Configuring IGMP Proxy

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Prerequisites for IGMP Proxy

- All devices on the IGMP UDL have the same subnet address. If all devices on the UDL cannot have the same subnet address, the upstream device must be configured with secondary addresses to match all of the subnets to which the downstream devices are attached.
- IP multicast is enabled and the PIM interfaces are configured. When you are configuring PIM interfaces for IGMP proxy, use PIM sparse mode (PIM-SM) when the interface is operating in a sparse-mode region and you are running static RP, bootstrap (BSR), or Auto-RP with the Auto-RP listener capability.

Information About IGMP Proxy

IGMP Proxy

An IGMP proxy enables hosts in a unidirectional link routing (UDLR) environment that are not directly connected to a downstream router to join a multicast group sourced from an upstream network.

There are two methods of implementing IGMP Proxy:

- IGMP Proxy for a Single Upstream Interface
- IGMP Proxy for Multiple Upstream Interfaces

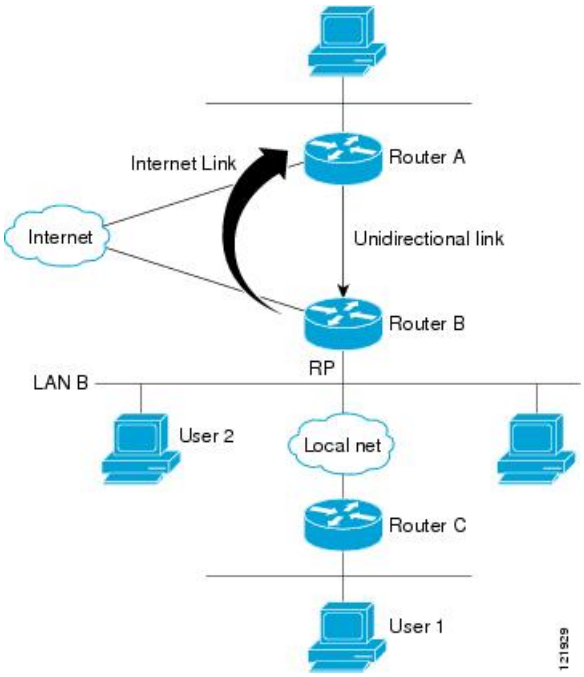
IGMP Proxy for a Single Upstream Interface

The figure below illustrates a sample topology that shows two UDLR scenarios:

- Traditional UDL routing scenario--A UDL device with directly connected receivers.
- IGMP proxy scenario--UDL device without directly connected receivers.

IGMP UDLs are needed on the upstream and downstream devices.

Note Although the following illustration and example uses routers in the configuration, any device (router or switch) can be used.



Scenario 1 - Traditional UDLR Scenario (UDL Device with Directly Connected Receivers)

For scenario 1, no IGMP proxy mechanism is needed. In this scenario, the following sequence of events occurs:

1. User 2 sends an IGMP membership report requesting interest in group G.
2. Router B receives the IGMP membership report, adds a forwarding entry for group G on LAN B, and proxies the IGMP report to Router A, which is the UDLR upstream device.
3. The IGMP report is then proxied across the Internet link.
4. Router A receives the IGMP proxy and maintains a forwarding entry on the unidirectional link.

Scenario 2 - IGMP Proxy Scenario (UDL Device without Directly Connected Receivers)

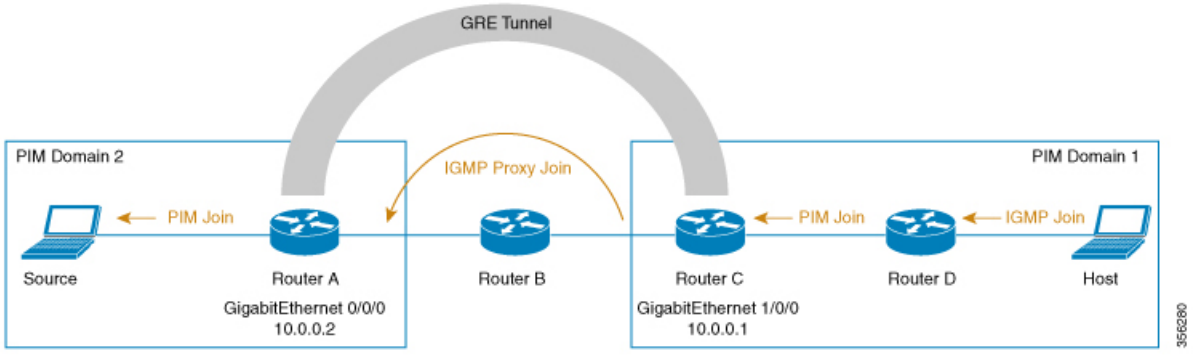
For scenario 2, the IGMP proxy mechanism is needed to enable hosts that are not directly connected to a downstream device to join a multicast group sourced from an upstream network. In this scenario, the following sequence of events occurs:

