

# HP 5120 EI Switch Series

## IP Multicast

### Configuration Guide

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# Multicast overview

## Introduction to multicast

As a technique that coexists with unicast and broadcast, the multicast technique effectively addresses the issue of point-to-multipoint data transmission. By enabling high-efficiency point-to-multipoint data transmission over a network, multicast greatly saves network bandwidth and reduces network load.

By using multicast technology, a network operator can easily provide new value-added services, such as live webcasting, web TV, distance learning, telemedicine, web radio, real time video conferencing, and other bandwidth-critical and time-critical information services.

The term "router " in this document refers to both routers and Layer 3 switches.

Unless otherwise stated, the term "multicast" in this document refers to IP multicast.

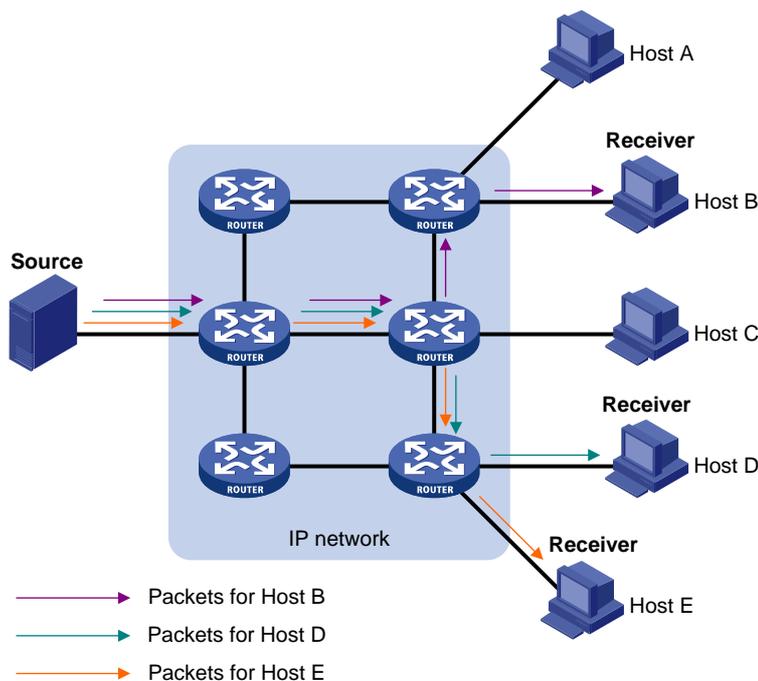
## Information transmission techniques

The information transmission techniques include unicast, broadcast, and multicast.

### Unicast

In unicast transmission, the information source must send a separate copy of information to each host that needs the information.

**Figure 1 Unicast transmission**



In [Figure 1](#), assume that Host B, Host D and Host E need the information. A separate transmission channel must be established from the information source to each of these hosts.

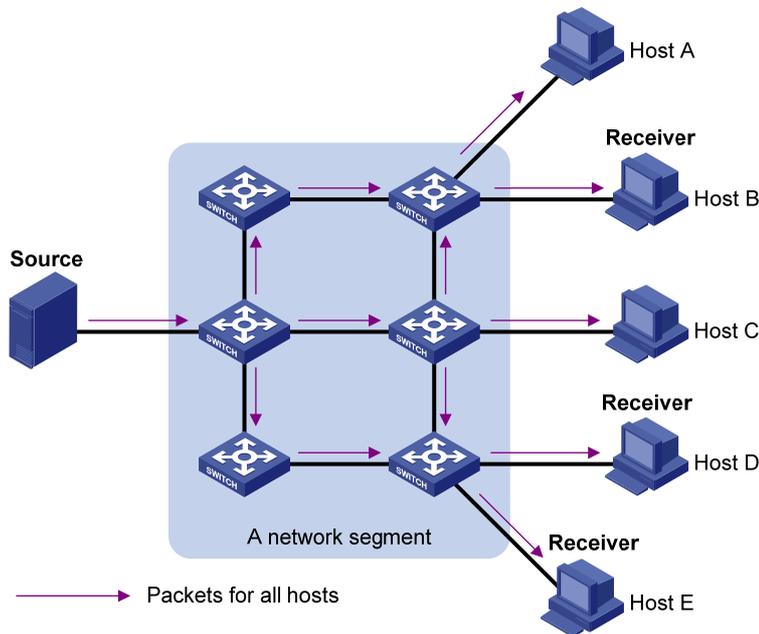
In unicast transmission, the traffic transmitted over the network is proportional to the number of hosts that need the information. If a large number of hosts need the information, the information source must send a separate copy of the same information to each of these hosts. Sending many copies can place a tremendous pressure on the information source and the network bandwidth.

Unicast is not suitable for batch transmission of information.

## Broadcast

In broadcast transmission, the information source sends information to all hosts on the subnet, even if some hosts do not need the information.

**Figure 2 Broadcast transmission**



In Figure 2, assume that only Host B, Host D, and Host E need the information. If the information is broadcast to the subnet, Host A and Host C also receive it. In addition to information security issues, broadcasting to hosts that do not need the information also causes traffic flooding on the same subnet.

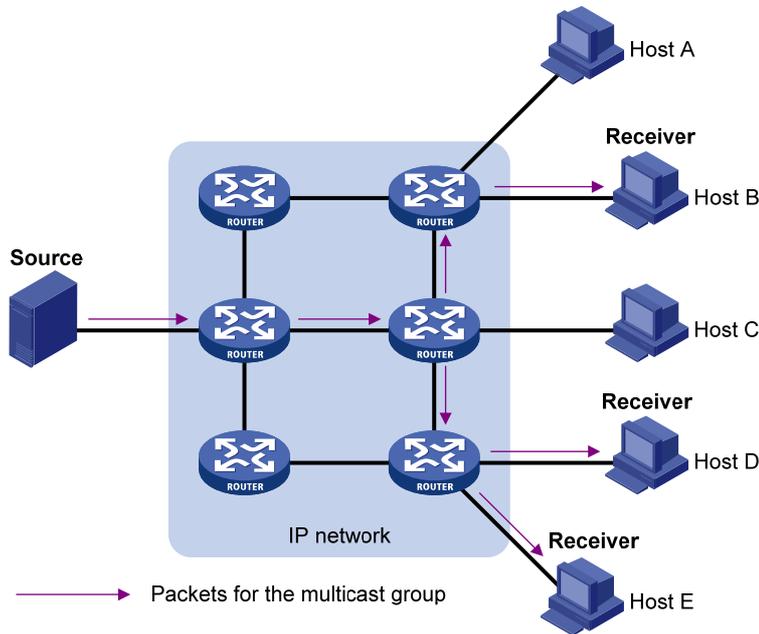
Broadcast is disadvantageous in transmitting data to specific hosts. Moreover, broadcast transmission is a significant waste of network resources.

## Multicast

Unicast and broadcast techniques cannot provide point-to-multipoint data transmissions with the minimum network consumption.

Multicast transmission can solve this problem. When some hosts on the network need multicast information, the information sender, or multicast source, sends only one copy of the information. Multicast distribution trees are built through multicast routing protocols, and the packets are replicated only on nodes where the trees branch.

Figure 3 Multicast transmission



The multicast source sends only one copy of the information to a multicast group. Host B, Host D and Host E, which are receivers of the information, must join the multicast group. The routers on the network duplicate and forward the information based on the distribution of the group members. Finally, the information is correctly delivered to Host B, Host D, and Host E.

To summarize, multicast has the following advantages:

- **Advantages over unicast**—Because multicast traffic flows to the farthest-possible node from the source before it is replicated and distributed, an increase in the number of hosts does not increase the load of the source or remarkably add to the usage of network resources.
- **Advantages over broadcast**—Because multicast data is sent only to the receivers that need it, multicast uses network bandwidth reasonably and enhances network security. In addition, data broadcast is confined to the same subnet, but multicast is not.

## Multicast features

- A multicast group is a multicast receiver set identified by an IP multicast address. Hosts join a multicast group to become members of the multicast group before they can receive the multicast data addressed to that multicast group. Typically, a multicast source does not need to join a multicast group.
- An information sender is called a "multicast source". A multicast source can send data to multiple multicast groups at the same time, and multiple multicast sources can send data to the same multicast group at the same time.
- All hosts that have joined a multicast group become members of the multicast group. The group memberships are dynamic. Hosts can join or leave multicast groups at any time. Multicast groups are not subject to geographic restrictions.
- Routers or Layer 3 switches that support Layer 3 multicast are called "multicast routers" or "Layer 3 multicast devices". In addition to providing the multicast routing function, a multicast router can also manage multicast group memberships on stub subnets with attached group members. A multicast router itself can be a multicast group member.

For a better understanding of the multicast concept, you can compare multicast transmission to the transmission of TV programs.

**Table 1 Comparing TV program transmission and multicast transmission**

<b>TV transmission</b>	<b>Multicast transmission</b>
A TV station transmits a TV program through a channel.	A multicast source sends multicast data to a multicast group.
A user tunes the TV set to the channel.	A receiver joins the multicast group.
The user starts to watch the TV program transmitted by the TV station via the channel.	The receiver starts to receive the multicast data that the source is sending to the multicast group.
The user turns off the TV set or tunes to another channel.	The receiver leaves the multicast group or joins another group.

## Common notations in multicast

The following notations are commonly used in multicast transmission:

- **(\*, G)**—Indicates a rendezvous point tree (RPT), or a multicast packet that any multicast source sends to multicast group G. Here, the asterisk represents any multicast source, and "G" represents a specific multicast group.
- **(S, G)**—Indicates a shortest path tree (SPT), or a multicast packet that multicast source S sends to multicast group G. Here, "S" represents a specific multicast source, and "G" represents a specific multicast group.

## Multicast advantages and applications

### Multicast advantages

Advantages of the multicast technique include the following:

- **Enhanced efficiency**—Reduces the processor load of information source servers and network devices.
- **Optimal performance**—Reduces redundant traffic.
- **Distributed application**—Enables point-to-multipoint applications at the price of minimum network resources.

### Multicast applications

The scenarios in which the multicast technique can be effectively applied are:

- Multimedia and streaming applications, such as web TV, web radio, and real time video/audio conferencing
- Communication for training and cooperative operations, such as distance learning and telemedicine
- Data warehouse and financial applications (stock quotes)
- Any other point-to-multipoint application for data distribution

# Multicast models

Based on how the receivers treat the multicast sources, the multicast models include any-source multicast (ASM), source-filtered multicast (SFM), and source-specific multicast (SSM).

## ASM model

In the ASM model, any sender can send information to a multicast group as a multicast source, and receivers can join a multicast group (identified by a group address) and obtain multicast information addressed to that multicast group. In this model, receivers do not know the positions of the multicast sources in advance. However, they can join or leave the multicast group at any time.

## SFM model

The SFM model is derived from the ASM model. To a sender, the two models appear to have the same multicast membership architecture.

The SFM model functionally extends the ASM model. The upper-layer software checks the source address of received multicast packets and permits or denies multicast traffic from specific sources. Therefore, receivers can receive the multicast data from only part of the multicast sources. To a receiver, multicast sources are not all valid; they are filtered.

## SSM model

Users might be interested in the multicast data from only certain multicast sources. The SSM model provides a transmission service that enables users to specify the multicast sources that they are interested in at the client side.

The main difference between the SSM model and the ASM model is that in the SSM model, receivers have already determined the locations of the multicast sources by some other means. In addition, the SSM model uses a multicast address range that is different from that of the ASM/SFM model, and dedicated multicast forwarding paths are established between receivers and the specified multicast sources.

# Multicast architecture

IP multicast addresses the following questions:

- Where should the multicast source transmit information to? (Multicast addressing.)
- What receivers exist on the network? (Host registration.)
- Where is the multicast source that will provide data to the receivers? (Multicast source discovery.)
- How should information be transmitted to the receivers? (Multicast routing.)

IP multicast is an end-to-end service. The multicast architecture involves the following parts:

- **Addressing mechanism**—A multicast source sends information to a group of receivers through a multicast address.
- **Host registration**—Receiver hosts can join and leave multicast groups dynamically. This mechanism is the basis for management of group memberships.
- **Multicast routing**—A multicast distribution tree (a forwarding path tree for multicast data on the network) is constructed for delivering multicast data from a multicast source to receivers.
- **Multicast applications**—A software system that supports multicast applications, such as video conferencing, must be installed on multicast sources and receiver hosts. The TCP/IP stack must support reception and transmission of multicast data.

# Multicast addresses

Network-layer multicast addresses (multicast IP addresses) enables communication between multicast sources and multicast group members. In addition, a technique must be available to map multicast IP addresses to link-layer multicast MAC addresses.

## IP multicast addresses

- IPv4 multicast addresses  
Internet Assigned Numbers Authority (IANA) assigned the Class D address space (224.0.0.0 to 239.255.255.255) to IPv4 multicast.

**Table 2 Class D IP address blocks and description**

Address block	Description
224.0.0.0 to 224.0.0.255	Reserved permanent group addresses. The IP address 224.0.0.0 is reserved. Other IP addresses can be used by routing protocols and for topology searching, protocol maintenance, and so on. <a href="#">Table 3</a> lists common permanent group addresses. A packet destined for an address in this block will not be forwarded beyond the local subnet regardless of the Time to Live (TTL) value in the IP header.
224.0.1.0 to 238.255.255.255	Globally scoped group addresses. This block includes the following types of designated group addresses: <ul style="list-style-type: none"><li>• <b>232.0.0.0/8</b>—SSM group addresses.</li><li>• <b>233.0.0.0/8</b>—Glop group addresses.</li></ul>
239.0.0.0 to 239.255.255.255	Administratively scoped multicast addresses. These addresses are considered locally unique rather than globally unique, and can be reused in domains administered by different organizations without causing conflicts. For more information, see RFC 2365.

### NOTE:

"Glop" is a mechanism for assigning multicast addresses between different autonomous systems (ASs). By filling an AS number into the middle two bytes of 233.0.0.0, you get 255 multicast addresses for that AS. For more information, see RFC 2770.

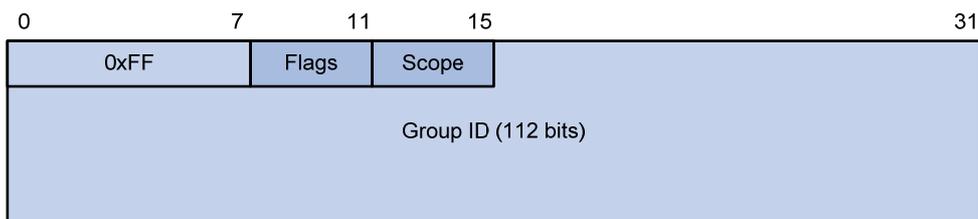
**Table 3 Some reserved multicast addresses**

Address	Description
224.0.0.1	All systems on this subnet, including hosts and routers
224.0.0.2	All multicast routers on this subnet
224.0.0.3	Unassigned
224.0.0.4	Distance Vector Multicast Routing Protocol (DVMRP) routers
224.0.0.5	Open Shortest Path First (OSPF) routers
224.0.0.6	OSPF designated routers and backup designated routers
224.0.0.7	Shared Tree (ST) routers
224.0.0.8	ST hosts
224.0.0.9	Routing Information Protocol version 2 (RIPv2) routers
224.0.0.11	Mobile agents

Address	Description
224.0.0.12	Dynamic Host Configuration Protocol (DHCP) server/relay agent
224.0.0.13	All Protocol Independent Multicast (PIM) routers
224.0.0.14	Resource Reservation Protocol (RSVP) encapsulation
224.0.0.15	All Core-Based Tree (CBT) routers
224.0.0.16	Designated Subnetwork Bandwidth Management (SBM)
224.0.0.17	All SBMs
224.0.0.18	Virtual Router Redundancy Protocol (VRRP)

- IPv6 multicast addresses

**Figure 4 IPv6 multicast format**



The following describes the fields of an IPv6 multicast address:

- **OxFF**—The most significant eight bits are 11111111, which indicates that this address is an IPv6 multicast address.
- **Flags**—The Flags field contains four bits.

**Figure 5 Flags field format**



**Table 4 Flags field description**

Bit	Description
0	Reserved, set to 0.
R	<ul style="list-style-type: none"> <li>• When set to 0, it indicates that this address is an IPv6 multicast address without an embedded RP address.</li> <li>• When set to 1, it indicates that this address is an IPv6 multicast address with an embedded RP address. (The P and T bits must also be set to 1.)</li> </ul>
P	<ul style="list-style-type: none"> <li>• When set to 0, it indicates that this address is an IPv6 multicast address not based on a unicast prefix.</li> <li>• When set to 1, it indicates that this address is an IPv6 multicast address based on a unicast prefix. (The T bit must also be set to 1.)</li> </ul>
T	<ul style="list-style-type: none"> <li>• When set to 0, it indicates that this address is an IPv6 multicast address permanently-assigned by IANA.</li> <li>• When set to 1, it indicates that this address is a transient, or dynamically assigned IPv6 multicast address.</li> </ul>

- **Scope**—The Scope field contains four bits, which indicate the scope of the IPv6 internetwork for which the multicast traffic is intended.

**Table 5 Values of the Scope field**

Value	Meaning
0, F	Reserved
1	Interface-local scope
2	Link-local scope
3	Subnet-local scope
4	Admin-local scope
5	Site-local scope
6, 7, 9 through D	Unassigned
8	Organization-local scope
E	Global scope

- **Group ID**—The Group ID field contains 112 bits. It uniquely identifies an IPv6 multicast group in the scope that the Scope field defines.

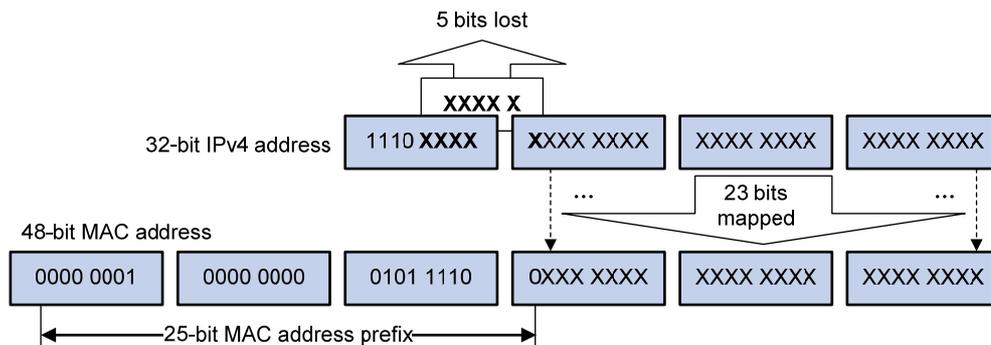
### Ethernet multicast MAC addresses

A multicast MAC address identifies a group of receivers at the data link layer.

- IPv4 multicast MAC addresses

As defined by IANA, the most significant 24 bits of an IPv4 multicast MAC address are 0x01005E. Bit 25 is 0, and the other 23 bits are the least significant 23 bits of a multicast IPv4 address.

**Figure 6 IPv4-to-MAC address mapping**

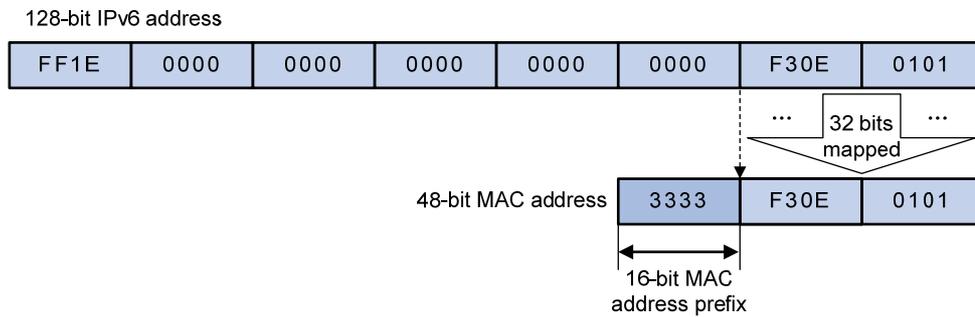


The most significant four bits of a multicast IPv4 address are 1110, which indicates that this address is a multicast address. Only 23 bits of the remaining 28 bits are mapped to a MAC address, so five bits of the multicast IPv4 address are lost. As a result, 32 multicast IPv4 addresses map to the same IPv4 multicast MAC address. Therefore, in Layer 2 multicast forwarding, a switch might receive some multicast data destined for other IPv4 multicast groups. The upper layer must filter such redundant data.

- IPv6 multicast MAC addresses

The most significant 16 bits of an IPv6 multicast MAC address are 0x3333. The least significant 32 bits are the least significant 32 bits of a multicast IPv6 address.

**Figure 7 An example of IPv6-to-MAC address mapping**



## Multicast protocols

Generally, Layer 3 multicast refers to IP multicast working at the network layer. The corresponding multicast protocols are Layer 3 multicast protocols, which include IGMP, MLD, PIM, IPv6 PIM, MSDP, MBGP, and IPv6 MBGP. Layer 2 multicast refers to IP multicast working at the data link layer. The corresponding multicast protocols are Layer 2 multicast protocols, which include IGMP snooping, MLD snooping, PIM snooping, IPv6 PIM snooping, multicast VLAN, and IPv6 multicast VLAN.

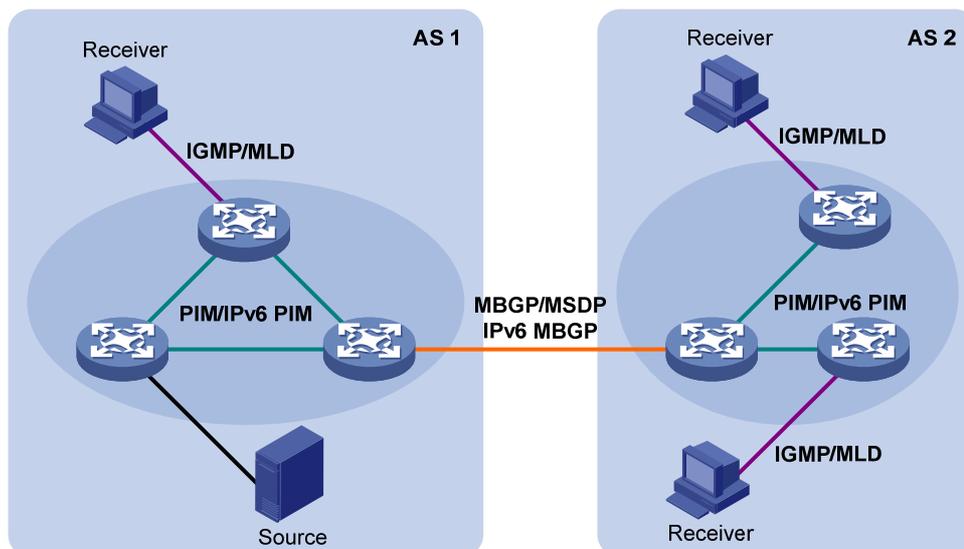
IGMP snooping, PIM snooping, multicast VLAN, IGMP, PIM, MSDP, and MBGP are for IPv4, and MLD snooping, IPv6 PIM snooping, IPv6 multicast VLAN, MLD, IPv6 PIM, and IPv6 MBGP are for IPv6.

This section provides only general descriptions about applications and functions of the Layer 2 and Layer 3 multicast protocols in a network.

### Layer 3 multicast protocols

Layer 3 multicast protocols include multicast group management protocols and multicast routing protocols.

**Figure 8 Positions of Layer 3 multicast protocols**



- Multicast group management protocols  
Typically, the Internet Group Management Protocol (IGMP) or Multicast Listener Discovery Protocol (MLD) is used between hosts and Layer 3 multicast devices that directly connect to the hosts. These

protocols define the mechanism of establishing and maintaining group memberships between hosts and Layer 3 multicast devices.

- Multicast routing protocols

A multicast routing protocol runs on Layer 3 multicast devices to establish and maintain multicast routes and forward multicast packets correctly and efficiently. Multicast routes constitute loop-free data transmission paths from a data source to multiple receivers, namely, a multicast distribution tree.

In the ASM model, multicast routes include intra-domain routes and inter-domain routes.

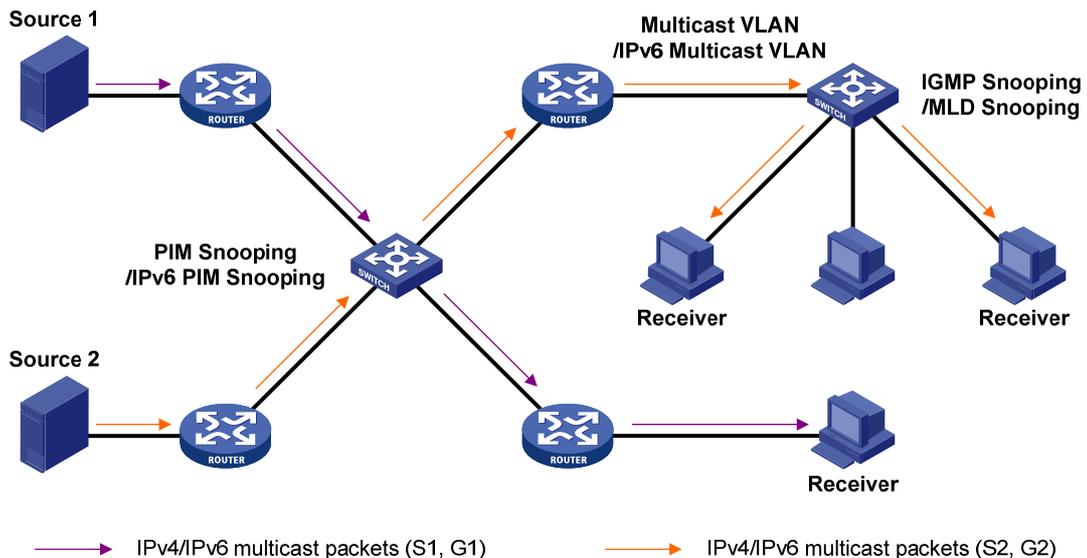
- An intra-domain multicast routing protocol discovers multicast sources and builds multicast distribution trees within an AS to deliver multicast data to receivers. Among a variety of mature intra-domain multicast routing protocols, Protocol Independent Multicast (PIM) is most widely used. Based on the forwarding mechanism, PIM has dense mode (often referred to as "PIM-DM"), and sparse mode (often referred to as "PIM-SM").
- An inter-domain multicast routing protocol is used for delivery of multicast information between two ASs. So far, mature solutions include Multicast Source Discovery Protocol (MSDP) and Multicast Border Gateway Protocol (MBGP). MSDP propagates multicast source information among different ASs. MBGP is an extension of the Multiprotocol Border Gateway Protocol (MP-BGP) for exchanging multicast routing information among different ASs.

For the SSM model, multicast routes are not divided into intra-domain routes and inter-domain routes. Because receivers know the position of the multicast source, channels established through PIM-SM are sufficient for the transport of multicast information.

## Layer 2 multicast protocols

Layer 2 multicast protocols include IGMP snooping, MLD snooping, PIM snooping, IPv6 PIM snooping, multicast VLAN, and IPv6 multicast VLAN.

**Figure 9 Positions of Layer 2 multicast protocols**



- IGMP snooping and MLD snooping

IGMP snooping and MLD snooping are multicast constraining mechanisms that run on Layer 2 devices. They manage and control multicast groups by monitoring and analyzing IGMP or MLD messages exchanged between the hosts and Layer 3 multicast devices, effectively controlling the flooding of multicast data in a Layer 2 network.

- PIM snooping and IPv6 PIM snooping  
PIM snooping and IPv6 PIM snooping run on Layer 2 devices. They determine which ports are interested in multicast data by analyzing the received IPv6 PIM messages, and add the ports to a multicast forwarding entry to make sure that multicast data can be forwarded to only the ports that are interested in the data.
- Multicast VLAN and IPv6 multicast VLAN  
In the traditional multicast-on-demand mode, when users in different VLANs on a Layer 2 device need multicast information, the upstream Layer 3 device must forward a separate copy of the multicast data to each VLAN of the Layer 2 device. When the multicast VLAN or IPv6 multicast VLAN feature is enabled on the Layer 2 device, the Layer 3 multicast device sends only one copy of multicast to the multicast VLAN or IPv6 multicast VLAN on the Layer 2 device. This approach avoids waste of network bandwidth and extra burden on the Layer 3 device.

## Multicast packet forwarding mechanism

In a multicast model, a multicast source sends information to the host group identified by the multicast group address in the destination address field of IP multicast packets. To deliver multicast packets to receivers located at different positions of the network, multicast routers on the forwarding paths usually need to forward multicast packets that an incoming interface receives to multiple outgoing interfaces. Compared with a unicast model, a multicast model is more complex in the following aspects:

- To ensure multicast packet transmission in the network, unicast routing tables or multicast routing tables (for example, the MBGP routing table) specially provided for multicast must be used as guidance for multicast forwarding.
- To process the same multicast information from different peers received on different interfaces of the same device, every multicast packet undergoes a reverse path forwarding (RPF) check on the incoming interface. The result of the RPF check determines whether the packet will be forwarded or discarded. The RPF check mechanism is the basis for most multicast routing protocols to implement multicast forwarding.

# Configuring IGMP snooping

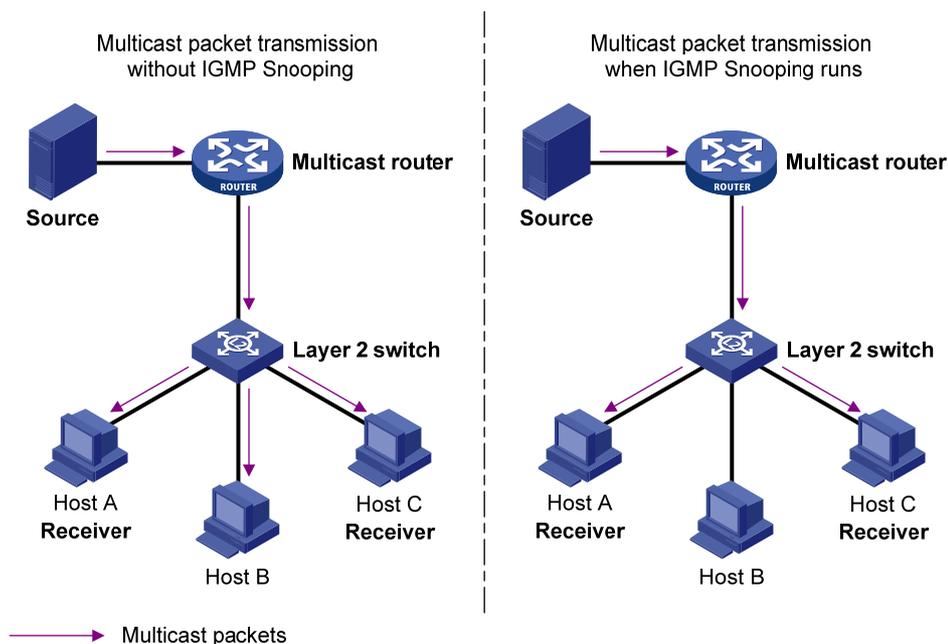
## Overview

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

By analyzing received IGMP messages, a Layer 2 device that runs IGMP snooping establishes mappings between ports and multicast MAC addresses, and forwards multicast data based on these mappings.

As shown in Figure 10, without IGMP snooping enabled, the Layer 2 switch floods multicast packets to all devices at Layer 2. With IGMP snooping enabled, the Layer 2 switch forwards multicast packets for known multicast groups to only the receivers that require the multicast data at Layer 2. This feature improves bandwidth efficiency, enhances multicast security, and helps per-host accounting for multicast users.

**Figure 10 Before and after IGMP snooping is enabled on the Layer 2 device**

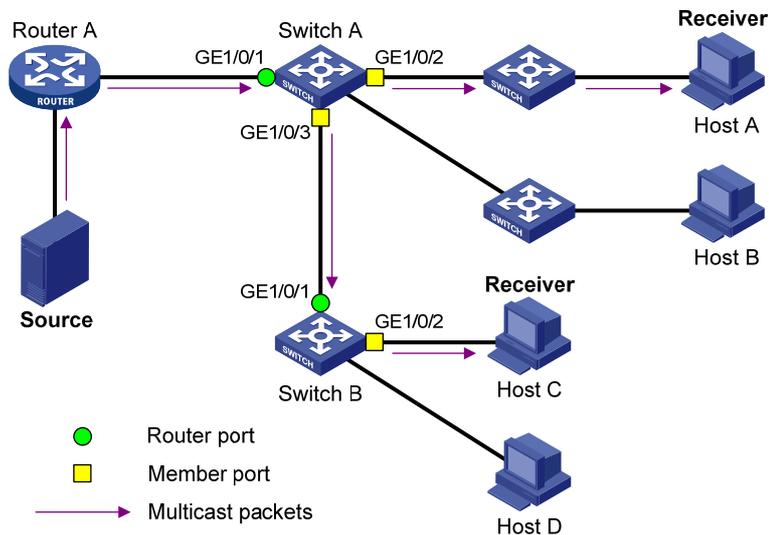


## Basic concepts in IGMP snooping

### IGMP snooping related ports

As shown in Figure 11, Router A connects to the multicast source, IGMP snooping runs on Switch A and Switch B, and Host A and Host C are receiver hosts as members of a multicast group.

**Figure 11 IGMP snooping related ports**



The following describes the ports involved in IGMP snooping:

- **Router port**—Layer 3 multicast device-side port. Layer 3 multicast devices include designated routers (DRs) and IGMP queriers. In Figure 11, GigabitEthernet 1/0/1 of Switch A and GigabitEthernet 1/0/1 of Switch B are router ports. The switch registers all its router ports in its router port list.

Do not confuse the "router port" in IGMP snooping with the "routed interface" commonly known as the "Layer 3 interface." The router port in IGMP snooping is the Layer 2 interface.

- **Member port**—Multicast receiver-side port. In Figure 11, GigabitEthernet 1/0/2 and GigabitEthernet 1/0/3 of Switch A and GigabitEthernet 1/0/2 of Switch B are member ports. The switch registers all its member ports in its IGMP snooping forwarding table.

Unless otherwise specified, router ports and member ports in this document include both static and dynamic router ports and member ports.

**NOTE:**

An IGMP-snooping-enabled switch deems that all its ports on which IGMP general queries with the source IP address other than 0.0.0.0 or that receive PIM hello messages are received are dynamic router ports.

**Aging timers for dynamic ports in IGMP snooping and related messages and actions**

Timer	Description	Message before expiry	Action after expiry
Dynamic router port aging timer	For each dynamic router port, the switch starts an aging timer. When the timer expires, the dynamic router port ages out.	IGMP general query of which the source address is not 0.0.0.0 or PIM hello.	The switch removes this port from its router port list.

Timer	Description	Message before expiry	Action after expiry
Dynamic member port aging timer	When a port dynamically joins a multicast group, the switch starts an aging timer for the port. When the timer expires, the dynamic member port ages out.	IGMP membership report.	The switch removes this port from the IGMP snooping forwarding table.

**NOTE:**

In IGMP snooping, only dynamic ports age out. Static ports never age out.

## How IGMP snooping works

In this section, the involved ports are dynamic ports. For information about how to configure and remove static ports, see "[Configuring static ports.](#)"

A switch that runs IGMP snooping performs different actions when it receives different IGMP messages.

### When receiving a general query

The IGMP querier periodically sends IGMP general queries to all hosts and routers identified by the address 224.0.0.1 on the local subnet to determine whether any active multicast group members exist on the subnet.

After receiving an IGMP general query, the switch forwards it to all ports in the VLAN, except the port that received the query. The switch also performs one of the following actions:

- If the receiving port is a dynamic router port in the router port list, restarts the aging timer for the port.
- If the receiving port is not in its router port list, adds it into its router port list as a dynamic router port and starts an aging timer for the port.

### When receiving a membership report

A host sends an IGMP report to the IGMP querier for the following purposes:

- If the host has been a member of a multicast group, responds to the query with an IGMP report.
- Applies for joining a multicast group.

After receiving an IGMP report, the switch forwards it through all the router ports in the VLAN, resolves the address of the reported multicast group. The switch also performs one of the following actions:

- If no forwarding entry matches the group address, creates a forwarding entry for the group, adds the receiving port as a dynamic member port to the forwarding entry, and starts an aging timer for the port.
- If a forwarding entry matches the group address, but the receiving port is not in the forwarding entry for the group, adds the port as a dynamic member port to the forwarding entry and starts an aging timer for the port.
- If a forwarding entry matches the group address and the receiving port is in the forwarding entry for the group, restarts the aging timer for the port.

A switch does not forward an IGMP report through a non-router port. If the switch forwards a report message through a member port, the IGMP report suppression mechanism causes all the attached hosts

that are monitoring the reported multicast address suppress their own reports. This makes the switch unable to know whether the reported multicast group still has active members attached to that port.

### When receiving a leave message

When an IGMPv1 host leaves a multicast group, the host does not send an IGMP leave message, and the switch cannot know immediately that the host has left the multicast group. However, because the host stops sending IGMP reports as soon as it leaves the multicast group, the switch removes the port that connects to the host from the forwarding entry for the multicast group when the aging timer for the port expires.

When an IGMPv2 or IGMPv3 host leaves a multicast group, the host sends an IGMP leave message to the multicast router.

When the switch receives an IGMP leave message on a dynamic member port, the switch first examines whether a forwarding entry matches the group address in the message, and, if a match is found, whether the forwarding entry for the group contains the dynamic member port.

- If no forwarding entry matches the group address, or if the forwarding entry does not contain the port, the switch directly discards the IGMP leave message.
- If a forwarding entry matches the group address and the forwarding entry contains the port, the switch forwards the leave message to all router ports in the VLAN. Because the switch does not know whether any other hosts attached to the port are still listening to that group address, the switch does not immediately remove the port from the forwarding entry for that group. Instead, it restarts the aging timer for the port.

