AutoRP Enhancement

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This module provides information about how to configure an auto rendezvous point (RP) for automating the distribution of group-to-RP mappings in a PIM network.

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.

Restrictions for AutoRP Enhancement

The simultaneous deployment of AutoRP and bootstrap router (BSR) is not supported.

Information About AutoRP Enhancement

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The Role of AutoRP in a PIM Network

AutoRP automates the distribution of group-to-rendezvous point (RP) mappings in a PIM network. To make AutoRP work, a device must be designated as an RP mapping agent, which receives the RP announcement messages from the RPs and arbitrates conflicts. The RP mapping agent then sends the consistent group-to-RP mappings to all other devices by way of dense mode flooding.

Thus, all routers automatically discover which RP to use for the groups they support. The Internet Assigned Numbers Authority (IANA) has assigned two group addresses, 224.0.1.39 and 224.0.1.40, for AutoRP.

The mapping agent receives announcements of intention to become the RP from Candidate-RPs. The mapping agent then announces the winner of the RP election. This announcement is made independently of the decisions by the other mapping agents.

IP Multicast Boundary

As shown in the figure, address scoping defines domain boundaries so that domains with RPs that have the same IP address do not leak into each other. Scoping is performed on the subnet boundaries within large domains and on the boundaries between the domain and the Internet.

Figure 1　　　　*Address Scoping at Boundaries*
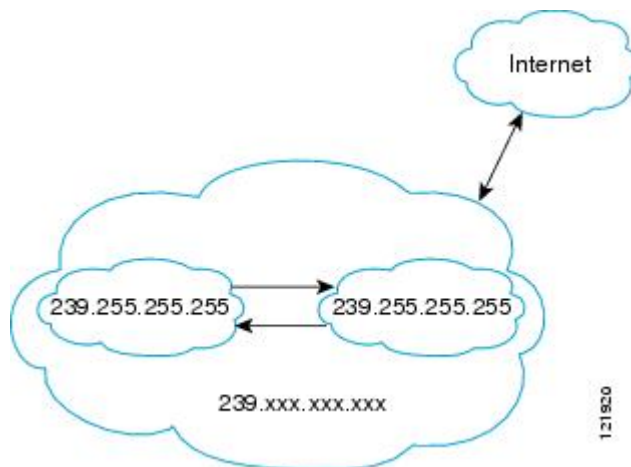
You can set up an administratively scoped boundary on an interface for multicast group addresses using the **ip multicast boundary** command with the *access-list* argument. A standard access list defines the range of addresses affected. When a boundary is set up, no multicast data packets are allowed to flow across the boundary from either direction. The boundary allows the same multicast group address to be reused in different administrative domains.

The Internet Assigned Numbers Authority (IANA) has designated the multicast address range 239.0.0.0 to 239.255.255.255 as the administratively scoped addresses. This range of addresses can be reused in domains administered by different organizations. They would be considered local, not globally unique.

You can configure the **filter-autorp** keyword to examine and filter AutoRP discovery and announcement messages at the administratively scoped boundary. Any AutoRP group range announcements from the AutoRP packets that are denied by the boundary access control list (ACL) are removed. An AutoRP group range announcement is permitted and passed by the boundary only if all addresses in the AutoRP group range are permitted by the boundary ACL. If any address is not permitted, the entire group range is filtered and removed from the AutoRP message before the AutoRP message is forwarded.

Benefits of Auto-RP in a PIM Network

- Auto-RP allows any change to the RP designation to be configured only on the devices that are RPs, not on the leaf routers.
- Auto-RP offers the ability to scope the RP address within a domain.

How to Configure AutoRP Enhancement

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Configuring Sparse Mode with AutoRP

- An interface configured in sparse-dense mode is treated in either sparse mode or dense mode of operation, depending on the mode in which the multicast group operates. You must decide how to configure your interfaces.
- All access lists that are needed when AutoRP is configured should be configured prior to beginning the configuration task.

Note

- If a group has no known RP and the interface is configured to be sparse-dense mode, the interface is treated as if it were in dense mode, and data is flooded over the interface. To avoid this data flooding, configure the AutoRP listener and then configure the interface as sparse mode.
- When configuring AutoRP, you must either configure the AutoRP listener feature (Step 5) and specify sparse mode (Step 7) or specify sparse-dense mode (Step 8) .
- When you configure sparse-dense mode, dense mode failover may result in a network dense-mode flood. To avoid this condition, use PIM sparse mode with the AutoRP listener feature.

