```
May 13 05:35:36 [MCST] timer: Vlan 2 multicast group 225.1.1.1 response time expiry.
```

```
May 13 05:35:36 [MCST]      at port:
```

```
May 13 05:35:36 [MCST]      E1/3:1
```

1.3 GPON Multicast Configuration Examples

1.3.1 Configuration Example of IGMP-Snooping

ONU is connected to the GPON0/3 port of IEP3310/3314. And then the G0/2 port of IEP3310/3314 is connected with the multicast router.

The network topology is shown in figure 1.

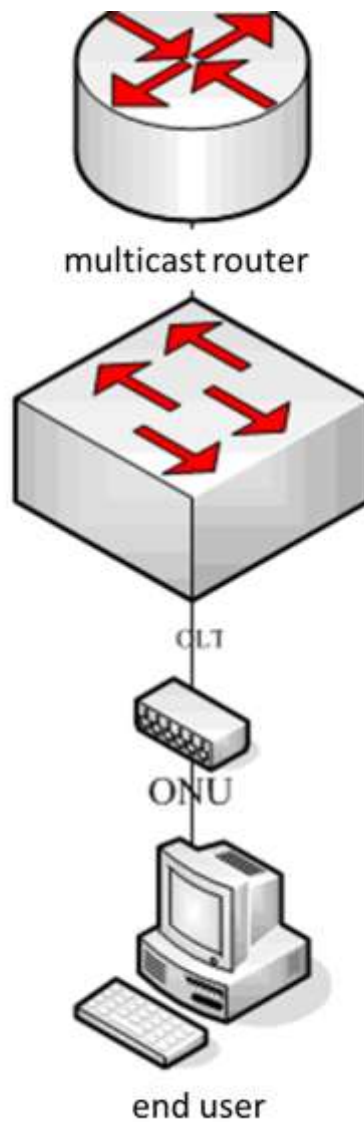


Figure 1 IGMP-Snooping configuration

- (1) Enable the multicast function of OLT
`OLT_config#ip mcst enable`
- (2) Configure the uplink interface of multicast mrouter:
 create multi-vlan:
`OLT_config#ip mcst mrouter-multi-vlan 2`
 Configure multicast mrouter uplink port and multi-vlan belonging to the port:
`OLT_config#ip mcst mrouter interface GigaEthernet0/1 multi-vlan 2`
- (3) Configure the corresponding relation of multicast VLAN and multicast ip address group:
`OLT_config#ip mcst mc-vlan 100 range 225.0.0.1 – 225.0.0.10`
- (4) Configure fast-leave-mode and tat-strip mode of ONU
`OLT_config#gpon profile onu-mcst-operation oper`
`OLT_config_prof_onuMcstOper_oper#gpon-profile fast-leave-mode enable`
`OLT_config_prof_onuMcstOper_oper#gpon-profile multicast-tag-strip enable`
- (5) Configure the dynamic template of ONU (suppose the value ranges from 225.0.0.1~225.0.0.10, and the vlan is 100):
`OLT_config#gpon profile onu-mcst-dynamic-group 2`
`OLT_config_prof_onuMcstDynamicGroup_2#gpon-profile entry 1 multicast-gemport 4093`
`OLT_config_prof_onuMcstDynamicGroup_2#gpon-profile entry 1 multicast-vlan-id 100`
`OLT_config_prof_onuMcstDynamicGroup_2#gpon-profile entry 1 multicast-group-address-range start 225.0.0.1 stop 225.0.0.10`
- (6) Use **gpon profile onu-mcst-operation** and **onu-mcst-dynamic-group** on ONU:
`gpon onu uni 1 mcst-oper-profile oper`
`gpon onu uni 1 mcst-dynamic-group-profile 2`

1.3.2 Configuration Example of IGMP-Proxy

ONU is connected to the GPON0/3 port of IEP3310/3314. And then the G0/2 port of IEP3310/3314 is connected with the multicast router.

The network topology is shown in figure 2.