1. User 1 sends an IGMP membership report requesting interest in group G.

2. Router C sends a PIM Join message hop-by-hop to the RP (Router B).
3. Router B receives the PIM Join message and adds a forwarding entry for group G on LAN B.
4. Router B periodically checks its mroute table and proxies the IGMP membership report to its upstream UDL device across the Internet link.
5. Router A creates and maintains a forwarding entry on the unidirectional link (UDL).

In an enterprise network, it is desirable to be able to receive IP multicast traffic via satellite and forward the traffic throughout the network. With unidirectional link routing (UDLR) alone, scenario 2 would not be possible because receiving hosts must be directly connected to the downstream device, Router B. The IGMP proxy mechanism overcomes this limitation by creating an IGMP report for (*, G) entries in the multicast forwarding table. To make this scenario functional, therefore, you must enable IGMP report forwarding of proxied (*, G) multicast static route (mroute) entries (using the **ip igmp mroute-proxy** command) and enable the mroute proxy service (using the **ip igmp proxy-service** command) on interfaces leading to PIM-enabled networks with potential members.

Note Because PIM messages are not forwarded upstream, each downstream network and the upstream network have a separate domain.



Scenario 3 - IGMP Proxy Scenario without UDLR

For scenario 3, the IGMP proxy mechanism is used to enable hosts to receive traffic from an upstream network, without using a UDLR link. In this scenario, the following sequence of events occurs:

1. The host is in PIM Domain 1 and sends an IGMP membership report (a join request) to ***Router D*** requesting interest in group G. ***Router D*** converts the IGMP Join to a PIM join and sends it to ***Router C***. This request should now be sent upstream, from ***Router C*** to ***Router A***. The routers are in two different PIM domains (not PIM neighbors) and are connected through a GRE tunnel instead.
2. ***Router C*** converts the PIM join message to an IGMP proxy join so that it can be forwarded to the GRE tunnel endpoint, which is ***Router A***.

Note IGMP proxy joins can be transferred across 1 hop only.

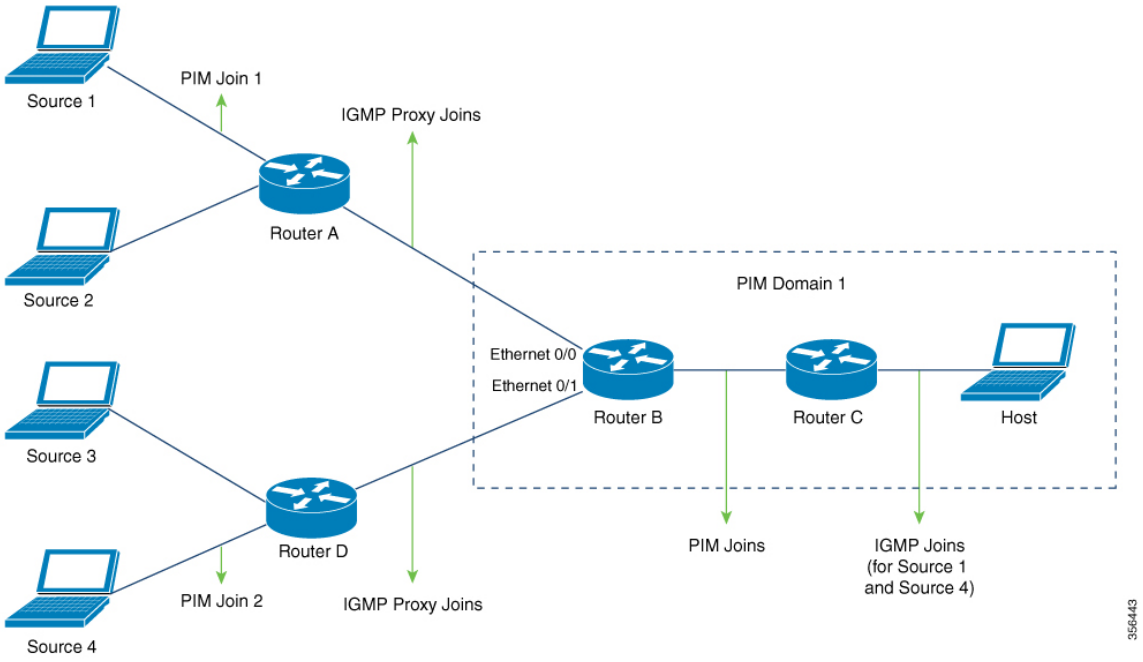
In the figure above, the GRE tunnel provides this single hop between Router C and Router A (bypassing Router B).