Follow this procedure to configure auto-rendezvous point (AutoRP). AutoRP can also be optionally used with anycast RP.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **ip multicast-routing** [**distributed**]
4. Either perform Steps 5 through 7 or perform Steps 6 and 8.
5. **ip pim autorp listener**
6. **interface** *type number*
7. **ip pim sparse-mode**
8. **ip pim sparse-dense-mode**
9. **exit**
10. Repeat Steps 1 through 9 on all PIM interfaces.
11. **ip pim send-rp-announce** {*interface-type interface-number | ip-address*} **scope** *ttl-value* [**group-list** *access-list*] [**interval** *seconds*] [**bidir**]
12. **ip pim send-rp-discovery** [*interface-type interface-number*] **scope** *ttl-value* [**interval** *seconds*]
13. **ip pim rp-announce-filter rp-list** *access-list* **group-list** *access-list*
14. **no ip pim dm-fallback**
15. **interface** *type number*
16. **ip multicast boundary** *access-list* [**filter-autorp**]
17. **end**
18. **show ip pim autorp**
19. **show ip pim rp** [**mapping**] [*rp-address*]
20. **show ip igmp groups** [*group-name | group-address| interface-type interface-number*] [**detail**]
21. **show ip mroute** [*group-address | group-name*] [*source-address | source-name*] [*interface-type interface-number*] [**summary**] [**count**] [**active** *kbps*]

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.

	Command or Action	Purpose
Step 3	**ip multicast-routing** [**distributed**] **Example:** Device(config)# ip multicast-routing	Enables IP multicast routing. • Use the **distributed** keyword to enabled Multicast Distributed Switching.
Step 4	Either perform Steps 5 through 7 or perform Steps 6 and 8.	--
Step 5	**ip pim autorp listener** **Example:** Device(config)# ip pim autorp listener	Causes IP multicast traffic for the two AutoRP groups 224.0.1.39 and 224.0.1.40 to be PIM dense mode flooded across interfaces operating in PIM sparse mode. • Skip this step if you are configuring sparse-dense mode in Step 8.
Step 6	**interface** *type number* **Example:** Device(config)# interface Gigabitethernet 1/0/0	Selects an interface that is connected to hosts on which PIM can be enabled.
Step 7	**ip pim sparse-mode** **Example:** Device(config-if)# ip pim sparse-mode	Enables PIM sparse mode on an interface. When configuring AutoRP in sparse mode, you must also configure the AutoRP listener in the next step. • Skip this step if you are configuring sparse-dense mode in Step 8.
Step 8	**ip pim sparse-dense-mode** **Example:** Device(config-if)# ip pim sparse-dense-mode	Enables PIM sparse-dense mode on an interface. • Skip this step if you configured sparse mode in Step 7.
Step 9	**exit** **Example:** Device(config-if)# exit	Exits interface configuration mode and returns to global configuration mode.
Step 10	Repeat Steps 1 through 9 on all PIM interfaces.	--

	Command or Action	Purpose
Step 11	**ip pim send-rp-announce** {*interface-type interface-number* | *ip-address*} **scope** *ttl-value* [**group-list** *access-list*] [**interval** *seconds*] [**bidir**] **Example:** `Device(config)# ip pim send-rp-announce loopback0 scope 31 group-list 5`	Sends RP announcements out all PIM-enabled interfaces. • Perform this step on the RP device only. • Use the *interface-type* and *interface-number* arguments to define which IP address is to be used as the RP address. • Use the *ip-address* argument to specify a directly connected IP address as the RP address. **Note** If the *ip-address* argument is configured for this command, the RP-announce message will be sourced by the interface to which this IP address is connected (that is, the source address in the IP header of the RP-announce message is the IP address of that interface). • This example shows that the interface is enabled with a maximum of 31 hops. The IP address by which the device wants to be identified as RP is the IP address associated with loopback interface 0. Access list 5 describes the groups for which this device serves as RP.
Step 12	**ip pim send-rp-discovery** [*interface-type interface-number*] **scope** *ttl-value* [**interval** *seconds*] **Example:** `Device(config)# ip pim send-rp-discovery loopback 1 scope 31`	Configures the device to be an RP mapping agent. • Perform this step on RP mapping agent devices or on combined RP/RP mapping agent devices. **Note** AutoRP allows the RP function to run separately on one device and the RP mapping agent to run on one or multiple devices. It is possible to deploy the RP and the RP mapping agent on a combined RP/RP mapping agent device. • Use the optional *interface-type* and *interface-number* arguments to define which IP address is to be used as the source address of the RP mapping agent. • Use the **scope** keyword and *ttl-value* argument to specify the Time-to-Live (TTL) value in the IP header of AutoRP discovery messages. • Use the optional **interval** keyword and *seconds* argument to specify the interval at which AutoRP discovery messages are sent. **Note** Lowering the interval at which AutoRP discovery messages are sent from the default value of 60 seconds results in more frequent floodings of the group-to-RP mappings. In some network environments, the disadvantages of lowering the interval (more control packet overhead) may outweigh the advantages (more frequent group-to-RP mapping updates). • The example shows limiting the AutoRP discovery messages to 31 hops on loopback interface 1.

