Implementing Multicast Stub Routing

This module describes the concepts and configuration tasks used to implement multicast stub routing. Multicast stub routing can be used for the following purposes:

- To prevent multicast transit when it is enforced by unicast stub routing.
- To eliminate periodic flooding and pruning of dense mode traffic on low bandwidth links.
- To reduce overall processing of Protocol Indendent Multicast (PIM) control traffic; and protect against multicast spoofing of PIM Designated Router (DR) messages and PIM assert messages.

Finding Feature Information

Your software release may not support all the features documented in this module. For the latest caveats and feature information, see Bug Search Tool and the release notes for your platform and software release. To find information about the features documented in this module, and to see a list of the releases in which each feature is supported, see the feature information table at the end of this module.

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.

Prerequisites for Multicast Stub Routing

IP multicast is enabled and the Protocol Independent Multicast (PIM) interfaces are configured using the tasks described in the "Configuring Basic IP Multicast" module of the *IP Multicast: PIM Configuration Guide*.

Restrictions for Multicast Stub Routing

- Multicast stub routing does not prevent the configuration of other Interior Gateway Protocols (IGPs) that do not support stub routing, such as Routing Information Protocol (RIP), Open Shortest Path First (OSPF), and Intermediate System-to-Intermediate System (IS-IS) to bypass this restriction. Multicast stub routing also does not prevent the configuration of static routing to bypass this restriction. Multicast stub routing is enforced by unicast stub routing. The proper unicast Enhanced Interior Gateway Routing Protocol (EIGRP) stub routing configuration will assist in multicast stub routing.

  Note For more information about unicast EIGRP stub routing, see the "Configuring EIGRP" module of the *IP Routing: EIGRP Configuration Guide*.

- Multicast stub routing can only be implemented in nonredundant stub network topologies.

Information About Multicast Stub Routing

Multicast Stub Networks

Multicast stub networks are those segments that receivers are directly connected to for any multicast group, even though there are receivers interested in multicast traffic beyond those segments. Multicast stub routing can only be implemented in nonredundant stub network topologies.

Multicast Stub Routing

Multicast stub routing can be used on two types of links for multicast stub networks:

- Upstream link between the stub and distribution devices--The stub device's interface facing the distribution device has full PIM functionality; a distribution device's interface facing the stub device does not and relies on a PIM neighbor filter or operates in PIM passive mode.
- Downstream link between the stub device and interested receiver--Downstream links are connected to Layer 2 access domains, such as VLANs, or Layer 3 routed interfaces. The downstream link operates in PIM passive mode and assumes that it is the only interface on that access domain, making it the Designated Router (DR). In Cisco IOS releases that do not support PIM passive mode, the downstream link relies on a PIM neighbor filter to prevent the stub device from discovering other PIM neighbors on that interface. In addition, an Interior Group Management Protocol (IGMP) helper is used to proxy IGMP reports to the distribution device's link facing the stub device.

Multicast Stub Routing Between Stub and Distribution Devices

Implementing multicast stub routing between the stub and distribution device is useful in PIM dense mode (PIM-DM) where periodic flooding and subsequent pruning of multicast traffic occurs for unwanted multicast groups. Multicast stub routing in this scenario prevents periodic flooding and pruning and also allows multicast traffic to be forwarded for groups in which receivers are available on the stub network.

Implementing multicast stub routing between the stub and distribution device in PIM sparse mode (PIM-SM) and bidirectional PIM (bidir-PIM) environments eliminates the need to maintain the group-to-Rendezvous Point (RP) mapping cache on the stub device, and saves periodic update bandwidth--if Auto-RP or PIM bootstrap router (BSR) is used for distributing the RP information.

Multicast stub routing is intended to forward multicast traffic from the distribution to the stub device. Although it is possible to have sources directly connected to the stub network, it would only work in a PIM-DM environment. It is not possible in PIM-SM, Source Specific Multicast (SSM), and bidirectional PIM (bidir-PIM) environments because the first hop device will be filtered by the PIM neighbor filter applied on the distribution device, resulting in reverse path forwarding (RPF) failures. Furthermore, receivers must be directly connected to the stub device and cannot be further downstream.