After receiving the IGMP leave message, the IGMP querier resolves the multicast group address in the message and sends an IGMP group-specific query to the multicast group through the port that received the leave message. After receiving the IGMP group-specific query, the switch forwards it through all its router ports in the VLAN and all member ports of the multicast group. The switch also performs the following judgment for the port that received the IGMP leave message:

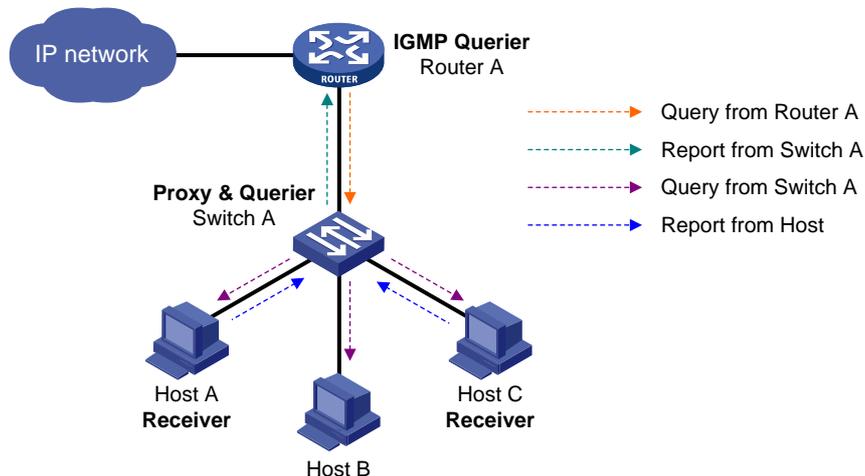
- If the port (assuming that it is a dynamic member port) receives an IGMP report in response to the group-specific query before its aging timer expires, it indicates that some host attached to the port is receiving or expecting to receive multicast data for the multicast group. The switch restarts the aging timer for the port.
- If the port receives no IGMP report in response to the group-specific query before its aging timer expires, it indicates that no hosts attached to the port are still listening to that group address. The switch removes the port from the forwarding entry for the multicast group when the aging timer expires.

## IGMP snooping proxying

You can configure the IGMP snooping proxying function on an edge device to reduce the number of IGMP reports and leave messages sent to its upstream device. The device configured with IGMP snooping proxying is called an IGMP snooping proxy. It is a host from the perspective of its upstream device.

Even though an IGMP snooping proxy is a host from the perspective of its upstream device, the IGMP membership report suppression mechanism for hosts does not take effect on it.

**Figure 12 Network diagram**



As shown in Figure 12, Switch A works as an IGMP snooping proxy. As a host from the perspective of the querier Router A, Switch A represents its attached hosts to send membership reports and leave messages to Router A.

**Table 6 IGMP message processing on an IGMP snooping proxy**

IGMP message	Actions
General query	When receiving an IGMP general query, the proxy forwards it to all ports but the receiving port. In addition, the proxy generates a report according to the group memberships it maintains and sends the report out of all router ports.
Group-specific query	In response to the IGMP group-specific query for a certain multicast group, the proxy sends the report to the group out of all router ports if the forwarding entry for the group still contains a member port.
Report	<p>After receiving a report for a multicast group, the proxy looks up the multicast forwarding table for the forwarding entry for the multicast group.</p> <ul style="list-style-type: none"> <li>• If a forwarding entry matches the multicast group and contains the receiving port as a dynamic member port, the proxy restarts the aging timer for the port.</li> <li>• If a forwarding entry matches the multicast group but does not contain the receiving port, the proxy adds the port to the forwarding entry as a dynamic member port and starts an aging timer for the port.</li> <li>• If no forwarding entry matches the multicast group, the proxy creates a forwarding entry for the multicast group, adds the receiving port to the forwarding entry as a dynamic member port, and starts an aging timer for the port.</li> </ul>
Leave	In response to an IGMP leave message for a multicast group, the proxy sends a group-specific query out of the receiving port. After making sure that no member port is contained in the forwarding entry for the multicast group, the proxy sends a leave message to the group out of all router ports.

# Protocols and standards

RFC 4541, *Considerations for Internet Group Management Protocol (IGMP) and Multicast Listener Discovery (MLD) Snooping Switches*

## IGMP snooping configuration task list

Task	Remarks	
Configuring basic IGMP snooping functions	Enabling IGMP snooping	Required
	Specifying the version of IGMP snooping	Optional
	Configuring static multicast MAC address entries	Optional
Configuring IGMP snooping port functions	Setting aging timers for dynamic ports	Optional
	Configuring static ports	Optional
	Configuring a port as a simulated member host	Optional
	Enabling IGMP snooping fast-leave processing	Optional
Configuring IGMP snooping querier	Disabling a port from becoming a dynamic router port	Optional
	Enabling IGMP snooping querier	Optional
	Configuring parameters for IGMP queries and responses	Optional
	Configuring the source IP addresses for IGMP queries	Optional
Configuring IGMP snooping proxying	Enabling IGMP snooping proxying	Optional
	Configuring a source IP address for the IGMP messages sent by the proxy	Optional
Configuring an IGMP snooping policy	Configuring a multicast group filter	Optional
	Configuring multicast source port filtering	Optional
	Enabling dropping unknown multicast data	Optional
	Configuring IGMP report suppression	Optional
	Setting the maximum number of multicast groups that a port can join	Optional
	Setting the 802.1p precedence for IGMP messages	Optional
	Enabling multicast group replacement	Optional
	Configuring a multicast user control policy	Optional
Enabling the IGMP snooping host tracking function	Optional	
Setting the DSCP value for IGMP messages	Optional	

For the configuration tasks in this section:

- In IGMP snooping view, the configurations that you make are effective in all VLANs. In VLAN view, the configurations that you make are effective on only the ports that belong to the current VLAN. For a given VLAN, a configuration that you make in IGMP snooping view is effective only if you do not make the same configuration in VLAN view.

- In IGMP snooping view, the configurations that you make are effective on all ports. In Layer 2 Ethernet interface view or Layer 2 aggregate interface view, the configurations that you make are effective only on the current port. In port group view, the configurations that you make are effective on all ports in the current port group. For a given port, a configuration that you make in IGMP snooping view is effective only if you do not make the same configuration in Layer 2 Ethernet interface view, Layer 2 aggregate interface view, or port group view.
- For IGMP snooping, the configurations that you make on a Layer 2 aggregate interface do not interfere with those you make on its member ports, nor do they participate in aggregation calculations. Configurations that you make on a member port of an aggregate group do not take effect until it leaves the aggregate group.

## Configuring basic IGMP snooping functions

Before you configure basic IGMP snooping functions, complete the following tasks:

- Configure the corresponding VLANs.
- Determine the version of IGMP snooping.

### Enabling IGMP snooping

When you enable IGMP snooping, follow these guidelines:

- You must enable IGMP snooping globally before you enable it in a VLAN.
- When you enable IGMP snooping in a specified VLAN, IGMP snooping works only on the ports in this VLAN.

To enable IGMP snooping:

Step	Command	Remarks
1. Enter system view.	<b>system-view</b>	N/A
2. Enable IGMP snooping globally and enter IGMP-snooping view.	<b>igmp-snooping</b>	Disabled by default
3. Return to system view.	<b>quit</b>	N/A
4. Enter VLAN view.	<b>vlan</b> <i>vlan-id</i>	N/A
5. Enable IGMP snooping in the VLAN.	<b>igmp-snooping enable</b>	Disabled by default

### Specifying the version of IGMP snooping

Different versions of IGMP snooping can process different versions of IGMP messages:

- IGMPv2 snooping can process IGMPv1 and IGMPv2 messages, but cannot process IGMPv3 messages, which will be flooded in the VLAN.
- IGMPv3 snooping can process IGMPv1, IGMPv2 and IGMPv3 messages.

If you change IGMPv3 snooping to IGMPv2 snooping, the system:

- Clears all IGMP snooping forwarding entries that are dynamically added.
- Keeps static IGMPv3 snooping forwarding entries (\*, G).

- Clears static IGMPv3 snooping forwarding entries (S, G), which will be restored when IGMP snooping is switched back to IGMPv3 snooping.

For more information about static joins, see "[Configuring static ports.](#)"

To specify the version of IGMP snooping:

Step	Command	Remarks
1. Enter system view.	<b>system-view</b>	N/A
2. Enter VLAN view.	<b>vlan</b> <i>vlan-id</i>	N/A
3. Specify the version of IGMP snooping.	<b>igmp-snooping version</b> <i>version-number</i>	Version 2 by default

## Configuring static multicast MAC address entries

In Layer-2 multicast, a Layer 2 multicast protocol (such as IGMP snooping) can dynamically add multicast MAC address entries. Or, you can manually configure multicast MAC address entries.

### Configuration guidelines

- In system view, the configuration is effective for the specified ports. In interface view or port group view, the configuration is effective only on the current port or the ports in the current port group.
- Any legal multicast MAC address except 0100-5Exx-xxxx (where "x" represents a hexadecimal number from 0 to F) can be manually added to the multicast MAC address table. Multicast MAC addresses are the MAC addresses whose the least significant bit of the most significant octet is 1.

### Configuration procedure

To configure a static multicast MAC address entry in system view:

Step	Command	Remarks
1. Enter system view.	<b>system-view</b>	N/A
2. Configure a static multicast MAC address entry.	<b>mac-address multicast</b> <i>mac-address interface interface-list</i> <b>vlan</b> <i>vlan-id</i>	No static multicast MAC address entries exist by default.

To configure static multicast MAC address entries in interface view:

Step	Command	Remarks
1. Enter system view.	<b>system-view</b>	N/A
2. Enter Layer 2 Ethernet interface view, Layer 2 aggregate interface view, or port group view.	<ul style="list-style-type: none"> <li>• Enter Layer 2 Ethernet interface view or Layer 2 aggregate interface view: <b>interface</b> <i>interface-type interface-number</i></li> <li>• Enter port group view: <b>port-group manual</b> <i>port-group-name</i></li> </ul>	Use either command.
3. Configure a static multicast MAC address entry.	<b>mac-address multicast</b> <i>mac-address</i> <b>vlan</b> <i>vlan-id</i>	No static multicast MAC address entries exist by default.

# Configuring IGMP snooping port functions

Before you configure IGMP snooping port functions, complete the following tasks:

- Enable IGMP snooping in the VLAN.
- Configure the corresponding port groups.
- Determine the aging time of dynamic router ports.
- Determine the aging time of dynamic member ports.
- Determine the multicast group and multicast source addresses.

## Setting aging timers for dynamic ports

If a switch receives no IGMP general queries or PIM hello messages on a dynamic router port when the aging timer of the port expires, the switch removes the port from the router port list.

If the switch receives no IGMP reports for a multicast group on a dynamic member port when the aging timer of the port expires, the switch removes the port from the multicast forwarding entry for that multicast group.

If the memberships of multicast groups change frequently, you can set a relatively small value for the aging timer of the dynamic member ports. If the memberships of multicast groups change rarely, you can set a relatively large value.

### Configuring aging timers for dynamic ports globally

Step	Command	Remarks
1. Enter system view.	<b>system-view</b>	N/A
2. Enter IGMP-snooping view.	<b>igmp-snooping</b>	N/A
3. Set the aging timer for dynamic router ports.	<b>router-aging-time</b> <i>interval</i>	105 seconds by default
4. Set the aging timer for dynamic member ports.	<b>host-aging-time</b> <i>interval</i>	260 seconds by default

### Configuring aging timers for dynamic ports in a VLAN

Step	Command	Remarks
1. Enter system view.	<b>system-view</b>	N/A
2. Enter VLAN view.	<b>vlan</b> <i>vlan-id</i>	N/A
3. Set the aging timer for dynamic router ports.	<b>igmp-snooping router-aging-time</b> <i>interval</i>	105 seconds by default
4. Set the aging timer for dynamic member ports.	<b>igmp-snooping host-aging-time</b> <i>interval</i>	260 seconds by default

## Configuring static ports

If all hosts attached to a port are interested in the multicast data addressed to a particular multicast group or the multicast data that a particular multicast source sends to a particular group, you can configure the port as a static member port for the specified multicast group or the specified multicast source and group.

You can also configure a port as a static router port, through which the switch can forward all the multicast traffic that it received.

### Configuration guidelines

- A static member port does not respond to queries from the IGMP querier; when you configure a port as a static member port or cancel this configuration on the port, the port does not send an unsolicited IGMP report or an IGMP leave message.
- Static member ports and static router ports never age out. To remove such a port, use the corresponding **undo** command.

### Configuration procedure

To configure static ports:

Step	Command	Remarks
1. Enter system view.	<b>system-view</b>	N/A
2. Enter Layer 2 Ethernet interface view, Layer 2 aggregate interface view, or port group view.	<ul style="list-style-type: none"><li>• Enter Layer 2 Ethernet interface view or Layer 2 aggregate interface view: <b>interface</b> <i>interface-type</i> <i>interface-number</i></li><li>• Enter port group view: <b>port-group manual</b> <i>port-group-name</i></li></ul>	Use either command.
3. Configure the port as a static member port.	<b>igmp-snooping static-group</b> <i>group-address</i> [ <b>source-ip</b> <i>source-address</i> ] <b>vlan</b> <i>vlan-id</i>	No static member ports exist by default.
4. Configure the port as a static router port.	<b>igmp-snooping static-router-port</b> <b>vlan</b> <i>vlan-id</i>	No static router ports exist by default.

## Configuring a port as a simulated member host

Generally, a host that runs IGMP can respond to IGMP queries that the IGMP querier sends. If a host fails to respond, the multicast router might deem that no member of this multicast group exists on the network segment, and removes the corresponding forwarding path.

To avoid this situation, you can configure the port as a simulated member host for a multicast group. A simulated host is equivalent to an independent host. For example, when a simulated member host receives an IGMP query, it gives a response separately. Therefore, the switch can continue receiving multicast data.

A simulated host acts like a real host in the following ways:

- When a port is configured as a simulated member host, the switch sends an unsolicited IGMP report through the port, and can respond to IGMP general queries with IGMP reports through the port.

- When the simulated joining function is disabled on a port, the switch sends an IGMP leave message through the port.

Unlike a static member port, a port that you configure as a simulated member host ages out like a dynamic member port.

To configure a port as a simulated member host:

Step	Command	Remarks
1. Enter system view.	<b>system-view</b>	N/A
2. Enter Layer 2 Ethernet interface view, Layer 2 aggregate interface view, or port group view.	<ul style="list-style-type: none"> <li>• Enter Layer 2 Ethernet interface view or Layer 2 aggregate interface view: <b>interface</b> <i>interface-type</i> <i>interface-number</i></li> <li>• Enter port group view: <b>port-group manual</b> <i>port-group-name</i></li> </ul>	Use either command.
3. Configure a port as a simulated member host.	<b>igmp-snooping host-join</b> <i>group-address</i> [ <b>source-ip</b> <i>source-address</i> ] <b>vlan</b> <i>vlan-id</i>	Not configured by default.

## Enabling IGMP snooping fast-leave processing

IGMP snooping fast-leave processing enables the switch to process IGMP leave messages quickly. With IGMP snooping fast-leave processing enabled, when the switch receives an IGMP leave message on a port, it immediately removes that port from the forwarding entry for the multicast group specified in the message. Then, when the switch receives IGMP group-specific queries for that multicast group, it does not forward them to that port.

On a port that has only one host attached, you can enable IGMP snooping fast-leave processing to save bandwidth and resources. However, on a port that has multiple hosts attached, you should not enable IGMP snooping fast-leave processing if you have enabled dropping unknown multicast data globally or for the port. Otherwise, if a host on the port leaves a multicast group, the other hosts attached to the port in the same multicast group cannot receive the multicast data for the group.

### Enabling IGMP snooping fast-leave processing globally

Step	Command	Remarks
1. Enter system view.	<b>system-view</b>	N/A
2. Enter IGMP-snooping view.	<b>igmp-snooping</b>	N/A
3. Enable IGMP snooping fast-leave processing.	<b>fast-leave</b> [ <b>vlan</b> <i>vlan-list</i> ]	Disabled by default

### Enabling IGMP snooping fast-leave processing on a port

Step	Command	Remarks
1. Enter system view.	<b>system-view</b>	N/A

Step	Command	Remarks
2. Enter Layer 2 Ethernet interface view, Layer 2 aggregate interface view, or port group view.	<ul style="list-style-type: none"> <li>Enter Layer 2 Ethernet interface view or Layer 2 aggregate interface view: <b>interface</b> <i>interface-type</i> <i>interface-number</i></li> <li>Enter port group view: <b>port-group manual</b> <i>port-group-name</i></li> </ul>	Use either command.
3. Enable IGMP snooping fast-leave processing.	<b>igmp-snooping fast-leave</b> [ <b>vlan</b> <i>vlan-list</i> ]	Disabled by default.

## Disabling a port from becoming a dynamic router port

The following problems might exist in a multicast access network:

- After receiving an IGMP general query or a PIM hello message from a connected host, a router port becomes a dynamic router port. Before its timer expires, this dynamic router port receives all multicast packets within the VLAN where the port belongs, and forwards them to the host, affecting normal multicast reception of the host.
- In addition, the IGMP general query or PIM hello message that the host sends affects the multicast routing protocol state on Layer 3 devices, such as the IGMP querier or DR election, and might further cause network interruption.

To solve these problems, disable that router port from becoming a dynamic router port after the port receives an IGMP general query or a PIM hello message, so as to improve network security and control over multicast users.

To disable a port from becoming a dynamic router port:

Step	Command	Remarks
1. Enter system view.	<b>system-view</b>	N/A
2. Enter Layer 2 Ethernet interface view, Layer 2 aggregate interface view, or port group view.	<ul style="list-style-type: none"> <li>Enter Layer 2 Ethernet interface view or Layer 2 aggregate interface view: <b>interface</b> <i>interface-type</i> <i>interface-number</i></li> <li>Enter port group view: <b>port-group manual</b> <i>port-group-name</i></li> </ul>	Use either command.
3. Disable the ports from becoming dynamic router port.	<b>igmp-snooping router-port-deny</b> [ <b>vlan</b> <i>vlan-list</i> ]	By default, a port can become a dynamic router port.

### NOTE:

This configuration does not affect the static router port configuration.

# Configuring IGMP snooping querier

Before you configure IGMP snooping querier, complete the following tasks:

- Enable IGMP snooping in the VLAN.
- Determine the IGMP general query interval.
- Determine the IGMP last-member query interval.
- Determine the maximum response delay for IGMP general queries.
- Determine the source address of IGMP general queries.
- Determine the source address of IGMP group-specific queries.

## Enabling IGMP snooping querier

In an IP multicast network that runs IGMP, a multicast router or Layer 3 multicast switch sends IGMP queries, so that all Layer 3 multicast devices can establish and maintain multicast forwarding entries, in order to forward multicast traffic correctly at the network layer. This router or Layer 3 switch is called the "IGMP querier."

However, a Layer 2 multicast switch does not support IGMP, and therefore cannot send general queries by default. When you enable IGMP snooping querier on a Layer 2 switch in a VLAN where multicast traffic is switched only at Layer 2 and no multicast routers are present, the Layer 2 switch sends IGMP queries, so that multicast forwarding entries can be established and maintained at the data link layer.

To enable IGMP snooping querier:

Step	Command	Remarks
1. Enter system view.	<b>system-view</b>	N/A
2. Enter VLAN view.	<b>vlan</b> <i>vlan-id</i>	N/A
3. Enable IGMP snooping querier.	<b>igmp-snooping querier</b>	Disabled by default

### ! IMPORTANT:

In a multicast network that runs IGMP, you do not need to configure an IGMP snooping querier because it may affect IGMP querier elections by sending IGMP general queries with a low source IP address.

## Configuring parameters for IGMP queries and responses

### △ CAUTION:

In the configuration, make sure that the IGMP general query interval is larger than the maximum response delay for IGMP general queries. Otherwise, multicast group members might be deleted by mistake.

You can modify the IGMP general query interval based on actual condition of the network.

A multicast listening host starts a timer for each multicast group that it has joined when it receives an IGMP query (general query or group-specific query). This timer is initialized to a random value in the range of 0 to the maximum response delay advertised in the IGMP query message. When the timer value decreases to 0, the host sends an IGMP report to the multicast group.

To speed up the response of hosts to IGMP queries and avoid simultaneous timer expirations causing IGMP report traffic bursts, you must properly set the maximum response delay.

- The maximum response delay for IGMP general queries is set by the **max-response-time** command.
- The maximum response delay for IGMP group-specific queries equals the IGMP last-member query interval.

### Configuring the global parameters for IGMP queries and responses

Step	Command	Remarks
1. Enter system view.	<b>system-view</b>	N/A
2. Enter IGMP-snooping view.	<b>igmp-snooping</b>	N/A
3. Set the maximum response delay for IGMP general queries.	<b>max-response-time</b> <i>interval</i>	10 seconds by default
4. Set the IGMP last-member query interval.	<b>last-member-query-interval</b> <i>interval</i>	1 second by default

### Configuring the parameters for IGMP queries and responses in a VLAN

Step	Command	Remarks
1. Enter system view.	<b>system-view</b>	N/A
2. Enter VLAN view.	<b>vlan</b> <i>vlan-id</i>	N/A
3. Set the interval for sending IGMP general queries.	<b>igmp-snooping query-interval</b> <i>interval</i>	60 seconds by default
4. Set the maximum response delay for IGMP general queries.	<b>igmp-snooping max-response-time</b> <i>interval</i>	10 seconds by default
5. Set the IGMP last-member query interval.	<b>igmp-snooping last-member-query-interval</b> <i>interval</i>	1 second by default

## Configuring the source IP addresses for IGMP queries

After the switch receives an IGMP query whose source IP address is 0.0.0.0 on a port, it does not enlist that port as a dynamic router port. This might prevent multicast forwarding entries from being correctly created at the data link layer and eventually cause multicast traffic forwarding to fail. To avoid this problem, when a Layer 2 switch acts as the IGMP snooping querier, HP recommends you to configure a non-all-zero IP address as the source IP address of IGMP queries.

#### ⓘ IMPORTANT:

The source address of IGMP query messages might affect the IGMP querier election within the segment

To configure the source IP addresses for IGMP queries:

Step	Command	Remarks
1. Enter system view.	<b>system-view</b>	N/A

Step	Command	Remarks
2. Enter VLAN view.	<b>vlan</b> <i>vlan-id</i>	N/A
3. Configure the source address of IGMP general queries.	<b>igmp-snooping general-query source-ip</b> { <i>ip-address</i>   <b>current-interface</b> }	0.0.0.0 by default
4. Configure the source IP address of IGMP group-specific queries.	<b>igmp-snooping special-query source-ip</b> { <i>ip-address</i>   <b>current-interface</b> }	0.0.0.0 by default

## Configuring IGMP snooping proxying

Before you configure IGMP snooping proxying in a VLAN, complete the following tasks:

- Enable IGMP snooping in the VLAN.
- Determine the source IP address for the IGMP reports sent by the proxy.
- Determine the source IP address for the IGMP leave messages sent by the proxy.

### Enabling IGMP snooping proxying

The IGMP snooping proxying function works on a per-VLAN basis. After you enable the function in a VLAN, the device works as the IGMP snooping proxy for the downstream hosts and upstream router in the VLAN.

To enable IGMP snooping proxying in a VLAN:

Step	Command	Remarks
1. Enter system view.	<b>system-view</b>	N/A
2. Enter VLAN view.	<b>vlan</b> <i>vlan-id</i>	N/A
3. Enable IGMP snooping proxying in the VLAN.	<b>igmp-snooping proxying enable</b>	Disabled by default

## Configuring a source IP address for the IGMP messages sent by the proxy

You can set the source IP addresses in the IGMP reports and leave messages that the IGMP snooping proxy sends on behalf of its attached hosts.

To configure the source IP addresses for the IGMP messages that the IGMP snooping proxy sends on behalf of its attached hosts in a VLAN:

Step	Command	Remarks
1. Enter system view.	<b>system-view</b>	N/A
2. Enter VLAN view.	<b>vlan</b> <i>vlan-id</i>	N/A
3. Configure a source IP address for the IGMP reports that the proxy sends.	<b>igmp-snooping report source-ip</b> { <i>ip-address</i>   <b>current-interface</b> }	The default is 0.0.0.0.

Step	Command	Remarks
4. Configure a source IP address for the IGMP leave messages that the proxy sends.	<b>igmp-snooping leave source-ip</b> { <i>ip-address</i>   <b>current-interface</b> }	The default is 0.0.0.0.

## Configuring an IGMP snooping policy

Before you configure an IGMP snooping policy, complete the following tasks:

- Enable IGMP snooping in the VLAN.
- Determine the ACL rule for multicast group filtering.
- Determine the maximum number of multicast groups that a port can join.
- Determine the 802.1p precedence for IGMP messages.

## Configuring a multicast group filter

On an IGMP snooping-enabled switch, you can configure a multicast group filter to limit multicast programs available to users.

In an application, when a user requests a multicast program, the user's host initiates an IGMP report. After receiving this report message, the switch resolves the multicast group address in the report and looks up the ACL. If a match is found to permit the port that received the report to join the multicast group, the switch creates an IGMP snooping forwarding entry for the multicast group and adds the port to the forwarding entry. Otherwise, the switch drops this report message, in which case, the multicast data for the multicast group is not sent to this port, and the user cannot retrieve the program.

### Configuration guidelines

- When you configure a multicast group filter in a multicast VLAN, be sure to configure the filter in the sub-VLANs of the multicast VLAN. Otherwise, the configuration does not take effect.
- In a network that runs IGMPv3, when a host joins multiple multicast groups, the multicast group filter cannot correctly filter multicast groups because the host that runs IGMPv3 sends multiple multicast groups that it wants to join in one membership report.

### Configuration procedure

To configure a multicast group filter globally:

Step	Command	Remarks
1. Enter system view.	<b>system-view</b>	N/A
2. Enter IGMP-snooping view.	<b>igmp-snooping</b>	N/A
3. Configure a multicast group filter.	<b>group-policy</b> <i>acl-number</i> [ <b>vlan</b> <i>vlan-list</i> ]	By default, no group filter is globally configured. That is, the hosts in a VLAN can join any valid multicast group.

To configure a multicast group filter on a port:

Step	Command	Remarks
1. Enter system view.	<b>system-view</b>	N/A
2. Enter Layer 2 Ethernet interface view, Layer 2 aggregate interface view, or port group view.	<ul style="list-style-type: none"> <li>Enter Layer 2 Ethernet interface view or Layer 2 aggregate interface view: <b>interface</b> <i>interface-type</i> <i>interface-number</i></li> <li>Enter port group view: <b>port-group manual</b> <i>port-group-name</i></li> </ul>	Use either command.
3. Configure a multicast group filter.	<b>igmp-snooping group-policy</b> <i>acl-number</i> [ <b>vlan</b> <i>vlan-list</i> ]	By default, no group filter is configured on the current port. That is, the hosts on this port can join any valid multicast group.

## Configuring multicast source port filtering

When the multicast source port filtering feature is enabled on a port, the port can connect to only multicast receivers rather than to multicast sources, because the port blocks all multicast data packets but it permits multicast protocol packets to pass.

If this feature is disabled on a port, the port can connect to both multicast sources and multicast receivers.

### Configuring multicast source port filtering globally

Step	Command	Remarks
1. Enter system view.	<b>system-view</b>	N/A
2. Enter IGMP-snooping view.	<b>igmp-snooping</b>	N/A
3. Enable multicast source port filtering.	<b>source-deny port</b> <i>interface-list</i>	Disabled by default

### Configuring multicast source port filtering on a port

Step	Command	Remarks
1. Enter system view.	<b>system-view</b>	N/A
2. Enter Layer 2 Ethernet interface view or port group view.	<ul style="list-style-type: none"> <li>Enter Layer 2 Ethernet interface view: <b>interface</b> <i>interface-type</i> <i>interface-number</i></li> <li>Enter port group view: <b>port-group manual</b> <i>port-group-name</i></li> </ul>	Use either command.
3. Enable multicast source port filtering.	<b>igmp-snooping source-deny</b>	Disabled by default.

## Enabling dropping unknown multicast data

Unknown multicast data refers to multicast data for which no entries exist in the IGMP snooping forwarding table. When the switch receives such multicast traffic, one of the following occurs:

- When the function of dropping unknown multicast data is disabled, the switch floods unknown multicast data in the VLAN that the unknown multicast data belongs to, causing network bandwidth waste and low forwarding efficiency.
- When the function of dropping unknown multicast data is enabled, the switch forwards unknown multicast data to its router ports instead of flooding it in the VLAN. If no router ports exist, the switch drops the unknown multicast data.

### Configuration procedure

To enable dropping unknown multicast data in a VLAN:

Step	Command	Remarks
1. Enter system view.	<b>system-view</b>	N/A
2. Enter VLAN view.	<b>vlan</b> <i>vlan-id</i>	N/A
3. Enable dropping unknown multicast data.	<b>igmp-snooping drop-unknown</b>	Disabled by default

## Configuring IGMP report suppression

When a Layer 2 switch receives an IGMP report from a multicast group member, the switch forwards the message to the Layer 3 device that directly connects to the Layer 2 switch. When multiple members of a multicast group are attached to the Layer 2 switch, the Layer 3 device might receive duplicate IGMP reports for the multicast group from these members.

With the IGMP report suppression function enabled, within each query interval, the Layer 2 switch forwards only the first IGMP report for the multicast group to the Layer 3 device. It does not forward the subsequent IGMP reports for the same multicast group. This helps reduce the number of packets being transmitted over the network.

### ! IMPORTANT:

On an IGMP snooping proxy, IGMP membership reports are suppressed if the entries for the corresponding groups exist in the forwarding table, no matter the suppression function is enabled or not.

To configure IGMP report suppression:

Step	Command	Remarks
1. Enter system view.	<b>system-view</b>	N/A
2. Enter IGMP-snooping view.	<b>igmp-snooping</b>	N/A
3. Enable IGMP report suppression.	<b>report-aggregation</b>	Enabled by default

## Setting the maximum number of multicast groups that a port can join

To regulate multicast traffic on a port, configure the maximum number of multicast groups that the port can join.

When you configure this maximum number, if the number of multicast groups the port has joined exceeds the configured maximum value, the system deletes all the forwarding entries for the port from the IGMP snooping forwarding table, and the hosts on this port join multicast groups again until the number of multicast groups that the port joins reaches the maximum value. When the port joins a multicast group, if the port has been configured as a static member port, the system applies the configurations to the port again. If you have configured simulated joining on the port, the system establishes corresponding forwarding entry for the port after receiving a report from the simulated member host.

To set the maximum number of multicast groups that a port can join:

Step	Command	Remarks
1. Enter system view.	<b>system-view</b>	N/A
2. Enter Layer 2 Ethernet interface view, Layer 2 aggregate interface view, or port group view.	<ul style="list-style-type: none"><li>Enter Layer 2 Ethernet interface view or Layer 2 aggregate interface view: <b>interface</b> <i>interface-type</i> <i>interface-number</i></li><li>Enter port group view: <b>port-group manual</b> <i>port-group-name</i></li></ul>	Use either command.
3. Set the maximum number of multicast groups that a port can join.	<b>igmp-snooping group-limit</b> <i>limit</i> [ <b>vlan</b> <i>vlan-list</i> ]	1000 by default.

## Enabling multicast group replacement

For various reasons, the number of multicast groups that the switch or a port joins might exceed the upper limit. In addition, in some specific applications, a multicast group that the switch newly joins must replace an existing multicast group automatically. A typical example is channel switching. To view a new channel, a user switches from the current multicast group to the new one.

To realize such requirements, you can enable the multicast group replacement function on the switch or on a certain port. When the number of multicast groups that the switch or on the port has joined reaches the limit, one of the following occurs:

- If the multicast group replacement feature is disabled, new IGMP reports are automatically discarded.
- If the multicast group replacement feature is enabled, the multicast group that the switch or a port newly joins automatically replaces an existing multicast group that has the lowest address.

### ! IMPORTANT:

In the configuration, be sure to configure the maximum number of multicast groups allowed on a port (see "[Setting the maximum number of multicast groups that a port can join](#)") before enabling multicast group replacement. Otherwise, the multicast group replacement functionality will not take effect.

## Enabling multicast group replacement globally

Step	Command	Remarks
1. Enter system view.	<b>system-view</b>	N/A
2. Enter IGMP-snooping view.	<b>igmp-snooping</b>	N/A
3. Enable multicast group replacement.	<b>overflow-replace [ vlan <i>vlan-list</i> ]</b>	Disabled by default

## Enabling multicast group replacement on a port

Step	Command	Remarks
1. Enter system view.	<b>system-view</b>	N/A
2. Enter Layer 2 Ethernet interface view, Layer 2 aggregate interface view, or port group view.	<ul style="list-style-type: none"><li>Enter Layer 2 Ethernet interface view or Layer 2 aggregate interface view: <b>interface</b> <i>interface-type</i> <i>interface-number</i></li><li>Enter port group view: <b>port-group manual</b> <i>port-group-name</i></li></ul>	Use either command.
3. Enable multicast group replacement.	<b>igmp-snooping overflow-replace [ vlan <i>vlan-list</i> ]</b>	Disabled by default.

## Setting the 802.1p precedence for IGMP messages

You can change the 802.1p precedence for IGMP messages so that they can be assigned higher forwarding priority when congestion occurs on their outgoing ports.

### Setting the 802.1p precedence for IGMP messages globally

Step	Command	Remarks
1. Enter system view.	<b>system-view</b>	N/A
2. Enter IGMP-snooping view.	<b>igmp-snooping</b>	N/A
3. Set the 802.1p precedence for IGMP messages.	<b>dot1p-priority</b> <i>priority-number</i>	The default 802.1p precedence for IGMP messages is 0.

### Setting the 802.1p precedence for IGMP messages in a VLAN

Step	Command	Remarks
1. Enter system view.	<b>system-view</b>	N/A
2. Enter VLAN view.	<b>vlan</b> <i>vlan-id</i>	N/A

Step	Command	Remarks
3.	Set the 802.1p precedence for IGMP messages in the VLAN. <b>igmp-snooping dot1p-priority</b> <i>priority-number</i>	The default 802.1p precedence for IGMP messages is 0.

## Configuring a multicast user control policy

Multicast user control policies are configured on access switches to allow only authorized users to receive requested multicast traffic flows. This helps restrict users from ordering certain multicast-on-demand programs.

In practice, a device first needs to perform authentication (802.1X authentication, for example) on connected hosts through a RADIUS server. Then, the device uses the configured multicast user control policy to perform multicast access control on authenticated users as follows:

- After receiving an IGMP report from a host, the access switch matches the multicast group address and multicast source address carried in the report with the configured policies. If a match is found, the host is allowed to join the multicast group. Otherwise, the join report is dropped by the access switch.
- After receiving an IGMP leave message from a host, the access switch matches the multicast group and source addresses with the policies. If a match is found, the host is allowed to leave the group. Otherwise, the leave message is dropped by the access switch.

A multicast user control policy is functionally similar to a multicast group filter. A difference is that a control policy can control both multicast joining and leaving of users based on authentication and authorization, but a multicast group filter is configured on a port to control only multicast joining but not leaving of users without authentication or authorization.

To configure a multicast user control policy:

Step	Command	Remarks
1.	Enter system view. <b>system-view</b>	N/A
2.	Create a user profile and enter its view. <b>user-profile</b> <i>profile-name</i>	N/A
3.	Configure a multicast user control policy. <b>igmp-snooping access-policy</b> <i>acl-number</i>	No policy is configured by default. That is, a host can join or leave a valid multicast group at any time.
4.	Return to system view. <b>quit</b>	N/A
5.	Enable the created user profile. <b>user-profile</b> <i>profile-name</i> <b>enable</b>	Disabled by default.

For more information about the **user-profile** and **user-profile enable** commands, see *Security Command Reference*.

## Enabling the IGMP snooping host tracking function

With the IGMP snooping host tracking function, the switch can record the information of the member hosts that are receiving multicast traffic, including the host IP address, running duration, and timeout time. You can monitor and manage the member hosts according to the recorded information.

## Enabling the IGMP snooping host tracking function globally

Step	Command	Remarks
1. Enter system view.	<b>system-view</b>	N/A
2. Enter IGMP-snooping view.	<b>igmp-snooping</b>	N/A
3. Enable the IGMP snooping host tracking function globally.	<b>host-tracking</b>	Disabled by default

## Enabling the IGMP snooping host tracking function in a VLAN

Step	Command	Remarks
1. Enter system view.	<b>system-view</b>	N/A
2. Enter VLAN view.	<b>vlan</b> <i>vlan-id</i>	N/A
3. Enable the IGMP snooping host tracking function in the VLAN.	<b>igmp-snooping host-tracking</b>	Disabled by default

## Setting the DSCP value for IGMP messages

IPv4 uses an eight-bit ToS field to identify type of service for IP packets. As defined in RFC 2474, the first six bits contains the DSCP priority for prioritizing traffic in the network and the last two bits are reserved.

This configuration applies to only the IGMP messages that the local switch generates when the switch or its port acts as a member host, rather than those forwarded ones.

To set the DSCP value for IGMP messages:

Step	Command	Remarks
1. Enter system view.	<b>system-view</b>	N/A
2. Enter IGMP-snooping view.	<b>igmp-snooping</b>	N/A
3. Set the DSCP value for IGMP messages.	<b>dscp</b> <i>dscp-value</i>	By default, the DSCP value in IGMP messages is 48.

## Displaying and maintaining IGMP snooping

Task	Command	Remarks
Display IGMP snooping group information.	<b>display igmp-snooping group</b> [ <b>vlan</b> <i>vlan-id</i> ] [ <b>slot</b> <i>slot-number</i> ] [ <b>verbose</b> ] [ [ { <b>begin</b>   <b>exclude</b>   <b>include</b> } <i>regular-expression</i> ]	Available in any view.