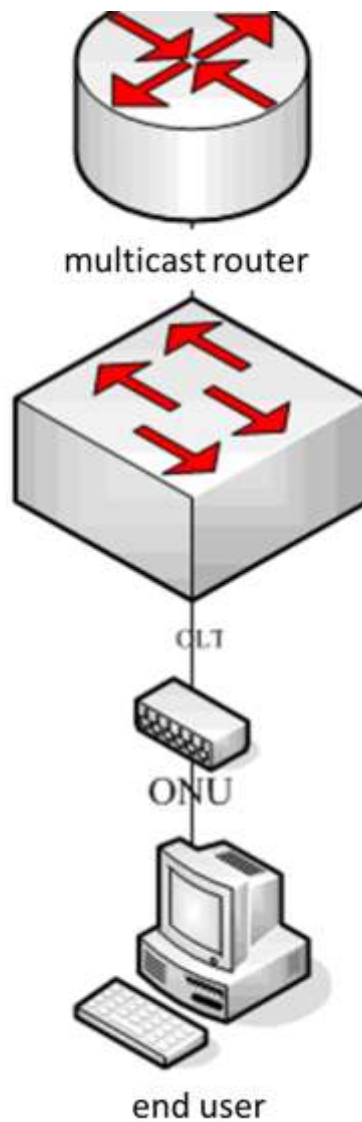


Figure 2 IGMP-Proxy configuration

- (1) Enable the multicast function of OLT:
OLT_config#ip mcst enable
- (2) Enable the proxy function of OLT:
OLT_config#ip igmp-proxy enable
- (3) Configure the uplink interface of multicast mrouter:
Create multi-vlan:
OLT_config#ip mcst mrouter-multi-vlan 2
Configure the uplink interface of multicast mrouter and multi-vlan belonging to the interface:
OLT_config#ip mcst mrouter interface GigaEthernet0/1 multi-vlan 2

- (4) Configure the corresponding relation of multicast VLAN and multicast ip address group

```
OLT_config#ip mcst mc-vlan 100 range 225.0.0.1 – 225.0.0.10
```

- (5) Configure the fast-leave-group and tag-strip function of ONU

```
OLT_config#gpon profile onu-mcst-operation oper
```

```
OLT_config_prof_onuMcstOper_oper#gpon-profile fast-leave-mode enable
```

```
OLT_config_prof_onuMcstOper_oper#gpon-profile          multicast-tag-strip
enable
```

- (6) Configure the dynamic template of ONU (suppose the value ranges from 225.0.0.1~225.0.0.10, and the vlan is 100):

```
OLT_config#gpon profile onu-mcst-dynamic-group 2
```

```
OLT_config_prof_onuMcstDynamicGroup_2#gpon-profile          entry          1
multicast-gemport 4093
```

```
OLT_config_prof_onuMcstDynamicGroup_2#gpon-profile entry 1 multicast-vlan-id
100
```

```
OLT_config_prof_onuMcstDynamicGroup_2#gpon-profile          entry          1
multicast-group-address-range start 225.0.0.1 stop 225.0.0.10
```

- (7) Use **gpon profile onu-mcst-operation** and **onu-mcst-dynamic-group** on ONU:

```
gpon onu uni 1 mcst-oper-profile oper
```

```
gpon onu uni 1 mcst-dynamic-group-profile 2
```

1.3.3 Configuration Examples of Controllable IGMP Multicast

ONU is connected to the GPON0/3 port of IEP3310/3314. And then the G0/2 port of IEP3310/3314 is connected with the multicast router.

The network topology is shown in figure 3.