Multicast Stub Routing Between the Stub Device and Interested Receivers

Implementing multicast stub routing between the stub device and interested receivers is used to reduce the overall processing of PIM control traffic, especially as the number of stub links increases on the stub device, and to protect against DoS attacks targeted at the PIM DR.

Benefits of Multicast Stub Routing

Multicast stub routing allows such stub networks to be configured easily for multicast connectivity and provides the following benefits:

- Prevents stub networks from being used for multicast transit when they are enforced by unicast stub routing (EIGRP).
- Eliminates periodic flooding and pruning of dense mode traffic on low bandwidth links.
- Reduces overall processing of PIM control traffic.
- Protects against multicast spoofing of PIM DR messages and PIM assert messages.

Note Multicast stub routing can only be implemented in nonredundant stub network topologies.

How to Implement Multicast Stub Routing

Implementing Multicast Stub Routing

Prerequisites

- The tasks in this section assume that IP multicast has been enabled and that the PIM interfaces have been configured using the tasks described in the " Configuring Basic IP Multicast " module.

Restrictions

- Multicast stub routing does not prevent the configuration of other IGPs that do not support stub routing, such as RIP, OSPF, and IS-IS to bypass this restriction. Multicast stub routing also does not prevent the configuration of static routing to bypass this restriction. Multicast stub routing is enforced by unicast stub routing. The proper unicast EIGRP stub routing configuration will assist in multicast stub routing.

Note For more information about configuring unicast EIGRP stub routing, see the "Configuring EIGRP" module.

- Multicast stub routing can only be implemented in nonredundant stub network topologies.

Configuring the Stub Device for Multicast Stub Routing

Perform this task to configure a stub device for multicast stub routing.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **interface** *type number*
4. Do one of the following:
   - **ip pim passive**
   - **ip pim neighbor-filter** *access-list*
5. **ip igmp helper-address** *ip-address*
6. **end**
7. **show ip pim interface** [*type number*]

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 GigabitEthernet0/0`	Enters interface configuration mode.

Step 4	Do one of the following:
	
	• **ip pim passive**
	
	• **ip pim neighbor-filter** *access-list*
	
	Example:
	
	`Device(config-if)# ip pim passive`
	
	Example:
	
	`Device(config-if)# ip pim neighbor-filter 1`
		• The first sample shows how to configure the interface to operate in PIM passive mode.
		
		• If the **ip pim passive** command is configured on an interface enabled for IP multicast, the device will operate this interface in PIM passive mode, which means that the device will not send PIM messages on the interface nor will it accept PIM messages from other devices across this interface. The device will instead consider that it is the only PIM device on the network and thus act as the DR and also as the DF for all bidir-PIM group ranges. IGMP operations are unaffected by this command.
		Note Do not use this command on LANs that have more than one multicast device connected to them because all devices with this command configured will consider themselves to be DR/DF, resulting in duplicate traffic (PIM-SM, PIM-DM, PIM-SSM) or even in looping traffic (bidir-PIM). Instead, use the **ip pim neighbor-filter** command to limit PIM messages to and from valid devices on LANs with more than one device.
		
		• The second sample shows how to restrict a PIM neighbor from participating in PIM by filtering all PIM control messages that match the access list specified for the *access-list* argument.
		Note The **ip pim neighbor-filter**command does not filter Auto-RP announcements and is intended only to filter control messages between PIM neighbors.