Task	Command	Remarks
Display information about the hosts tracked by IGMP snooping.	<b>display igmp-snooping host vlan</b> <i>vlan-id group group-address</i> [ <b>source</b> <i>source-address</i> ] [ <b>slot</b> <i>slot-number</i> ] [   { <b>begin</b>   <b>exclude</b>   <b>include</b> } <i>regular-expression</i> ]	Available in any view.
Display static multicast MAC address entries.	<b>display mac-address</b> [ <i>mac-address</i> [ <b>vlan</b> <i>vlan-id</i> ]   [ <b>multicast</b> ] [ <b>vlan</b> <i>vlan-id</i> ] [ <b>count</b> ] ] [   { <b>begin</b>   <b>exclude</b>   <b>include</b> } <i>regular-expression</i> ]	Available in any view.
Display statistics for the IGMP messages learned by IGMP snooping.	<b>display igmp-snooping statistics</b> [   { <b>begin</b>   <b>exclude</b>   <b>include</b> } <i>regular-expression</i> ]	Available in any view.
Remove all the dynamic group entries of a specified IGMP snooping group or all IGMP snooping groups.	<b>reset igmp-snooping group</b> { <i>group-address</i>   <b>all</b> } [ <b>vlan</b> <i>vlan-id</i> ]	Available in user view.  This command works only on an IGMP snooping-enabled VLAN, but not in a VLAN with IGMP enabled on its VLAN interface.  This command cannot remove the static group entries of IGMP snooping groups.
Clear statistics for the IGMP messages learned by IGMP snooping.	<b>reset igmp-snooping statistics</b>	Available in user view.

## IGMP snooping configuration examples

### Group policy and simulated joining configuration example

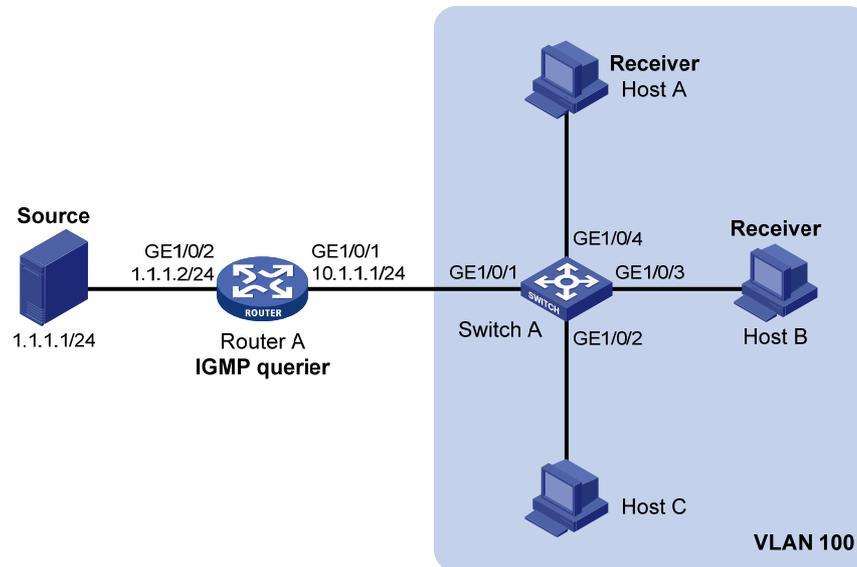
#### Network requirements

As shown in [Figure 13](#), IGMPv2 runs on Router A, IGMPv2 snooping runs on Switch A, and Router A acts as the IGMP querier on the subnet.

The receivers, Host A and Host B, can receive multicast traffic addressed to multicast group 224.1.1.1 only.

Multicast data for group 224.1.1.1 can be forwarded through GigabitEthernet 1/0/3 and GigabitEthernet 1/0/4 of Switch A even if Host A and Host B accidentally, temporarily stop receiving multicast data, and that Switch A drops unknown multicast data and does not broadcast the data to the VLAN where Switch A resides.

Figure 13 Network diagram



### Configuration procedure

1. Configure an IP address and subnet mask for each interface as per Figure 13. (Details not shown.)
2. On Router A, enable IP multicast routing, enable IGMP on GigabitEthernet 1/0/1, and enable PIM-DM on each interface.

```
<RouterA> system-view
[RouterA] multicast routing-enable
[RouterA] interface gigabitethernet 1/0/1
[RouterA-GigabitEthernet1/0/1] igmp enable
[RouterA-GigabitEthernet1/0/1] pim dm
[RouterA-GigabitEthernet1/0/1] quit
[RouterA] interface gigabitethernet 1/0/2
[RouterA-GigabitEthernet1/0/2] pim dm
[RouterA-GigabitEthernet1/0/2] quit
```

3. Configure Switch A:

# Enable IGMP snooping globally.

```
<SwitchA> system-view
[SwitchA] igmp-snooping
[SwitchA-igmp-snooping] quit
```

# Create VLAN 100, assign GigabitEthernet 1/0/1 through GigabitEthernet 1/0/4 to this VLAN, and enable IGMP snooping and the function of dropping unknown multicast traffic in the VLAN.

```
[SwitchA] vlan 100
[SwitchA-vlan100] port gigabitethernet 1/0/1 to gigabitethernet 1/0/4
[SwitchA-vlan100] igmp-snooping enable
[SwitchA-vlan100] igmp-snooping drop-unknown
[SwitchA-vlan100] quit
```

# Configure a multicast group filter so that the hosts in VLAN 100 can join only the multicast group 224.1.1.1.

```
[SwitchA] acl number 2001
[SwitchA-acl-basic-2001] rule permit source 224.1.1.1 0
```

```

[SwitchA-acl-basic-2001] quit
[SwitchA] igmp-snooping
[SwitchA-igmp-snooping] group-policy 2001 vlan 100
[SwitchA-igmp-snooping] quit
# Configure GigabitEthernet 1/0/3 and GigabitEthernet 1/0/4 as simulated hosts for multicast
group 224.1.1.1.
[SwitchA] interface gigabitethernet 1/0/3
[SwitchA-GigabitEthernet1/0/3] igmp-snooping host-join 224.1.1.1 vlan 100
[SwitchA-GigabitEthernet1/0/3] quit
[SwitchA] interface gigabitethernet 1/0/4
[SwitchA-GigabitEthernet1/0/4] igmp-snooping host-join 224.1.1.1 vlan 100
[SwitchA-GigabitEthernet1/0/4] quit

```

## Verifying the configuration

# Display detailed IGMP snooping group information in VLAN 100 on Switch A.

```

[SwitchA] display igmp-snooping group vlan 100 verbose
Total 1 IP Group(s).
Total 1 IP Source(s).
Total 1 MAC Group(s).

Port flags: D-Dynamic port, S-Static port, C-Copy port, P-PIM port
Subvlan flags: R-Real VLAN, C-Copy VLAN
Vlan(id):100.
Total 1 IP Group(s).
Total 1 IP Source(s).
Total 1 MAC Group(s).
Router port(s):total 1 port.
    GE1/0/1                (D) ( 00:01:30 )
IP group(s):the following ip group(s) match to one mac group.
IP group address:224.1.1.1
(0.0.0.0, 224.1.1.1):
Attribute:   Host Port
Host port(s):total 2 port.
    GE1/0/3                (D) ( 00:03:23 )
    GE1/0/4                (D) ( 00:04:10 )
MAC group(s):
MAC group address:0100-5e01-0101
Host port(s):total 2 port.
    GE1/0/3
    GE1/0/4

```

The output shows that GigabitEthernet 1/0/3 and GigabitEthernet 1/0/4 of Switch A has joined multicast group 224.1.1.1.

## Static port configuration example

### Network requirements

As shown in [Figure 14](#), IGMPv2 runs on Router A, and IGMPv2 snooping runs on Switch A, Switch B, and Switch C. Router A acts as the IGMP querier.

Host A and host C are permanent receivers of multicast group 224.1.1.1. GigabitEthernet 1/0/3 and GigabitEthernet 1/0/5 on Switch C are required to be configured as static member ports for multicast group 224.1.1.1 to enhance the reliability of multicast traffic transmission.

Suppose STP runs on the network. To avoid data loops, the forwarding path from Switch A to Switch C is blocked under normal conditions, and multicast traffic flows to the receivers attached to Switch C only along the path of Switch A—Switch B—Switch C.

Configure GigabitEthernet 1/0/3 on Switch A as a static router port, so that multicast traffic can flow to the receivers nearly uninterruptedly along the path of Switch A—Switch C in the case that the path of Switch A—Switch B—Switch C gets blocked.

For more information about the Spanning Tree Protocol (STP), see *Layer 2—LAN Switching Configuration Guide*.

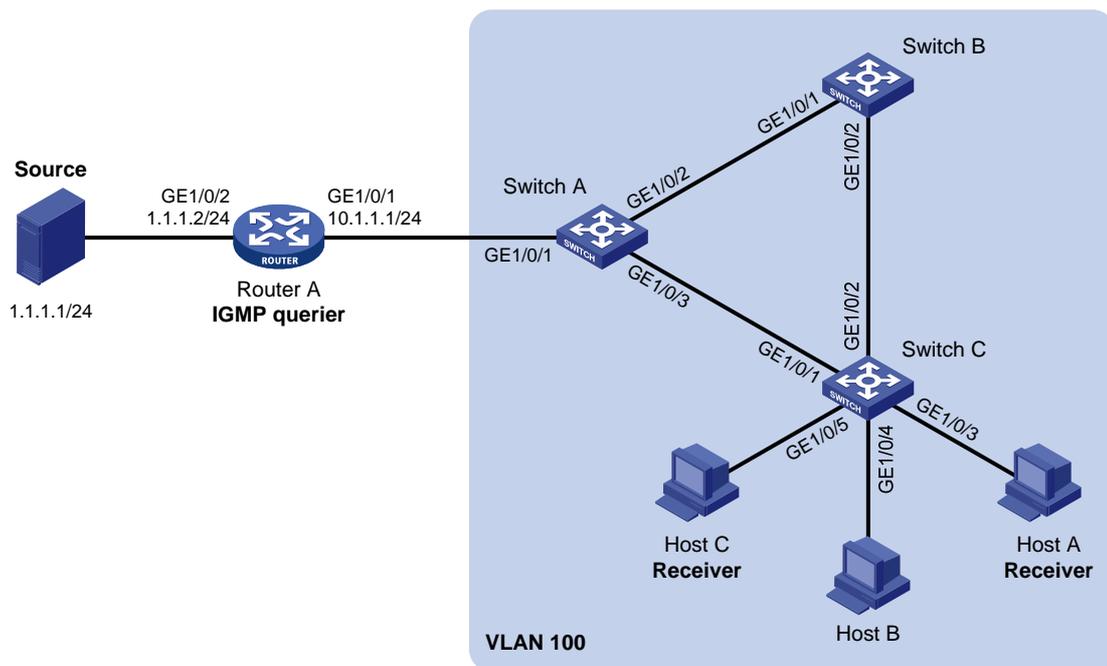
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**NOTE:**

If no static router port is configured, when the path of Switch A—Switch B—Switch C gets blocked, at least one IGMP query-response cycle must be completed before the multicast data can flow to the receivers along the new path of Switch A—Switch C. Namely multicast delivery will be interrupted during this process.

---

**Figure 14 Network diagram**



### Configuration procedure

1. Configure an IP address and subnet mask for each interface as per Figure 14. (Details not shown.)
2. On Router A, enable IP multicast routing, enable IGMP on GigabitEthernet 1/0/1, and enable PIM-DM on each interface.

```
<RouterA> system-view
[RouterA] multicast routing-enable
[RouterA] interface gigabitethernet 1/0/1
[RouterA-GigabitEthernet1/0/1] igmp enable
[RouterA-GigabitEthernet1/0/1] pim dm
```

```
[RouterA-GigabitEthernet1/0/1] quit
[RouterA] interface gigabitethernet 1/0/2
[RouterA-GigabitEthernet1/0/2] pim dm
[RouterA-GigabitEthernet1/0/2] quit
```

### 3. Configure Switch A:

# Enable IGMP snooping globally.

```
<SwitchA> system-view
[SwitchA] igmp-snooping
[SwitchA-igmp-snooping] quit
```

# Create VLAN 100, assign GigabitEthernet 1/0/1 through GigabitEthernet 1/0/3 to this VLAN, and enable IGMP snooping in the VLAN.

```
[SwitchA] vlan 100
[SwitchA-vlan100] port gigabitethernet 1/0/1 to gigabitethernet 1/0/3
[SwitchA-vlan100] igmp-snooping enable
[SwitchA-vlan100] quit
```

# Configure GigabitEthernet 1/0/3 to be a static router port.

```
[SwitchA] interface gigabitethernet 1/0/3
[SwitchA-GigabitEthernet1/0/3] igmp-snooping static-router-port vlan 100
[SwitchA-GigabitEthernet1/0/3] quit
```

### 4. Configure Switch B:

# Enable IGMP snooping globally.

```
<SwitchB> system-view
[SwitchB] igmp-snooping
[SwitchB-igmp-snooping] quit
```

# Create VLAN 100, assign GigabitEthernet 1/0/1 and GigabitEthernet 1/0/2 to this VLAN, and enable IGMP snooping in the VLAN.

```
[SwitchB] vlan 100
[SwitchB-vlan100] port gigabitethernet 1/0/1 gigabitethernet 1/0/2
[SwitchB-vlan100] igmp-snooping enable
[SwitchB-vlan100] quit
```

### 5. Configure Switch C:

# Enable IGMP snooping globally.

```
<SwitchC> system-view
[SwitchC] igmp-snooping
[SwitchC-igmp-snooping] quit
```

# Create VLAN 100, assign GigabitEthernet 1/0/1 through GigabitEthernet 1/0/5 to this VLAN, and enable IGMP snooping in the VLAN.

```
[SwitchC] vlan 100
[SwitchC-vlan100] port gigabitethernet 1/0/1 to gigabitethernet 1/0/5
[SwitchC-vlan100] igmp-snooping enable
[SwitchC-vlan100] quit
```

# Configure GigabitEthernet 1/0/3 and GigabitEthernet 1/0/5 as static member ports for multicast group 224.1.1.1.

```
[SwitchC] interface GigabitEthernet 1/0/3
[SwitchC-GigabitEthernet1/0/3] igmp-snooping static-group 224.1.1.1 vlan 100
[SwitchC-GigabitEthernet1/0/3] quit
```

```
[SwitchC] interface GigabitEthernet 1/0/5
[SwitchC-GigabitEthernet1/0/5] igmp-snooping static-group 224.1.1.1 vlan 100
[SwitchC-GigabitEthernet1/0/5] quit
```

## Verifying the configuration

# Display detailed IGMP snooping group information in VLAN 100 on Switch A.

```
[SwitchA] display igmp-snooping group vlan 100 verbose
Total 1 IP Group(s).
Total 1 IP Source(s).
Total 1 MAC Group(s).

Port flags: D-Dynamic port, S-Static port, C-Copy port, P-PIM port
Subvlan flags: R-Real VLAN, C-Copy VLAN
Vlan(id):100.
Total 1 IP Group(s).
Total 1 IP Source(s).
Total 1 MAC Group(s).
Router port(s):total 2 port.
    GE1/0/1          (D) ( 00:01:30 )
    GE1/0/3          (S)
IP group(s):the following ip group(s) match to one mac group.
IP group address:224.1.1.1
(0.0.0.0, 224.1.1.1):
Attribute:   Host Port
Host port(s):total 1 port.
    GE1/0/2          (D) ( 00:03:23 )
MAC group(s):
MAC group address:0100-5e01-0101
Host port(s):total 1 port.
    GE1/0/2
```

The output shows that GigabitEthernet 1/0/3 of Switch A has become a static router port.

# Display detailed IGMP snooping group information in VLAN 100 on Switch C.

```
[SwitchC] display igmp-snooping group vlan 100 verbose
Total 1 IP Group(s).
Total 1 IP Source(s).
Total 1 MAC Group(s).

Port flags: D-Dynamic port, S-Static port, C-Copy port, P-PIM port
Subvlan flags: R-Real VLAN, C-Copy VLAN
Vlan(id):100.
Total 1 IP Group(s).
Total 1 IP Source(s).
Total 1 MAC Group(s).
Router port(s):total 1 port.
    GE1/0/2          (D) ( 00:01:23 )
IP group(s):the following ip group(s) match to one mac group.
IP group address:224.1.1.1
(0.0.0.0, 224.1.1.1):
```

```

Attribute:      Host Port
Host port(s):total 2 port.
    GE1/0/3          (S)
    GE1/0/5          (S)
MAC group(s):
MAC group address:0100-5e01-0101
Host port(s):total 2 port.
    GE1/0/3
    GE1/0/5

```

The output shows that GigabitEthernet 1/0/3 and GigabitEthernet 1/0/5 on Switch C have become static member ports for multicast group 224.1.1.1.

## IGMP snooping querier configuration example

### Network requirements

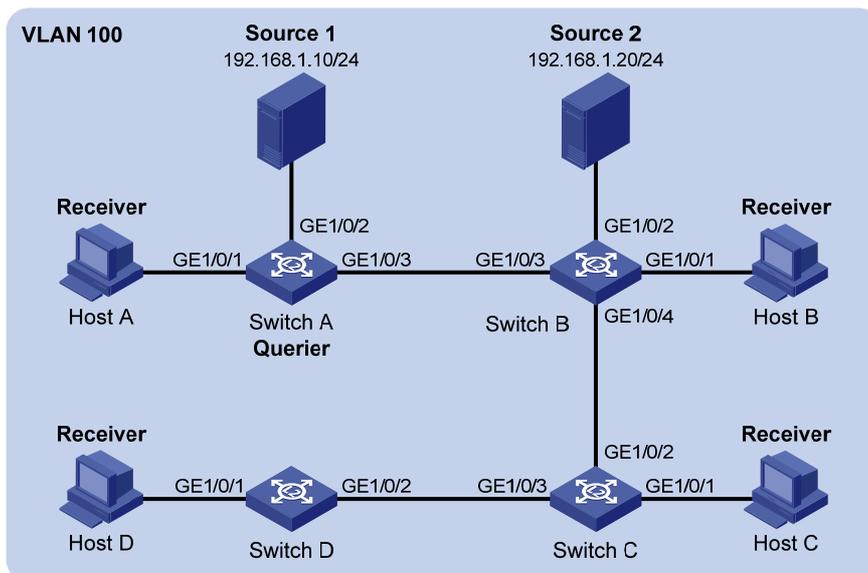
As shown in Figure 15, in a Layer 2-only network environment, two multicast sources Source 1 and Source 2 send multicast data to multicast groups 224.1.1.1 and 225.1.1.1 respectively, Host A and Host C are receivers of multicast group 224.1.1.1, and Host B and Host D are receivers of multicast group 225.1.1.1.

All the receivers run IGMPv2, and all the switches run IGMPv2 snooping. Switch A, which is close to the multicast sources, is chosen as the IGMP snooping querier.

To prevent flooding of unknown multicast traffic within the VLAN, be sure to configure all the switches to drop unknown multicast data packets.

Because a switch does not enlist a port that has heard an IGMP query with a source IP address of 0.0.0.0 (default) as a dynamic router port, configure a non-all-zero IP address as the source IP address of IGMP queries to ensure normal creation of Layer 2 multicast forwarding entries.

Figure 15 Network diagram



### Configuration procedure

1. Configure switch A:

```

# Enable IGMP snooping globally.
<SwitchA> system-view
[SwitchA] igmp-snooping
[SwitchA-igmp-snooping] quit
# Create VLAN 100 and assign GigabitEthernet 1/0/1 through GigabitEthernet 1/0/3 to the
VLAN.
[SwitchA] vlan 100
[SwitchA-vlan100] port gigabitethernet 1/0/1 to gigabitethernet 1/0/3
# Enable IGMP snooping and the function of dropping unknown multicast traffic in VLAN 100.
[SwitchA-vlan100] igmp-snooping enable
[SwitchA-vlan100] igmp-snooping drop-unknown
# Enable the IGMP snooping querier function in VLAN 100
[SwitchA-vlan100] igmp-snooping querier
# Set the source IP address of IGMP general queries and group-specific queries to 192.168.1.1
in VLAN 100.
[SwitchA-vlan100] igmp-snooping general-query source-ip 192.168.1.1
[SwitchA-vlan100] igmp-snooping special-query source-ip 192.168.1.1
[SwitchA-vlan100] quit

```

## 2. Configure Switch B:

```

# Enable IGMP snooping globally.
<SwitchB> system-view
[SwitchB] igmp-snooping
[SwitchB-igmp-snooping] quit
# Create VLAN 100, and assign GigabitEthernet 1/0/1 through GigabitEthernet 1/0/4 to the
VLAN.
[SwitchB] vlan 100
[SwitchB-vlan100] port gigabitethernet 1/0/1 to gigabitethernet 1/0/4
# Enable IGMP snooping and the function of dropping unknown multicast traffic in VLAN 100.
[SwitchB-vlan100] igmp-snooping enable
[SwitchB-vlan100] igmp-snooping drop-unknown
[SwitchB-vlan100] quit

```

Configurations on Switch C and Switch D are similar to the configuration on Switch B.

## Verifying the configuration

After the IGMP snooping querier starts to work, all the switches but the querier can receive IGMP general queries. By using the **display igmp-snooping statistics** command, you can display statistics for the IGMP messages received. For example:

```

# Display IGMP message statistics on Switch B.
[SwitchB] display igmp-snooping statistics
Received IGMP general queries:3.
Received IGMPv1 reports:0.
Received IGMPv2 reports:12.
Received IGMP leaves:0.
Received IGMPv2 specific queries:0.
Sent IGMPv2 specific queries:0.
Received IGMPv3 reports:0.

```

```

Received IGMPv3 reports with right and wrong records:0.
Received IGMPv3 specific queries:0.
Received IGMPv3 specific sg queries:0.
Sent IGMPv3 specific queries:0.
Sent IGMPv3 specific sg queries:0.
Received error IGMP messages:0.

```

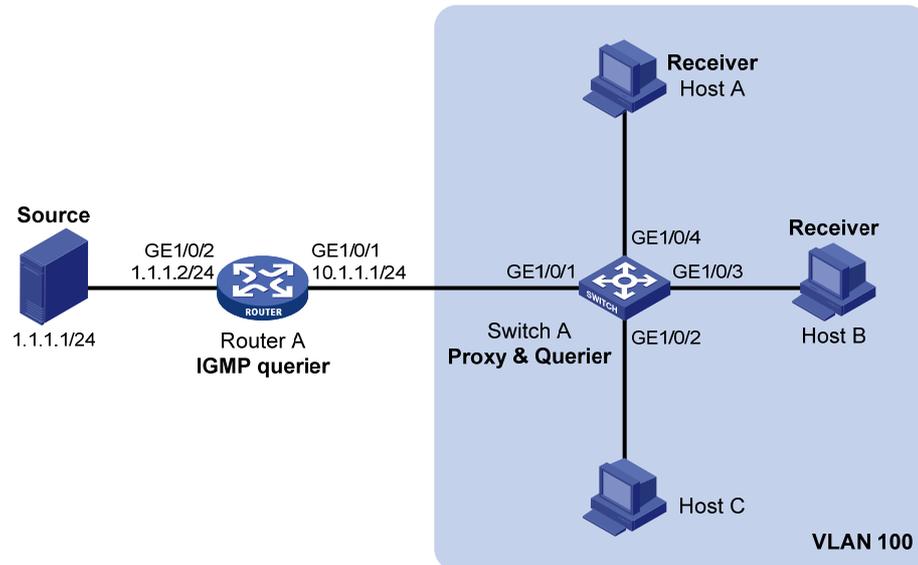
## IGMP snooping proxying configuration example

### Network requirements

As shown in [Figure 16](#), Router A runs IGMPv2 and Switch A runs IGMPv2 snooping. Router A acts as the IGMP querier.

Configure IGMP snooping proxying on Switch A, enabling the switch to forward IGMP reports and leave messages on behalf of attached hosts and to respond to IGMP queries from Router A and forward the queries to the hosts on behalf of Router A.

**Figure 16 Network diagram**



### Configuration procedure

1. Configure an IP address and subnet mask for each interface as per [Figure 16](#). (Details not shown.)
2. On Router A, enable IP multicast routing, enable IGMP on GigabitEthernet 1/0/1, and enable PIM-DM on each interface.

```

<RouterA> system-view
[RouterA] multicast routing-enable
[RouterA] interface gigabitethernet 1/0/1
[RouterA-GigabitEthernet1/0/1] igmp enable
[RouterA-GigabitEthernet1/0/1] pim dm
[RouterA-GigabitEthernet1/0/1] quit
[RouterA] interface gigabitethernet 1/0/2
[RouterA-GigabitEthernet1/0/2] pim dm
[RouterA-GigabitEthernet1/0/2] quit

```

3. Configure Switch A:

```
# Enable IGMP snooping globally.
```

```
<SwitchA> system-view  
[SwitchA] igmp-snooping  
[SwitchA-igmp-snooping] quit
```

```
# Create VLAN 100, assign ports GigabitEthernet 1/0/1 through GigabitEthernet 1/0/4 to this  
VLAN, and enable IGMP snooping and IGMP snooping proxying in the VLAN.
```

```
[SwitchA] vlan 100  
[SwitchA-vlan100] port gigabitethernet 1/0/1 to gigabitethernet 1/0/4  
[SwitchA-vlan100] igmp-snooping enable  
[SwitchA-vlan100] igmp-snooping proxying enable  
[SwitchA-vlan100] quit
```

## Verifying the configuration

After the configuration is completed, Host A and Host B send IGMP join messages for group 224.1.1.1. Receiving the messages, Switch A sends a join message for the group out of port GigabitEthernet 1/0/1 (a router port) to Router A.

Use the **display igmp-snooping group** command and the **display igmp group** command to display information about IGMP snooping groups and IGMP multicast groups. For example:

```
# Display information about IGMP snooping groups on Switch A.
```

```
[SwitchA] display igmp-snooping group  
Total 1 IP Group(s).  
Total 1 IP Source(s).  
Total 1 MAC Group(s).
```

```
Port flags: D-Dynamic port, S-Static port, C-Copy port, P-PIM port
```

```
Subvlan flags: R-Real VLAN, C-Copy VLAN
```

```
Vlan(id):100.
```

```
Total 1 IP Group(s).
```

```
Total 1 IP Source(s).
```

```
Total 1 MAC Group(s).
```

```
Router port(s):total 1 port.
```

```
GE1/0/1 (D) ( 00:01:23 )
```

```
IP group(s):the following ip group(s) match to one mac group.
```

```
IP group address:224.1.1.1
```

```
(0.0.0.0, 224.1.1.1):
```

```
Host port(s):total 2 port.
```

```
GE1/0/3 (D)
```

```
GE1/0/4 (D)
```

```
MAC group(s):
```

```
MAC group address:0100-5e01-0101
```

```
Host port(s):total 2 port.
```

```
GE1/0/3
```

```
GE1/0/4
```

```
# Display information about IGMP multicast groups on Router A.
```

```
[RouterA] display igmp group
```

```
Total 1 IGMP Group(s).
```

```
Interface group report information of VPN-Instance: public net
```

```
GigabitEthernet1/0/1(10.1.1.1):
Total 1 IGMP Group reported
  Group Address      Last Reporter    Uptime    Expires
  224.1.1.1          0.0.0.0          00:00:06  00:02:04
```

When Host A leaves the multicast group, it sends an IGMP leave message to Switch A. Receiving the message, Switch A removes port GigabitEthernet 1/0/4 from the member port list of the forwarding entry for the group; however, it does not remove the group or forward the leave message to Router A because Host B is still in the group. Use the **display igmp-snooping group** command to display information about IGMP snooping groups. For example:

# Display information about IGMP snooping groups on Switch A.

```
[SwitchA] display igmp-snooping group
Total 1 IP Group(s).
Total 1 IP Source(s).
Total 1 MAC Group(s).
Port flags: D-Dynamic port, S-Static port, C-Copy port, P-PIM port
Subvlan flags: R-Real VLAN, C-Copy VLAN
Vlan(id):100.
Total 1 IP Group(s).
Total 1 IP Source(s).
Total 1 MAC Group(s).
Router port(s):total 1 port.
      GE1/0/1                (D) ( 00:01:23 )
IP group(s):the following ip group(s) match to one mac group.
IP group address:224.1.1.1
      (0.0.0.0, 224.1.1.1):
      Host port(s):total 1 port.
      GE1/0/3                (D)
MAC group(s):
MAC group address:0100-5e01-0101
Host port(s):total 1 port.
      GE1/0/3
```

## Multicast source and user control policy configuration example

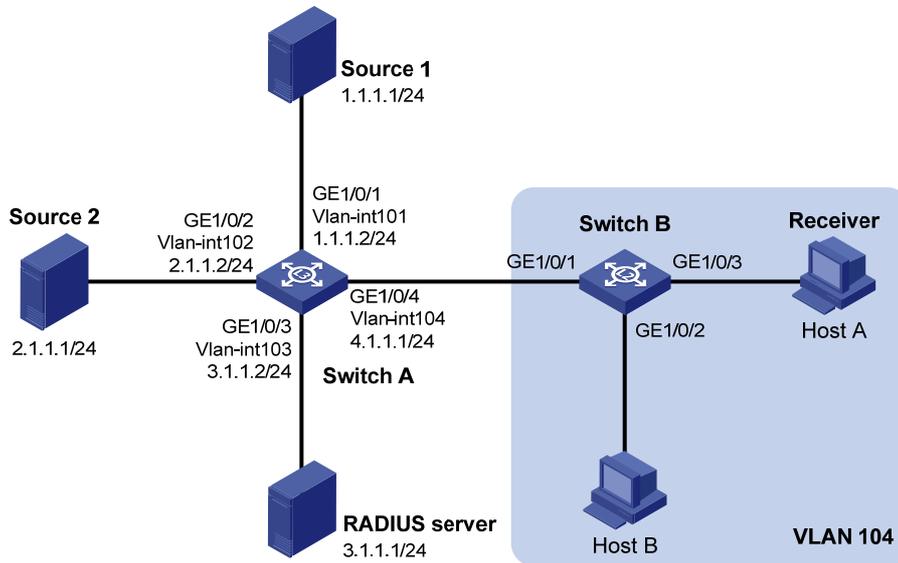
### Network requirements

As shown in [Figure 17](#), Switch A is a Layer-3 switch. Switch A runs IGMPv2 and Switch B runs IGMPv2 snooping. Multicast sources and hosts run 802.1X client.

A multicast source control policy is configured on Switch A to block multicast flows from Source 2 to 224.1.1.1.

A multicast user control policy is configured on Switch B so that Host A can join or leave only multicast group 224.1.1.1.

Figure 17 Network diagram



## Configuration procedures

1. Configure an IP address and subnet mask for each interface as per Figure 17. (Details not shown.)
2. Configure Switch A:

# Create VLAN 101 through VLAN 104 and assign GigabitEthernet 1/0/1 through GigabitEthernet 1/0/4 to the four VLANs respectively.

```
<SwitchA> system-view
[SwitchA] vlan 101
[SwitchA-vlan101] port gigabitethernet 1/0/1
[SwitchA-vlan101] quit
[SwitchA] vlan 102
[SwitchA-vlan102] port gigabitethernet 1/0/2
[SwitchA-vlan102] quit
[SwitchA] vlan 103
[SwitchA-vlan103] port gigabitethernet 1/0/3
[SwitchA-vlan103] quit
[SwitchA] vlan 104
[SwitchA-vlan104] port gigabitethernet 1/0/4
[SwitchA-vlan104] quit
```

# Enable IP multicast routing. Enable PIM-DM on VLAN-interface 101, VLAN-interface 102 and VLAN-interface 104, and enable IGMP on VLAN-interface 104.

```
[SwitchA] multicast routing-enable
[SwitchA] interface vlan-interface 101
[SwitchA-Vlan-interface101] pim dm
[SwitchA-Vlan-interface101] quit
[SwitchA] interface vlan-interface 102
[SwitchA-Vlan-interface102] pim dm
[SwitchA-Vlan-interface102] quit
[SwitchA] interface vlan-interface 104
[SwitchA-Vlan-interface104] pim dm
[SwitchA-Vlan-interface104] igmp enable
```

```

[SwitchA-Vlan-interface104] quit
# Create QoS policy policy1 to block multicast flows from Source 2 to 224.1.1.1.
[SwitchA] acl number 3001
[SwitchA-acl-adv-3001] rule permit udp source 2.1.1.1 0 destination 224.1.1.1 0
[SwitchA-acl-adv-3001] quit [SwitchA] traffic classifier classifier1
[SwitchA-classifier-classifier1] if-match acl 3001
[SwitchA-classifier-classifier1] quit
[SwitchA] traffic behavior behavior1
[SwitchA-behavior-behavior1] filter deny
[SwitchA-behavior-behavior1] quit
[SwitchA] qos policy policy1
[SwitchA-qospolicy-policy1] classifier classifier1 behavior behavior1
[SwitchA-qospolicy-policy1] quit
# Create user profile profile1, apply QoS policy policy1 to the inbound direction in user profile
view, and enable the user profile.
[SwitchA] user-profile profile1
[SwitchA-user-profile-profile1] qos apply policy policy1 inbound
[SwitchA-user-profile-profile1] quit
[SwitchA] user-profile profile1 enable
# Create RADIUS scheme scheme1; set the service type for the RADIUS server to extended; specify
the IP addresses of the primary authentication/authorization server and accounting server as
3.1.1.1; set the shared keys to 123321; specify that no domain name is carried in a username
sent to the RADIUS server.
[SwitchA] radius scheme scheme1
[SwitchA-radius-scheme1] server-type extended
[SwitchA-radius-scheme1] primary authentication 3.1.1.1
[SwitchA-radius-scheme1] key authentication 123321
[SwitchA-radius-scheme1] primary accounting 3.1.1.1
[SwitchA-radius-scheme1] key accounting 123321
[SwitchA-radius-scheme1] user-name-format without-domain
[SwitchA-radius-scheme1] quit
# Create ISP domain domain1; reference scheme1 for the authentication, authorization, and
accounting of LAN users; specify domain1 as the default ISP domain.
[SwitchA] domain domain1
[SwitchA-isp-domian1] authentication lan-access radius-scheme scheme1
[SwitchA-isp-domian1] authorization lan-access radius-scheme scheme1
[SwitchA-isp-domian1] accounting lan-access radius-scheme scheme1
[SwitchA-isp-domian1] quit
[SwitchA] domain default enable domain1
# Globally enable 802.1X and then enable it on GigabitEthernet 1/0/1 and GigabitEthernet
1/0/2 respectively.
[SwitchA] dot1x
[SwitchA] interface gigabitethernet 1/0/1
[SwitchA-GigabitEthernet1/0/1] dot1x
[SwitchA-GigabitEthernet1/0/1] quit
[SwitchA] interface gigabitethernet 1/0/2
[SwitchA-GigabitEthernet1/0/2] dot1x
[SwitchA-GigabitEthernet1/0/2] quit

```

### 3. Configure Switch B:

# Globally enable IGMP snooping.

```
<SwitchB> system-view
[SwitchB] igmp-snooping
[SwitchB-igmp-snooping] quit
```

# Create VLAN 104, assign GigabitEthernet 1/0/1 through GigabitEthernet 1/0/3 to this VLAN, and enable IGMP snooping in this VLAN.

```
[SwitchB] vlan 104
[SwitchB-vlan104] port gigabitethernet 1/0/1 to gigabitethernet 1/0/3
[SwitchB-vlan104] igmp-snooping enable
[SwitchB-vlan104] quit
```

# Create a user profile **profile2** to allow users to join or leave only one multicast group, 224.1.1.1. Then, enable the user profile.

```
[SwitchB] acl number 2001
[SwitchB-acl-basic-2001] rule permit source 224.1.1.1 0
[SwitchB-acl-basic-2001] quit
[SwitchB] user-profile profile2
[SwitchB-user-profile-profile2] igmp-snooping access-policy 2001
[SwitchB-user-profile-profile2] quit
[SwitchB] user-profile profile2 enable
```

# Create a RADIUS scheme **scheme2**; set the service type for the RADIUS server to **extended**; specify the IP addresses of the primary authentication/authorization server and accounting server as 3.1.1.1; set the shared keys to 321123; specify that a username sent to the RADIUS server carry no domain name.

```
[SwitchB] radius scheme scheme2
[SwitchB-radius-scheme2] server-type extended
[SwitchB-radius-scheme2] primary authentication 3.1.1.1
[SwitchB-radius-scheme2] key authentication 321123
[SwitchB-radius-scheme2] primary accounting 3.1.1.1
[SwitchB-radius-scheme2] key accounting 321123
[SwitchB-radius-scheme2] user-name-format without-domain
[SwitchB-radius-scheme2] quit
```

# Create an ISP domain **domain2**; reference **scheme2** for the authentication, authorization, and accounting of LAN users; specify **domain2** as the default ISP domain.

```
[SwitchB] domain domain2
[SwitchB-isp-domian2] authentication lan-access radius-scheme scheme2
[SwitchB-isp-domian2] authorization lan-access radius-scheme scheme2
[SwitchB-isp-domian2] accounting lan-access radius-scheme scheme2
[SwitchB-isp-domian2] quit
[SwitchB] domain default enable domain2
```

# Globally enable 802.1X and then enable it on GigabitEthernet 1/0/2 and GigabitEthernet 1/0/3 respectively.

```
[SwitchB] dot1x
[SwitchB] interface gigabitethernet 1/0/2
[SwitchB-GigabitEthernet1/0/2] dot1x
[SwitchB-GigabitEthernet1/0/2] quit
[SwitchB] interface gigabitethernet 1/0/3
```

```
[SwitchB-GigabitEthernet1/0/3] dot1x
[SwitchB-GigabitEthernet1/0/3] quit
```

#### 4. Configure the RADIUS server:

On the RADIUS server, configure the parameters related to Switch A and Switch B. For more information, see the configuration guide of the RADIUS server.