	Command or Action	Purpose
Step 13	**ip pim rp-announce-filter rp-list** *access-list* **group-list** *access-list* **Example:** Device(config)# ip pim rp-announce-filter rp-list 1 group-list 2	Filters incoming RP announcement messages sent from candidate RPs (C-RPs) to the RP mapping agent. • Perform this step on the RP mapping agent only.
Step 14	**no ip pim dm-fallback** **Example:** Device(config)# no ip pim dm-fallback	(Optional) Prevents PIM dense mode fallback. • Skip this step if all interfaces have been configured to operate in PIM sparse mode. **Note** The **no ip pim dm-fallback** command behavior is enabled by default if all the interfaces are configured to operate in PIM sparse mode (using the **ip pim sparse-mode** command).
Step 15	**interface** *type number* **Example:** Device(config)# interface gigabitethernet 1/0/0	Selects an interface that is connected to hosts on which PIM can be enabled.
Step 16	**ip multicast boundary** *access-list* [**filter-autorp**] **Example:** Device(config-if)# ip multicast boundary 10 filter-autorp	Configures an administratively scoped boundary. • Perform this step on the interfaces that are boundaries to other devices. • The access list is not shown in this task. • An access list entry that uses the **deny** keyword creates a multicast boundary for packets that match that entry.
Step 17	**end** **Example:** Device(config-if)# end	Returns to global configuration mode.
Step 18	**show ip pim autorp** **Example:** Device# show ip pim autorp	(Optional) Displays the AutoRP information.

	Command or Action	Purpose
Step 19	**show ip pim rp** [**mapping**] [*rp-address*] **Example:** `Device# show ip pim rp mapping`	(Optional) Displays RPs known in the network and shows how the device learned about each RP.
Step 20	**show ip igmp groups** [*group-name* | *group-address*| *interface-type interface-number*] [**detail**] **Example:** `Device# show ip igmp groups`	(Optional) Displays the multicast groups having receivers that are directly connected to the device and that were learned through Internet Group Management Protocol (IGMP). • A receiver must be active on the network at the time that this command is issued in order for receiver information to be present on the resulting display.
Step 21	**show ip mroute** [*group-address* | *group-name*] [*source-address* | *source-name*] [*interface-type interface-number*] [**summary**] [**count**] [**active kbps**] **Example:** `Device# show ip mroute cbone-audio`	(Optional) Displays the contents of the IP multicast routing (mroute) table.

Configuration Examples for AutoRP Enhancement

Example: Sparse Mode with AutoRP

The following example configures sparse mode with AutoRP:

```
ip multicast-routing
ip pim autorp listener
ip pim send-rp-announce Loopback0 scope 16 group-list 1
ip pim send-rp-discovery Loopback1 scope 16
no ip pim dm-fallback
access-list 1 permit 239.254.2.0 0.0.0.255
access-list 1 permit 239.254.3.0 0.0.0.255
.
.
.
access-list 10 permit 224.0.1.39
access-list 10 permit 224.0.1.40
access-list 10 permit 239.254.2.0 0.0.0.255
access-list 10 permit 239.254.3.0 0.0.0.255
```

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 AutoRP Ennhancement

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 AutoRP Enhancement*

Feature Name	Releases	Feature Information
AutoRP Enhancement	12.2(25)S 12.2(33)SXH 12.3(4)T Cisco IOS XE Release 2.1	Auto-RP automates the distribution of group-to-rendezvous point (RP) mappings in a PIM network. To make Auto-RP work, a router must be designated as an RP mapping agent, which receives the RP announcement messages from the RPs and arbitrates conflicts.