	Command or Action	Purpose
		Note The **ip pim passive** and **ip pim neighbor-filter** commands can be used together on an interface. If both commands are configured, the **ip pim passive** command will take precedence over the **ip pim neighbor-filter** command.
Step 5	**ip igmp helper-address** *ip-address* **Example:** `Device(config-if)# ip igmp helper-address 172.16.32.1`	Configures the device to forward all IGMP host reports and leave messages received on the interface to the specified IP address. • The IGMP host reports and leave messages are forwarded to the IP address specified for the *ip-address*argument, using the source address of the next hop interface. • This command enables a type of "dense-mode" join, allowing stub sites not participating in PIM to indicate membership in IP multicast groups.
Step 6	**end** **Example:** `Device(config-if)# end`	Returns to privileged EXEC mode.
Step 7	**show ip pim interface** [*type number*] **Example:** `Device# show ip pim interface`	Displays information about interfaces configured for PIM. • Use this command to confirm the mode in which the PIM interfaces are operating.

Configuring the Distribution Device for Multicast Stub Routing

Perform the following task to configure the distribution device for multicast stub routing.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **interface** *type number*
4. Do one of the following:
   - **ip pim passive**
   - **ip pim neighbor-filter** *access-list*
5. **end**
6. **show ip pim interface** [*type number*]

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 GigabitEthernet0/0`	Enters interface configuration mode.

Step 4	Do one of the following:
	
	• **ip pim passive**
	
	• **ip pim neighbor-filter** *access-list*
	
	Example:
	
	`Device(config-if)# ip pim passive`
	
	Example:
	
	`Device(config-if)# ip pim neighbor-filter 1`
		• The first sample shows how to configure the interface to operate in PIM passive mode.
		
		• If the **ip pim passive** command is configured on an interface enabled for IP multicast, the device will operate this interface in PIM passive mode, which means that the device will not send PIM messages on the interface nor will it accept PIM messages from other devices across this interface. The device will instead consider that it is the only PIM device on the network and thus act as the DR and also as the DF for all bidir-PIM group ranges. IGMP operations are unaffected by this command.
		Note Do not use this command on LANs that have more than one multicast device connected to them because all devices with this command configured will consider themselves to be DR/DF, resulting in duplicate traffic (PIM-SM, PIM-DM, PIM-SSM) or even in looping traffic (bidir-PIM). Instead, use the **ip pim neighbor-filter** command to limit PIM messages to and from valid devices on LANs with more than one device.
		
		• The second sample shows how to restrict a PIM neighbor from participating in PIM by filtering all PIM control messages that match the access list specified for the *access-list* argument.
		Note The **ip pim neighbor-filter**command does not filter Auto-RP announcements and is intended only to filter control messages between PIM neighbors.

	Command or Action	Purpose
		Note The **ip pim passive** and **ip pim neighbor-filter** commands can be used together on an interface. If both commands are configured, the **ip pim passive** command will take precedence over the **ip pim neighbor-filter** command.
Step 5	**end** **Example:** `Device(config-if)# end`	Returns to privileged EXEC mode.
Step 6	**show ip pim interface** [*type number*] **Example:** `Device# show ip pim interface`	Displays information about interfaces configured for PIM. • Use this command to confirm the mode in which PIM interfaces are operating.