In the absence of a GRE tunnel, devices from different PIM domains must have directly (back-to-back) connected interfaces.

3. After the IGMP proxy join reaches ***Router A***, it is forwarded to the source device as a PIM join message.

IGMP Proxy for Multiple Upstream Interfaces

IGMP proxy also enables the user to request data from multiple upstream interfaces. You can implement IGMP proxy by this method if there are more number of upstream devices in the network. With this method, you can also implement IGMP proxy for a single upstream device as in any of the three scenarios described in the previous section.



In this method, IGMP proxy is used to enable the user to receive traffic from multiple upstream devices. The following sequence of events occurs:

1. The host is in PIM Domain 1 and sends multiple IGMP membership reports (join requests) to **Router C** requesting interest in different groups. **Router C** converts the IGMP joins to PIM joins and sends them to **Router B**. These requests should be sent upstream, from **Router B** to **Router A**. The routers are in two different PIM domains (not PIM neighbors).
2. **Router B** converts the PIM join messages to IGMP proxy joins so that it can be forwarded to the upward interfaces.

3. A class-map is configured globally. This class-map describes the information about multicast groups. The IGMP proxy joins for different multicast groups are sent if the following conditions are met:
   - There is (*, G) or and (S, G) entry for that group.
   - (*, G) or the (S, G) entry has a NON-NULL OIF list.
4. During the IGMP proxy intervals, the IGMP proxy joins for different groups are sent through the respective upstream interfaces.
5. After the IGMP proxy join reaches **Router A**, it is forwarded to the different source devices as PIM join messages.

How to Configure IGMP Proxy

Configuring the Upstream UDL Device for IGMP UDLR

Perform this task to configure the upstream UDL device for IGMP UDLR.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **interface** *type number*
4. **ip igmp unidirectional-link**
5. **end**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** `Device> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Device# configure terminal`	Enters global configuration mode.
Step 3	**interface** *type number* **Example:** `Device(config)# interface gigabitethernet 1/0/0`	Enters interface configuration mode. • For the *type* and *number* arguments, specify the interface to be used as the UDL on the upstream device.
Step 4	**ip igmp unidirectional-link** **Example:**	Configures IGMP on the interface to be unidirectional for IGMP UDLR.

	Command or Action	Purpose
	`Device(config-if)# ip igmp unidirectional-link`	
Step 5	**end** **Example:** `Device(config-if)# end`	Ends the current configuration session and returns to privileged EXEC mode.

Configuring the Downstream UDL Device for IGMP UDLR with IGMP Proxy Support

Perform this task to configure the downstream UDL device for IGMP UDLR with IGMP proxy support.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **interface** *type number*
4. **ip igmp unidirectional-link**
5. **exit**
6. **interface** *type number*
7. **ip igmp mroute-proxy** *type number*
8. **exit**
9. **interface** *type number*
10. **ip igmp helper-address udl** *interface-type interface-number*
11. **ip igmp proxy-service**
12. **end**
13. **show ip igmp interface**
14. **show ip igmp udlr**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** `Device> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Device# configure terminal`	Enters global configuration mode.
Step 3	**interface** *type number* **Example:**	Enters interface configuration mode.