### Verifying the configuration

After the configurations, the two multicast sources and hosts initiate 802.1X authentication. After passing authentication, Source 1 sends multicast flows to 224.1.1.1 and Source 2 sends multicast flows to 224.1.1.2; Host A sends messages to join multicast groups 224.1.1.1 and 224.1.1.2. Use the **display igmp-snooping group** command to display information about IGMP snooping groups. For example:

# Display information about IGMP snooping groups in VLAN 104 on Switch B.

```
[SwitchB] display igmp-snooping group vlan 104 verbose
Total 1 IP Group(s).
Total 1 IP Source(s).
Total 1 MAC Group(s).

Port flags: D-Dynamic port, S-Static port, C-Copy port, P-PIM port
Subvlan flags: R-Real VLAN, C-Copy VLAN
Vlan(id):104.
Total 1 IP Group(s).
Total 1 IP Source(s).
Total 1 MAC Group(s).
Router port(s):total 1 port.
    GE1/0/1                (D) ( 00:01:30 )
IP group(s):the following ip group(s) match to one mac group.
  IP group address:224.1.1.1
    (0.0.0.0, 224.1.1.1):
      Attribute:   Host Port
      Host port(s):total 1 port.
        GE1/0/3                (D) ( 00:04:10 )
MAC group(s):
  MAC group address:0100-5e01-0101
  Host port(s):total 1 port.
    GE1/0/3
```

The output shows that GigabitEthernet 1/0/3 on Switch B has joined 224.1.1.1 but not 224.1.1.2.

Assume that Source 2 starts sending multicast traffic to 224.1.1.1. Use the **display multicast forwarding-table** to display the multicast forwarding table information.

# Display information about 224.1.1.1 in the multicast forwarding table on Switch A.

```
[SwitchA] display multicast forwarding-table 224.1.1.1
Multicast Forwarding Table of VPN-Instance: public net

Total 1 entry

Total 1 entry matched
00001. (1.1.1.1, 224.1.1.1)
  MID: 0, Flags: 0x0:0
```

```
Uptime: 00:08:32, Timeout in: 00:03:26
Incoming interface: Vlan-interface101
List of 1 outgoing interfaces:
  1: Vlan-interface104
Matched 19648 packets(20512512 bytes), Wrong If 0 packets
Forwarded 19648 packets(20512512 bytes)
```

The output shows that Switch A maintains a multicast forwarding entry for multicast packets from Source 1 to 224.1.1.1. No forwarding entry exists for packets from Source 2 to 224.1.1.1, which indicates that multicast packets from Source 2 are blocked.

## Troubleshooting IGMP snooping

### Layer 2 multicast forwarding cannot function

#### Symptom

Layer 2 multicast forwarding cannot function.

#### Analysis

IGMP snooping is not enabled.

#### Solution

1. Use the **display current-configuration** command to check the running status of IGMP snooping.
2. If IGMP snooping is not enabled, use the **igmp-snooping** command to enable IGMP snooping globally, and then use the **igmp-snooping enable** command to enable IGMP snooping in VLAN view.
3. If IGMP snooping is disabled only for the corresponding VLAN, use the **igmp-snooping enable** command in VLAN view to enable IGMP snooping in the corresponding VLAN.

### Configured multicast group policy fails to take effect

#### Symptom

Although a multicast group policy has been configured to allow hosts to join specific multicast groups, the hosts can still receive multicast data addressed to other multicast groups.

#### Analysis

- The ACL rule is incorrectly configured.
- The multicast group policy is not correctly applied.
- The function of dropping unknown multicast data is not enabled, so unknown multicast data is flooded.

#### Solution

1. Use the **display acl** command to check the configured ACL rule. Make sure that the ACL rule conforms to the multicast group policy to be implemented.
2. Use the **display this** command in IGMP-snooping view or in the corresponding interface view to verify that the correct multicast group policy has been applied. If not, use the **group-policy** or **igmp-snooping group-policy** command to apply the correct multicast group policy.

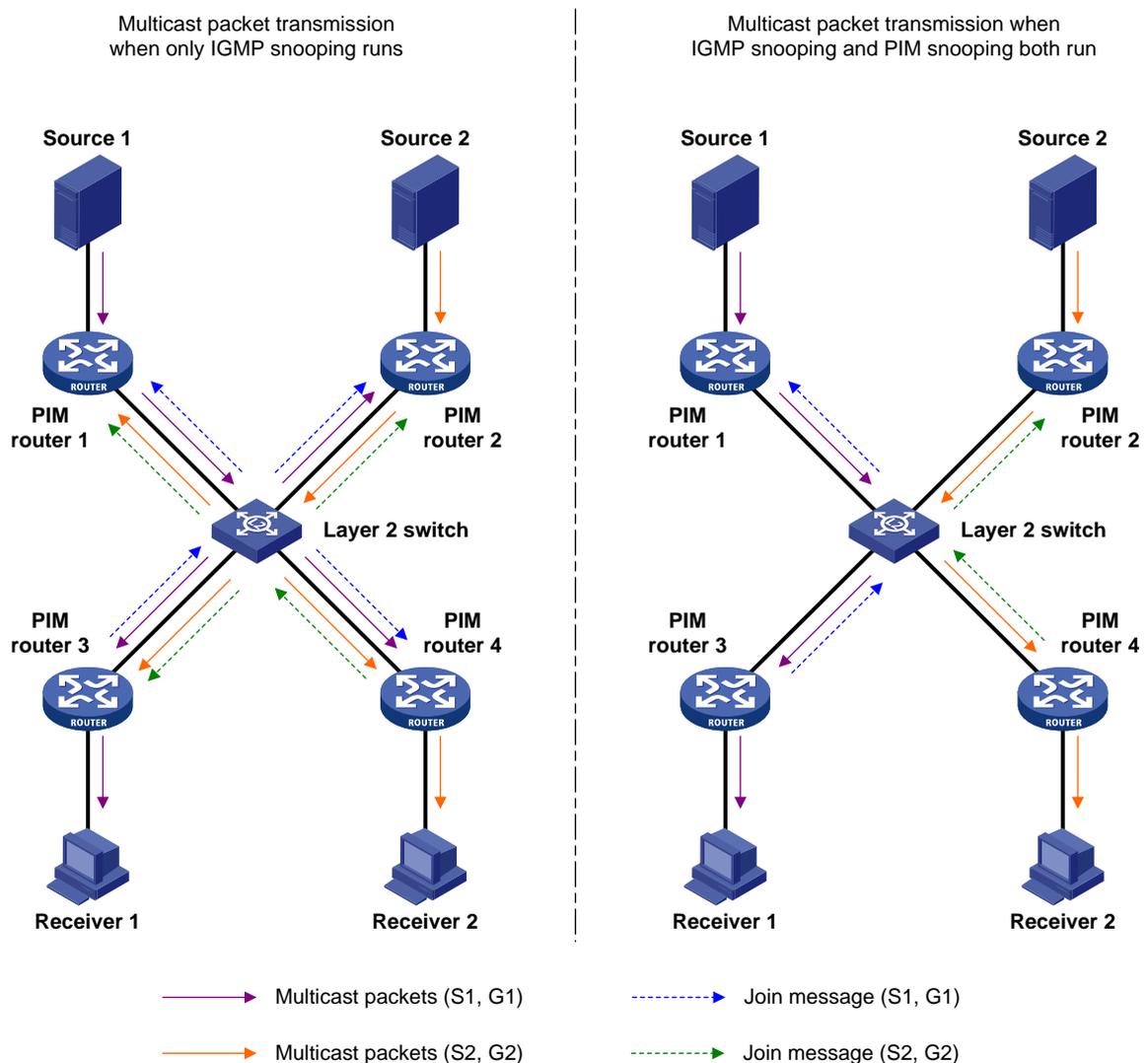
3. Use the **display current-configuration** command to verify that the function of dropping unknown multicast data is enabled. If not, use the **igmp-snooping drop-unknown** command to enable the function of dropping unknown multicast data.

# Configuring PIM snooping

## Overview

Protocol Independent Multicast (PIM) snooping runs on Layer 2 devices. It determines which ports are interested in multicast data by analyzing the received PIM messages, and adds the ports to a multicast forwarding entry to make sure that multicast data can be forwarded to only the ports that are interested in the data.

**Figure 18 Multicast packet transmission without or with PIM snooping**



As shown in Figure 18, Source 1 sends multicast data to multicast group G1, and Source 2 sends multicast data to multicast group G2. Receiver 1 belongs to G1, and Receiver 2 belongs to G2. The Layer 2 switch's interfaces that connect to the PIM-capable routers are in the same VLAN.

- When the Layer 2 switch runs only IGMP snooping, it maintains the router ports according to the received PIM hello messages that PIM-capable routers send, broadcasts all other types of received

PIM messages in the VLAN, and forwards all multicast data to all router ports in the VLAN. Each PIM-capable router in the VLAN, whether interested in the multicast data or not, can receive all multicast data and all PIM messages except PIM hello messages.

- When the Layer 2 switch runs both IGMP snooping and PIM snooping, it determines whether PIM-capable routers are interested in the multicast data addressed to a multicast group according to PIM messages received from the routers, and adds only the ports for connecting the routers that are interested in the data to a multicast forwarding entry. Then, the Layer 2 switch forwards PIM messages and multicast data to only the routers that are interested in the data, saving network bandwidth.

For more information about IGMP snooping and the router port, see "[Configuring IGMP snooping](#)."

## Configuring PIM snooping

When you configure PIM snooping, follow these guidelines:

- Before configuring PIM snooping for a VLAN, be sure to enable IGMP snooping globally and specifically for the VLAN.
- After you enable PIM snooping in a VLAN, PIM snooping works only on the member interfaces of the VLAN.
- PIM snooping does not work in the sub-VLANs of a multicast VLAN. For more information about multicast VLAN, see "[Configuring multicast VLANs](#)."
- In a network with PIM snooping enabled switches, configure the size of each join/prune message no more than the path maximum transmission unit (MTU) on the PIM-enabled edge router on the receiver side.

To configure PIM snooping:

Step	Command	Remarks
1. Enter system view.	<b>system-view</b>	N/A
2. Enable IGMP snooping globally and enter IGMP-snooping view.	<b>igmp-snooping</b>	Disabled by default
3. Return to system view.	<b>quit</b>	N/A
4. Enter VLAN view.	<b>vlan</b> <i>vlan-id</i>	N/A
5. Enable IGMP snooping in the VLAN.	<b>igmp-snooping enable</b>	Disabled by default
6. Enable PIM snooping in the VLAN.	<b>pim-snooping enable</b>	Disabled by default

For more information about the **igmp-snooping** and **igmp-snooping enable** commands, see *IP Multicast Command Reference*.

# Displaying and maintaining PIM snooping

Task	Command	Remarks
Display PIM snooping neighbor information.	<b>display pim-snooping neighbor</b> [ <b>vlan</b> <i>vlan-id</i> ] [ <b>slot</b> <i>slot-number</i> ] [   { <b>begin</b>   <b>exclude</b>   <b>include</b> } <i>regular-expression</i> ]	Available in any view
Display PIM snooping routing entries.	<b>display pim-snooping routing-table</b> [ <b>vlan</b> <i>vlan-id</i> ] [ <b>slot</b> <i>slot-number</i> ] [   { <b>begin</b>   <b>exclude</b>   <b>include</b> } <i>regular-expression</i> ]	Available in any view
Display the statistics information of PIM messages learned by PIM snooping.	<b>display pim-snooping statistics</b> [   { <b>begin</b>   <b>exclude</b>   <b>include</b> } <i>regular-expression</i> ]	Available in any view
Clear the statistics information of PIM messages learned by PIM snooping.	<b>reset pim-snooping statistics</b>	Available in user view

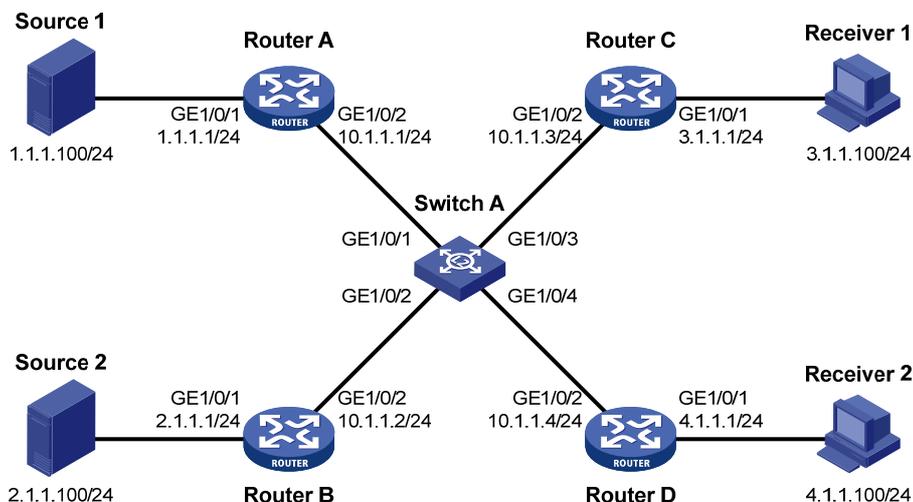
## PIM snooping configuration example

### Network requirements

As shown in Figure 19, Source 1 sends multicast data to multicast group 224.1.1.1, and Source 2 sends multicast data to multicast group 225.1.1.1. Receiver 1 belongs to multicast group 224.1.1.1, and Receiver 2 belongs to multicast group 225.1.1.1. Router C and Router D run IGMP on their interface GigabitEthernet 1/0/1. Router A, Router B, Router C, and Router D run PIM-SM, and interface GigabitEthernet 1/0/2 on Router A acts as a C-BSR and C-RP.

Configure IGMP snooping and PIM snooping on Switch A so that Switch A forwards PIM messages and multicast data to only the routers that are interested in the multicast data.

Figure 19 Network diagram



## Configuration procedure

1. Configure an IP address and subnet mask for each interface according to [Figure 19](#). (Details not shown.)
2. On Router A, enable IP multicast routing, enable PIM-SM on each interface, and configure interface GigabitEthernet 1/0/2 as a C-BSR and C-RP.

```
<RouterA> system-view
[RouterA] multicast routing-enable
[RouterA] interface gigabitethernet 1/0/1
[RouterA-GigabitEthernet1/0/1] pim sm
[RouterA-GigabitEthernet1/0/1] quit
[RouterA] interface gigabitethernet 1/0/2
[RouterA-GigabitEthernet1/0/2] pim sm
[RouterA-GigabitEthernet1/0/2] quit
[RouterA] pim
[RouterA-pim] c-bsr gigabitethernet 1/0/2
[RouterA-pim] c-rp gigabitethernet 1/0/2
```

3. On Router B, enable IP multicast routing and enable PIM-SM on each interface.

```
<RouterB> system-view
[RouterB] multicast routing-enable
[RouterB] interface gigabitethernet 1/0/1
[RouterB-GigabitEthernet1/0/1] pim sm
[RouterB-GigabitEthernet1/0/1] quit
[RouterB] interface gigabitethernet 1/0/2
[RouterB-GigabitEthernet1/0/2] pim sm
```

4. On Router C, enable IP multicast routing, enable PIM-SM on each interface, and enable IGMP on GigabitEthernet 1/0/1.

```
<RouterC> system-view
[RouterC] multicast routing-enable
[RouterC] interface gigabitethernet 1/0/1
[RouterC-GigabitEthernet1/0/1] pim sm
[RouterC-GigabitEthernet1/0/1] igmp enable
[RouterC-GigabitEthernet1/0/1] quit
[RouterC] interface gigabitethernet 1/0/2
[RouterC-GigabitEthernet1/0/2] pim sm
```

5. Configure Router D in the same way as you configure Router C. (Details not shown.)

6. Configure Switch A:

# Enable IGMP snooping globally.

```
<SwitchA> system-view
[SwitchA] igmp-snooping
[SwitchA-igmp-snooping] quit
```

# Create VLAN 100, assign GigabitEthernet 1/0/1 through GigabitEthernet 1/0/4 to this VLAN, and enable IGMP snooping and PIM snooping in the VLAN.

```
[SwitchA] vlan 100
[SwitchA-vlan100] port gigabitethernet 1/0/1 to gigabitethernet 1/0/4
[SwitchA-vlan100] igmp-snooping enable
[SwitchA-vlan100] pim-snooping enable
[SwitchA-vlan100] quit
```

## Verifying the configuration

# On Switch A, display the PIM snooping neighbor information of VLAN 100.

```
[SwitchA] display pim-snooping neighbor vlan 100
```

```
Total number of neighbors: 4
```

```
VLAN ID: 100
```

```
Total number of neighbors: 4
```

Neighbor	Port	Expires	Option Flags
10.1.1.1	GE1/0/1	02:02:23	LAN Prune Delay
10.1.1.2	GE1/0/2	03:00:05	LAN Prune Delay
10.1.1.3	GE1/0/3	02:22:13	LAN Prune Delay
10.1.1.4	GE1/0/4	03:07:22	LAN Prune Delay

The output shows that Router A, Router B, Router C, and Router D are PIM snooping neighbors.

# On Switch A, display the PIM snooping routing information of VLAN 100.

```
[SwitchA] display pim-snooping routing-table vlan 100 slot 1
```

```
Total 2 entry(ies)
```

```
FSM Flag: NI-no info, J-join, PP-prune pending
```

```
VLAN ID: 100
```

```
Total 2 entry(ies)
```

```
(* , 224.1.1.1)
```

```
Upstream neighbor: 10.1.1.1
```

```
Upstream port: GE1/0/1
```

```
Total number of downstream ports: 1
```

```
1: GE1/0/3
```

```
Expires: 00:03:01, FSM: J
```

```
(* , 225.1.1.1)
```

```
Upstream neighbor: 10.1.1.2
```

```
Upstream port: GE1/0/2
```

```
Total number of downstream ports: 1
```

```
1: GE1/0/4
```

```
Expires: 00:01:05, FSM: J
```

The output shows that Switch A will forward the multicast data intended for multicast group 224.1.1.1 to only Router C, and forward the multicast data intended for multicast group 225.1.1.1 to only Router D.

# Troubleshooting PIM snooping

## PIM snooping does not work

### Symptom

PIM snooping does not work on the switch.

### Analysis

IGMP snooping or PIM snooping is not enabled on the switch.

## Solution

1. Use the **display current-configuration** command to check the status of IGMP snooping and PIM snooping.
2. If IGMP snooping is not enabled, enter system view and use the **igmp-snooping** command to enable IGMP snooping globally. Then, enter VLAN view and use the **igmp-snooping enable** and **pim-snooping enable** commands to enable IGMP snooping and PIM snooping in the VLAN.
3. If PIM snooping is not enabled, enter VLAN view and use the **pim-snooping enable** command to enable PIM snooping in the VLAN.

## Some downstream PIM-capable routers cannot receive multicast data

### Symptom

In a network with fragmented join/prune messages, some downstream PIM-capable routers cannot receive multicast data.

### Analysis

PIM snooping cannot reassemble messages, and it cannot maintain the status of downstream routers that the join/prune message fragments carry. To ensure the normal operation of the system, PIM snooping must broadcast join/prune message fragments in the VLAN. However, if the VLAN has a PIM-capable router that has the join suppression function enabled, the broadcast join/prune message fragments might suppress the join messages of other PIM-capable routers in the VLAN. As a result, some PIM-capable routers cannot receive the multicast data destined for a specific multicast group because their join messages are suppressed. To solve this problem, disable the join suppression function on all PIM-capable routers that connect to the PIM snooping-capable switch in the VLAN.

### Solution

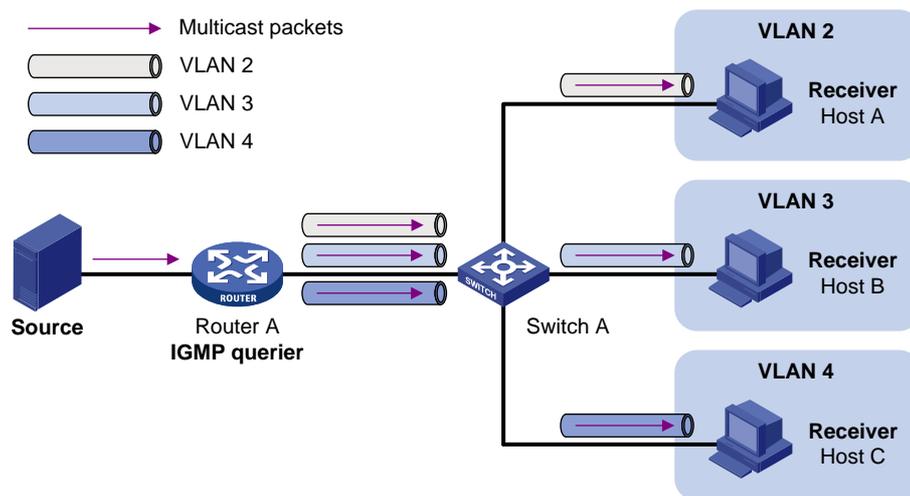
1. Use the **pim hello-option neighbor-tracking** command to enable the neighbor tracking function on the interfaces of PIM routers that connect to the PIM snooping-capable switch.
2. If a PIM-capable router cannot be enabled with the neighbor tracking function, you have to disable PIM snooping on the switch.

# Configuring multicast VLANs

## Overview

In the traditional multicast programs-on-demand mode shown in [Figure 20](#), when hosts (Host A, Host B and Host C) that belong to different VLANs require multicast programs-on-demand service, the Layer 3 device, Router A, must forward a separate copy of the multicast traffic in each user VLAN to the Layer 2 device, Switch A. This results in not only waste of network bandwidth but also extra burden on the Layer 3 device.

**Figure 20 Multicast transmission without multicast VLAN**



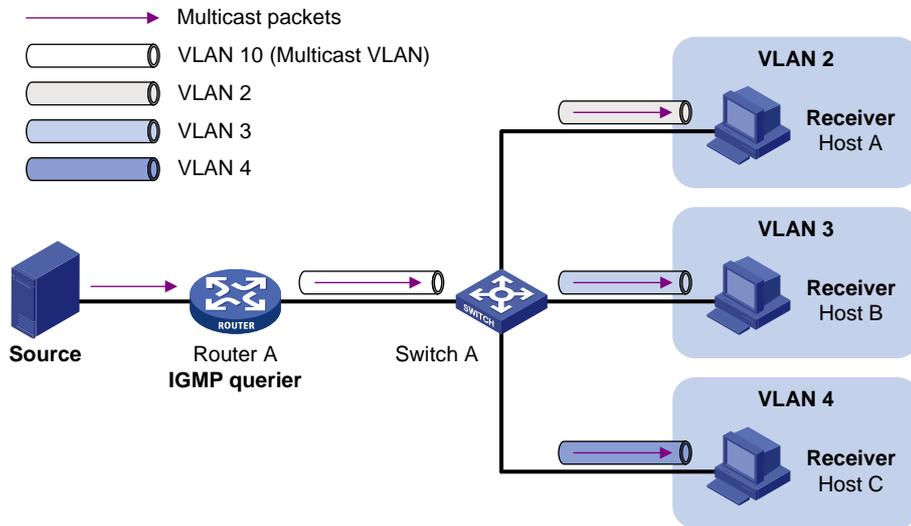
The multicast VLAN feature configured on the Layer 2 device is the solution to this issue. With the multicast VLAN feature, the Layer 3 device replicates the multicast traffic only in the multicast VLAN instead of making a separate copy of the multicast traffic in each user VLAN. This saves network bandwidth and lessens the burden on the Layer 3 device.

The multicast VLAN feature can be implemented in sub-VLAN-based multicast VLAN and port-based multicast VLAN.

### Sub-VLAN-based multicast VLAN

As shown in [Figure 21](#), Host A, Host B, and Host C are in different user VLANs. On Switch A, configure VLAN 10 as a multicast VLAN, configure all the user VLANs as sub-VLANs of VLAN 10, and enable IGMP snooping in the multicast VLAN.

**Figure 21 Sub-VLAN-based multicast VLAN**

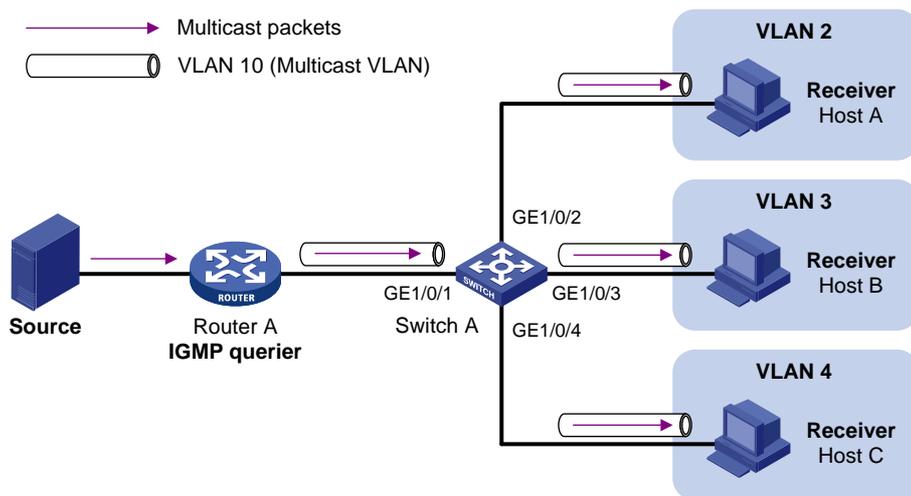


After the configuration, IGMP snooping manages router ports in the multicast VLAN and member ports in the sub-VLANs. When forwarding multicast data to Switch A, Router A sends only one copy of multicast data to Switch A in the multicast VLAN, and Switch A distributes the data to the multicast VLAN's sub-VLANs that contain receivers.

### Port-based multicast VLAN

As shown in Figure 22, Host A, Host B, and Host C are in different user VLANs. All the user ports (ports with attached hosts) on Switch A are hybrid ports. On Switch A, configure VLAN 10 as a multicast VLAN, assign all the user ports to VLAN 10, and enable IGMP snooping in the multicast VLAN and all the user VLANs.

**Figure 22 Port-based multicast VLAN**



After the configuration, if Switch A receives an IGMP message on a user port, it tags the message with the multicast VLAN ID and relays it to the IGMP querier, so that IGMP snooping can uniformly manage the router port and member ports in the multicast VLAN. When Router A forwards multicast data to Switch A, it sends only one copy of multicast data to Switch A in the multicast VLAN, and Switch A distributes the data to all the member ports in the multicast VLAN.

For more information about IGMP snooping, router ports, and member ports, see "[Configuring IGMP snooping](#)."

For more information about VLAN tags, see *Layer 2—LAN Switching Configuration Guide*.

## Multicast VLAN configuration task list

Task	Remarks
<a href="#">Configuring a sub-VLAN-based multicast VLAN</a>	Required
<a href="#">Configuring a port-based multicast VLAN</a>	Use either approach.
	<a href="#">Configuring user port attributes</a>
	<a href="#">Configuring multicast VLAN ports</a>

### NOTE:

If you have configured both sub-VLAN-based multicast VLAN and port-based multicast VLAN on a device, the port-based multicast VLAN configuration is given preference.

## Configuring a sub-VLAN-based multicast VLAN

Before you configure sub-VLAN-based multicast VLAN, complete the following tasks:

- Create VLANs as required.
- Enable IGMP snooping in the VLAN to be configured as a multicast VLAN.

## Configuration guidelines

- The VLAN to be configured as a multicast VLAN must exist.
- The VLANs to be configured as sub-VLANs of the multicast VLAN must exist and must not be multicast VLANs or sub-VLANs of any other multicast VLAN.
- The total number of sub-VLANs of a multicast VLAN must not exceed the maximum number the system can support.

## Configuration procedure

In this approach, you configure a VLAN as a multicast VLAN and configure user VLANs as sub-VLANs of the multicast VLAN.

To configure a sub-VLAN-based multicast VLAN:

Step	Command	Remarks
1. Enter system view.	<b>system-view</b>	N/A
2. Configure the specified VLAN as a multicast VLAN and enter multicast VLAN view.	<b>multicast-vlan</b> <i>vlan-id</i>	By default, a VLAN is not a multicast VLAN.
3. Configure the specified VLANs as sub-VLANs of the multicast VLAN.	<b>subvlan</b> <i>vlan-list</i>	By default, a multicast VLAN has no sub-VLANs.

# Configuring a port-based multicast VLAN

When you configure a port-based multicast VLAN, you must configure the attributes of each user port and then assign the ports to the multicast VLAN.

A user port can be configured as a multicast VLAN port only if it is an Ethernet port, or Layer 2 aggregate interface.

In Ethernet interface view or Layer 2 aggregate interface view, configurations that you make are effective on only the current port. In port group view, configurations that you make are effective on all ports in the current port group.

## Configuration prerequisites

Before you configure a port-based multicast VLAN, complete the following tasks:

- Create VLANs as required.
- Enable IGMP snooping in the VLAN to be configured as a multicast VLAN.
- Enable IGMP snooping in all the user VLANs.

## Configuring user port attributes

First, configure the user ports as hybrid ports that permit packets of the specified user VLAN to pass, and configure the user VLAN to which the user ports belong as the default VLAN.

Then, configure the user ports to permit packets of the multicast VLAN to pass and untag the packets. Thus, after receiving multicast packets tagged with the multicast VLAN ID from the upstream device, the Layer 2 device untags the multicast packets and forwards them to its downstream device.

To configure user port attributes:

Step	Command	Remarks
1. Enter system view.	<b>system-view</b>	N/A
2. Enter interface view or port group view.	<ul style="list-style-type: none"><li>• Enter Layer 2 Ethernet interface view or Layer 2 aggregate interface view: <b>interface</b> <i>interface-type</i> <i>interface-number</i></li><li>• Enter port group view: <b>port-group manual</b> <i>port-group-name</i></li></ul>	Use either command.
3. Configure the user port link type as hybrid.	<b>port link-type hybrid</b>	Access by default
4. Specify the user VLAN that comprises the current user ports as the default VLAN.	<b>port hybrid pvid vlan</b> <i>vlan-id</i>	VLAN 1 by default
5. Configure the current user ports to permit packets of the specified multicast VLANs to pass and untag the packets.	<b>port hybrid vlan</b> <i>vlan-id-list</i> <b>untagged</b>	By default, a hybrid port permits only packets of VLAN 1 to pass.

For more information about the **port link-type**, **port hybrid pvid vlan**, and **port hybrid vlan** commands, see *Layer 2—LAN Switching Command Reference*.

## Configuring multicast VLAN ports

In this approach, you configure a VLAN as a multicast VLAN and assign user ports to it. You can do this by either adding the user ports in the multicast VLAN or specifying the multicast VLAN on the user ports. These two methods provide the same result.

### Configuration guidelines

- The VLAN to be configured as a multicast VLAN must exist.
- A port can belong to only one multicast VLAN.

### Configuration procedure

To configure multicast VLAN ports in multicast VLAN view:

Step	Command	Remarks
1. Enter system view.	<b>system-view</b>	N/A
2. Configure the specified VLAN as a multicast VLAN and enter multicast VLAN view.	<b>multicast-vlan</b> <i>vlan-id</i>	By default, a VLAN is not a multicast VLAN.
3. Assign ports to the multicast VLAN.	<b>port</b> <i>interface-list</i>	By default, a multicast VLAN has no ports.

To configure multicast VLAN ports in interface view or port group view:

Step	Command	Remarks
1. Enter system view.	<b>system-view</b>	N/A
2. Configure the specified VLAN as a multicast VLAN and enter multicast VLAN view.	<b>multicast-vlan</b> <i>vlan-id</i>	By default, a VLAN is not a multicast VLAN.
3. Return to system view.	<b>quit</b>	N/A
4. Enter interface view or port group view.	<ul style="list-style-type: none"> <li>• Enter Layer 2 Ethernet interface view or Layer 2 aggregate interface view: <b>interface</b> <i>interface-type</i> <i>interface-number</i></li> <li>• Enter port group view: <b>port-group manual</b> <i>port-group-name</i></li> </ul>	Use either command.
5. Configure the current port as a member port of the multicast VLAN.	<b>port multicast-vlan</b> <i>vlan-id</i>	By default, a user port does not belong to any multicast VLAN.

# Displaying and maintaining multicast VLAN

Task	Command	Remarks
Display information about a multicast VLAN.	<code>display multicast-vlan [ vlan-id ] [   { begin   exclude   include } regular-expression ]</code>	Available in any view

## Multicast VLAN configuration examples

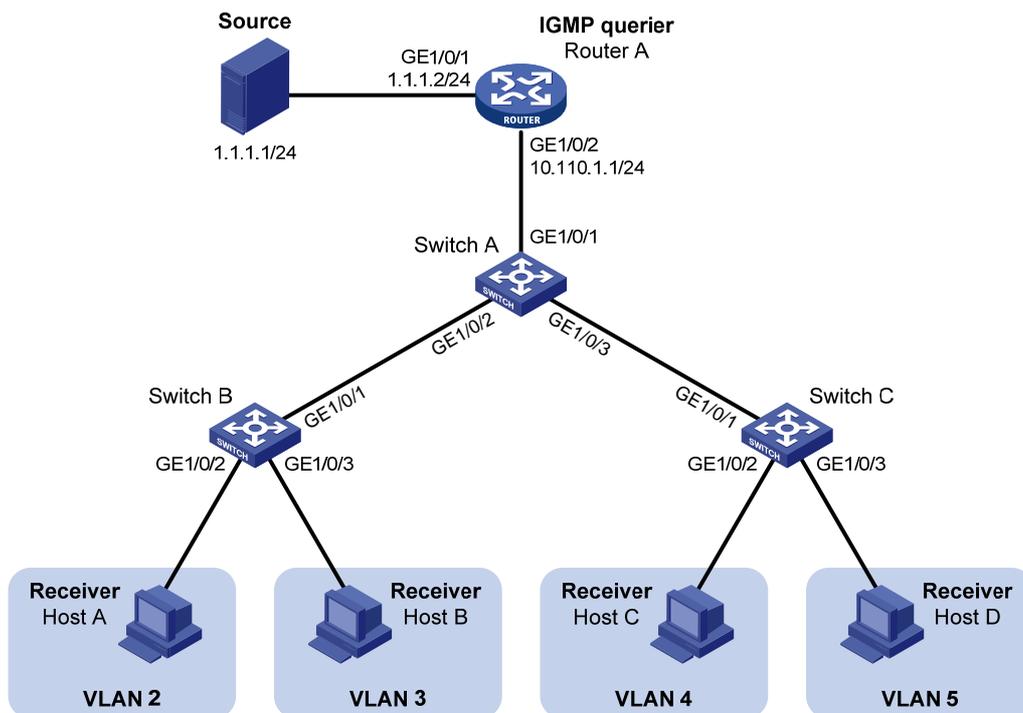
### Sub-VLAN-based multicast VLAN configuration example

#### Network requirements

As shown in [Figure 23](#), IGMPv2 runs on Router A, and IGMPv2 snooping runs on Switch A, Switch B, and Switch C. Router A acts as the IGMP querier. The multicast source sends multicast data to multicast group 224.1.1.1. Host A, Host B, Host C, and Host D are receivers of the multicast group. The hosts belong to VLAN 2 through VLAN 5 respectively.

Configure the sub-VLAN-based multicast VLAN feature on Switch A so that Router A just sends multicast data to Switch A through the multicast VLAN and Switch A forwards the traffic to the receivers that belong to different user VLANs.