Configuration Examples for Implementing Multicast Stub Routing

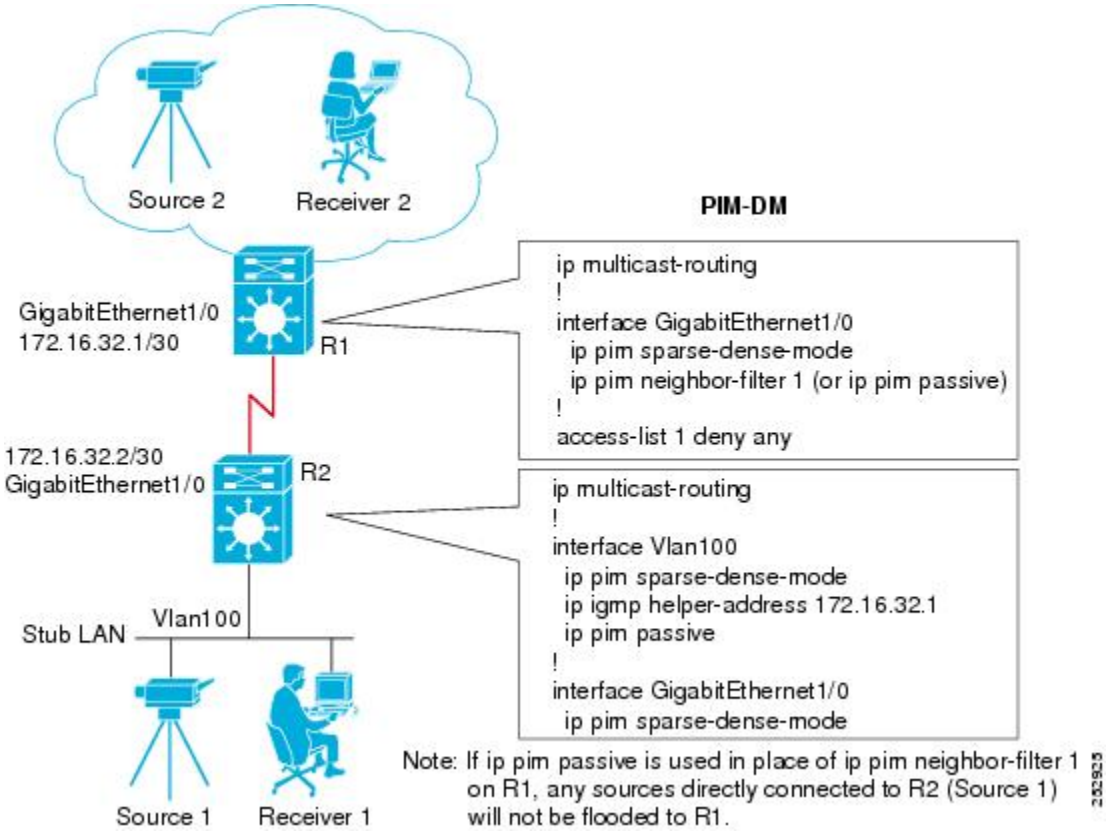
Examples Implementing Multicast Stub Routing

This section contains the following examples for implementing multicast stub routing. The examples provide the configurations for both multicast stub routing using a PIM neighbor filter and an IGMP helper and using a PIM passive interface.

Example: Implementing Multicast Stub Routing - PIM-DM

The following example shows the configuration of multicast stub routing in a PIM-DM environment. The example is based on the topology shown in the figure.

Figure 1: Multicast Stub Routing Example Topology (PIM-DM)



Distribution Device Configuration

```
ip multicast-routing
!
interface GigabitEthernet1/0
  ip pim sparse-dense-mode
  ip pim neighbor-filter 1 (or ip pim passive)
!
access-list 1 deny any
```