	Command or Action	Purpose
	`Device(config)# interface gigabitethernet 0/0/0`	• For the *type* and *number* arguments, specify the interface to be used as the UDL on the downstream device for IGMP UDLR.
Step 4	**ip igmp unidirectional-link** **Example:** `Device(config-if)# ip igmp unidirectional-link`	Configures IGMP on the interface to be unidirectional for IGMP UDLR.
Step 5	**exit** **Example:** `Device(config-if)# exit`	Exits interface configuration mode and returns to global configuration mode.
Step 6	**interface** *type number* **Example:** `Device(config)# interface gigabitethernet 1/0/0`	Enters interface configuration mode. • For the *type* and *number* arguments, select an interface that is facing the nondirectly connected hosts.
Step 7	**ip igmp mroute-proxy** *type number* **Example:** `Device(config-if)# ip igmp mroute-proxy loopback 0`	Enables IGMP report forwarding of proxied (*, G) multicast static route (mroute) entries. • This step is performed to enable the forwarding of IGMP reports to a proxy service interface for all (*, G) forwarding entries in the multicast forwarding table. • In this example, the **ip igmp mroute-proxy** command is configured on Gigabit Ethernet interface 1/0/0 to request that IGMP reports be sent to loopback interface 0 for all groups in the mroute table that are forwarded to Gigabit Ethernet interface 1/0/0.
Step 8	**exit** **Example:** `Device(config-if)# exit`	Exits interface configuration mode and returns to global configuration mode.
Step 9	**interface** *type number* **Example:** `Device(config)# interface loopback 0`	Enters interface configuration mode for the specified interface. • In this example, loopback interface 0 is specified.
Step 10	**ip igmp helper-address udl** *interface-type interface-number* **Example:** `Device(config-if)# ip igmp helper-address udl gigabitethernet 0/0/0`	Configures IGMP helpering for UDLR. • This step allows the downstream device to helper IGMP reports received from hosts to an upstream device connected to a UDL associated with the

	Command or Action	Purpose
		interface specified for the *interface-type* and *interface-number* arguments. • In the example topology, IGMP helpering is configured over loopback interface 0 on the downstream device. Loopback interface 0, thus, is configured to helper IGMP reports from hosts to an upstream device connected to Gigabit Ethernet interface 0/0/0.
Step 11	**ip igmp proxy-service** **Example:** `Device(config-if)# ip igmp proxy-service`	Enables the mroute proxy service. • When the mroute proxy service is enabled, the device periodically checks the static mroute table for (*, G) forwarding entries that match interfaces configured with the **ip igmp mroute-proxy** command (see Step 7) based on the IGMP query interval. Where there is a match, one IGMP report is created and received on this interface. **Note** The **ip igmp proxy-service** command is intended to be used with the **ip igmp helper-address** (UDL) command. • In this example, the **ip igmp proxy-service** command is configured on loopback interface 0 to enable the forwarding of IGMP reports out the interface for all groups on interfaces registered through the **ip igmp mroute-proxy** command (see Step 7).
Step 12	**end** **Example:** `Device(config-if)# end`	Ends the current configuration session and returns to privileged EXEC mode.
Step 13	**show ip igmp interface** **Example:** `Device# show ip igmp interface`	(Optional) Displays multicast-related information about an interface.
Step 14	**show ip igmp udlr** **Example:** `Device# show ip igmp udlr`	(Optional) Displays UDLR information for directly connected multicast groups on interfaces that have a UDL helper address configured.

Configuring the Downstream Device for IGMP Proxy Join without UDLR

Perform this task to configure the downstream device for IGMP Proxy without UDLR.