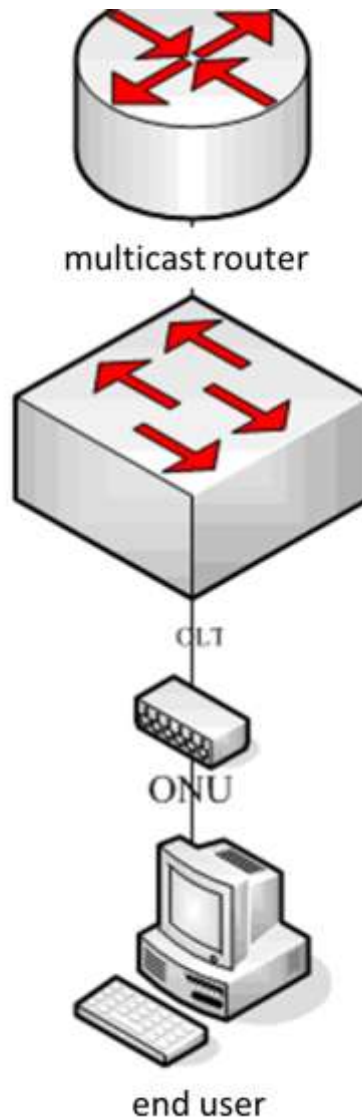


Figure-1 IGMP Controllable Multicast Configuration Example

- (1) Enable the multicast function of OLT:
OLT_config#ip mcst enable
- (2) Configure the uplink interface of multicast mrouter:
Create multi-vlan:
OLT_config#ip mcst mrouter-multi-vlan 2
Configure the uplink interface of multicast mrouter and multi-vlan belonging to the interface:
OLT_config#ip mcst mrouter interface GigaEthernet0/1 multi-vlan 2
- (3) Configure the corresponding relation of multicast VLAN and multicast ip address group
OLT_config#ip mcst mc-vlan 100 range 225.0.0.1 – 225.0.0.10
- (4) Configure the fast-leave-group and tag-strip function of ONU

```
OLT_config#gpon profile onu-mcst-operation oper
```

```
OLT_config_prof_onuMcstOper_oper#gpon-profile fast-leave-mode enable
```

```
OLT_config_prof_onuMcstOper_oper#gpon-profile          multicast-tag-strip
enable
```

- (5) Configure the dynamic template of ONU (suppose the value ranges from 225.0.0.1~225.0.0.10, and the vlan is 100, the longest preview time is 30 mins, the minimum preview interval is 1 hour, the max times for preview is 5 times/day; reset the preview count at 24:00):

```
OLT_config#gpon profile onu-mcst-dynamic-group 2
```

```
OLT_config_prof_onuMcstDynamicGroup_2#gpon-profile          entry          1
multicast-gemport 4093
```

```
OLT_config_prof_onuMcstDynamicGroup_2#gpon-profile entry 1 multicast-vlan-id
100
```

```
OLT_config_prof_onuMcstDynamicGroup_2#gpon-profile          entry          1
multicast-group-address-range start 225.0.0.1 stop 225.0.0.10
```

```
OLT_config_prof_onuMcstDynamicGroup_2#gpon-profile entry 1 preview-length
1800
```

```
OLT_config_prof_onuMcstDynamicGroup_2#gpon-profile          entry          1
preview-repeat-time 3600
```

```
OLT_config_prof_onuMcstDynamicGroup_2#gpon-profile          entry          1
preview-repeat-count 5
```

```
OLT_config_prof_onuMcstDynamicGroup_2#gpon-profile          entry          1
preview-reset-time 24
```

- (6) Use **gpon profile onu-mcst-operation** and **onu-mcst-dynamic-group** on ONU:

```
gpon onu uni 1 mcst-oper-profile oper
```

```
gpon onu uni 1 mcst-dynamic-group-profile 2
```

1.3.4 Configuration Example of IGMP ctc-mode

Connect the ONU to gpon0/3 and connect G0/1 and the multicast router.

The topology is shown in Figure-1.

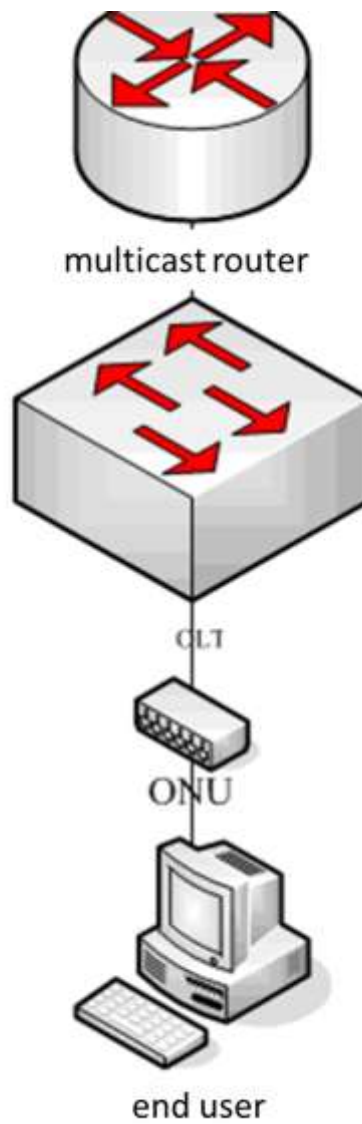


Figure 1 Configuration example of IGMP controllable multicast

- (1) Enable the multicast function of OLT:
OLT_config#ip mcst enable
- (2) Configure the multicast mode of OLT as ctc-mode
OLT_config#ip mcst ctc-mode
- (3) Configure ctc-mcvlan of OLT as 2999