Stub Device Configuration

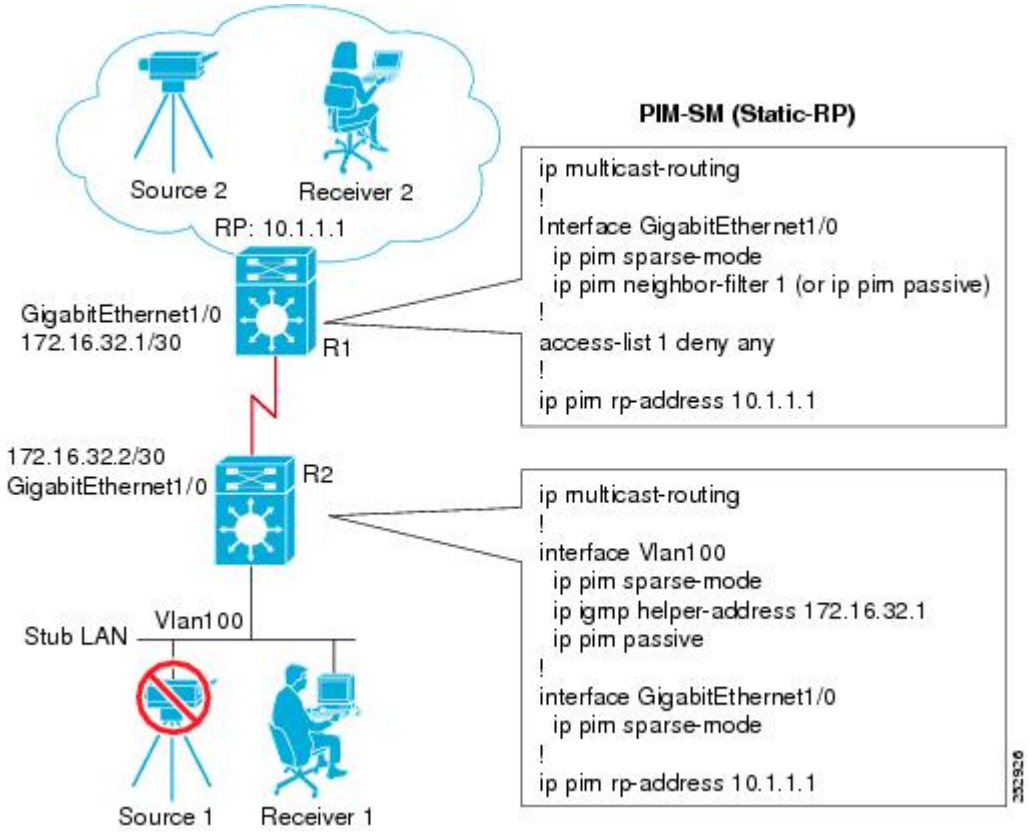
```
ip multicast-routing
!
interface Vlan100
  ip pim sparse-dense-mode
  ip igmp helper-address 172.16.32.1
  ip pim passive
!
```

```
interface GigabitEthernet1/0
  ip pim sparse-dense-mode
```

Example: Implementing Multicast Stub Routing - PIM-SM Static RP

The following example shows the configuration of multicast stub routing in a PIM-SM environment using static RP. The example is based on the topology shown in the figure.

Figure 2: Multicast Stub Routing Example Topology (PIM-SM, Static RP)



Distribution Device Configuration

```
ip multicast-routing
!
Interface GigabitEthernet1/0
  ip pim sparse-mode
  ip pim neighbor-filter 1 (or ip pim passive)
!
access-list 1 deny any
!
ip pim rp-address 10.1.1.1
```

Stub Device Configuration

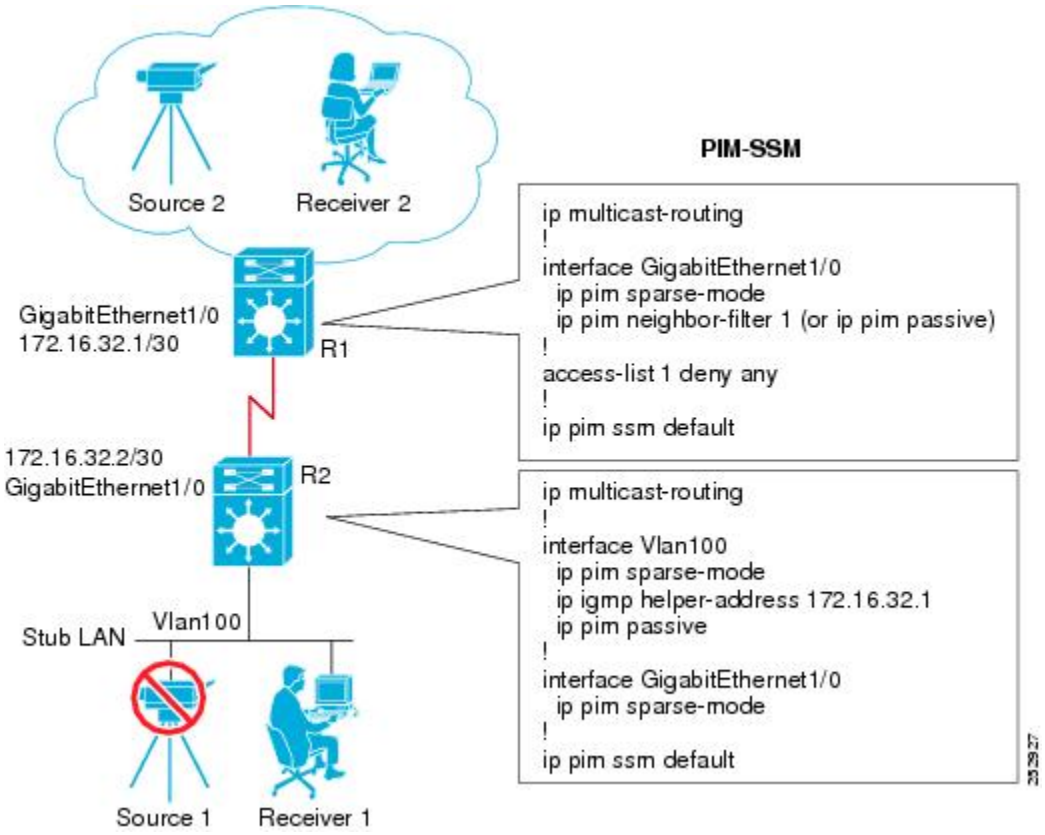
```
ip multicast-routing
!
interface Vlan100
```

```
  ip pim sparse-mode
  ip igmp helper-address 172.16.32.1
  ip pim passive
!
interface GigabitEthernet1/0
  ip pim sparse-mode
!
ip pim rp-address 10.1.1.1
```