**Figure 23 Network diagram**



#### Configuration procedure

1. Configure an IP address and subnet mask for each interface as per [Figure 23](#). (Details not shown.)

2. On Router A, enable IP multicast routing, enable PIM-DM on each interface and enable IGMP on the host-side interface GigabitEthernet 1/0/2.

```
<RouterA> system-view
[RouterA] multicast routing-enable
[RouterA] interface gigabitethernet 1/0/1
[RouterA-GigabitEthernet1/0/1] pim dm
[RouterA-GigabitEthernet1/0/1] quit
[RouterA] interface gigabitethernet 1/0/2
[RouterA-GigabitEthernet1/0/2] pim dm
[RouterA-GigabitEthernet1/0/2] igmp enable
```

3. Configure Switch A:

# Enable IGMP snooping globally.

```
<SwitchA> system-view
[SwitchA] igmp-snooping
[SwitchA-igmp-snooping] quit
```

# Create VLAN 2 through VLAN 5.

```
[SwitchA] vlan 2 to 5
```

# Configure GigabitEthernet 1/0/2 as a trunk port, and assign it to VLAN 2 and VLAN 3.

```
[SwitchA] interface gigabitethernet 1/0/2
[SwitchA-GigabitEthernet1/0/2] port link-type trunk
[SwitchA-GigabitEthernet1/0/2] port trunk permit vlan 2 3
[SwitchA-GigabitEthernet1/0/2] quit
```

# Configure GigabitEthernet 1/0/3 as a trunk port, and assign it to VLAN 4 and VLAN 5.

```
[SwitchA] interface gigabitethernet 1/0/3
[SwitchA-GigabitEthernet1/0/3] port link-type trunk
[SwitchA-GigabitEthernet1/0/3] port trunk permit vlan 4 5
[SwitchA-GigabitEthernet1/0/3] quit
```

# Create VLAN 10, assign GigabitEthernet 1/0/1 to this VLAN and enable IGMP snooping in the VLAN.

```
[SwitchA] vlan 10
[SwitchA-vlan10] port gigabitethernet 1/0/1
[SwitchA-vlan10] igmp-snooping enable
[SwitchA-vlan10] quit
```

# Configure VLAN 10 as a multicast VLAN and configure VLAN 2 through VLAN 5 as its sub-VLANs.

```
[SwitchA] multicast-vlan 10
[SwitchA-mvlan-10] subvlan 2 to 5
[SwitchA-mvlan-10] quit
```

4. Configure Switch B:

# Enable IGMP snooping globally.

```
<SwitchB> system-view
[SwitchB] igmp-snooping
[SwitchB-igmp-snooping] quit
```

# Create VLAN 2, assign GigabitEthernet 1/0/2 to VLAN 2, and enable IGMP snooping in the VLAN.

```
[SwitchB] vlan 2
```

```
[SwitchB-vlan2] port gigabitethernet 1/0/2
[SwitchB-vlan2] igmp-snooping enable
[SwitchB-vlan2] quit
# Create VLAN 3, assign GigabitEthernet 1/0/3 to VLAN 3, and enable IGMP snooping in the
VLAN.
```

```
[SwitchB] vlan 3
[SwitchB-vlan3] port gigabitethernet 1/0/3
[SwitchB-vlan3] igmp-snooping enable
[SwitchB-vlan3] quit
```

# Configure GigabitEthernet 1/0/1 as a trunk port, and assign it to VLAN 2 and VLAN 3.

```
[SwitchB] interface gigabitethernet 1/0/1
[SwitchB-GigabitEthernet1/0/1] port link-type trunk
[SwitchB-GigabitEthernet1/0/1] port trunk permit vlan 2 3
```

5. Configure Switch C in the same way as you configure Switch B. (Details not shown.)

## Verifying the configuration

# Display information about the multicast VLAN.

```
[SwitchA] display multicast-vlan
Total 1 multicast-vlan(s)
```

```

Multicast vlan 10
  subvlan list:
    vlan 2-5
  port list:
    no port
```

# Display the IGMP snooping multicast group information on Switch A.

```
[SwitchA] display igmp-snooping group
Total 5 IP Group(s).
Total 5 IP Source(s).
Total 5 MAC Group(s).
```

Port flags: D-Dynamic port, S-Static port, C-Copy port, P-PIM port

Subvlan flags: R-Real VLAN, C-Copy VLAN

Vlan(id):2.

```
Total 1 IP Group(s).
Total 1 IP Source(s).
Total 1 MAC Group(s).
Router port(s):total 0 port(s).
```

IP group(s):the following ip group(s) match to one mac group.

```
IP group address:224.1.1.1
(0.0.0.0, 224.1.1.1):
  Host port(s):total 1 port(s).
    GE1/0/2 (D)
```

MAC group(s):

```
MAC group address:0100-5e01-0101
  Host port(s):total 1 port(s).
    GE1/0/2
```

Vlan(id):3.  
Total 1 IP Group(s).  
Total 1 IP Source(s).  
Total 1 MAC Group(s).  
Router port(s):total 0 port(s).  
IP group(s):the following ip group(s) match to one mac group.  
IP group address:224.1.1.1  
(0.0.0.0, 224.1.1.1):  
Host port(s):total 1 port(s).  
GE1/0/2 (D)  
MAC group(s):  
MAC group address:0100-5e01-0101  
Host port(s):total 1 port(s).  
GE1/0/2

Vlan(id):4.  
Total 1 IP Group(s).  
Total 1 IP Source(s).  
Total 1 MAC Group(s).  
Router port(s):total 0 port(s).  
IP group(s):the following ip group(s) match to one mac group.  
IP group address:224.1.1.1  
(0.0.0.0, 224.1.1.1):  
Host port(s):total 1 port(s).  
GE1/0/3 (D)  
MAC group(s):  
MAC group address:0100-5e01-0101  
Host port(s):total 1 port(s).  
GE1/0/3

Vlan(id):5.  
Total 1 IP Group(s).  
Total 1 IP Source(s).  
Total 1 MAC Group(s).  
Router port(s):total 0 port(s).  
IP group(s):the following ip group(s) match to one mac group.  
IP group address:224.1.1.1  
(0.0.0.0, 224.1.1.1):  
Host port(s):total 1 port(s).  
GE1/0/3 (D)  
MAC group(s):  
MAC group address:0100-5e01-0101  
Host port(s):total 1 port(s).  
GE1/0/3

Vlan(id):10.  
Total 1 IP Group(s).  
Total 1 IP Source(s).

```

Total 1 MAC Group(s).
Router port(s):total 1 port(s).
    GE1/0/1                (D)
IP group(s):the following ip group(s) match to one mac group.
  IP group address:224.1.1.1
    (0.0.0.0, 224.1.1.1):
      Host port(s):total 0 port(s).
MAC group(s):
  MAC group address:0100-5e01-0101
    Host port(s):total 0 port(s).

```

The output shows that IGMP snooping is maintaining the router port in the multicast VLAN (VLAN 10) and the member ports in the sub-VLANs (VLAN 2 through VLAN 5).

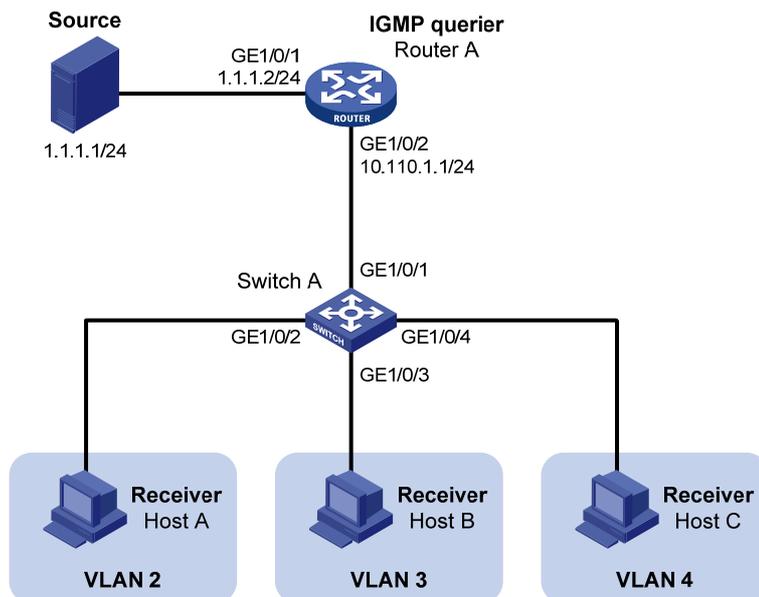
## Port-based multicast VLAN configuration example

### Network requirements

As shown in [Figure 24](#), IGMPv2 runs on Router A. IGMPv2 Snooping runs on Switch A. Router A acts as the IGMP querier. The multicast source sends multicast data to multicast group 224.1.1.1. Host A, Host B, and Host C are receivers of the multicast group, and the hosts belong to VLAN 2 through VLAN 4 respectively.

Configure the port-based multicast VLAN feature on Switch A so that Router A just sends multicast data to Switch A through the multicast VLAN and Switch A forwards the multicast data to the receivers that belong to different user VLANs.

**Figure 24 Network diagram**



### Configuration procedure

1. Configure the IP address and subnet mask for each interface as per [Figure 24](#). (Details not shown.)
2. On Router A, enable IP multicast routing, enable PIM-DM on each interface, and enable IGMP on the host-side interface GigabitEthernet 1/0/2.

```
<RouterA> system-view
```

```
[RouterA] multicast routing-enable
[RouterA] interface gigabitethernet 1/0/1
[RouterA-GigabitEthernet1/0/1] pim dm
[RouterA-GigabitEthernet1/0/1] quit
[RouterA] interface gigabitethernet 1/0/2
[RouterA-GigabitEthernet1/0/2] pim dm
[RouterA-GigabitEthernet1/0/2] igmp enable
```

### 3. Configure Switch A:

# Enable IGMP snooping globally.

```
<SwitchA> system-view
[SwitchA] igmp-snooping
[SwitchA-igmp-snooping] quit
```

# Create VLAN 10, assign GigabitEthernet 1/0/1 to VLAN 10, and enable IGMP snooping in this VLAN.

```
[SwitchA] vlan 10
[SwitchA-vlan10] port gigabitethernet 1/0/1
[SwitchA-vlan10] igmp-snooping enable
[SwitchA-vlan10] quit
```

# Create VLAN 2 and enable IGMP snooping in the VLAN.

```
[SwitchA] vlan 2
[SwitchA-vlan2] igmp-snooping enable
[SwitchA-vlan2] quit
```

The configuration for VLAN 3 and VLAN 4 is similar. (Details not shown.)

# Configure GigabitEthernet 1/0/2 as a hybrid port. Configure VLAN 2 as the default VLAN. Configure GigabitEthernet 1/0/2 to permit packets of VLAN 2 and VLAN 10 to pass and untag the packets when forwarding them.

```
[SwitchA] interface gigabitethernet 1/0/2
[SwitchA-GigabitEthernet1/0/2] port link-type hybrid
[SwitchA-GigabitEthernet1/0/2] port hybrid pvid vlan 2
[SwitchA-GigabitEthernet1/0/2] port hybrid vlan 2 untagged
[SwitchA-GigabitEthernet1/0/2] port hybrid vlan 10 untagged
[SwitchA-GigabitEthernet1/0/2] quit
```

The configuration for GigabitEthernet 1/0/3 and GigabitEthernet 1/0/4 is similar. (Details not shown.)

# Configure VLAN 10 as a multicast VLAN.

```
[SwitchA] multicast-vlan 10
```

# Assign GigabitEthernet 1/0/2 and GigabitEthernet 1/0/3 to VLAN 10.

```
[SwitchA-mvlan-10] port gigabitethernet 1/0/2 to gigabitethernet 1/0/3
[SwitchA-mvlan-10] quit
```

# Assign GigabitEthernet 1/0/4 to VLAN 10.

```
[SwitchA] interface gigabitethernet 1/0/4
[SwitchA-GigabitEthernet1/0/4] port multicast-vlan 10
[SwitchA-GigabitEthernet1/0/4] quit
```

## Verifying the configuration

# Display the multicast VLAN information on Switch A.

```
[SwitchA] display multicast-vlan
```

```
Total 1 multicast-vlan(s)
```

```
Multicast vlan 10
```

```
subvlan list:
```

```
no subvlan
```

```
port list:
```

```
GE1/0/2
```

```
GE1/0/3
```

```
GE1/0/4
```

```
# Display the IGMP snooping multicast group information on Switch A.
```

```
[SwitchA] display igmp-snooping group
```

```
Total 1 IP Group(s).
```

```
Total 1 IP Source(s).
```

```
Total 1 MAC Group(s).
```

```
Port flags: D-Dynamic port, S-Static port, C-Copy port, P-PIM port
```

```
Subvlan flags: R-Real VLAN, C-Copy VLAN
```

```
Vlan(id):10.
```

```
Total 1 IP Group(s).
```

```
Total 1 IP Source(s).
```

```
Total 1 MAC Group(s).
```

```
Router port(s):total 1 port(s).
```

```
GE1/0/1 (D)
```

```
IP group(s):the following ip group(s) match to one mac group.
```

```
IP group address:224.1.1.1
```

```
(0.0.0.0, 224.1.1.1):
```

```
Host port(s):total 3 port(s).
```

```
GE1/0/2 (D)
```

```
GE1/0/3 (D)
```

```
GE1/0/4 (D)
```

```
MAC group(s):
```

```
MAC group address:0100-5e01-0101
```

```
Host port(s):total 3 port(s).
```

```
GE1/0/2
```

```
GE1/0/3
```

```
GE1/0/4
```

The output shows that IGMP snooping is maintaining the router ports and member ports in VLAN 10.

# Configuring MLD snooping

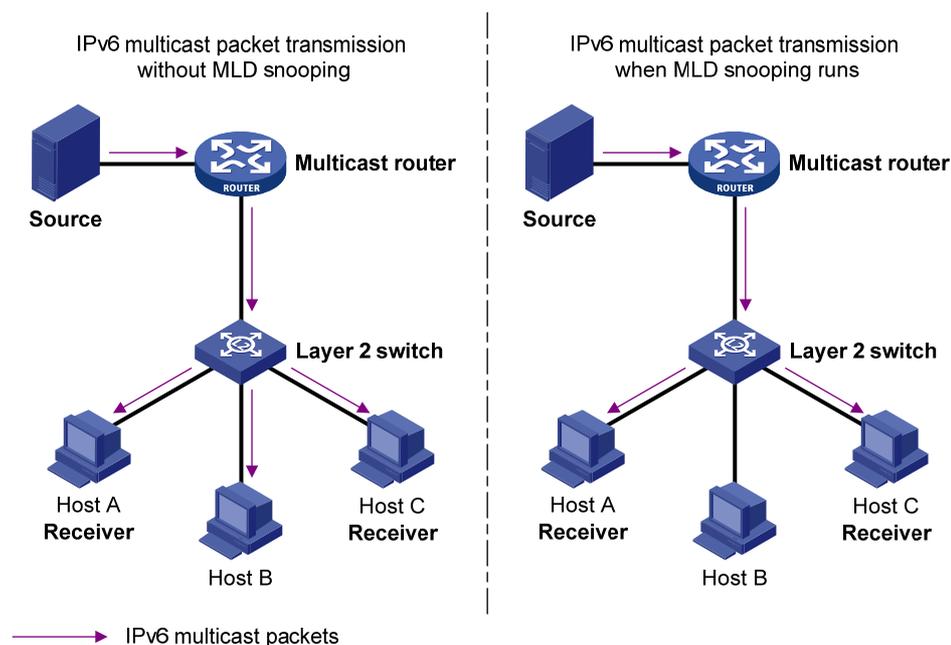
## Overview

Multicast Listener Discovery (MLD) snooping is an IPv6 multicast constraining mechanism that runs on Layer 2 devices to manage and control IPv6 multicast groups.

By analyzing received MLD messages, a Layer 2 device that runs MLD snooping establishes mappings between ports and multicast MAC addresses and forwards IPv6 multicast data based on these mappings.

As shown in [Figure 25](#), without MLD snooping enabled, the Layer 2 switch floods IPv6 multicast packets to all devices at Layer 2. With MLD snooping enabled, the Layer 2 switch forwards IPv6 multicast packets destined for known IPv6 multicast groups to only the receivers that require the multicast data at Layer 2. This feature improves bandwidth efficiency, enhances multicast security, and helps per-host accounting for multicast users.

**Figure 25 Before and after MLD snooping is enabled on the Layer 2 device**

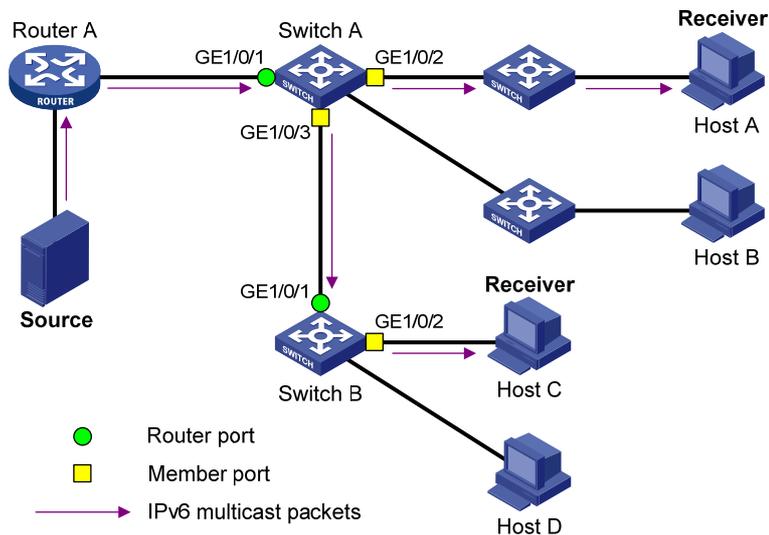


## Basic concepts in MLD snooping

### MLD snooping related ports

As shown in [Figure 26](#), Router A connects to the multicast source, MLD snooping runs on Switch A and Switch B, and Host A and Host C are receiver hosts as members of an IPv6 multicast group.

**Figure 26 MLD snooping related ports**



Ports involved in MLD snooping, as shown in Figure 26, are described as follows:

- **Router port**—Layer 3 multicast device-side port. Layer 3 multicast devices include designated routers (DRs) and MLD querier. In the figure, GigabitEthernet 1/0/1 of Switch A and GigabitEthernet 1/0/1 of Switch B are router ports. The switch registers all its router ports in its router port list.

Do not confuse the "router port" in MLD snooping with the "routed interface" commonly known as the "Layer 3 interface." The router port in MLD snooping is the Layer 2 interface.

- **Member port**—Multicast receiver-side port. In the figure, GigabitEthernet 1/0/2 and GigabitEthernet 1/0/3 of Switch A and GigabitEthernet 1/0/2 of Switch B are member ports. The switch registers all its member ports in its MLD snooping forwarding table.

Unless otherwise specified, router ports and member ports in this document include both static and dynamic router ports and member ports.

**NOTE:**

An MLD snooping-enabled switch deems that all its ports that receive MLD general queries with the source address other than 0::0 or that receive IPv6 PIM hello messages are dynamic router ports.

**Aging timers for dynamic ports in MLD snooping and related messages and actions**

Timer	Description	Message before expiry	Action after expiry
Dynamic router port aging timer	For each dynamic router port, the switch starts an aging timer. When the timer expires, the dynamic router port ages out.	MLD general query of which the source address is not 0::0 or IPv6 PIM hello.	The switch removes this port from its router port list.
Dynamic member port aging timer	When a port dynamically joins a multicast group, the switch starts an aging timer for the port. When the timer expires, the dynamic member port ages out.	MLD report message.	The switch removes this port from the MLD snooping forwarding table.

---

**NOTE:**

In MLD snooping, only dynamic ports age out. Static ports never age out.

---

## How MLD snooping works

In this section, the involved ports are dynamic ports. For information about how to configure and remove static ports, see "[Configuring static ports](#)."

A switch that runs MLD snooping performs different actions when it receives different MLD messages, as follows:

### When receiving a general query

The MLD querier periodically sends MLD general queries to all hosts and routers identified by the IPv6 address FF02::1 on the local subnet to determine whether any active IPv6 multicast group members exist on the subnet.

After receiving an MLD general query, the switch forwards it to all ports in the VLAN, except the port that received the query. The switch also performs one of the following actions:

- If the receiving port is a dynamic router port in the router port list, restarts the aging timer for the port.
- If the receiving port is not in the router port list, adds it into the router port list as a dynamic router port and starts an aging timer for the port.

### When receiving a membership report

A host sends an MLD report to the MLD querier for the following purposes:

- If the host has been a member of an IPv6 multicast group, responds to the query with an MLD report.
- Applies for joining an IPv6 multicast group.

After receiving an MLD report, the switch forwards it through all the router ports in the VLAN, resolves the address of the reported IPv6 multicast group, and performs one of the following actions:

- If no forwarding entry matches the group address, creates a forwarding entry for the group, adds the receiving port as a dynamic member port to the forwarding entry for the group, and starts an aging timer for the port.
- If a forwarding entry matches the group address, but the receiving port is not in the forwarding entry for the group, adds the port as a dynamic member port to the forwarding entry, and starts an aging timer for the port.
- If a forwarding entry matches the group address and the receiving port is in the forwarding entry for the group, restarts the aging timer for the port.

A switch does not forward an MLD report through a non-router port. If the switch forwards a report message through a member port, the MLD report suppression mechanism causes all the attached hosts that monitor the reported IPv6 multicast address suppress their own reports. This makes the switch unable to know whether the reported multicast group still has active members attached to that port.

### When receiving a done message

When a host leaves an IPv6 multicast group, the host sends an MLD done message to the multicast routers. When the switch receives the MLD done message on a dynamic member port, the switch first checks whether a forwarding entry matches the IPv6 multicast group address in the message, and, if a match is found, whether the forwarding entry contains the dynamic member port.

- If no forwarding entry matches the IPv6 multicast group address, or if the forwarding entry does not contain the port, the switch directly discards the MLD done message.
- If a forwarding entry matches the IPv6 multicast group address and contains the port, the switch forwards the done message to all router ports in the native VLAN. Because the switch does not know whether any other hosts attached to the port are still listening to that IPv6 multicast group address, the switch does not immediately remove the port from the forwarding entry for that group. Instead, it restarts the aging timer for the port.

After receiving the MLD done message, the MLD querier resolves the IPv6 multicast group address in the message and sends an MLD multicast-address-specific query to that IPv6 multicast group through the port that received the MLD done message. After receiving the MLD multicast-address-specific query, the switch forwards it through all its router ports in the VLAN and all member ports of the IPv6 multicast group. The switch also performs the following judgment for the port that received the MLD done message:

- If the port (assuming that it is a dynamic member port) receives an MLD report in response to the MLD multicast-address-specific query before its aging timer expires, it indicates that some host attached to the port is receiving or expecting to receive IPv6 multicast data for that IPv6 multicast group. The switch restarts the aging timer for the port.
- If the port receives no MLD report in response to the MLD multicast-address-specific query before its aging timer expires, it indicates that no hosts attached to the port are still monitoring that IPv6 multicast group address. The switch removes the port from the forwarding entry for the IPv6 multicast group when the aging timer expires.

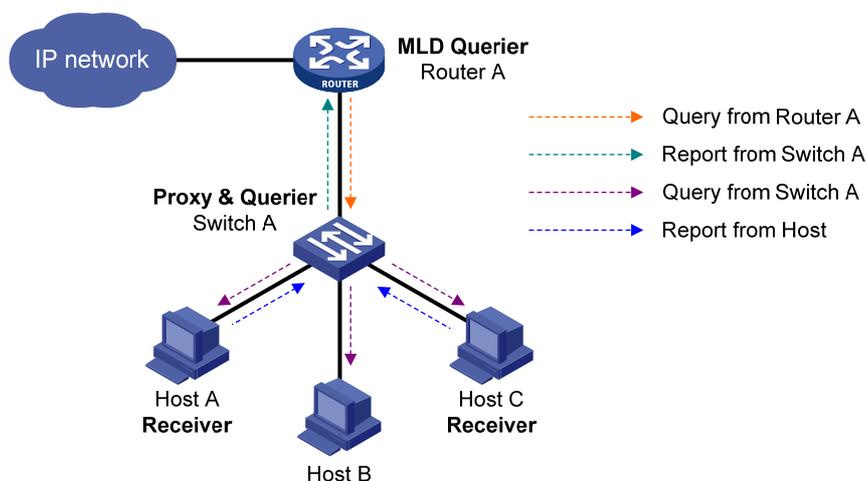
## MLD snooping proxying

You can configure the MLD snooping proxying function on an edge device to reduce the number of MLD reports and done messages sent to its upstream device. The device configured with MLD snooping proxying is called an MLD snooping proxy. It is a host from the perspective of its upstream device.

### NOTE:

Even though an MLD snooping proxy is a host from the perspective of its upstream device, the MLD membership report suppression mechanism for hosts does not take effect on it.

**Figure 27 Network diagram**



As shown in [Figure 27](#), Switch A works as an MLD snooping proxy. As a host from the perspective of the querier Router A, Switch A represents its attached hosts to send their membership reports and done messages to Router A.

[Table 7](#) describes how an MLD snooping proxy processes MLD messages.

**Table 7 MLD message processing on an MLD snooping proxy**

MLD message	Actions
General query	When receiving an MLD general query, the proxy forwards it to all ports but the receiving port. In addition, the proxy generates a report according to the group memberships that it maintains and sends the report out of all router ports.
Multicast-address-specific query	In response to the MLD group-specific query for a certain IPv6 multicast group, the proxy sends the report to the group out of all router ports if the forwarding entry for the group still contains a member port.
Report	<p>When receiving a report for an IPv6 multicast group, the proxy looks up the multicast forwarding table for the entry for the multicast group.</p> <ul style="list-style-type: none"> <li>• If a forwarding entry matches the IPv6 multicast group, and contains the receiving port as a dynamic member port, the proxy restarts the aging timer for the port.</li> <li>• If a forwarding entry matches the IPv6 multicast group but does not contain the receiving port, the proxy adds the port to the forwarding entry as a dynamic member port and starts an aging timer for the port.</li> <li>• If no forwarding entry matches the IPv6 multicast group, the proxy creates a forwarding entry for the group, adds the receiving port to the forwarding entry as a dynamic member port, and starts an aging timer for the port.</li> </ul> <p>Then, the switch sends the report to the group out of all router ports.</p>
Done	In response to a done message for an IPv6 multicast group, the proxy sends a multicast-address-specific query for the group out of the receiving port. After making sure that no member port is contained in the forwarding entry for the IPv6 multicast group, the proxy sends a done message for the group out of all router ports.

## Protocols and standards

RFC 4541, *Considerations for Internet Group Management Protocol (IGMP) and Multicast Listener Discovery (MLD) Snooping Switches*

## MLD snooping configuration task list

Task	Remarks	
Configuring basic MLD snooping functions	<a href="#">Enabling MLD snooping</a>	Required
	<a href="#">Specifying the version of MLD snooping</a>	Optional
	<a href="#">Configuring IPv6 static multicast MAC address entries</a>	Optional
Configuring MLD snooping port functions	<a href="#">Configuring aging timers for dynamic ports</a>	Optional
	<a href="#">Configuring static ports</a>	Optional
	<a href="#">Configuring a port as a simulated member host</a>	Optional
	<a href="#">Enabling fast-leave processing</a>	Optional

Task	Remarks	
	Disabling a port from becoming a dynamic router port	Optional
Configuring MLD snooping querier	Enabling MLD snooping querier	Optional
	Configuring parameters for MLD queries and responses	Optional
	Configuring the source IPv6 addresses for MLD queries	Optional
Configuring MLD snooping proxying	Enabling MLD snooping proxying	Optional
	Configuring the source IPv6 addresses for the MLD messages sent by the proxy	Optional
Configuring an MLD snooping policy	Configuring an IPv6 multicast group filter	Optional
	Configuring IPv6 multicast source port filtering	Optional
	Enabling dropping unknown IPv6 multicast data	Optional
	Configuring MLD report suppression	Optional
	Setting the maximum number of multicast groups that a port can join	Optional
	Enabling IPv6 multicast group replacement	Optional
	Setting the 802.1p precedence for MLD messages	Optional
	Configuring an IPv6 multicast user control policy	Optional
	Enabling the MLD snooping host tracking function	Optional
Setting the DSCP value for MLD messages	Optional	

For the configuration tasks in this section:

- In MLD-snooping view, the configurations that you make are effective in all VLANs. In VLAN view, the configurations that you make are effective only on the ports that belong to the current VLAN. For a given VLAN, a configuration that you make in MLD-snooping view is effective only if you do not make the same configuration in VLAN view.
- In MLD-snooping view, the configurations that you make are effective on all ports. In Layer 2 Ethernet interface view or Layer 2 aggregate interface view, the configurations that you make are effective only on the current port. In port group view, the configurations that you make are effective on all ports in only the current port group. For a given port, a configuration that you make in MLD-snooping view is effective only if you do not make the same configuration in Layer 2 Ethernet interface view, Layer 2 aggregate interface view, or port group view.
- For MLD snooping, the configurations that you make on a Layer 2 aggregate interface do not interfere with those made on its member ports, nor do they participate in aggregation calculations. Configurations that you make on a member port of the aggregate group will not take effect until the port leaves the aggregate group.

## Configuring basic MLD snooping functions

Before you configure basic MLD snooping functions, complete the following tasks:

- Enable IPv6 forwarding.
- Configure the corresponding VLANs.
- Determine the version of MLD snooping.

## Enabling MLD snooping

When you enable MLD snooping, follow these guidelines:

- You must enable MLD snooping globally before you enable it for a VLAN.
- After you enable MLD snooping for a VLAN, you cannot enable MLD or IPv6 PIM on the corresponding VLAN interface, and vice versa.
- MLD snooping for a VLAN works only on the ports in this VLAN.

To enable MLD snooping:

Step	Command	Remarks
1. Enter system view.	<b>system-view</b>	N/A
2. Enable MLD snooping globally and enter MLD-snooping view.	<b>mld-snooping</b>	Disabled by default
3. Return to system view.	<b>quit</b>	N/A
4. Enter VLAN view.	<b>vlan</b> <i>vlan-id</i>	N/A
5. Enable MLD snooping for the VLAN.	<b>mld-snooping enable</b>	Disabled by default

## Specifying the version of MLD snooping

Different versions of MLD snooping can process different versions of MLD messages:

- MLDv1 snooping can process MLDv1 messages, but flood MLDv2 messages in the VLAN instead of processing them.
- MLDv2 snooping can process MLDv1 and MLDv2 messages.

If you change MLDv2 snooping to MLDv1 snooping, the system:

- Clears all MLD snooping forwarding entries that are dynamically created.
- Keeps static MLDv2 snooping forwarding entries (\*, G).
- Clears static MLDv2 snooping forwarding entries (S, G), which will be restored when MLDv1 snooping is changed back to MLDv2 snooping.

For more information about static joining, see "[Configuring static ports.](#)"

### Configuration procedure

To specify the version of MLD snooping:

Step	Command	Remarks
1. Enter system view.	<b>system-view</b>	N/A
2. Enter VLAN view.	<b>vlan</b> <i>vlan-id</i>	N/A
3. Specify the version of MLD snooping.	<b>mld-snooping version</b> <i>version-number</i>	Version 1 by default

## Configuring IPv6 static multicast MAC address entries

In Layer-2 multicast, a Layer-2 IPv6 multicast protocol (such as MLD snooping) can dynamically add IPv6 multicast MAC address entries. Or, you can manually configure IPv6 multicast MAC address entries.

### Configuration guidelines

- The configuration that you make in system view is effective on the specified interfaces. The configuration that you make in interface view or port group view is effective only on the current interface or interfaces in the current port group.
- Any legal IPv6 multicast MAC address except 3333-xxxx-xxxx (where x represents a hexadecimal number from 0 to F) can be manually added to the MAC address table. IPv6 multicast MAC addresses are the MAC addresses whose the least significant bit of the most significant octet is 1.

### Configuration procedure

To configure an IPv6 static multicast MAC address entry in system view:

Step	Command	Remarks
1. Enter system view.	<b>system-view</b>	N/A
2. Configure a static multicast MAC address entry.	<b>mac-address multicast</b> <i>mac-address interface interface-list</i> <b>vlan</b> <i>vlan-id</i>	No static multicast MAC address entries exist by default.

To configure an IPv6 static multicast MAC address entry in interface view:

Step	Command	Remarks
1. Enter system view.	<b>system-view</b>	N/A
2. Enter Layer 2 Ethernet interface view, Layer 2 aggregate interface view, or port group view.	<ul style="list-style-type: none"><li>• Enter Layer 2 Ethernet interface view or Layer 2 aggregate interface view: <b>interface</b> <i>interface-type interface-number</i></li><li>• Enter port group view: <b>port-group manual</b> <i>port-group-name</i></li></ul>	In Ethernet interface view or Layer 2 aggregate interface view, the configuration is effective on only the current interface. In port group view, the configuration is effective on all ports in the port group.
3. Configure a static multicast MAC address entry.	<b>mac-address multicast</b> <i>mac-address</i> <b>vlan</b> <i>vlan-id</i>	No static multicast MAC address entries exist by default.

## Configuring MLD snooping port functions

Before you configure MLD snooping port functions, complete the following tasks:

- Enable MLD snooping in the VLAN.
- Configure the corresponding port groups.
- Determine the aging time of dynamic router ports.
- Determine the aging time of dynamic member ports.
- Determine the IPv6 multicast group and IPv6 multicast source addresses.

## Configuring aging timers for dynamic ports

If a switch receives no MLD general queries or IPv6 PIM hello messages on a dynamic router port when the aging timer of the port expires, the switch removes the port from the router port list.

If the switch receives no MLD reports for an IPv6 multicast group on a dynamic member port when the aging timer of the port expires, the switch removes the port from the forwarding entry for the IPv6 multicast group.

If the memberships of IPv6 multicast groups change frequently, you can set a relatively small value for the aging timer of the dynamic member ports. If the memberships of IPv6 multicast groups change rarely, you can set a relatively large value.

### Setting the global aging timers for dynamic ports

Step	Command	Remarks
1. Enter system view.	<b>system-view</b>	N/A
2. Enter MLD-snooping view.	<b>mld-snooping</b>	N/A
3. Set the global aging timer for dynamic router ports.	<b>router-aging-time</b> <i>interval</i>	260 seconds by default
4. Set the global aging timer for dynamic member ports.	<b>host-aging-time</b> <i>interval</i>	260 seconds by default

### Setting the aging timers for the dynamic ports in a VLAN

Step	Command	Remarks
1. Enter system view.	<b>system-view</b>	N/A
2. Enter VLAN view.	<b>vlan</b> <i>vlan-id</i>	N/A
3. Set the aging timer for the dynamic router ports.	<b>mld-snooping router-aging-time</b> <i>interval</i>	260 seconds by default
4. Set the aging timer for the dynamic member ports.	<b>mld-snooping host-aging-time</b> <i>interval</i>	260 seconds by default

## Configuring static ports

If all hosts attached to a port are interested in the IPv6 multicast data addressed to a particular IPv6 multicast group, configure the port as a static member port for that IPv6 multicast group.

You can configure a port as a static router port, through which the switch can forward all IPv6 multicast data that it received.

A static member port does not respond to queries from the MLD querier; when you configure a port as a static member port or cancel this configuration on the port, the port does not send an unsolicited MLD report or an MLD done message.

Static member ports and static router ports never age out. To remove such a port, you use the corresponding **undo** command.

To configure static ports:

Step	Command	Remarks
1. Enter system view.	<b>system-view</b>	N/A
2. Enter Layer 2 Ethernet interface view, Layer 2 aggregate interface view, or port group view.	<ul style="list-style-type: none"> <li>Enter Layer 2 Ethernet interface view or Layer 2 aggregate interface view: <b>interface</b> <i>interface-type</i> <i>interface-number</i></li> <li>Enter port group view: <b>port-group manual</b> <i>port-group-name</i></li> </ul>	Use either command.
3. Configure the port as a static member port.	<b>mld-snooping static-group</b> <i>ipv6-group-address</i> [ <b>source-ip</b> <i>ipv6-source-address</i> ] <b>vlan</b> <i>vlan-id</i>	No static member ports exist by default.
4. Configure the port as a static router port.	<b>mld-snooping static-router-port</b> <i>vlan</i> <i>vlan-id</i>	No static router ports exist by default.

## Configuring a port as a simulated member host

Generally, a host that runs MLD can respond to MLD queries. If a host fails to respond, the multicast router might deem that the IPv6 multicast group has no members on the subnet, and removes the corresponding forwarding path.

To avoid this situation, you can configure a port on the switch as a simulated member host for an IPv6 multicast group. A simulated host is equivalent to an independent host. For example, when a simulated member host receives an MLD query, it gives a response separately. Therefore, the switch can continue receiving IPv6 multicast data.

A simulated host acts like a real host in the following ways:

- When a port is configured as a simulated member host, the switch sends an unsolicited MLD report through the port, and can respond to MLD general queries with MLD reports through the port.
- When the simulated joining configuration is canceled on the port, the switch sends an MLD done message through that port.

To configure a port as a simulated member host:

Step	Command	Remarks
1. Enter system view.	<b>system-view</b>	N/A
2. Enter Layer 2 Ethernet interface view, Layer 2 aggregate interface view, port group view.	<ul style="list-style-type: none"> <li>Enter Layer 2 Ethernet interface view or Layer 2 aggregate interface view: <b>interface</b> <i>interface-type</i> <i>interface-number</i></li> <li>Enter port group view: <b>port-group manual</b> <i>port-group-name</i></li> </ul>	Use either command.
3. Configure the port as a simulated member host.	<b>mld-snooping host-join</b> <i>ipv6-group-address</i> [ <b>source-ip</b> <i>ipv6-source-address</i> ] <b>vlan</b> <i>vlan-id</i>	Not configured by default.

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**NOTE:**

Unlike a static member port, a port that you configure as a simulated member host ages out like a dynamic member port.

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## Enabling fast-leave processing

The fast-leave processing feature enables the switch to process MLD done messages quickly. After the fast-leave processing feature is enabled, when the switch receives an MLD done message on a port, it immediately removes that port from the forwarding entry for the multicast group specified in the message. Then, when the switch receives MLD multicast-address-specific queries for that multicast group, it does not forward them to that port.

On a port that has only one host attached, you can enable fast-leave processing to save bandwidth and resources. However, on a port that has multiple hosts attached, you should not enable fast-leave processing if you have enabled dropping unknown IPv6 multicast data globally or for the port. Otherwise, if a host on the port leaves an IPv6 multicast group, the other hosts attached to the port in the same IPv6 multicast group cannot receive the IPv6 multicast data for the group.

### Enabling fast-leave processing globally

Step	Command	Remarks
1. Enter system view.	<b>system-view</b>	N/A
2. Enter MLD-snooping view.	<b>mld-snooping</b>	N/A
3. Enable fast-leave processing.	<b>fast-leave [ vlan <i>vlan-list</i> ]</b>	Disabled by default

### Enabling fast-leave processing on a port

Step	Command	Remarks
1. Enter system view.	<b>system-view</b>	N/A
2. Enter Layer 2 Ethernet interface view, Layer 2 aggregate interface view, or port group view.	<ul style="list-style-type: none"><li>Enter Layer 2 Ethernet interface view or Layer 2 aggregate interface view: <b>interface</b> <i>interface-type</i> <i>interface-number</i></li><li>Enter port group view: <b>port-group manual</b> <i>port-group-name</i></li></ul>	Use either command.
3. Enable fast-leave processing.	<b>mld-snooping fast-leave [ vlan <i>vlan-list</i> ]</b>	Disabled by default.

## Disabling a port from becoming a dynamic router port

The following problems exist in a multicast access network:

- After receiving an MLD general query or IPv6 PIM hello message from a connected host, a router port becomes a dynamic router port. Before its timer expires, this dynamic router port receives all

multicast packets within the VLAN where the port belongs, and forwards them to the host, affecting normal multicast reception of the host.

- In addition, the MLD general query and IPv6 PIM hello message that the host sends affects the multicast routing protocol state on Layer 3 devices, such as the MLD querier or DR election, and might further cause network interruption.

