Configuring IP Multicast Routing

Finding Feature Information

Your software release may not support all the features documented in this module. For the latest feature information and caveats, see the release notes for your platform and software release.

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

Prerequisites for Configuring IP Multicast Routing

The following are the prerequisites for configuring IP multicast routing:

- To use the IP multicast routing feature on the switch, the switch or active switch must be running the IP Services feature set.
- You must enable IP multicast routing and configure the PIM version and PIM mode on the switch. After performing these tasks, the switch can then forward multicast packets and can populate its multicast routing table.

- To participate in IP multicasting, the multicast hosts, routers, and multilayer switch must have IGMP operating.

Restrictions for Configuring IP Multicast Routing

The following are the restrictions for configuring IP multicast routing:

- You cannot have a switch stack containing a mix of Catalyst 3850 and Catalyst 3650 switches.

Information About IP Multicast Routing

IP multicasting is an efficient way to use network resources, especially for bandwidth-intensive services such as audio and video. IP multicast routing enables a host (source) to send packets to a group of hosts (receivers) anywhere within the IP network by using a special form of IP address called the IP multicast group address.

The sending host inserts the multicast group address into the IP destination address field of the packet, and IP multicast routers and multilayer switches forward incoming IP multicast packets out all interfaces that lead to members of the multicast group. Any host, regardless of whether it is a member of a group, can send to a group. However, only the members of a group receive the message.

Cisco's Implementation of IP Multicast Routing

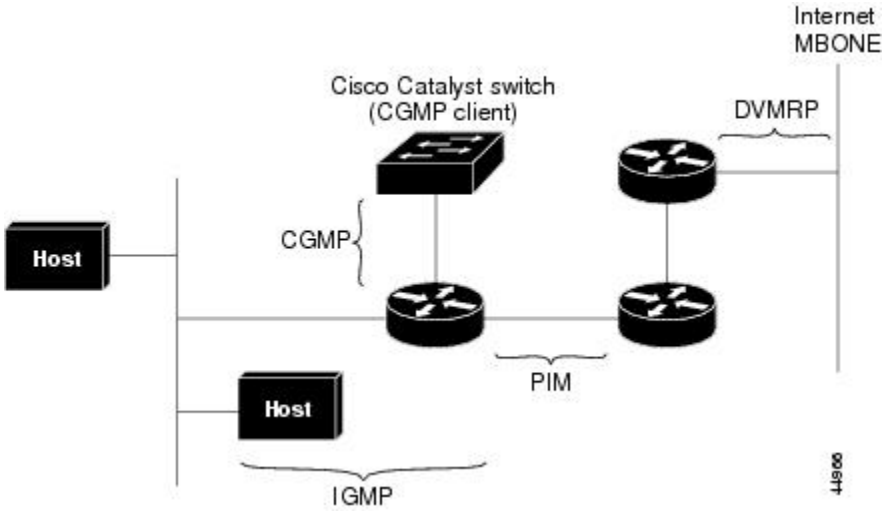
Cisco IOS software supports the following protocols to implement IP multicast routing:

- Internet Group Management Protocol (IGMP) is used among hosts on a LAN and the routers (and multilayer switches) on that LAN to track the multicast groups of which hosts are members.
- Protocol-Independent Multicast (PIM) protocol is used among routers and multilayer switches to track which multicast packets to forward to each other and to their directly connected LANs.

Note The switch does not support the Distance Vector Multicast Routing Protocol (DVMRP) nor the Cisco Group Management Protocol (CGMP).

The following figure shows where the Cisco-supported protocols for the switch operate within the IP multicast environment.

Figure 1: IP Multicast Routing Protocols



According to IPv4 multicast standards, the MAC destination multicast address begins with 0100:5e and is appended by the last 23 bits of the IP address. For example, if the IP destination address is 239.1.1.39, the MAC destination address is 0100:5e01:0127.