Example: Implementing Multicast Stub Routing - PIM-SSM

The following example shows the configuration of multicast stub routing in a PIM-SSM environment. The example is based on the topology shown in the figure.

Figure 3: Multicast Stub Routing Example Topology (PIM-SSM)



Distribution Device Configuration

```
ip multicast-routing
!
interface GigabitEthernet1/0
  ip pim sparse-mode
  ip pim neighbor-filter 1 (or ip pim passive)
!
access-list 1 deny any
!
ip pim ssm default
```

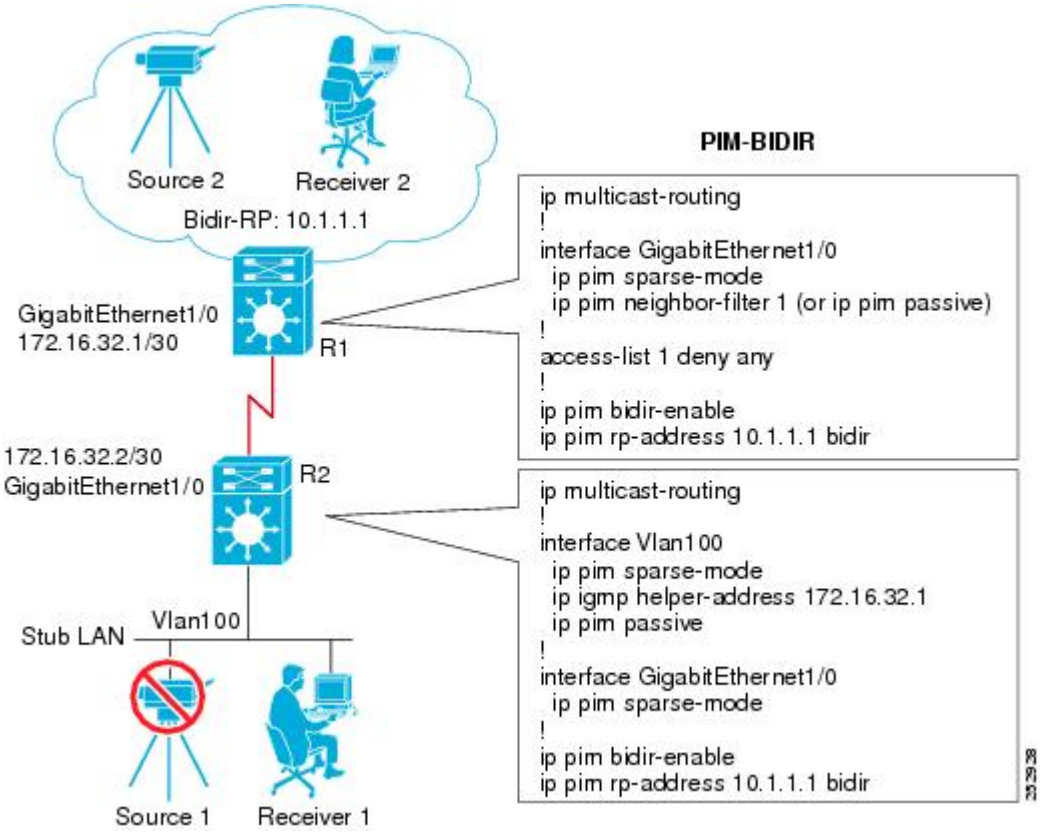
Stub Device Configuration

```
ip multicast-routing
!
interface Vlan100
  ip pim sparse-mode
  ip igmp helper-address 172.16.32.1
  ip pim passive
!
interface GigabitEthernet1/0
  ip pim sparse-mode
!
ip pim ssm default
```