To solve these problems, disable that router port from becoming a dynamic router port after the port receives an MLD general query or IPv6 PIM hello message, so as to improve network security and control over multicast users.

To disable a port from becoming a dynamic router port:

Step	Command	Remarks
1. Enter system view.	<b>system-view</b>	N/A
2. Enter Layer 2 Ethernet interface view, Layer 2 aggregate interface view, or port group view.	<ul style="list-style-type: none"> <li>• Enter Layer 2 Ethernet interface view or Layer 2 aggregate interface view: <b>interface</b> <i>interface-type</i> <i>interface-number</i></li> <li>• Enter port group view: <b>port-group manual</b> <i>port-group-name</i></li> </ul>	Use either command.
3. Disable the port from becoming a dynamic router port.	<b>mld-snooping router-port-deny</b> [ <b>vlan</b> <i>vlan-list</i> ]	By default, a port can become a dynamic router port.

**NOTE:**

This configuration does not affect the static router port configuration.

## Configuring MLD snooping querier

Before you configure MLD snooping querier, complete the following tasks:

- Enable MLD snooping in the VLAN.
- Determine the MLD general query interval.
- Determine the MLD last-member query interval.
- Determine the maximum response time for MLD general queries.
- Determine the source IPv6 address of MLD general queries.
- Determine the source IPv6 address of MLD multicast-address-specific queries.

## Enabling MLD snooping querier

In an IPv6 multicast network that runs MLD, a multicast router or Layer 3 multicast switch sends MLD queries, so that all Layer 3 multicast devices can establish and maintain multicast forwarding entries, in order to forward multicast traffic correctly at the network layer. This router or Layer 3 switch is called the "MLD querier."

However, a Layer 2 multicast switch does not support MLD. Therefore, it cannot send MLD general queries by default. When you enable MLD snooping querier on a Layer 2 switch in a VLAN where multicast traffic is switched only at Layer 2 and no Layer 3 multicast devices are present, the Layer 2

switch sends MLD queries, so that multicast forwarding entries can be created and maintained at the data link layer.

**!** **IMPORTANT:**

It is meaningless to configure an MLD snooping querier in an IPv6 multicast network that runs MLD. Although an MLD snooping querier does not participate in MLD querier elections, it might affect MLD querier elections because it sends MLD general queries with a low source IPv6 address.

To enable the MLD snooping querier:

Step	Command	Remarks
1. Enter system view.	<b>system-view</b>	N/A
2. Enter VLAN view.	<b>vlan</b> <i>vlan-id</i>	N/A
3. Enable the MLD snooping querier.	<b>mld-snooping querier</b>	Disabled by default

## Configuring parameters for MLD queries and responses

**△** **CAUTION:**

In the configuration, make sure that the interval for sending MLD general queries is greater than the maximum response delay for MLD general queries. Otherwise, IPv6 multicast members might be deleted by mistake.

You can modify the MLD general query interval based on the actual condition of the network.

A multicast listening host starts a timer for each IPv6 multicast group that it has joined when it receives an MLD query (general query or multicast-address-specific query). This timer is initialized to a random value in the range of 0 to the maximum response delay advertised in the MLD query message. When the timer value decreases to 0, the host sends an MLD report to the IPv6 multicast group.

To speed up the response of hosts to MLD queries and avoid simultaneous timer expirations causing MLD report traffic bursts, you must properly set the maximum response delay.

- The maximum response delay for MLD general queries is set by the **max-response-time** command.
- The maximum response delay for MLD multicast-address-specific queries equals the MLD last-listener query interval.

### Configuring MLD queries and responses globally

Step	Command	Remarks
1. Enter system view.	<b>system-view</b>	N/A
2. Enter MLD-snooping view.	<b>mld-snooping</b>	N/A
3. Set the maximum response delay for MLD general queries.	<b>max-response-time</b> <i>interval</i>	10 seconds by default
4. Set the MLD last-member query interval.	<b>last-listener-query-interval</b> <i>interval</i>	1 second by default

## Configuring the parameters for MLD queries and responses in a VLAN

Step	Command	Remarks
1. Enter system view.	<b>system-view</b>	N/A
2. Enter VLAN view.	<b>vlan</b> <i>vlan-id</i>	N/A
3. Set the MLD query interval.	<b>mld-snooping query-interval</b> <i>interval</i>	125 seconds by default
4. Set the maximum response delay for MLD general queries.	<b>mld-snooping max-response-time</b> <i>interval</i>	10 seconds by default
5. Set the MLD last-member query interval.	<b>mld-snooping last-listener-query-interval</b> <i>interval</i>	1 second by default

## Configuring the source IPv6 addresses for MLD queries

Step	Command	Remarks
1. Enter system view.	<b>system-view</b>	N/A
2. Enter VLAN view.	<b>vlan</b> <i>vlan-id</i>	N/A
3. Configure the source IPv6 address of MLD general queries.	<b>mld-snooping general-query source-ip</b> { <i>ipv6-address</i>   <b>current-interface</b> }	FE80::02FF:FFFF:FE00:0001 by default
4. Configure the source IPv6 address of MLD multicast-address-specific queries.	<b>mld-snooping special-query source-ip</b> { <i>ipv6-address</i>   <b>current-interface</b> }	FE80::02FF:FFFF:FE00:0001 by default

### ! IMPORTANT:

The source IPv6 address of MLD query messages might affect MLD querier election within the subnet.

## Configuring MLD snooping proxying

Before you configure MLD snooping proxying in a VLAN, complete the following tasks:

- Enable MLD snooping in the VLAN.
- Determine the source IPv6 address for the MLD reports sent by the proxy.
- Determine the source IPv6 address for the MLD done messages sent by the proxy.

## Enabling MLD snooping proxying

The MLD snooping proxying function works on a per-VLAN basis. After you enable the function in a VLAN, the device works as the MLD snooping proxy for the downstream hosts and upstream router in the VLAN.

To enable MLD snooping proxying in a VLAN:

Step	Command	Remarks
1. Enter system view.	<b>system-view</b>	N/A
2. Enter VLAN view.	<b>vlan</b> <i>vlan-id</i>	N/A
3. Enable MLD snooping proxying in the VLAN.	<b>mld-snooping proxying enable</b>	Disabled by default

## Configuring the source IPv6 addresses for the MLD messages sent by the proxy

You can set the source IPv6 addresses for the MLD reports and done messages that the MLD snooping proxy sends on behalf of its attached hosts.

To configure the source IPv6 addresses for the MLD messages that the MLD snooping proxy sends in a VLAN:

Step	Command	Remarks
1. Enter system view.	<b>system-view</b>	N/A
2. Enter VLAN view.	<b>vlan</b> <i>vlan-id</i>	N/A
3. Configure a source IPv6 address for the MLD reports that the proxy sends.	<b>mld-snooping report source-ip</b> { <i>ipv6-address</i>   <b>current-interface</b> }	The default is FE80::02FF:FFFF:FE00:0001.
4. Configure a source IPv6 address for the MLD done messages that the proxy sends.	<b>mld-snooping done source-ip</b> { <i>ipv6-address</i>   <b>current-interface</b> }	The default is FE80::02FF:FFFF:FE00:0001.

## Configuring an MLD snooping policy

Before you configure an MLD snooping policy, complete the following tasks:

- Enable MLD snooping in the VLAN.
- Determine the IPv6 ACL rule for IPv6 multicast group filtering.
- Determine the maximum number of IPv6 multicast groups that a port can join.
- Determine the 802.1p precedence for MLD messages.

## Configuring an IPv6 multicast group filter

On an MLD snooping–enabled switch, you can configure an IPv6 multicast group filter to limit multicast programs available to users.

In an application, when a user requests a multicast program, the user's host initiates an MLD report. After receiving this report message, the switch resolves the IPv6 multicast group address in the report and looks up the ACL. If a match is found to permit the port that received the report to join the IPv6 multicast group, the switch creates an MLD snooping forwarding entry for the IPv6 multicast group and adds the port to the forwarding entry. Otherwise, the switch drops this report message, in which case, the IPv6 multicast data for the IPv6 multicast group is not sent to this port, and the user cannot retrieve the program.

When you configure a multicast group filter in an IPv6 multicast VLAN, be sure to configure the filter in the sub-VLANs of the IPv6 multicast VLAN. Otherwise, the configuration does not take effect.

In an IPv6 network that runs MLDv2, when a host joins multiple multicast groups, the multicast group filter cannot correctly filter multicast groups because the host that runs MLDv2 sends multiple multicast groups that it wants to join in one membership report.

### Configuring an IPv6 multicast group globally

Step	Command	Remarks
1. Enter system view.	<b>system-view</b>	N/A
2. Enter MLD-snooping view.	<b>mld-snooping</b>	N/A
3. Configure an IPv6 multicast group filter.	<b>group-policy</b> <i>acl6-number</i> [ <b>vlan</b> <i>vlan-list</i> ]	By default, no IPv6 group filter is globally configured. That is, the hosts in a VLAN can join any valid multicast group.

### Configuring an IPv6 multicast group filter for a port

Step	Command	Remarks
1. Enter system view.	<b>system-view</b>	N/A
2. Enter Layer 2 Ethernet interface view, Layer 2 aggregate interface view, or port group view.	<ul style="list-style-type: none"> <li>Enter Layer 2 Ethernet interface view or Layer 2 aggregate interface view: <b>interface</b> <i>interface-type</i> <i>interface-number</i></li> <li>Enter port group view: <b>port-group manual</b> <i>port-group-name</i></li> </ul>	Use either command.
3. Configure an IPv6 multicast group filter.	<b>mld-snooping group-policy</b> <i>acl6-number</i> [ <b>vlan</b> <i>vlan-list</i> ]	By default, no IPv6 group filter is configured on an interface. That is, the hosts on the interface can join any valid multicast group.

## Configuring IPv6 multicast source port filtering

When the IPv6 multicast source port filtering feature is enabled on a port, the port can connect only to IPv6 multicast receivers rather than multicast sources. The reason is that the port blocks all IPv6 multicast data packets but it permits multicast protocol packets to pass.

If this feature is disabled on a port, the port can connect to both multicast sources and IPv6 multicast receivers.

### Configuring IPv6 multicast source port filtering globally

Step	Command	Remarks
1. Enter system view.	<b>system-view</b>	N/A
2. Enter MLD-snooping view.	<b>mld-snooping</b>	N/A

Step	Command	Remarks
3. Enable IPv6 multicast source port filtering.	<b>source-deny port</b> <i>interface-list</i>	Disabled by default

## Configuring IPv6 multicast source port filtering for a port

Step	Command	Remarks
1. Enter system view.	<b>system-view</b>	N/A
2. Enter Layer 2 Ethernet interface view, or port group view.	<ul style="list-style-type: none"> <li>Enter Layer 2 Ethernet interface view: <b>interface</b> <i>interface-type</i> <i>interface-number</i></li> <li>Enter port group view: <b>port-group manual</b> <i>port-group-name</i></li> </ul>	Use either command.
3. Enable IPv6 multicast source port filtering.	<b>mld-snooping source-deny</b>	Disabled by default.

### NOTE:

Some models of devices, when enabled to filter IPv6 multicast data based on the source ports, are automatically enabled to filter IPv4 multicast data based on the source ports.

## Enabling dropping unknown IPv6 multicast data

Unknown IPv6 multicast data refers to IPv6 multicast data for which no entries exist in the MLD snooping forwarding table. When the switch receives such IPv6 multicast traffic, one of the following occurs:

- When the function of dropping unknown IPv6 multicast data is disabled, the switch floods unknown IPv6 multicast data in the VLAN to which the unknown IPv6 multicast data belongs.
- When the function of dropping unknown IPv6 multicast data is enabled, the switch forwards unknown multicast data to its router ports instead of flooding it in the VLAN. If no router ports exist, the switch drops the unknown multicast data.

### Configuration procedure

To enable dropping unknown IPv6 multicast data in a VLAN:

Step	Command	Remarks
1. Enter system view.	<b>system-view</b>	N/A
2. Enter VLAN view.	<b>vlan</b> <i>vlan-id</i>	N/A
3. Enable dropping unknown IPv6 multicast data.	<b>mld-snooping drop-unknown</b>	Disabled by default

## Configuring MLD report suppression

When a Layer 2 switch receives an MLD report from an IPv6 multicast group member, the Layer 2 switch forwards the message to the Layer 3 device that directly connects to the Layer 2 switch. When multiple

members of an IPv6 multicast group are attached to the Layer 2 switch, the Layer 3 device might receive duplicate MLD reports for the IPv6 multicast group from these members.

With the MLD report suppression function enabled, within a query interval, the Layer 2 switch forwards only the first MLD report for the IPv6 multicast group to the Layer 3 device. It does not forward subsequent MLD reports for the same IPv6 multicast group to the Layer 3 device. This helps reduce the number of packets being transmitted over the network.

On an MLD snooping proxy, MLD reports for an IPv6 multicast group from downstream hosts are suppressed if the forwarding entry for the multicast group exists on the proxy, whether the suppression function is enabled or not.

To configure MLD report suppression:

Step	Command	Remarks
1. Enter system view.	<b>system-view</b>	N/A
2. Enter MLD-snooping view.	<b>mld-snooping</b>	N/A
3. Enable MLD report suppression.	<b>report-aggregation</b>	Enabled by default

## Setting the maximum number of multicast groups that a port can join

You can set the maximum number of IPv6 multicast groups that a port can join to regulate the traffic on the port.

When you configure this maximum number, if the number of IPv6 multicast groups the port has joined exceeds the configured maximum value, the system deletes all the forwarding entries for the port from the MLD snooping forwarding table, and the hosts on this port join IPv6 multicast groups again until the number of IPv6 multicast groups that the port joins reaches the maximum value. When the port joins an IPv6 multicast group, if the port has been configured as a static member port, the system applies the configurations to the port again. If you have configured simulated joining on the port, the system establishes corresponding forwarding entry for the port after receiving a report from the simulated member host.

To configure the maximum number of IPv6 multicast groups that a port can join:

Step	Command	Remarks
1. Enter system view.	<b>system-view</b>	N/A
2. Enter Layer 2 Ethernet interface view, Layer 2 aggregate interface view, port group view.	<ul style="list-style-type: none"> <li>Enter Layer 2 Ethernet interface view or Layer 2 aggregate interface view: <b>interface</b> <i>interface-type</i> <i>interface-number</i></li> <li>Enter port group view: <b>port-group manual</b> <i>port-group-name</i></li> </ul>	Use either command.
3. Set the maximum number of IPv6 multicast groups that a port can join.	<b>mld-snooping group-limit</b> <i>limit</i> [ <b>vlan</b> <i>vlan-list</i> ]	1000 by default.

## Enabling IPv6 multicast group replacement

For various reasons, the number of IPv6 multicast groups that a switch or a port can join might exceed the upper limit. In addition, in some specific applications, an IPv6 multicast group that the switch newly joins must replace an existing IPv6 multicast group automatically. A typical example is channel switching. To view a new TV channel, a user switches from the current IPv6 multicast group to the new one.

To realize such requirements, you can enable the IPv6 multicast group replacement function on the switch or on a certain port. When the number of IPv6 multicast groups that the switch or the port has joined reaches the limit, one of the following occurs:

- If the IPv6 multicast group replacement feature is disabled, new MLD reports are automatically discarded.
- If the IPv6 multicast group replacement feature is enabled, the IPv6 multicast group that the switch or the port newly joins automatically replaces an existing IPv6 multicast group that has the lowest IPv6 address.

### ! IMPORTANT:

Be sure to configure the maximum number of IPv6 multicast groups allowed on a port (see "[Setting the maximum number of multicast groups that a port can join](#)") before enabling IPv6 multicast group replacement. Otherwise, the IPv6 multicast group replacement functionality will not take effect.

### Enabling IPv6 multicast group replacement globally

Step	Command	Remarks
1. Enter system view.	<b>system-view</b>	N/A
2. Enter MLD-snooping view.	<b>mld-snooping</b>	N/A
3. Enable IPv6 multicast group replacement.	<b>overflow-replace [ vlan <i>vlan-list</i> ]</b>	Disabled by default

### Enabling IPv6 multicast group replacement for a port

Step	Command	Remarks
1. Enter system view.	<b>system-view</b>	N/A
2. Enter Layer 2 Ethernet interface view, Layer 2 aggregate interface view, or port group view.	<ul style="list-style-type: none"><li>• Enter Layer 2 Ethernet interface view or Layer 2 aggregate interface view: <b>interface</b> <i>interface-type</i> <i>interface-number</i></li><li>• Enter port group view: <b>port-group manual</b> <i>port-group-name</i></li></ul>	Use either command.
3. Enable IPv6 multicast group replacement.	<b>mld-snooping overflow-replace [ vlan <i>vlan-list</i> ]</b>	Disabled by default.

## Setting the 802.1p precedence for MLD messages

You can change the 802.1p precedence of MLD messages so that they can be assigned higher forwarding priority when congestion occurs on their outgoing ports.

### Setting the 802.1p precedence for MLD messages globally

Step	Command	Remarks
1. Enter system view.	<b>system-view</b>	N/A
2. Enter MLD-snooping view.	<b>mld-snooping</b>	N/A
3. Set the 802.1p precedence for MLD messages.	<b>dot1p-priority</b> <i>priority-number</i>	The default 802.1p precedence for MLD messages is 0.

### Setting the 802.1p precedence for MLD messages in a VLAN

Step	Command	Remarks
1. Enter system view.	<b>system-view</b>	N/A
2. Enter VLAN view.	<b>vlan</b> <i>vlan-id</i>	N/A
3. Set the 802.1p precedence for MLD messages.	<b>mld-snooping dot1p-priority</b> <i>priority-number</i>	The default 802.1p precedence for MLD messages is 0.

## Configuring an IPv6 multicast user control policy

IPv6 multicast user control policies are configured on access switches to allow only authorized users to receive requested IPv6 multicast data. This helps restrict users from ordering certain multicast-on-demand programs.

In practice, a device first needs to perform authentication (for example, 802.1X authentication) for the connected hosts through a RADIUS server. Then, the device uses the configured multicast user control policy to perform multicast access control for authenticated users as follows.

- After receiving an MLD report from a host, the access switch matches the IPv6 multicast group address and multicast source address carried in the report with the configured policies. If a match is found, the user is allowed to join the multicast group. Otherwise, the join report is dropped by the access switch.
- After receiving a done message from a host, the access switch matches the IPv6 multicast group address and source address against the policies. If a match is found, the host is allowed to leave the group. Otherwise, the done message is dropped by the access switch.

An IPv6 multicast user control policy is functionally similar to an IPv6 multicast group filter. A difference lies in that a control policy can control both multicast joining and leaving of users based on authentication and authorization, but a multicast group filter is configured on a port to control only multicast joining but not leaving of users without authentication or authorization.

To configure a multicast user control policy

Step	Command	Remarks
1. Enter system view.	<b>system-view</b>	N/A

Step	Command	Remarks
2. Create a user profile and enter its view.	<b>user-profile</b> <i>profile-name</i>	N/A
3. Configure a multicast user control policy.	<b>mld-snooping access-policy</b> <i>acl6-number</i>	No policy is configured by default. That is, a host can join or leave a valid multicast group at any time.
4. Return to system view.	<b>quit</b>	N/A
5. Enable the created user profile.	<b>user-profile</b> <i>profile-name</i> <b>enable</b>	Not enabled by default.

For more information about the **user-profile** and **user-profile enable** commands, see *Security Command Reference*.

## Enabling the MLD snooping host tracking function

With the MLD snooping host tracking function, the switch can record the information of the member hosts that are receiving IPv6 multicast traffic, including the host IPv6 address, running duration, and timeout time. You can monitor and manage the member hosts according to the recorded information.

### Enabling the MLD snooping host tracking function globally

Step	Command	Remarks
1. Enter system view.	<b>system-view</b>	N/A
2. Enter MLD-snooping view.	<b>mld-snooping</b>	N/A
3. Enable the MLD snooping host tracking function globally.	<b>host-tracking</b>	Disabled by default

### Enabling the MLD snooping host tracking function in a VLAN

Step	Command	Remarks
1. Enter system view.	<b>system-view</b>	N/A
2. Enter VLAN view.	<b>vlan</b> <i>vlan-id</i>	N/A
3. Enable the MLD snooping host tracking function in the VLAN.	<b>mld-snooping host-tracking</b>	Disabled by default

## Setting the DSCP value for MLD messages

IPv6 uses an eight-bit Traffic class field (called ToS in IPv4) to identify type of service for IP packets. As defined in RFC 2474, the first six bits contains the DSCP priority for prioritizing traffic in the network and the last two bits are reserved.

This configuration applies to only the MLD messages that the local switch generates when the switch or its port acts as a member host, rather than those forwarded ones.

To set the DSCP value for MLD messages:

Step	Command	Remarks
1. Enter system view.	<b>system-view</b>	N/A
2. Enter MLD-snooping view.	<b>mld-snooping</b>	N/A
3. Set the DSCP value for MLD messages.	<b>dscp</b> <i>dscp-value</i>	By default, the DSCP value in MLD messages is 48.

## Displaying and maintaining MLD snooping

Task	Command	Remarks
Display MLD snooping group information.	<b>display mld-snooping group</b> [ <b>vlan</b> <i>vlan-id</i> ] [ <b>slot</b> <i>slot-number</i> ] [ <b>verbose</b> ] [   { <b>begin</b>   <b>exclude</b>   <b>include</b> } <i>regular-expression</i> ]	Available in any view.
Display information about the hosts tracked by MLD snooping.	<b>display mld-snooping host vlan</b> <i>vlan-id</i> <b>group</b> <i>ipv6-group-address</i> [ <b>source</b> <i>ipv6-source-address</i> ] [ <b>slot</b> <i>slot-number</i> ] [   { <b>begin</b>   <b>exclude</b>   <b>include</b> } <i>regular-expression</i> ]	Available in any view.
Display IPv6 static multicast MAC address entries.	<b>display mac-address</b> [ <i>mac-address</i> [ <b>vlan</b> <i>vlan-id</i> ] ]   [ <b>multicast</b> ] [ <b>vlan</b> <i>vlan-id</i> ] [ <b>count</b> ] [   { <b>begin</b>   <b>exclude</b>   <b>include</b> } <i>regular-expression</i> ]	Available in user view.
Display statistics for the MLD messages learned through MLD snooping.	<b>display mld-snooping statistics</b> [   { <b>begin</b>   <b>exclude</b>   <b>include</b> } <i>regular-expression</i> ]	Available in any view.
Remove dynamic group entries of a specified MLD snooping group or all MLD snooping groups.	<b>reset mld-snooping group</b> { <i>ipv6-group-address</i>   <b>all</b> } [ <b>vlan</b> <i>vlan-id</i> ]	Available in user view. This command works only on an MLD snooping-enabled VLAN, but not in a VLAN with MLD enabled on its VLAN interface. This command cannot remove the static group entries of MLD snooping groups.
Clear statistics for the MLD messages learned through MLD snooping.	<b>reset mld-snooping statistics</b>	Available in user view.

# MLD snooping configuration examples

## IPv6 group policy and simulated joining configuration example

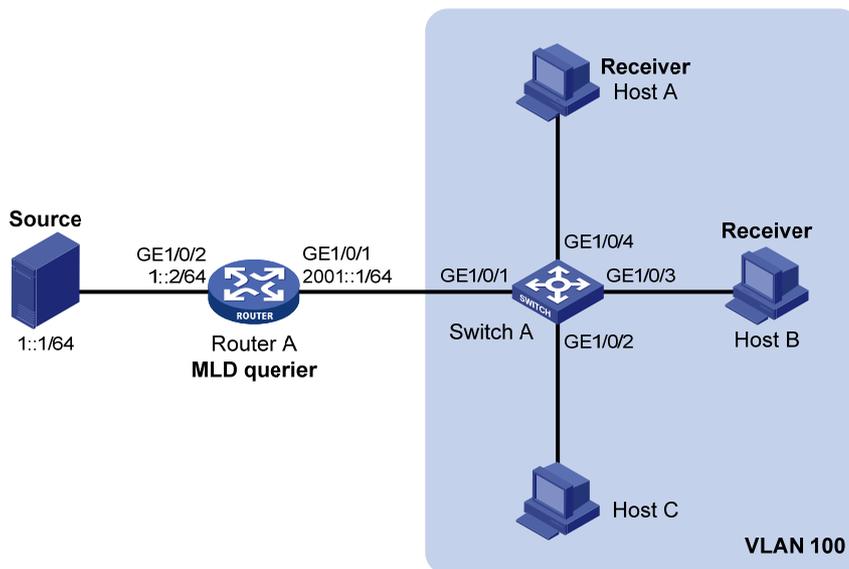
### Network requirements

As shown in [Figure 28](#), MLDv1 runs on Router A, MLDv1 snooping required on Switch A, and Router A acts as the MLD querier on the subnet.

The receivers, Host A and Host B can receive IPv6 multicast traffic addressed to IPv6 multicast group FF1E::101 only.

IPv6 multicast data for group FF1E::101 can be forwarded through GigabitEthernet 1/0/3 and GigabitEthernet 1/0/4 of Switch A even if Host A and Host B accidentally, temporarily stop receiving IPv6 multicast data, and that Switch A drops unknown IPv6 multicast data and does not broadcast the data to the VLAN where Switch A resides.

**Figure 28 Network diagram**



### Configuration procedure

1. Enable IPv6 forwarding and configure an IPv6 address and prefix length for each interface as per [Figure 28](#). (Details not shown.)
2. On Router A, Enable IPv6 multicast routing, enable IPv6 PIM-DM on each interface, and enable MLDv1 on GigabitEthernet 1/0/1.

```
<RouterA> system-view
[RouterA] multicast ipv6 routing-enable
[RouterA] interface gigabitethernet 1/0/1
[RouterA-GigabitEthernet1/0/1] mld enable
[RouterA-GigabitEthernet1/0/1] pim ipv6 dm
[RouterA-GigabitEthernet1/0/1] quit
[RouterA] interface gigabitethernet 1/0/2
[RouterA-GigabitEthernet1/0/2] pim ipv6 dm
[RouterA-GigabitEthernet1/0/2] quit
```

### 3. Configure Switch A:

# Enable MLD snooping globally.

```
<SwitchA> system-view
[SwitchA] mld-snooping
[SwitchA-mld-snooping] quit
```

# Create VLAN 100, assign GigabitEthernet 1/0/1 through GigabitEthernet 1/0/4 to this VLAN, and enable MLD snooping and the function of dropping IPv6 unknown multicast traffic in the VLAN.

```
[SwitchA] vlan 100
[SwitchA-vlan100] port gigabitethernet 1/0/1 to gigabitethernet 1/0/4
[SwitchA-vlan100] mld-snooping enable
[SwitchA-vlan100] mld-snooping drop-unknown
[SwitchA-vlan100] quit
```

# Configure an IPv6 multicast group filter so that the hosts in VLAN 100 can join only the IPv6 multicast group FF1E::101.

```
[SwitchA] acl ipv6 number 2001
[SwitchA-acl6-basic-2001] rule permit source ff1e::101 128
[SwitchA-acl6-basic-2001] quit
[SwitchA] mld-snooping
[SwitchA-mld-snooping] group-policy 2001 vlan 100
[SwitchA-mld-snooping] quit
```

# Configure GigabitEthernet 1/0/3 and GigabitEthernet 1/0/4 as simulated hosts for IPv6 multicast group FF1E::101.

```
[SwitchA] interface gigabitethernet 1/0/3
[SwitchA-GigabitEthernet1/0/3] mld-snooping host-join ff1e::101 vlan 100
[SwitchA-GigabitEthernet1/0/3] quit
[SwitchA] interface gigabitethernet 1/0/4
[SwitchA-GigabitEthernet1/0/4] mld-snooping host-join ff1e::101 vlan 100
[SwitchA-GigabitEthernet1/0/4] quit
```

### Verifying the configuration

Display detailed MLD snooping group information in VLAN 100 on Switch A.

```
[SwitchA] display mld-snooping group vlan 100 verbose
```

```
Total 1 IP Group(s).
Total 1 IP Source(s).
Total 1 MAC Group(s).
```

Port flags: D-Dynamic port, S-Static port, C-Copy port, P-PIM port

Subvlan flags: R-Real VLAN, C-Copy VLAN

Vlan(id):100.

```
Total 1 IP Group(s).
Total 1 IP Source(s).
Total 1 MAC Group(s).
```

Router port(s):total 1 port(s).

```
GE1/0/1 (D) ( 00:01:30 )
```

IP group(s):the following ip group(s) match to one mac group.

```
IP group address:FF1E::101
( ::, FF1E::101):
```

```

Attribute:      Host Port
Host port(s):total 2 port(s).
  GE1/0/3          (D) ( 00:03:23 )
  GE1/0/4          (D) ( 00:04:10 )
MAC group(s):
MAC group address:3333-0000-0101
Host port(s):total 2 port(s).
  GE1/0/3
  GE1/0/4

```

The output shows that GigabitEthernet 1/0/3 and GigabitEthernet 1/0/4 of Switch A have joined IPv6 multicast group FF1E::101.

## Static port configuration example

### Network requirements

As shown in [Figure 29](#), MLDv1 runs on Router A, and MLDv1 snooping runs on Switch A, Switch B and Switch C. Router A acts as the MLD querier.

Host A and Host C are permanent receivers of IPv6 multicast group FF1E::101. GigabitEthernet 1/0/3 and GigabitEthernet 1/0/5 on Switch C are required to be configured as static member ports for multicast group FF1E::101 to enhance the reliability of multicast traffic transmission.

Suppose STP runs on the network. To avoid data loops, the forwarding path from Switch A to Switch C is blocked under normal conditions, and IPv6 multicast traffic flows to the receivers attached to Switch C only along the path of Switch A—Switch B—Switch C.

Configure GigabitEthernet 1/0/3 on Switch C as a static router port, so that IPv6 multicast traffic can flow to the receivers nearly uninterruptedly along the path of Switch A—Switch C in the case that the path of Switch A—Switch B—Switch C becomes blocked.

---

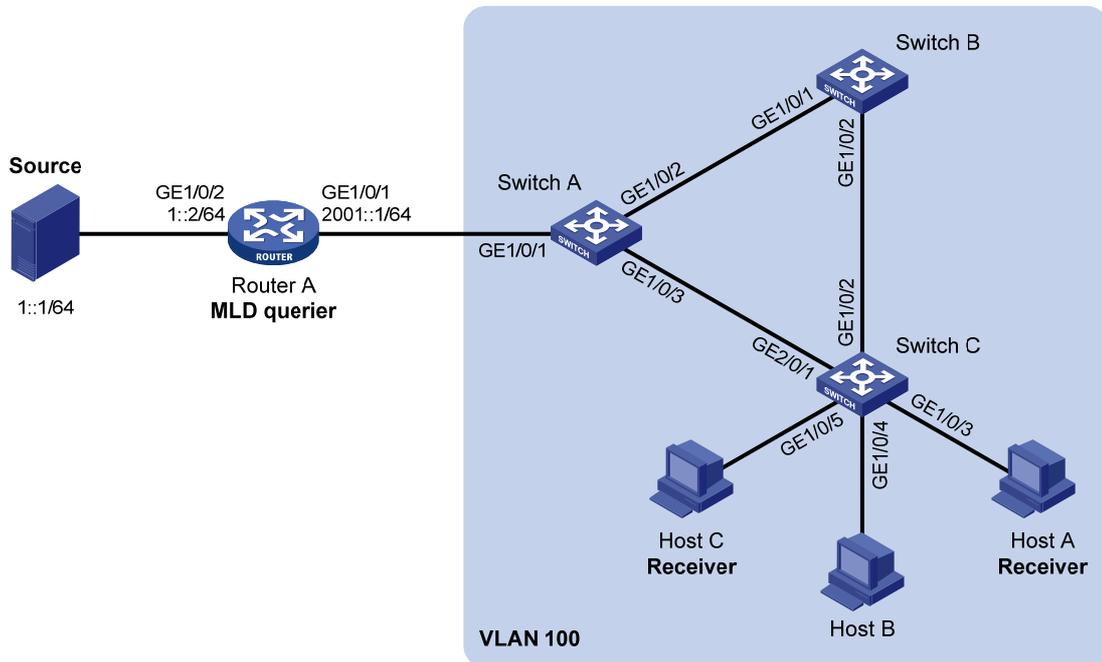
#### NOTE:

If no static router port is configured, when the path of Switch A—Switch B—Switch C becomes blocked, at least one MLD query-response cycle must be completed before the IPv6 multicast data can flow to the receivers along the new path of Switch A—Switch C. Namely, IPv6 multicast delivery will be interrupted during this process.

---

For more information about the Spanning Tree Protocol (STP), see *Layer 2—LAN Switching Configuration Guide*.

Figure 29 Network diagram



### Configuration procedure

1. Enable IPv6 forwarding and configure an IPv6 address and prefix length for each interface as per Figure 29.
2. On Router A, enable IPv6 multicast routing, enable IPv6 PIM-DM on each interface, and enable MLD on GigabitEthernet 1/0/1.

```
<RouterA> system-view
[RouterA] multicast ipv6 routing-enable
[RouterA] interface gigabitethernet 1/0/1
[RouterA-GigabitEthernet1/0/1] mld enable
[RouterA-GigabitEthernet1/0/1] pim ipv6 dm
[RouterA-GigabitEthernet1/0/1] quit
[RouterA] interface gigabitethernet 1/0/2
[RouterA-GigabitEthernet1/0/2] pim ipv6 dm
[RouterA-GigabitEthernet1/0/2] quit
```

3. Configure Switch A:

# Enable MLD snooping globally.

```
<SwitchA> system-view
[SwitchA] mld-snooping
[SwitchA-mld-snooping] quit
```

# Create VLAN 100, assign GigabitEthernet 1/0/1 through GigabitEthernet 1/0/3 to this VLAN, and enable MLD snooping in the VLAN.

```
[SwitchA] vlan 100
[SwitchA-vlan100] port gigabitethernet 1/0/1 to gigabitethernet 1/0/3
[SwitchA-vlan100] mld-snooping enable
[SwitchA-vlan100] quit
```

# Configure GigabitEthernet 1/0/3 to be a static router port.

```
[SwitchA] interface gigabitEthernet 1/0/3
[SwitchA-GigabitEthernet1/0/3] mld-snooping static-router-port vlan 100
[SwitchA-GigabitEthernet1/0/3] quit
```

#### 4. Configure Switch B:

# Enable MLD snooping globally.

```
<SwitchB> system-view
[SwitchB] mld-snooping
[SwitchB-mld-snooping] quit
```

# Create VLAN 100, assign GigabitEthernet 1/0/1 and GigabitEthernet 1/0/2 to this VLAN, and enable MLD snooping in the VLAN.

```
[SwitchB] vlan 100
[SwitchB-vlan100] port gigabitEthernet 1/0/1 gigabitEthernet 1/0/2
[SwitchB-vlan100] mld-snooping enable
[SwitchB-vlan100] quit
```

#### 5. Configure Switch C:

# Enable MLD snooping globally.

```
<SwitchC> system-view
[SwitchC] mld-snooping
[SwitchC-mld-snooping] quit
```

# Create VLAN 100, assign GigabitEthernet 1/0/1 through GigabitEthernet 1/0/5 to this VLAN, and enable MLD snooping in the VLAN.

```
[SwitchC] vlan 100
[SwitchC-vlan100] port gigabitEthernet 1/0/1 to gigabitEthernet 1/0/5
[SwitchC-vlan100] mld-snooping enable
[SwitchC-vlan100] quit
```

# Configure GigabitEthernet 1/0/3 and GigabitEthernet 1/0/5 as static member ports for IPv6 multicast group FF1E::101.

```
[SwitchC] interface GigabitEthernet 1/0/3
[SwitchC-GigabitEthernet1/0/3] mld-snooping static-group ff1e::101 vlan 100
[SwitchC-GigabitEthernet1/0/3] quit
[SwitchC] interface GigabitEthernet 1/0/5
[SwitchC-GigabitEthernet1/0/5] mld-snooping static-group ff1e::101 vlan 100
[SwitchC-GigabitEthernet1/0/5] quit
```

### Verifying the configuration

# Display detailed MLD snooping group information in VLAN 100 on Switch A.

```
[SwitchA] display mld-snooping group vlan 100 verbose
```

```
Total 1 IP Group(s).
Total 1 IP Source(s).
Total 1 MAC Group(s).
```

Port flags: D-Dynamic port, S-Static port, C-Copy port, P-PIM port

Subvlan flags: R-Real VLAN, C-Copy VLAN

Vlan(id):100.

```
Total 1 IP Group(s).
Total 1 IP Source(s).
Total 1 MAC Group(s).
```

```

Router port(s):total 2 port(s).
    GE1/0/1                (D) ( 00:01:30 )
    GE1/0/3                (S)
IP group(s):the following ip group(s) match to one mac group.
IP group address:FF1E::101
  (::, FF1E::101):
  Attribute:   Host Port
  Host port(s):total 1 port(s).
    GE1/0/2                (D) ( 00:03:23 )
MAC group(s):
MAC group address:3333-0000-0101
  Host port(s):total 1 port(s).
    GE1/0/2

```

The output shows that GigabitEthernet 1/0/3 of Switch A has become a static router port.

# Display detailed MLD snooping group information in VLAN 100 on Switch C.

```

[SwitchC] display mld-snooping group vlan 100 verbose
Total 1 IP Group(s).
Total 1 IP Source(s).
Total 1 MAC Group(s).

Port flags: D-Dynamic port, S-Static port, C-Copy port, P-PIM port
Subvlan flags: R-Real VLAN, C-Copy VLAN
Vlan(id):100.
Total 1 IP Group(s).
Total 1 IP Source(s).
Total 1 MAC Group(s).
Router port(s):total 1 port(s).
    GE1/0/2                (D) ( 00:01:23 )
IP group(s):the following ip group(s) match to one mac group.
IP group address:FF1E::101
  (::, FF1E::101):
  Attribute:   Host Port
  Host port(s):total 2 port(s).
    GE1/0/3                (S)
    GE1/0/5                (S)
MAC group(s):
MAC group address:3333-0000-0101
  Host port(s):total 2 port(s).
    GE1/0/3
    GE1/0/5

```

The output shows that GigabitEthernet 1/0/3 and GigabitEthernet 1/0/5 on Switch C have become static member ports for IPv6 multicast group FF1E::101.