(Referring to the figure above, all the steps are configured on ***Router C***)

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **interface** *type number*
4. **ip igmp mroute-proxy** *type number*
5. **exit**
6. **interface** *type number*
7. **ip igmp helper-address** *ip-address*
8. **ip igmp proxy-service**
9. **end**
10. **show ip igmp interface**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** `Device > enable`	Enables privileged EXEC mode. Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Device# configure terminal`	Enters global configuration mode.
Step 3	**interface** *type number* **Example:** `Device(config)# interface gigabitethernet 1/0/0`	Enters interface configuration mode. For the *type* and *number* arguments, specify the interface that is facing the host.
Step 4	**ip igmp mroute-proxy** *type number* **Example:** `Device(config-if)# ip igmp mroute-proxy loopback 0`	Enables the forwarding of IGMP reports to the specified proxy service interface, for forwarding of all proxied (*, G) multicast static route (mroute) entries in the multicast forwarding table. In the step example, *loopback interface 0* is such a proxy service interface.
Step 5	**exit** **Example:** `Device(config-if)# exit`	Exits interface configuration mode and returns to global configuration mode.
Step 6	**interface** *type number* **Example:** `Device(config)# interface loopback 0`	Enters interface configuration mode for the specified proxy service interface. In the step example, *loopback interface 0* is specified.
Step 7	**ip igmp helper-address** *ip-address* **Example:**	Configures IGMP helper for IGMP proxy join.

	Command or Action	Purpose
	`Device(config-if)# ip igmp helper-address 10.0.0.2`	For the *ip-address* argument, specify the ip address of the upstream device to which the IGMP proxy join should reach. In the example topology, the IGMP helper is configured over loopback interface 0 on the downstream device (Router C). This command configures loopback interface 0 to help convert the PIM joins received from Router D to IGMP proxy joins and transfer them to the upstream device (Router A).
Step 8	**ip igmp proxy-service** **Example:** `Device(config-if) ip igmp proxy-service`	Enables the mroute proxy service. When the mroute proxy service is enabled, the device periodically checks the static mroute table for (*, G) forwarding entries that match interfaces configured with the **ip igmp mroute-proxy** command (see Step 7) based on the IGMP query interval. Where there is a match, one IGMP report is created and received on this interface. **Note** The **ip igmp proxy-service** command is intended to be used with the **ip igmp helper-address** command.
Step 9	**end** **Example:** `Device(config-if)# end`	Ends the current configuration session and returns to privileged EXEC mode.
Step 10	**show ip igmp interface** **Example:** `Device# show ip igmp interface`	(Optional) Displays multicast-related information about an interface.

Configuring the Downstream Device for IGMP Proxy for Multiple Upstream Interfaces

Perform this task to configure the downstream device for IGMP Proxy for multiple upstream interfaces.

(Referring to the figure earlier, all the steps are configured on the *Router B* interface facing the upstream device)

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **class-map type multicast-flows** *name*
4. **interface** *type number*
5. **ip igmp upstream-proxy** *class-map-name*

6. **ip igmp iif-starg**
7. **ip igmp proxy-report-interval** *time*
8. **end**
9. **show ip igmp interface**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** `Device > enable`	Enables privileged EXEC mode. Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Device# configure terminal`	Enters global configuration mode.
Step 3	**class-map type multicast-flows** *name* **Example:** `Device(config-if)# class-map type multicast-flows proxymap`	Configures the interface with a class-map where the uplink interfaces for different multicast groups are defined. The range of the multicast groups is from group 225.0.0.1 to 225.0.0.10.
Step 4	**interface** *type number* **Example:** `Device(config)# interface ethernet 0/0`	Enters interface configuration mode. For the *type* and *number* arguments, specify the interface that is facing the host.
Step 5	**ip igmp upstream-proxy** *class-map-name* **Example:** `Device(config-if)# ip igmp upstream-proxy proxymap`	Enables the interface with an IGMP proxy. The IGMP proxy joins for those groups in the class map are sent if the following conditions are met: • (*,G) or (S,G) mroute exists for the group in the same mvrf as the interface. • (*,G) or (S,G) mroute has a NON-NULL OIF list.
Step 6	**ip igmp iif-starg** **Example:** `Device(config-if)# ip igmp iif-starg`	Alters the RPF interface of the mroutes of those groups specified in the class map to Ethernet 0/0.
Step 7	**ip igmp proxy-report-interval** *time* **Example:** `Device(config-if)# ip igmp proxy-report-interval 130`	Configures the interval (in seconds) at which the proxy reports will be sent. The default value is 60 seconds.
Step 8	**end** **Example:** `Device(config-if)# end`	Ends the current configuration session and returns to privileged EXEC mode.