Example Implementing Multicast Stub Routing - Bidir-PIM

The following example shows the configuration of multicast stub routing in a bidir-PIM environment using static RP. The example is based on the topology shown in the figure.

Figure 4: Multicast Stub Routing Example Topology (Bidir-PIM)



Distribution Device Configuration

```
ip multicast-routing
!
interface GigabitEthernet1/0
  ip pim sparse-mode
  ip pim neighbor-filter 1 (or ip pim passive)
```

```
!
access-list 1 deny any
!
ip pim bidir-enable
ip pim rp-address 10.1.1.1 bidir
```

Stub Device Configuration

```
ip multicast-routing
!
interface Vlan100
  ip pim sparse-mode
  ip igmp helper-address 172.16.32.1
  ip pim passive
!
interface GigabitEthernet1/0
  ip pim sparse-mode
!
ip pim bidir-enable
ip pim rp-address 10.1.1.1 bidir
```

Additional References

Related Documents

Related Topic	Document Title
Cisco IOS commands	Cisco IOS Master Commands List, All Releases
Cisco IOS IP SLAs commands	Cisco IOS IP Multicast Command Reference
Overview of the IP multicast technology area	" IP Multicast Technology Overview " module
Concepts, tasks, and examples for configuring an IP multicast network using PIM	" Configuring a Basic IP Multicast Network " module

Standards and RFCs

Standard/RFC	Title
No new or modified standards or RFCs are supported by this feature.	--

MIBs

MIB	MIBs Link
No new or modified MIBs are supported by this feature, and support for existing standards has not been modified by this feature.	To locate and download MIBs for selected platforms, Cisco software releases, and feature sets, use Cisco MIB Locator found at the following URL: http://www.cisco.com/go/mibs

Technical Assistance

Description	Link
The Cisco Support and Documentation website provides online resources to download documentation, software, and tools. Use these resources to install and configure the software and to troubleshoot and resolve technical issues with Cisco products and technologies. Access to most tools on the Cisco Support and Documentation website requires a Cisco.com user ID and password.	http://www.cisco.com/cisco/web/support/index.html

Feature Information for Implementing Multicast Stub Routing

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 Implementing Multicast Stub Routing

Feature Name	Releases	Feature Information
PIM Stub	12.2(37)SE 15.0(1)M 12.2(33)SRE Cisco IOS XE 3.1.0SG	The PIM Stub feature introduces the capability to configure an interface to operate in PIM passive mode, which means that the router will not send PIM messages on the interface nor will it accept PIM messages from other routers across this interface. The router will instead consider that is is the only PIM router on the network and thus act as the DR and also as the DF (for all bidir-PIM group ranges). This mode is used primarily in multicast stub routing scenarios. The following commands were introduced or modified: **ip pim passive**.