# MLD snooping querier configuration example

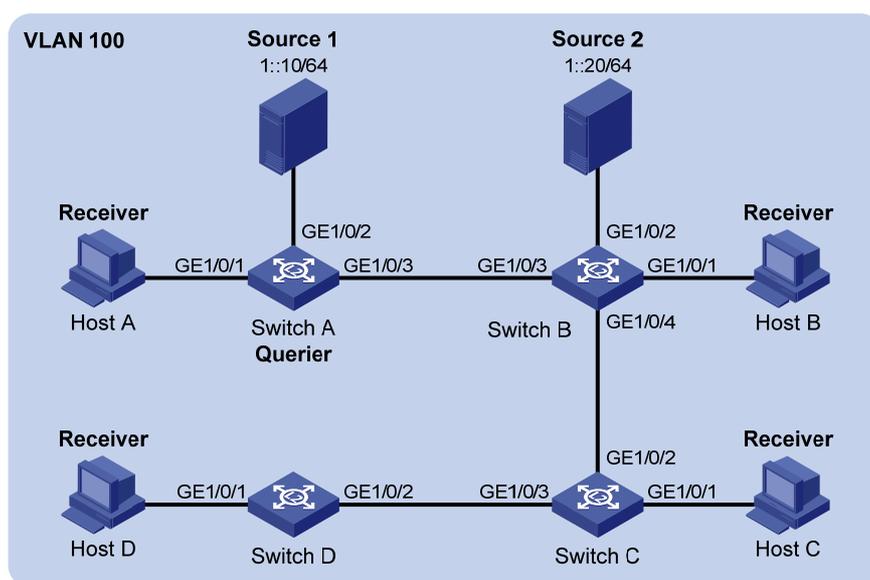
## Network requirements

As shown in Figure 30, in a Layer-2-only network environment, two multicast sources (Source 1 and Source 2) send IPv6 multicast data to multicast groups FF1E::101 and FF1E::102 respectively, Host A and Host C are receivers of multicast group FF1E::101 and Host B and Host D are receivers of multicast group FF1E::102.

MLDv1 runs on all the receivers and MLDv1 snooping runs on all the switches. Switch A, which is close to the multicast sources, is chosen as the MLD snooping querier.

To prevent flooding of unknown multicast traffic within the VLAN, configure all the switches to drop unknown multicast data packets.

Figure 30 Network diagram



## Configuration procedure

### 1. Configure Switch A:

# Enable IPv6 forwarding, and enable MLD snooping globally.

```
<SwitchA> system-view
[SwitchA] ipv6
[SwitchA] mld-snooping
[SwitchA-mld-snooping] quit
```

# Create VLAN 100 and assign GigabitEthernet 1/0/1 through GigabitEthernet 1/0/3 to VLAN 100.

```
[SwitchA] vlan 100
[SwitchA-vlan100] port gigabitethernet 1/0/1 to gigabitethernet 1/0/3
```

# Enable MLD snooping and the function of dropping unknown IPv6 multicast data packets in VLAN 100.

```
[SwitchA-vlan100] mld-snooping enable
[SwitchA-vlan100] mld-snooping drop-unknown
```

# Configure MLD snooping querier feature in VLAN 100.

```
[SwitchA-vlan100] mld-snooping querier
```

```
[SwitchA-vlan100] quit
```

## 2. Configure Switch B:

# Enable IPv6 forwarding, and enable MLD snooping globally.

```
<SwitchB> system-view
```

```
[SwitchB] ipv6
```

```
[SwitchB] mld-snooping
```

```
[SwitchB-mld-snooping] quit
```

# Create VLAN 100, add GigabitEthernet 1/0/1 through GigabitEthernet 1/0/4 into VLAN 100.

```
[SwitchB] vlan 100
```

```
[SwitchB-vlan100] port gigabitethernet 1/0/1 to gigabitethernet 1/0/4
```

# Enable the MLD snooping feature and the function of dropping unknown IPv6 multicast data packets in VLAN 100.

```
[SwitchB-vlan100] mld-snooping enable
```

```
[SwitchB-vlan100] mld-snooping drop-unknown
```

```
[SwitchB-vlan100] quit
```

## 3. Configure Switch C and Switch D in the same way as you configure Switch B.

### Verifying the configuration

When the MLD snooping querier starts to work, all the switches but the querier receive MLD general queries. Use the **display mld-snooping statistics** command to display statistics for MLD messages received.

# Display the MLD message statistics on Switch B.

```
[SwitchB-vlan100] display mld-snooping statistics
```

```
Received MLD general queries:3.
```

```
Received MLDv1 specific queries:0.
```

```
Received MLDv1 reports:12.
```

```
Received MLD dones:0.
```

```
Sent MLDv1 specific queries:0.
```

```
Received MLDv2 reports:0.
```

```
Received MLDv2 reports with right and wrong records:0.
```

```
Received MLDv2 specific queries:0.
```

```
Received MLDv2 specific sg queries:0.
```

```
Sent MLDv2 specific queries:0.
```

```
Sent MLDv2 specific sg queries:0.
```

```
Received error MLD messages:0.
```

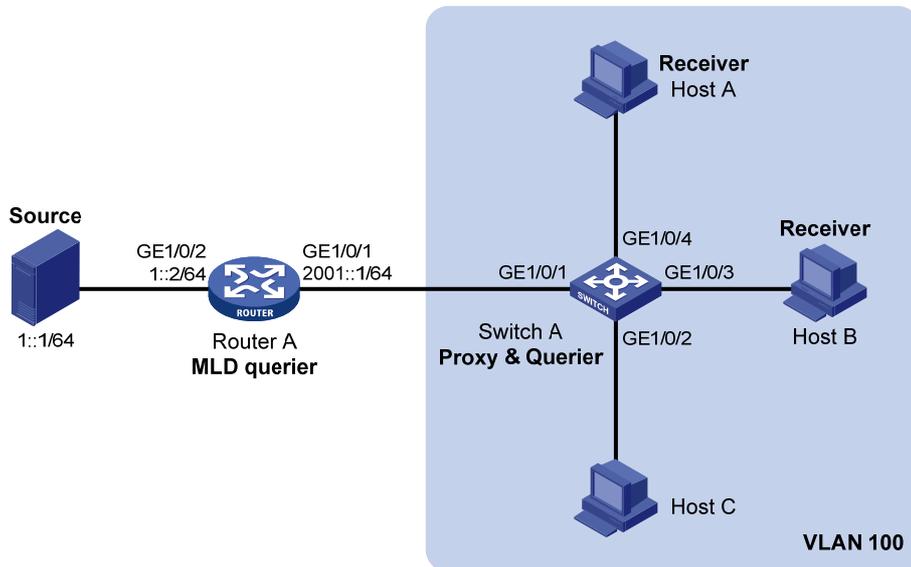
## MLD snooping proxying configuration example

### Network requirements

As shown in [Figure 31](#), MLDv1 runs on Router A and MLDv1 snooping runs on Switch A. Router A acts as the MLD querier.

Configure MLD snooping proxying on Switch A. This enables the switch to forward MLD reports and done messages on behalf of the attached hosts and to respond to MLD queries from Router A and then forward the queries to the hosts on behalf of Router A.

**Figure 31 Network diagram**



### Configuration procedure

1. Configure an IP address and prefix length for each interface as per Figure 31. (Details not shown.)
2. On Router A, enable IPv6 multicast routing, enable IPv6 PIM-DM on each interface, and enable MLD on port GigabitEthernet 1/0/1.

```
<RouterA> system-view
[RouterA] multicast ipv6 routing-enable
[RouterA] interface gigabitethernet 1/0/1
[RouterA-GigabitEthernet1/0/1] mld enable
[RouterA-GigabitEthernet1/0/1] pim ipv6 dm
[RouterA-GigabitEthernet1/0/1] quit
[RouterA] interface gigabitethernet 1/0/2
[RouterA-GigabitEthernet1/0/2] pim ipv6 dm
[RouterA-GigabitEthernet1/0/2] quit
```

3. Configure Switch A:

# Enable MLD snooping globally.

```
<SwitchA> system-view
[SwitchA] mld-snooping
[SwitchA-mld-snooping] quit
```

# Create VLAN 100, assign ports GigabitEthernet 1/0/1 through GigabitEthernet 1/0/4 to this VLAN, and enable MLD snooping and MLD snooping proxying in the VLAN.

```
[SwitchA] vlan 100
[SwitchA-vlan100] port gigabitethernet 1/0/1 to gigabitethernet 1/0/4
[SwitchA-vlan100] mld-snooping enable
[SwitchA-vlan100] mld-snooping proxying enable
[SwitchA-vlan100] quit
```

### Verifying the configuration

After the configuration is completed, Host A and Host B send MLD join messages addressed to group FF1E::101. When receiving the messages, Switch A sends a join message for the group out of port

GigabitEthernet 1/0/1 (a router port) to Router A. Use the **display mld-snooping group** command and the **display mld group** command to display information about MLD snooping groups and MLD multicast groups. For example:

# Display information about MLD snooping groups on Switch A.

```
[SwitchA] display mld-snooping group
Total 1 IP Group(s).
Total 1 IP Source(s).
Total 1 MAC Group(s).

Port flags: D-Dynamic port, S-Static port, C-Copy port, P-PIM port
Subvlan flags: R-Real VLAN, C-Copy VLAN
Vlan(id):100.
Total 1 IP Group(s).
Total 1 IP Source(s).
Total 1 MAC Group(s).
Router port(s):total 1 port(s).
    GE1/0/1                (D)
IP group(s):the following ip group(s) match to one mac group.
IP group address:FF1E::101
  (::, FF1E::101):
    Host port(s):total 2 port(s).
      GE1/0/3                (D)
      GE1/0/4                (D)
MAC group(s):
  MAC group address:3333-0000-0101
    Host port(s):total 2 port(s).
      GE1/0/3
      GE1/0/4
```

# Display information about MLD multicast groups on Router A.

```
[RouterA] display mld group
Total 1 MLD Group(s).
Interface group report information
GigabitEthernet1/0/1(2001::1):
Total 1 MLD Group reported
Group Address: FF1E::1
Last Reporter: FE80::2FF:FFFF:FE00:1
Uptime: 00:00:03
Expires: 00:04:17
```

When Host A leaves the IPv6 multicast group, it sends an MLD done message to Switch A. Receiving the message, Switch A removes port GigabitEthernet 1/0/4 from the member port list of the forwarding entry for the group; however, it does not remove the group or forward the done message to Router A because Host B is still in the group. Use the **display mld-snooping group** command to display information about MLD snooping groups. For example:

# Display information about MLD snooping groups on Switch A.

```
[SwitchA] display mld-snooping group
Total 1 IP Group(s).
Total 1 IP Source(s).
```

```

Total 1 MAC Group(s).
Port flags: D-Dynamic port, S-Static port, C-Copy port, P-PIM port
Subvlan flags: R-Real VLAN, C-Copy VLAN
Vlan(id):100.
  Total 1 IP Group(s).
  Total 1 IP Source(s).
  Total 1 MAC Group(s).
  Router port(s):total 1 port(s).
    GE1/0/1 (D)
  IP group(s):the following ip group(s) match to one mac group.
  IP group address:FF1E::101
  (::, FF1E::101):
  Host port(s):total 1 port(s).
    GE1/0/3 (D)
MAC group(s):
  MAC group address:3333-0000-0101
  Host port(s):total 1 port(s).
    GE1/0/3

```

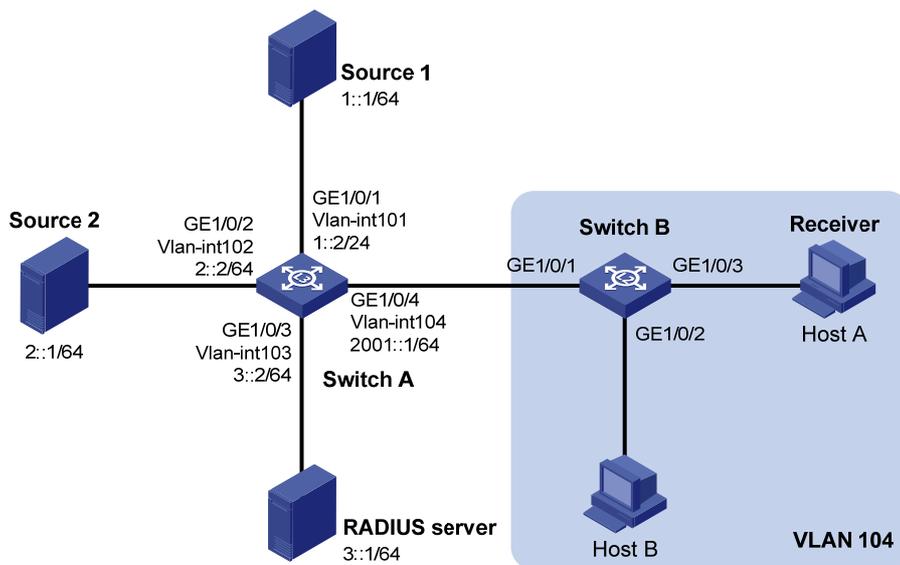
## IPv6 multicast source and user control policy configuration example

### Network requirements

As shown in [Figure 32](#), Switch A is a Layer-3 switch. MLDv1 runs on Switch A and MLDv1 snooping runs on Switch B. Multicast sources and hosts run 802.1X client.

An IPv6 multicast source control policy is configured on Switch A to block multicast flows from Source 2 to FF1E::101. An IPv6 multicast user control policy is configured on Switch B so that Host A can join or leave only multicast group FF1E::101.

**Figure 32 Network diagram**



## Configuration procedures

1. Enable IPv6 forwarding and configure an IP address and prefix length for each interface as per [Figure 32](#). (Details not shown.)
2. Configure Switch A:

# Create VLAN 101 through VLAN 104 and assign GigabitEthernet 1/0/1 through GigabitEthernet 1/0/4 to the four VLANs respectively.

```
<SwitchA> system-view
[SwitchA] vlan 101
[SwitchA-vlan101] port gigabitethernet 1/0/1
[SwitchA-vlan101] quit
[SwitchA] vlan 102
[SwitchA-vlan102] port gigabitethernet 1/0/2
[SwitchA-vlan102] quit
[SwitchA] vlan 103
[SwitchA-vlan103] port gigabitethernet 1/0/3
[SwitchA-vlan103] quit
[SwitchA] vlan 104
[SwitchA-vlan104] port gigabitethernet 1/0/4
[SwitchA-vlan104] quit
```

# Enable IPv6 multicast routing. Enable IPv6 PIM-DM on VLAN-interface 101, VLAN-interface 102 and VLAN-interface 104, and enable MLD on VLAN-interface 104.

```
[SwitchA] multicast ipv6 routing-enable
[SwitchA] interface vlan-interface 101
[SwitchA-Vlan-interface101] pim ipv6 dm
[SwitchA-Vlan-interface101] quit
[SwitchA] interface vlan-interface 102
[SwitchA-Vlan-interface102] pim ipv6 dm
[SwitchA-Vlan-interface102] quit
[SwitchA] interface vlan-interface 104
[SwitchA-Vlan-interface104] pim ipv6 dm
[SwitchA-Vlan-interface104] mld enable
[SwitchA-Vlan-interface104] quit
```

# Create a multicast source control policy, **policy1**, so that multicast flows from Source 2 to FF1E::101 will be blocked.

```
[SwitchA] acl ipv6 number 3001
[SwitchA-acl6-adv-3001] rule permit udp source 2::1 128 destination ffe::101 128
[SwitchA-acl6-adv-3001] quit
[SwitchA] traffic classifier classifier1
[SwitchA-classifier-classifier1] if-match acl ipv6 3001
[SwitchA-classifier-classifier1] quit
[SwitchA] traffic behavior behavior1
[SwitchA-behavior-behavior1] filter deny
[SwitchA-behavior-behavior1] quit
[SwitchA] qos policy policy1
[SwitchA-qospolicy-policy1] classifier classifier1 behavior behavior1
[SwitchA-qospolicy-policy1] quit
```

# Create a user profile, apply **policy1** to the inbound direction of GE 1/0/2 in user profile view, and enable the user profile.

```
[SwitchA] user-profile profile1
[SwitchA-user-profile-profile1] qos apply policy policy1 inbound
[SwitchA-user-profile-profile1] quit
[SwitchA] user-profile profile1 enable
```

# Create RADIUS scheme **scheme1**; set the service type for the RADIUS server to **extended**; specify the IP addresses of the primary authentication/authorization server and accounting server as 3::1; set the shared keys to 123321; specify that no domain name is carried in a username sent to the RADIUS server.

```
[SwitchA] radius scheme scheme1
[SwitchA-radius-scheme1] server-type extended
[SwitchA-radius-scheme1] primary authentication 3::1
[SwitchA-radius-scheme1] key authentication 123321
[SwitchA-radius-scheme1] primary accounting 3::1
[SwitchA-radius-scheme1] key accounting 123321
[SwitchA-radius-scheme1] user-name-format without-domain
[SwitchA-radius-scheme1] quit
```

# Create an ISP domain **domain1**; reference **scheme1** for the authentication, authorization, and accounting for LAN users; specify **domain1** as the default ISP domain.

```
[SwitchA] domain domain1
[SwitchA-isp-domain1] authentication lan-access radius-scheme scheme1
[SwitchA-isp-domain1] authorization lan-access radius-scheme scheme1
[SwitchA-isp-domain1] accounting lan-access radius-scheme scheme1
[SwitchA-isp-domain1] quit
[SwitchA] domain default enable domain1
```

# Globally enable 802.1X and then enable it on GigabitEthernet 1/0/1 and GigabitEthernet 1/0/2.

```
[SwitchA] dot1x
[SwitchA] interface gigabitethernet 1/0/1
[SwitchA-GigabitEthernet1/0/1] dot1x
[SwitchA-GigabitEthernet1/0/1] quit
[SwitchA] interface gigabitethernet 1/0/2
[SwitchA-GigabitEthernet1/0/2] dot1x
[SwitchA-GigabitEthernet1/0/2] quit
```

### 3. Configure Switch B:

# Globally enable MLD snooping.

```
<SwitchB> system-view
[SwitchB] mld-snooping
[SwitchB-mld-snooping] quit
```

# Create VLAN 104, assign GigabitEthernet 1/0/1 through GigabitEthernet 1/0/3 to this VLAN, and enable MLD snooping in this VLAN.

```
[SwitchB] vlan 104
[SwitchB-vlan104] port gigabitethernet 1/0/1 to gigabitethernet 1/0/3
[SwitchB-vlan104] mld-snooping enable
[SwitchB-vlan104] quit
```

# Create a user profile **profile2** and configure the user profile so that users can join or leave only one IPv6 multicast group, FF1E::101. Then, enable the user profile.

```
[SwitchB] acl ipv6 number 2001
[SwitchB-acl6-basic-2001] rule permit source ff1e::101 128
[SwitchB-acl6-basic-2001] quit
[SwitchB] user-profile profile2
[SwitchB-user-profile-profile2] mld-snooping access-policy 2001
[SwitchB-user-profile-profile2] quit
[SwitchB] user-profile profile2 enable
```

# Create a RADIUS scheme **scheme2**; set the service type for the RADIUS server to **extended**; specify the IP addresses of the primary authentication/authorization server and accounting server as 3::1; set the shared keys to 321123; specify that a username sent to the RADIUS server carry no domain name.

```
[SwitchB] radius scheme scheme2
[SwitchB-radius-scheme2] server-type extended
[SwitchB-radius-scheme2] primary authentication 3::1
[SwitchB-radius-scheme2] key authentication 321123
[SwitchB-radius-scheme2] primary accounting 3::1
[SwitchB-radius-scheme2] key accounting 321123
[SwitchB-radius-scheme2] user-name-format without-domain
[SwitchB-radius-scheme2] quit
```

# Create an ISP domain **domain2**; reference **scheme2** for the authentication, authorization, and accounting for LAN users; specify **domain2** as the default ISP domain.

```
[SwitchB] domain domain2
[SwitchB-isp-domain2] authentication lan-access radius-scheme scheme2
[SwitchB-isp-domain2] authorization lan-access radius-scheme scheme2
[SwitchB-isp-domain2] accounting lan-access radius-scheme scheme2
[SwitchB-isp-domain2] quit
[SwitchB] domain default enable domain2
```

# Globally enable 802.1X and then enable it on GigabitEthernet 1/0/2 and GigabitEthernet 1/0/3.

```
[SwitchB] dot1x
[SwitchB] interface gigabitethernet 1/0/2
[SwitchB-GigabitEthernet1/0/2] dot1x
[SwitchB-GigabitEthernet1/0/2] quit
[SwitchB] interface gigabitethernet 1/0/3
[SwitchB-GigabitEthernet1/0/3] dot1x
[SwitchB-GigabitEthernet1/0/3] quit
```

#### 4. Configure RADIUS server:

On the RADIUS server, configure the parameters related to Switch A and Switch B. For more information, see the configuration guide of the RADIUS server.

### Verifying the configuration

After the configurations, the two multicast sources and hosts initiate 802.1X authentication. After passing the authentication, Source 1 sends multicast flows to FF1E::101 and Source 2 sends multicast flows to FF1E::102; Host A sends report messages to join IPv6 multicast groups FF1E::101 and FF1E::102. Use the **display mld-snooping group** command to display information about MLD snooping groups. For example:

# Display information about MLD snooping groups in VLAN 104 on Switch B.

```
[SwitchB] display mld-snooping group vlan 104 verbose
Total 1 IP Group(s).
Total 1 IP Source(s).
Total 1 MAC Group(s).

Port flags: D-Dynamic port, S-Static port, C-Copy port, P-PIM port
Subvlan flags: R-Real VLAN, C-Copy VLAN
Vlan(id):104.
Total 1 IP Group(s).
Total 1 IP Source(s).
Total 1 MAC Group(s).
Router port(s):total 1 port(s).
    GE1/0/1                (D) ( 00:01:30 )
IP group(s):the following ip group(s) match to one mac group.
  IP group address:FF1E::101
    (::, FF1E::101):
      Attribute:    Host Port
      Host port(s):total 1 port(s).
        GE1/0/3                (D) ( 00:04:10 )
MAC group(s):
  MAC group address:3333-0000-0101
  Host port(s):total 1 port(s).
    GE1/0/3
```

The output shows that GigabitEthernet 1/0/3 on Switch B has joined FF1E::101 but not FF1E::102.

Assume that Source 2 starts sending multicast traffic to FF1E::101. Use the **display multicast ipv6 forwarding-table** to display the IPv6 multicast forwarding table information.

# Display the information about FF1E::101 in the IPv6 multicast forwarding table on Switch A.

```
[SwitchA] display multicast ipv6 forwarding-table ffile::101
IPv6 Multicast Forwarding Table

Total 1 entry

Total 1 entry matched
00001. (1::1, FF1E::101)
  MID: 0, Flags: 0x0:0
  Uptime: 00:08:32, Timeout in: 00:03:26
  Incoming interface: Vlan-interface101
  List of 1 outgoing interfaces:
    1: Vlan-interface104
  Matched 19648 packets(20512512 bytes), Wrong If 0 packets
  Forwarded 19648 packets(20512512 bytes)
```

The output shows that Switch A maintains a multicast forwarding entry for multicast packets from Source 1 to FF1E::101. No forwarding entry exists for packets from Source 2 to FF1E::101, which indicates that IPv6 multicast packets from Source 2 are blocked.

# Troubleshooting MLD snooping

## Layer 2 multicast forwarding cannot function

### Symptom

Layer 2 multicast forwarding cannot function.

### Analysis

MLD snooping is not enabled.

### Solution

1. Use the **display current-configuration** command to display the running status of MLD snooping.
2. If MLD snooping is not enabled, use the **mld-snooping** command to enable MLD snooping globally, and then use **mld-snooping enable** command to enable MLD snooping in VLAN view.
3. If MLD snooping is disabled only for the corresponding VLAN, use the **mld-snooping enable** command in VLAN view to enable MLD snooping in the corresponding VLAN.

## Configured IPv6 multicast group policy fails to take effect

### Symptom

Although an IPv6 multicast group policy has been configured to allow hosts to join specific IPv6 multicast groups, the hosts can still receive IPv6 multicast data addressed to other groups.

### Analysis

- The IPv6 ACL rule is incorrectly configured.
- The IPv6 multicast group policy is not correctly applied.
- The function of dropping unknown IPv6 multicast data is not enabled, so unknown IPv6 multicast data is flooded.

### Solution

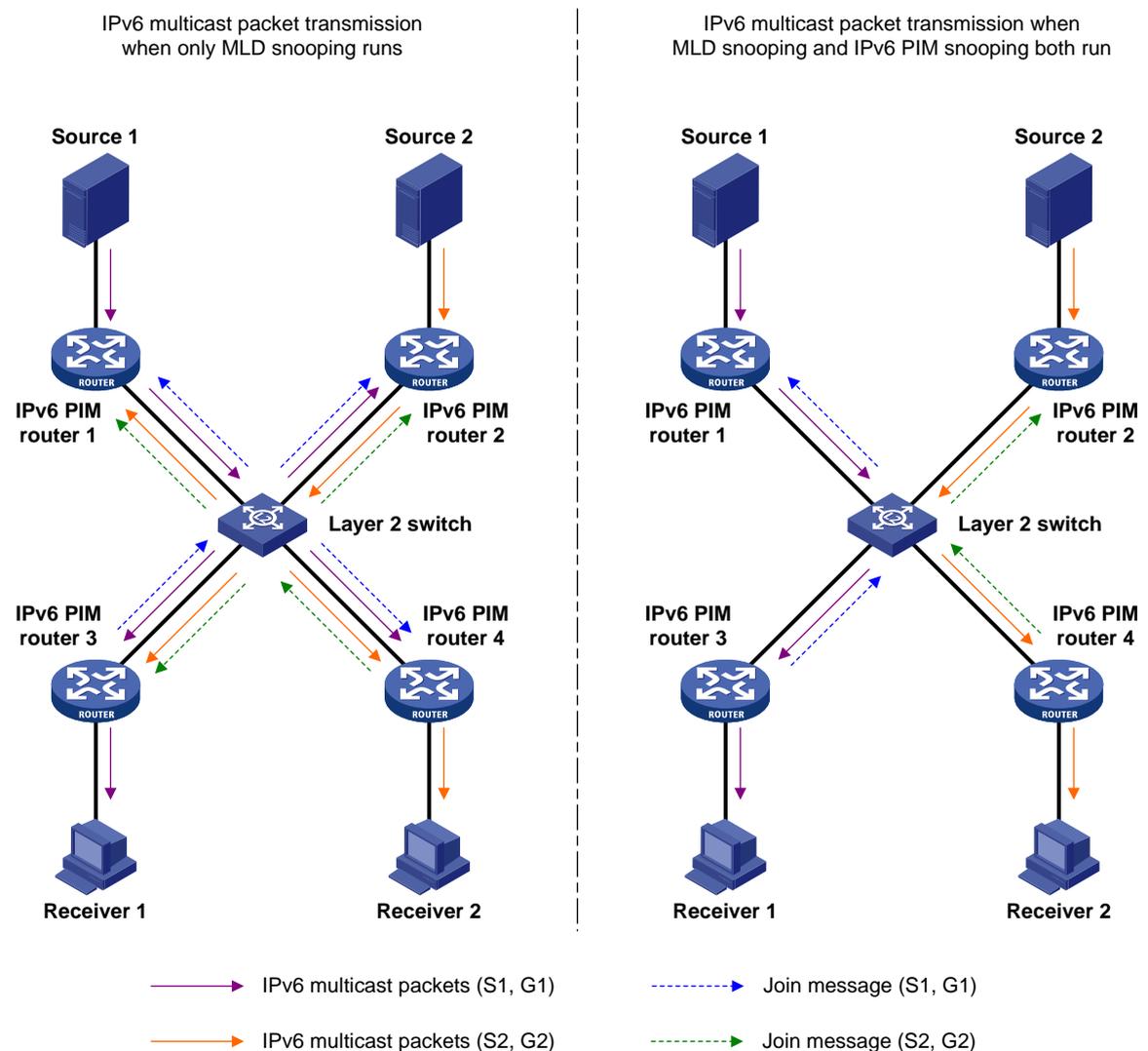
1. Use the **display acl ipv6** command to check the configured IPv6 ACL rule. Make sure that the IPv6 ACL rule conforms to the IPv6 multicast group policy to be implemented.
2. Use the **display this** command in MLD-snooping view or the corresponding interface view to verify that the correct IPv6 multicast group policy has been applied. If not, use the **group-policy** or **mld-snooping group-policy** command to apply the correct IPv6 multicast group policy.
3. Use the **display current-configuration** command to verify that the function of dropping unknown IPv6 multicast data is enabled. If not, use the **mld-snooping drop-unknown** command to enable the function of dropping unknown IPv6 multicast data.

# Configuring IPv6 PIM snooping

## Overview

IPv6 Protocol Independent Multicast (PIM) snooping runs on Layer 2 devices. It determines which ports are interested in multicast data by analyzing the received IPv6 PIM messages, and adds the ports to a multicast forwarding entry to make sure that multicast data can be forwarded to only the ports that are interested in the data.

**Figure 33 Multicast packet transmission without or with IPv6 PIM snooping**



As shown in Figure 33, Source 1 sends multicast data to multicast group G1, and Source 2 sends multicast data to multicast group G2. Receiver 1 belongs to G1, and Receiver 2 belongs to G2. The Layer 2 switch's interfaces that connect to the IPv6 PIM-capable routers are in the same VLAN.

- When running MLD snooping without IPv6 PIM snooping, the Layer 2 switch maintains the router ports according to IPv6 PIM hello messages received from IPv6 PIM-capable routers, broadcasts all

other types of received IPv6 PIM messages in the VLAN, and forwards all multicast data to all router ports in the VLAN. Each IPv6 PIM-capable router in the VLAN, whether interested in the multicast data or not, will receive all multicast data and all IPv6 PIM messages except for IPv6 PIM hello messages.

- If the Layer 2 switch runs both MLD snooping and IPv6 PIM snooping, it determines whether an IPv6 PIM-capable router is interested in the multicast data destined for a multicast group according to the received IPv6 PIM messages that the router sends, and adds the port that connects to the router to a multicast forwarding entry. Then, the Layer 2 switch can correctly forward IPv6 PIM messages and the multicast data only to the router according to the multicast forwarding entry, saving network bandwidth.

For more information about MLD snooping and the router port, see "[Configuring MLD snooping](#)."

## Configuring IPv6 PIM snooping

When you configure IPv6 PIM snooping, follow these guidelines:

- Before you configure IPv6 PIM snooping for a VLAN, you must enable IPv6 forwarding and MLD snooping globally and enable MLD snooping in the VLAN.
- IPv6 PIM snooping does not work in the sub-VLANs of a multicast VLAN. For more information about IPv6 multicast VLAN, see "[Configuring IPv6 multicast VLANs](#)."
- In a network with IPv6 PIM snooping enabled switches, configure the size of each join/prune message no more than the path maximum transmission unit (MTU) on the IPv6 PIM-enabled edge router on the receiver side.
- After you enable IPv6 PIM snooping in a VLAN, IPv6 PIM snooping works only on the member interfaces of the VLAN.

To configure IPv6 PIM snooping:

Step	Command	Remarks
1. Enter system view.	<b>system-view</b>	N/A
2. Enable IPv6 forwarding globally.	<b>ipv6</b>	Disabled by default
3. Enable MLD snooping globally and enter MLD-snooping view.	<b>mld-snooping</b>	Disabled by default
4. Return to system view.	<b>quit</b>	N/A
5. Enter VLAN view.	<b>vlan <i>vlan-id</i></b>	N/A
6. Enable MLD snooping in the VLAN.	<b>mld-snooping enable</b>	Disabled by default
7. Enable IPv6 PIM snooping in the VLAN.	<b>pim-snooping ipv6 enable</b>	Disabled by default

# Displaying and maintaining IPv6 PIM snooping

Task	Command	Remarks
Display IPv6 PIM snooping neighbor information.	<b>display pim-snooping ipv6 neighbor</b> [ <i>vlan vlan-id</i> ] [ <i>slot slot-number</i> ] [   { <b>begin</b>   <b>exclude</b>   <b>include</b> } <i>regular-expression</i> ]	Available in any view
Display IPv6 PIM snooping routing entries.	<b>display pim-snooping ipv6 routing-table</b> [ <i>vlan vlan-id</i> ] [ <i>slot slot-number</i> ] [   { <b>begin</b>   <b>exclude</b>   <b>include</b> } <i>regular-expression</i> ]	Available in any view
Display the statistics information of IPv6 PIM messages learned by IPv6 PIM snooping.	<b>display pim-snooping ipv6 statistics</b> [   { <b>begin</b>   <b>exclude</b>   <b>include</b> } <i>regular-expression</i> ]	Available in any view
Clear the statistics information of IPv6 PIM messages learned by IPv6 PIM snooping.	<b>reset pim-snooping ipv6 statistics</b>	Available in user view

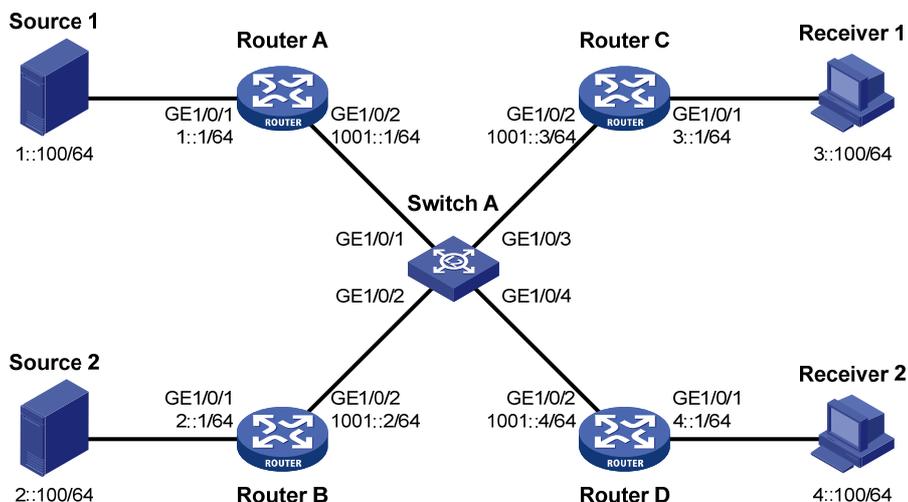
## IPv6 PIM snooping configuration example

### Network requirements

As shown in Figure 34, Source 1 sends multicast data to IPv6 multicast group FF1E::101, and Source 2 sends multicast data to IPv6 multicast group FF2E::101. Receiver 1 belongs to multicast group FF1E::101, and Receiver 2 belongs to multicast group FF2E::101. Router C and Router D run MLD on their interface GigabitEthernet 1/0/1. Router A, Router B, Router C, and Router D run IPv6 PIM-SM, and interface GigabitEthernet 1/0/2 on Router A acts as a C-BSR and C-RP.

Configure MLD snooping and IPv6 PIM snooping on Switch A so that Switch A forwards IPv6 PIM messages and multicast data to only the routers that are interested in the multicast data.

Figure 34 Network diagram



## Configuration procedure

1. Enable IPv6 forwarding on the devices, configure an IPv6 address and prefix length for each interface according to [Figure 34](#). (Details not shown.)
2. On Router A, enable IPv6 multicast routing, enable IPv6 PIM-SM on each interface, and configure interface GigabitEthernet 1/0/2 as a C-BSR and C-RP.

```
<RouterA> system-view
[RouterA] multicast ipv6 routing-enable
[RouterA] interface gigabitethernet 1/0/1
[RouterA-GigabitEthernet1/0/1] pim ipv6 sm
[RouterA-GigabitEthernet1/0/1] quit
[RouterA] interface gigabitethernet 1/0/2
[RouterA-GigabitEthernet1/0/2] pim ipv6 sm
[RouterA-GigabitEthernet1/0/2] quit
[RouterA] pim ipv6
[RouterA-pim6] c-bsr 1001::1
[RouterA-pim6] c-rp 1001::1
```

3. On Router B, enable IPv6 multicast routing, and enable IPv6 PIM-SM on each interface.

```
<RouterB> system-view
[RouterB] multicast ipv6 routing-enable
[RouterB] interface gigabitethernet 1/0/1
[RouterB-GigabitEthernet1/0/1] pim ipv6 sm
[RouterB-GigabitEthernet1/0/1] quit
[RouterB] interface gigabitethernet 1/0/2
[RouterB-GigabitEthernet1/0/2] pim ipv6 sm
```

4. On Router C, enable IPv6 multicast routing, enable IPv6 PIM-SM on each interface, and enable MLD on GigabitEthernet 1/0/1.

```
<RouterC> system-view
[RouterC] multicast ipv6 routing-enable
[RouterC] interface gigabitethernet 1/0/1
[RouterC-GigabitEthernet1/0/1] pim ipv6 sm
[RouterC-GigabitEthernet1/0/1] mld enable
[RouterC-GigabitEthernet1/0/1] quit
[RouterC] interface gigabitethernet 1/0/2
[RouterC-GigabitEthernet1/0/2] pim ipv6 sm
```

5. Configure Router D in the same way as you configure Router C. (Details not shown.)

6. Configure Switch A:

# Enable MLD snooping globally.

```
<SwitchA> system-view
[SwitchA] mld-snooping
[SwitchA-mld-snooping] quit
```

# Create VLAN 100, assign GigabitEthernet 1/0/1 through GigabitEthernet 1/0/4 to this VLAN, and enable MLD snooping and IPv6 PIM snooping in the VLAN.

```
[SwitchA] vlan 100
[SwitchA-vlan100] port gigabitethernet 1/0/1 to gigabitethernet 1/0/4
[SwitchA-vlan100] mld-snooping enable
[SwitchA-vlan100] pim-snooping ipv6 enable
[SwitchA-vlan100] quit
```

## Verifying the configuration

# On Switch A, display the IPv6 PIM snooping neighbor information of VLAN 100.

```
[SwitchA] display pim-snooping ipv6 neighbor vlan 100
Total number of neighbors: 4
```

```
VLAN ID: 100
Total number of neighbors: 4
Neighbor      Port          Expires      Option Flags
FE80::1      GE1/0/1      02:02:23    LAN Prune Delay
FE80::2      GE1/0/2      03:00:05    LAN Prune Delay
FE80::3      GE1/0/3      02:22:13    LAN Prune Delay
FE80::4      GE1/0/4      03:07:22    LAN Prune Delay
```

The output shows that Router A, Router B, Router C, and Router D are IPv6 PIM snooping neighbors.