	Command or Action	Purpose
Step 9	**show ip igmp interface** **Example:** `Device# show ip igmp interface`	(Optional) Displays multicast-related information about an interface.

Configuration Examples for IGMP Proxy

Example: Configuring the Upstream UDL Device for IGMP UDLR

The following example shows how to configure the upstream UDL device for IGMP UDLR:

```
interface gigabitethernet 0/0/0
ip address 10.1.1.1 255.255.255.0
ip pim sparse-mode
!
interface gigabitethernet 1/0/0
ip address 10.2.1.1 255.255.255.0
ip pim sparse-mode
ip igmp unidirectional-link
!
interface gigabitethernet 2/0/0
ip address 10.3.1.1 255.255.255.0
```

Example: Configuring the Downstream UDL Device for IGMP UDLR with IGMP Proxy Support

The following example shows how to configure the downstream UDL device for IGMP UDLR with IGMP proxy support:

```
ip pim rp-address 10.5.1.1 5
access-list 5 permit 239.0.0.0 0.255.255.255
!
interface loopback 0
ip address 10.7.1.1 255.255.255.0
ip pim sparse-mode
ip igmp helper-address udl ethernet 0
ip igmp proxy-service
!
interface gigabitethernet 0/0/0
ip address 10.2.1.2 255.255.255.0
ip pim sparse-mode
ip igmp unidirectional-link
!
interface gigabitethernet 1/0/0
ip address 10.5.1.1 255.255.255.0
ip pim sparse-mode
ip igmp mroute-proxy loopback 0
!
interface gigabitethernet 2/0/0
ip address 10.6.1.1 255.255.255.0
```

Example: Configuring the Downstream Device for IGMP Proxy Join without UDLR

The following example shows how to configure the downstream device for IGMP proxy without UDLR:

```
interface Loopback0
ip address 2.2.2.2 255.255.0.0
ip pim sparse-dense-mode
ip igmp helper-address 99.99.99.1
ip igmp proxy-service
ip ospf 1 area 0
!
```

Example: Configuring the Downstream Device for IGMP Proxy for Multiple Upstream Interfaces

The following example shows how to configure the downstream device for IGMP proxy for multiple upstream interfaces.

```
interface gigabitethernet0/0
ip address 99.99.99.1 255.255.255.0
ip pim passive
ip igmp upstream-proxy l2
ip igmp iif-starg
ip igmp proxy-report-interval 100
end

class-map type multicast-flows l2
group 229.0.0.1
group 228.0.0.1 to 228.0.0.10
```

Additional References for IGMP Proxy

The following sections provide references related to customizing IGMP.

Related Documents

Related Topic	Document Title
For complete syntax and usage information for the commands used in this chapter.	See the IP Multicast Routing Commands section of the*Command Reference (Catalyst 9400 Series Switches)*

Standards and RFCs

Standard/RFC	Title
RFC 1112	*Host extensions for IP multicasting*
RFC 2236	*Internet Group Management Protocol, Version 2*

Standard/RFC	Title
RFC 3376	*Internet Group Management Protocol, Version 3*

Feature History and Information for IGMP Proxy

The following table provides release information about the feature or features described in this module. This table lists only the software release that introduced support for a given feature in a given software release train. Unless noted otherwise, subsequent releases of that software release train also support that feature.

Use Cisco Feature Navigator to find information about platform support and Cisco software image support. To access Cisco Feature Navigator, go to www.cisco.com/go/cfn. An account on Cisco.com is not required.

Table 1: Feature Information for IGMP Proxy

Feature Name	Releases	Feature Information
IGMP Proxy	Cisco IOS XE Everest 16.6.1	An IGMP proxy enables hosts in a unidirectional link routing (UDLR) environment that are not directly connected to a downstream router to join a multicast group sourced from an upstream network.
IGMP Proxy without UDLR	Cisco IOS XE Gibraltar 16.12.1	The IGMP proxy enables hosts to receive traffic from an upstream network, without using a UDLR link.
IGMP Proxy for multiple upstream interfaces.	Cisco IOS XE Amsterdam 17.1.1	IGMP proxy enables the user to receive traffic from multiple upstream devices.