# On Switch A, display the IPv6 PIM snooping routing information of VLAN 100.

```
[SwitchA] display pim-snooping ipv6 routing-table vlan 100 slot 1
Total 2 entry(ies)
FSM Flag: NI-no info, J-join, PP-prune pending
```

```
VLAN ID: 100
Total 2 entry(ies)
(*, FF1E::101)
  Upstream neighbor: FE80::1
  Upstream port: GE1/0/1
  Total number of downstream ports: 1
    1: GE1/0/3
      Expires: 00:03:01, FSM: J
(*, FF2E::101)
  Upstream neighbor: FE80::2
  Upstream port: GE1/0/2
  Total number of downstream ports: 1
    1: GE1/0/4
      Expires: 00:01:05, FSM: J
```

The output shows that Switch A will forward the multicast data intended for IPv6 multicast group FF1E::101 to only Router C, and forward the multicast data intended for IPv6 multicast group FF2E::101 to only Router D.

# Troubleshooting IPv6 PIM snooping

## IPv6 PIM snooping does not work

### Symptom

IPv6 PIM snooping does not work.

### Analysis

MLD snooping or IPv6 PIM snooping is not enabled on the switch.

## Solution

1. Use the **display current-configuration** command to check the status of MLD snooping and IPv6 PIM snooping.
2. If MLD snooping is not enabled, enter system view and use the **mld-snooping** command to enable MLD snooping globally. Then, enter VLAN view and use the **mld-snooping enable** and **pim-snooping ipv6 enable** commands to enable MLD snooping and IPv6 PIM snooping in the VLAN.
3. If IPv6 PIM snooping is not enabled, enter VLAN view and use the **pim-snooping ipv6 enable** command to enable IPv6 PIM snooping in the VLAN.

## Some downstream IPv6 PIM-capable routers cannot receive multicast data

### Symptom

In a network with fragmented join/prune messages, some downstream IPv6 PIM-capable routers cannot receive multicast data.

### Analysis

IPv6 PIM snooping cannot reassemble messages, and it cannot maintain the status of downstream routers that the join/prune message fragments carry. To ensure the normal operation of the system, IPv6 PIM snooping must broadcast join/prune message fragments in the VLAN. However, if the VLAN has an IPv6 PIM-capable router that has the join suppression function enabled, the broadcast join/prune message fragments might suppress the join messages of other IPv6 PIM-capable routers in the VLAN. As a result, some IPv6 PIM-capable routers cannot receive the multicast data addressed to a specific multicast group because their join messages are suppressed. To solve this problem, disable the join suppression function on all IPv6 PIM-capable routers that connect to the IPv6 PIM snooping-capable switch in the VLAN.

### Solution

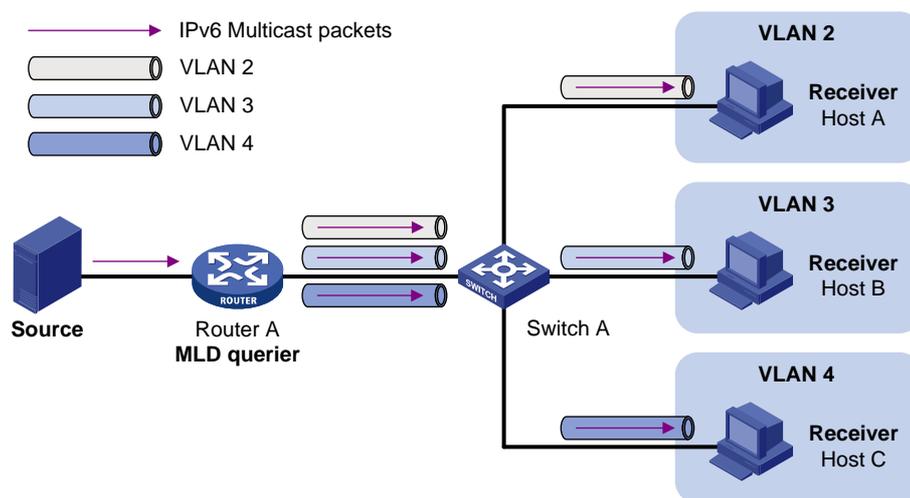
1. Use the **pim ipv6 hello-option neighbor-tracking** command to enable the neighbor tracking function on the interfaces of IPv6 PIM-capable routers that connect to the IPv6 PIM snooping-capable switch.
2. If the network has an IPv6 PIM-capable router that cannot be enabled with the neighbor tracking function, be sure to disable IPv6 PIM snooping on the IPv6 PIM snooping-capable switch.

# Configuring IPv6 multicast VLANs

## Overview

As shown in [Figure 35](#), in the traditional IPv6 multicast programs-on-demand mode, when hosts (Host A, Host B, and Host C), which belong to different VLANs, require IPv6 multicast programs on demand service, the Layer 3 device, Router A, must forward a separate copy of the multicast traffic in each user VLAN to the Layer 2 device, Switch A. This results in not only waste of network bandwidth but also extra burden on the Layer 3 device.

**Figure 35 Multicast transmission without IPv6 multicast VLAN**



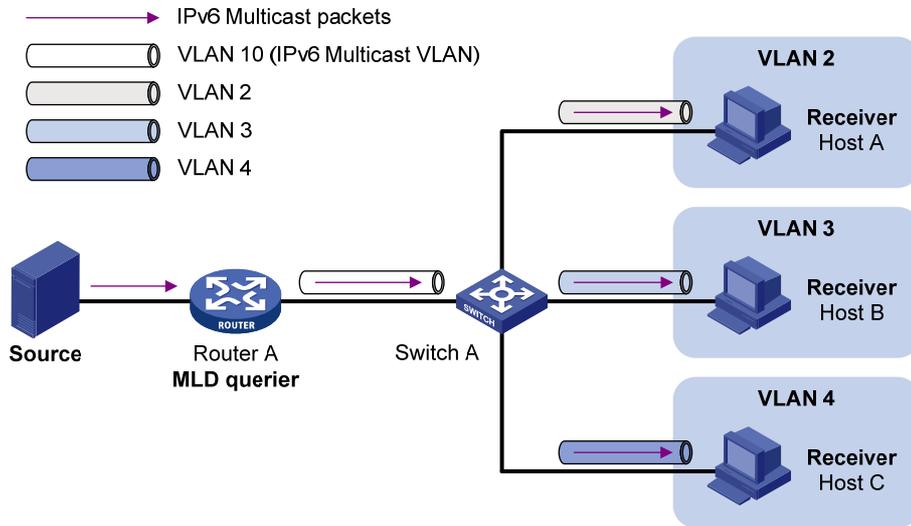
The IPv6 multicast VLAN feature configured on the Layer 2 device is the solution to this issue. With the IPv6 multicast VLAN feature, the Layer 3 device needs to replicate the multicast traffic only in the IPv6 multicast VLAN instead of making a separate copy of the multicast traffic in each user VLAN. This saves the network bandwidth and lessens the burden of the Layer 3 device.

The IPv6 multicast VLAN feature can be implemented in sub-VLAN-based IPv6 multicast VLAN and port-based IPv6 multicast VLAN.

### Sub-VLAN-based IPv6 multicast VLAN

As shown in [Figure 36](#), Host A, Host B and Host C are in different user VLANs. On Switch A, configure VLAN 10 as an IPv6 multicast VLAN, configure all the user VLANs as sub-VLANs of VLAN 10, and enable MLD snooping in the IPv6 multicast VLAN.

**Figure 36 Sub-VLAN-based IPv6 multicast VLAN**

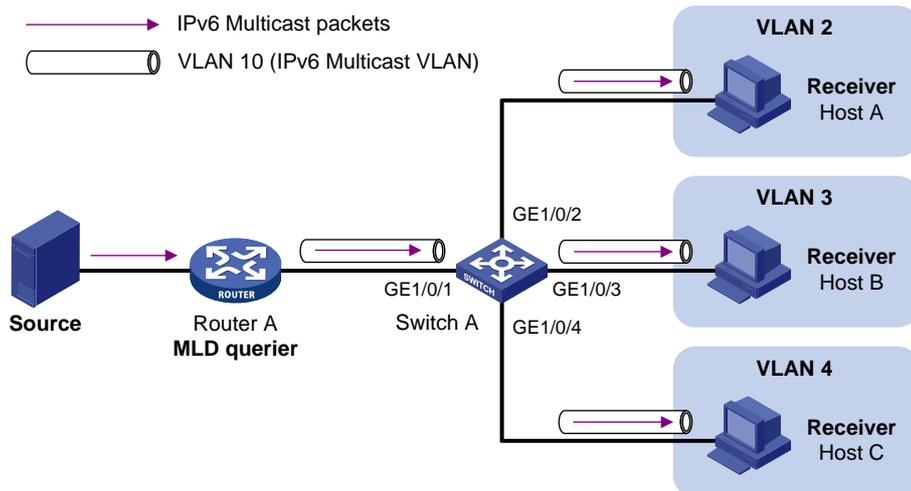


After the configuration, MLD snooping manages router ports in the IPv6 multicast VLAN and member ports in the sub-VLANs. When forwarding multicast data to Switch A, Router A sends only one copy of multicast data to Switch A in the IPv6 multicast VLAN, and Switch A distributes the data to the sub-VLANs that contain receivers.

### Port-based IPv6 multicast VLAN

As shown in Figure 37, Host A, Host B, and Host C are in different user VLANs. All the user ports are hybrid ports. On Switch A, configure VLAN 10 as an IPv6 multicast VLAN, assign all the user ports to VLAN 10, and enable MLD snooping in the IPv6 multicast VLAN and all user VLANs.

**Figure 37 Port-based IPv6 multicast VLAN**



After the configuration, if Switch A receives an MLD message on a user port, it tags the message with the IPv6 multicast VLAN ID and relays it to the MLD querier, so that MLD snooping can uniformly manage the router ports and member ports in the IPv6 multicast VLAN. When Router A forwards multicast data to Switch A, it sends only one copy of multicast data to Switch A in the IPv6 multicast VLAN, and Switch A distributes the data to all member ports in the IPv6 multicast VLAN.

For more information about MLD snooping, router ports, and member ports, see "[Configuring MLD snooping.](#)"

For more information about VLAN tags, see *Layer 2—LAN Switching Configuration Guide*.

## IPv6 multicast VLAN configuration task list

Configuration task	Remarks
Configuring a sub-VLAN-based IPv6 multicast VLAN	Required.
Configuring a port-based IPv6 multicast VLAN	Configuring user port attributes Configuring IPv6 multicast VLAN ports Use either approach.

### NOTE:

If you have configured both sub-VLAN-based IPv6 multicast VLAN and port-based IPv6 multicast VLAN on a device, the port-based IPv6 multicast VLAN configuration is given preference.

## Configuring a sub-VLAN-based IPv6 multicast VLAN

Before you configure a sub-VLAN-based IPv6 multicast VLAN, complete the following tasks:

- Enable IPv6 forwarding.
- Create VLANs as required.
- Enable MLD snooping in the VLAN to be configured as an IPv6 multicast VLAN.

## Configuration guidelines

- The VLAN to be configured as an IPv6 multicast VLAN must exist.
- The VLANs to be configured as the sub-VLANs of the IPv6 multicast VLAN must exist and must not be IPv6 multicast VLANs or sub-VLANs of any other IPv6 multicast VLAN.
- The total number of sub-VLANs of an IPv6 multicast VLAN must not exceed the maximum number the system can support.

## Configuration procedure

In this approach, you configure a VLAN as an IPv6 multicast VLAN, and configure user VLANs as sub-VLANs of the IPv6 multicast VLAN.

To configure a sub-VLAN-based IPv6 multicast VLAN:

Step	Command	Remarks
1. Enter system view.	<b>system-view</b>	N/A
2. Configure the specified VLAN as an IPv6 multicast VLAN and enter IPv6 multicast VLAN view.	<b>multicast-vlan ipv6</b> <i>vlan-id</i>	No IPv6 multicast VLAN configured by default.

Step	Command	Remarks
3. Configure the specified VLANs as sub-VLANs of the IPv6 multicast VLAN.	<b>subvlan</b> <i>vlan-list</i>	By default, an IPv6 multicast VLAN has no sub-VLANs.

## Configuring a port-based IPv6 multicast VLAN

When you configure a port-based IPv6 multicast VLAN, you need to configure the attributes of each user port and then assign the ports to the IPv6 multicast VLAN.

A user port can be configured as a multicast VLAN port only if it is an Ethernet port or Layer 2 aggregate interface.

In Ethernet interface view or Layer 2 aggregate interface view, configurations that you make are effective only on the current interface. In port group view, configurations that you make are effective on all ports in the current port group.

## Configuration prerequisites

Before you configure a port-based IPv6 multicast VLAN, complete the following tasks:

- Enable IPv6 forwarding.
- Create VLANs as required.
- Enable MLD snooping in the VLAN to be configured as an IPv6 multicast VLAN.
- Enable MLD snooping in all the user VLANs.

## Configuring user port attributes

First, configure the user ports as hybrid ports to permit packets of the specified user VLAN to pass and configure the user VLAN to which the user ports belong as the default VLAN.

Then, configure the user ports to permit packets of the IPv6 multicast VLAN to pass and untag the packets. After receiving multicast packets tagged with the IPv6 multicast VLAN ID from the upstream device, the Layer 2 device untags the multicast packets and forwards them to its downstream device.

To configure user port attributes:

Step	Command	Remarks
1. Enter system view.	<b>system-view</b>	N/A
2. Enter interface view or port group view.	<ul style="list-style-type: none"> <li>• Enter Layer 2 Ethernet interface view or Layer 2 aggregate interface view: <b>interface</b> <i>interface-type</i> <i>interface-number</i></li> <li>• Enter port group view: <b>port-group manual</b> <i>port-group-name</i></li> </ul>	Use either command.
3. Configure the user port link type as hybrid.	<b>port link-type hybrid</b>	Access by default.

Step	Command	Remarks
4. Specify the user VLAN that comprises the current user ports as the default VLAN.	<b>port hybrid pvid vlan</b> <i>vlan-id</i>	VLAN 1 by default.
5. Configure the current user ports to permit packets of the specified IPv6 multicast VLAN to pass and untag the packets.	<b>port hybrid vlan</b> <i>vlan-id-list</i> { <b>tagged</b>   <b>untagged</b> }	By default, a hybrid port permits only packets of VLAN 1 to pass.

For more information about the **port link-type**, **port hybrid pvid vlan**, and **port hybrid vlan** commands, see *Layer 2—LAN Switching Command Reference*.

## Configuring IPv6 multicast VLAN ports

In this approach, you configure a VLAN as an IPv6 multicast VLAN and assign user ports to it. You can do this by either adding the user ports in the IPv6 multicast VLAN or specifying the IPv6 multicast VLAN on the user ports. These two methods provide the same result.

### Configuration guidelines

- The VLAN to be configured as an IPv6 multicast VLAN must exist.
- A port can belong to only one IPv6 multicast VLAN.

### Configuration procedure

To configure IPv6 multicast VLAN ports in IPv6 multicast VLAN view:

Step	Command	Remarks
1. Enter system view.	<b>system-view</b>	N/A
2. Configure the specified VLAN as an IPv6 multicast VLAN and enter IPv6 multicast VLAN view.	<b>multicast-vlan ipv6</b> <i>vlan-id</i>	No IPv6 multicast VLAN configured by default.
3. Configure the ports as member ports of the IPv6 multicast VLAN.	<b>port</b> <i>interface-list</i>	By default, an IPv6 multicast VLAN has no member ports.

To configure IPv6 multicast VLAN ports in interface view or port group view:

Step	Command	Remarks
1. Enter system view.	<b>system-view</b>	N/A
2. Configure the specified VLAN as an IPv6 multicast VLAN and enter IPv6 multicast VLAN view.	<b>multicast-vlan ipv6</b> <i>vlan-id</i>	Not an IPv6 multicast VLAN by default.
3. Return to system view.	<b>quit</b>	N/A

Step	Command	Remarks
4. Enter interface view or port group view.	<ul style="list-style-type: none"> <li>Enter Layer 2 Ethernet interface view or Layer 2 aggregate interface view: <b>interface</b> <i>interface-type interface-number</i></li> <li>Enter port group view: <b>port-group manual</b> <i>port-group-name</i></li> </ul>	Use either command.
5. Configure the ports as member ports of the IPv6 multicast VLAN.	<b>port multicast-vlan ipv6</b> <i>vlan-id</i>	By default, a user port does not belong to any IPv6 multicast VLAN.

## Displaying and maintaining IPv6 multicast VLAN

Task	Command	Remarks
Display information about an IPv6 multicast VLAN.	<b>display multicast-vlan ipv6</b> [ <i>vlan-id</i> ] [   { <b>begin</b>   <b>exclude</b>   <b>include</b> } <i>regular-expression</i> ]	Available in any view

## IPv6 multicast VLAN configuration examples

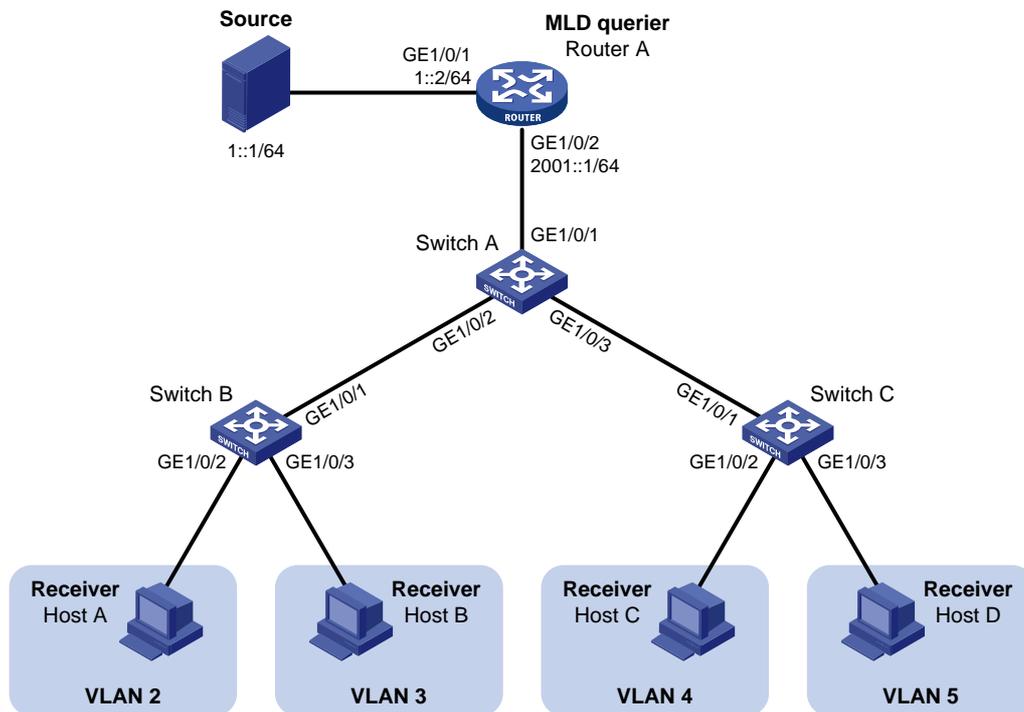
### Sub-VLAN-based multicast VLAN configuration example

#### Network requirements

As shown in [Figure 38](#), MLDv1 runs on Router A, and MLDv1 snooping runs on Switch A. Router A acts as the MLD querier. The IPv6 multicast source sends IPv6 multicast data to the IPv6 multicast group FF1E::101. Host A, Host B, Host C, and Host D are receivers of the IPv6 multicast group. The hosts belong to VLAN 2 through VLAN 5 respectively.

Configure the sub-VLAN-based IPv6 multicast VLAN feature on Switch A so that Router A just sends IPv6 multicast data to Switch A through the IPv6 multicast VLAN and Switch A forwards the traffic to the receivers that belong to different user VLANs.

**Figure 38 Network diagram**



### Configuration procedure

1. Enable IPv6 forwarding on each device and configure an IPv6 address and address prefix for each interface as per Figure 38. (Details not shown.)
2. On Router A, enable IPv6 multicast routing, enable IPv6 PIM-DM on each interface and enable MLD on the host-side interface GigabitEthernet 1/0/2.

```
<RouterA> system-view
[RouterA] multicast ipv6 routing-enable
[RouterA] interface gigabitethernet 1/0/1
[RouterA-GigabitEthernet1/0/1] pim ipv6 dm
[RouterA-GigabitEthernet1/0/1] quit
[RouterA] interface gigabitethernet 1/0/2
[RouterA-GigabitEthernet1/0/2] pim ipv6 dm
[RouterA-GigabitEthernet1/0/2] mld enable
```

3. Configure Switch A:

# Enable MLD snooping globally.

```
<SwitchA> system-view
[SwitchA] mld-snooping
[SwitchA-mld-snooping] quit
```

# Create VLAN 2 through VLAN 5.

```
[SwitchA] vlan 2 to 5
```

# Configure GigabitEthernet 1/0/2 as a trunk port that permits packets from VLAN 2 and VLAN 3 to pass through.

```
[SwitchA] interface gigabitethernet 1/0/2
[SwitchA-GigabitEthernet1/0/2] port link-type trunk
[SwitchA-GigabitEthernet1/0/2] port trunk permit vlan 2 3
```

```
[SwitchA-GigabitEthernet1/0/2] quit
# Configure GigabitEthernet 1/0/3 as a trunk port that permits packets from VLAN 4 and VLAN
5 to pass through.
[SwitchA] interface gigabitethernet 1/0/3
[SwitchA-GigabitEthernet1/0/3] port link-type trunk
[SwitchA-GigabitEthernet1/0/3] port trunk permit vlan 4 5
[SwitchA-GigabitEthernet1/0/3] quit
# Create VLAN 10, assign GigabitEthernet 1/0/1 to this VLAN and enable MLD snooping in the
VLAN.
[SwitchA] vlan 10
[SwitchA-vlan10] port gigabitethernet 1/0/1
[SwitchA-vlan10] mld-snooping enable
[SwitchA-vlan10] quit
# Configure VLAN 10 as an IPv6 multicast VLAN and configure VLAN 2 through VLAN 5 as its
sub-VLANs.
[SwitchA] multicast-vlan ipv6 10
[SwitchA-ipv6-mvlan-10] subvlan 2 to 5
[SwitchA-ipv6-mvlan-10] quit
```

#### 4. Configure Switch B:

# Enable MLD snooping globally.

```
<SwitchB> system-view
[SwitchB] mld-snooping
[SwitchB-mld-snooping] quit
```

# Create VLAN 2, assign GigabitEthernet 1/0/2 to VLAN 2, and enable MLD snooping in the VLAN.

```
[SwitchB] vlan 2
[SwitchB-vlan2] port gigabitethernet 1/0/2
[SwitchB-vlan2] mld-snooping enable
[SwitchB-vlan2] quit
```

# Create VLAN 3, assign GigabitEthernet 1/0/3 to VLAN 3, and enable MLD snooping in the VLAN.

```
[SwitchB] vlan 3
[SwitchB-vlan3] port gigabitethernet 1/0/3
[SwitchB-vlan3] mld-snooping enable
[SwitchB-vlan3] quit
```

# Configure GigabitEthernet 1/0/1 as a trunk port that permits packets from VLAN 2 and VLAN 3 to pass through.

```
[SwitchB] interface gigabitethernet 1/0/1
[SwitchB-GigabitEthernet1/0/1] port link-type trunk
[SwitchB-GigabitEthernet1/0/1] port trunk permit vlan 2 3
```

#### 5. Configure Switch C in the same way as you configure Switch B. (Details not shown.)

### Verifying the configuration

# Display information about the IPv6 multicast VLAN.

```
[SwitchA] display multicast-vlan ipv6
Total 1 IPv6 multicast-vlan(s)
IPv6 Multicast vlan 10
```

```
subvlan list:
vlan 2-5
port list:
no port
```

# Display the MLD snooping IPv6 multicast group information on Switch A.

```
[SwitchA] display mld-snooping group
Total 5 IP Group(s).
Total 5 IP Source(s).
Total 5 MAC Group(s).
Port flags: D-Dynamic port, S-Static port, C-Copy port, P-PIM port
Subvlan flags: R-Real VLAN, C-Copy VLAN
Vlan(id):2.
Total 1 IP Group(s).
Total 1 IP Source(s).
Total 1 MAC Group(s).
Router port(s):total 0 port(s).
IP group(s):the following ip group(s) match to one mac group.
IP group address:FF1E::101
(::, FF1E::101):
Host port(s):total 1 port(s).
GE1/0/2 (D)
MAC group(s):
MAC group address:3333-0000-0101
Host port(s):total 1 port(s).
GE1/0/2
Vlan(id):3.
Total 1 IP Group(s).
Total 1 IP Source(s).
Total 1 MAC Group(s).
Router port(s):total 0 port(s).
IP group(s):the following ip group(s) match to one mac group.
IP group address:FF1E::101
(::, FF1E::101):
Host port(s):total 1 port(s).
GE1/0/2 (D)
MAC group(s):
MAC group address:3333-0000-0101
Host port(s):total 1 port(s).
GE1/0/2
Vlan(id):4.
Total 1 IP Group(s).
Total 1 IP Source(s).
Total 1 MAC Group(s).
Router port(s):total 0 port(s).
IP group(s):the following ip group(s) match to one mac group.
IP group address:FF1E::101
(::, FF1E::101):
Host port(s):total 1 port(s).
```

```

                GE1/0/3                (D)
MAC group(s):
  MAC group address:3333-0000-0101
  Host port(s):total 1 port(s).
    GE1/0/3

Vlan(id):5.
  Total 1 IP Group(s).
  Total 1 IP Source(s).
  Total 1 MAC Group(s).
  Router port(s):total 0 port(s).
  IP group(s):the following ip group(s) match to one mac group.
    IP group address:FF1E::101
      (::, FF1E::101):
        Host port(s):total 1 port(s).
          GE1/0/3                (D)
  MAC group(s):
    MAC group address:3333-0000-0101
    Host port(s):total 1 port(s).
      GE1/0/3

Vlan(id):10.
  Total 1 IP Group(s).
  Total 1 IP Source(s).
  Total 1 MAC Group(s).
  Router port(s):total 1 port(s).
    GE1/0/1                (D)
  IP group(s):the following ip group(s) match to one mac group.
    IP group address:FF1E::101
      (::, FF1E::101):
        Host port(s):total 0 port(s).
  MAC group(s):
    MAC group address:3333-0000-0101
    Host port(s):total 0 port(s).

```

The output shows that MLD snooping is maintaining the router port in the IPv6 multicast VLAN (VLAN 10) and the member ports in the sub-VLANs (VLAN 2 through VLAN 5).

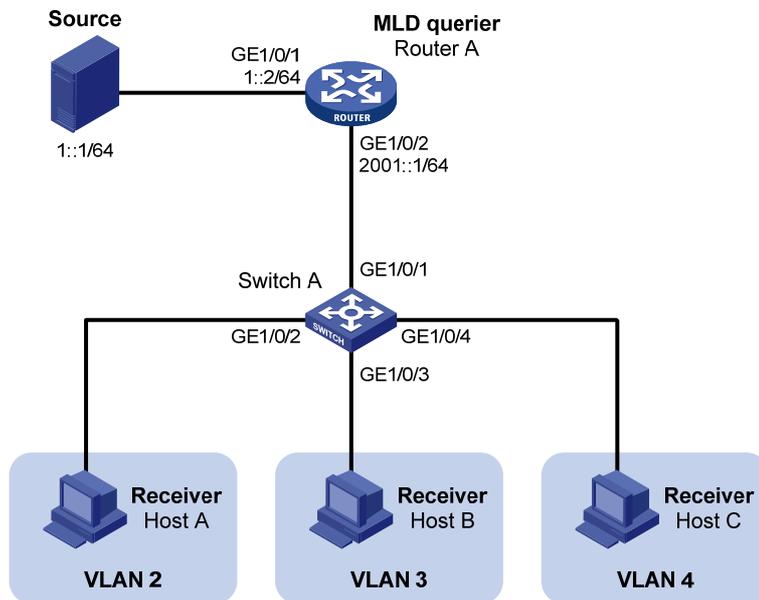
## Port-based multicast VLAN configuration example

### Network requirements

As shown in [Figure 39](#), MLDv1 runs on Router A. MLDv1 snooping runs on Switch A. Router A acts as the MLD querier. The IPv6 multicast source sends IPv6 multicast data to IPv6 multicast group FF1E::101. Host A, Host B, and Host C are receivers of the IPv6 multicast group. The hosts belong to VLAN 2 through VLAN 4 respectively.

Configure the port-based IPv6 multicast VLAN feature on Switch A so that Router A sends IPv6 multicast data to Switch A through the IPv6 multicast VLAN, and Switch A forwards the IPv6 multicast data to the receivers that belong to different user VLANs.

**Figure 39 Network diagram**



### Configuration procedure

1. Enable IPv6 forwarding on each device, and configure the IPv6 address and address prefix for each interface as per Figure 39. (Details not shown.)
2. On Router A, enable IPv6 multicast routing, enable IPv6 PIM-DM on each interface, and enable MLD on the host-side interface GigabitEthernet 1/0/2.

```
<RouterA> system-view
[RouterA] multicast ipv6 routing-enable
[RouterA] interface gigabitethernet 1/0/1
[RouterA-GigabitEthernet1/0/1] ipv6 pim dm
[RouterA-GigabitEthernet1/0/1] quit
[RouterA] interface gigabitethernet 1/0/2
[RouterA-GigabitEthernet1/0/2] ipv6 pim dm
[RouterA-GigabitEthernet1/0/2] mld enable
```

3. Configure Switch A:

# Enable MLD snooping globally.

```
<SwitchA> system-view
[SwitchA] mld-snooping
[SwitchA-mld-snooping] quit
```

# Create VLAN 10, assign GigabitEthernet 1/0/1 to VLAN 10, and enable MLD snooping in this VLAN.

```
[SwitchA] vlan 10
[SwitchA-vlan10] port gigabitethernet 1/0/1
[SwitchA-vlan10] mld-snooping enable
[SwitchA-vlan10] quit
```

# Create VLAN 2 and enable MLD snooping in the VLAN.

```
[SwitchA] vlan 2
[SwitchA-vlan2] mld-snooping enable
[SwitchA-vlan2] quit
```

The configuration for VLAN 3 and VLAN 4 is similar. (Details not shown.)

# Configure GigabitEthernet 1/0/2 as a hybrid port. Configure VLAN 2 as the default VLAN. Configure GigabitEthernet 1/0/2 to permit packets of VLAN 2 to pass and untag the packets when forwarding them.

```
[SwitchA] interface gigabitethernet 1/0/2
[SwitchA-GigabitEthernet1/0/2] port link-type hybrid
[SwitchA-GigabitEthernet1/0/2] port hybrid pvid vlan 2
[SwitchA-GigabitEthernet1/0/2] port hybrid vlan 2 untagged
[SwitchA-GigabitEthernet1/0/2] port hybrid vlan 10 untagged
[SwitchA-GigabitEthernet1/0/2] quit
```

The configuration for GigabitEthernet 1/0/3 and GigabitEthernet 1/0/4 is similar. (Details not shown.)

# Configure VLAN 10 as an IPv6 multicast VLAN.

```
[SwitchA] multicast-vlan ipv6 10
```

# Assign GigabitEthernet 1/0/2 and GigabitEthernet 1/0/3 to IPv6 multicast VLAN 10.

```
[SwitchA-ipv6-mvlan-10] port gigabitethernet 1/0/2 to gigabitethernet 1/0/3
[SwitchA-ipv6-mvlan-10] quit
```

# Assign GigabitEthernet 1/0/4 to IPv6 multicast VLAN 10.

```
[SwitchA] interface gigabitethernet 1/0/4
[SwitchA-GigabitEthernet1/0/4] port multicast-vlan ipv6 10
[SwitchA-GigabitEthernet1/0/4] quit
```

## Verifying the configuration

# Display the IPv6 multicast VLAN information on Switch A.

```
[SwitchA] display multicast-vlan ipv6
Total 1 IPv6 multicast-vlan(s)
IPv6 Multicast vlan 10
  subvlan list:
    no subvlan
  port list:
    GE1/0/2                GE1/0/3                GE1/0/4
```

# Display the MLD snooping multicast group information on Switch A.

```
[SwitchA] display mld-snooping group
Total 1 IP Group(s).
Total 1 IP Source(s).
Total 1 MAC Group(s).

Port flags: D-Dynamic port, S-Static port, C-Copy port, P-PIM port
Subvlan flags: R-Real VLAN, C-Copy VLAN
Vlan(id):10.
  Total 1 IP Group(s).
  Total 1 IP Source(s).
  Total 1 MAC Group(s).
  Router port(s):total 1 port(s).
    GE1/0/1                (D)
  IP group(s):the following ip group(s) match to one mac group.
    IP group address:FF1E::101
```

```
(::, FF1E::101):  
  Host port(s):total 3 port(s).  
    GE1/0/2          (D)  
    GE1/0/3          (D)  
    GE1/0/4          (D)  
MAC group(s):  
  MAC group address:3333-0000-0101  
  Host port(s):total 3 port(s).  
    GE1/0/2  
    GE1/0/3  
    GE1/0/4
```

The output shows that MLD snooping is maintaining router ports and member ports in VLAN 10.

---

# Support and other resources

## Contacting HP

For worldwide technical support information, see the HP support website:

<http://www.hp.com/support>

Before contacting HP, collect the following information:

- Product model names and numbers
- Technical support registration number (if applicable)
- Product serial numbers
- Error messages
- Operating system type and revision level
- Detailed questions

## Subscription service

HP recommends that you register your product at the Subscriber's Choice for Business website:

<http://www.hp.com/go/wwalerts>

After registering, you will receive email notification of product enhancements, new driver versions, firmware updates, and other product resources.

## Related information

### Documents

To find related documents, browse to the Manuals page of the HP Business Support Center website:

<http://www.hp.com/support/manuals>

- For related documentation, navigate to the Networking section, and select a networking category.
- For a complete list of acronyms and their definitions, see *HP FlexNetwork Technology Acronyms*.

### Websites

- HP.com <http://www.hp.com>
- HP Networking <http://www.hp.com/go/networking>
- HP manuals <http://www.hp.com/support/manuals>
- HP download drivers and software <http://www.hp.com/support/downloads>
- HP software depot <http://www.software.hp.com>
- HP Education <http://www.hp.com/learn>

# Conventions

This section describes the conventions used in this documentation set.

## Command conventions

Convention	Description
<b>Boldface</b>	<b>Bold</b> text represents commands and keywords that you enter literally as shown.
<i>Italic</i>	<i>Italic</i> text represents arguments that you replace with actual values.
[ ]	Square brackets enclose syntax choices (keywords or arguments) that are optional.
{ x   y   ... }	Braces enclose a set of required syntax choices separated by vertical bars, from which you select one.
[ x   y   ... ]	Square brackets enclose a set of optional syntax choices separated by vertical bars, from which you select one or none.
{ x   y   ... } *	Asterisk-marked braces enclose a set of required syntax choices separated by vertical bars, from which you select at least one.
[ x   y   ... ] *	Asterisk-marked square brackets enclose optional syntax choices separated by vertical bars, from which you select one choice, multiple choices, or none.
&<1-n>	The argument or keyword and argument combination before the ampersand (&) sign can be entered 1 to n times.
#	A line that starts with a pound (#) sign is comments.

## GUI conventions

Convention	Description
<b>Boldface</b>	Window names, button names, field names, and menu items are in bold text. For example, the <b>New User</b> window appears; click <b>OK</b> .
>	Multi-level menus are separated by angle brackets. For example, <b>File &gt; Create &gt; Folder</b> .

## Symbols

Convention	Description
 <b>WARNING</b>	An alert that calls attention to important information that if not understood or followed can result in personal injury.
 <b>CAUTION</b>	An alert that calls attention to important information that if not understood or followed can result in data loss, data corruption, or damage to hardware or software.
 <b>IMPORTANT</b>	An alert that calls attention to essential information.
<b>NOTE</b>	An alert that contains additional or supplementary information.
 <b>TIP</b>	An alert that provides helpful information.

## Network topology icons

---

	Represents a generic network device, such as a router, switch, or firewall.
	Represents a routing-capable device, such as a router or Layer 3 switch.
	Represents a generic switch, such as a Layer 2 or Layer 3 switch, or a router that supports Layer 2 forwarding and other Layer 2 features.
	Represents an access controller, a unified wired-WLAN module, or the switching engine on a unified wired-WLAN switch.
	Represents an access point.
	Represents a security product, such as a firewall, a UTM, or a load-balancing or security card that is installed in a device.
	Represents a security card, such as a firewall card, a load-balancing card, or a NetStream card.

---

## Port numbering in examples

The port numbers in this document are for illustration only and might be unavailable on your device.

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