A multicast packet is unmatched when the destination IPv4 address does not match the destination MAC address. The switch forwards the unmatched packet in hardware based upon the MAC address table. If the destination MAC address is not in the MAC address table, the switch floods the packet to the all port in the same VLAN as the receiving port.

Related Topics

Configuring Basic IP Multicast Routing (CLI), on page 6

Multicast Forwarding Information Base Overview

The switch uses the Multicast Forwarding Information Base (MFIB) architecture and the Multicast Routing Information Base (MRIB) for IP multicast.

The MFIB architecture provides both modularity and separation between the multicast control plane (Protocol Independent Multicast [PIM] and Internet Group Management Protocol [IGMP]) and the multicast forwarding plane (MFIB). This architecture is used in Cisco IOS IPv6 multicast implementations.

MFIB itself is a multicast routing protocol independent forwarding engine; that is, it does not depend on PIM or any other multicast routing protocol. It is responsible for:

- Forwarding multicast packets
- Registering with the MRIB to learn the entry and interface flags set by the control plane
- Handling data-driven events that must be sent to the control plane
- Maintaining counts, rates, and bytes of received, dropped, and forwarded multicast packets

The MRIB is the communication channel between MRIB clients. Examples of MRIB clients are PIM, IGMP, the multicast routing (mroute) table, and the MFIB.

Related Topics

Configuring IP Multicast Forwarding (CLI), on page 8

Multicast Group Concept

Multicast is based on the concept of a group. An arbitrary group of receivers expresses an interest in receiving a particular data stream. This group does not have any physical or geographical boundaries. The hosts can be located anywhere on the Internet. Hosts that are interested in receiving data flowing to a particular group must join the group using IGMP. Hosts must be a member of the group to receive the data stream.

Related Topics

Configuring an IP Multicast Boundary (CLI), on page 15
Example: Configuring an IP Multicast Boundary, on page 22

Multicast Boundaries

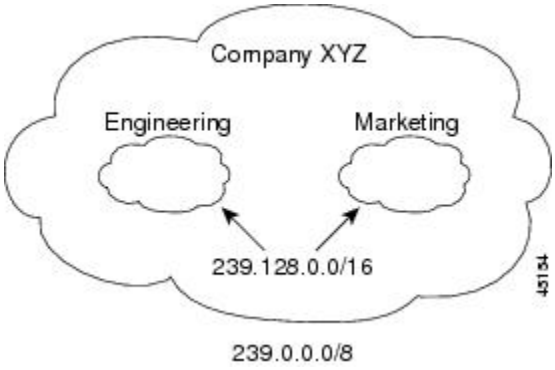
Administratively-scoped boundaries can be used to limit the forwarding of multicast traffic outside of a domain or subdomain. This approach uses a special range of multicast addresses, called administratively-scoped addresses, as the boundary mechanism. If you configure an administratively-scoped boundary on a routed interface, multicast traffic whose multicast group addresses fall in this range cannot enter or exit this interface, which provides a firewall for multicast traffic in this address range.

Note Multicast boundaries and TTL thresholds control the scoping of multicast domains; however, TTL thresholds are not supported by the switch. You should use multicast boundaries instead of TTL thresholds to limit the forwarding of multicast traffic outside of a domain or a subdomain.

The following figure shows that Company XYZ has an administratively-scoped boundary set for the multicast address range 239.0.0.0/8 on all routed interfaces at the perimeter of its network. This boundary prevents any multicast traffic in the range 239.0.0.0 through 239.255.255.255 from entering or leaving the network. Similarly, the engineering and marketing departments have an administratively-scoped boundary of 239.128.0.0/16

around the perimeter of their networks. This boundary prevents multicast traffic in the range of 239.128.0.0 through 239.128.255.255 from entering or leaving their respective networks.

Figure 2: Administratively-Scoped Boundaries



You can define an administratively-scoped boundary on a routed interface for multicast group addresses. A standard access list defines the range of addresses affected. When a boundary is defined, 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 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 then be reused in domains administered by different organizations. The addresses would be considered local, not globally unique.

Related Topics

Configuring an IP Multicast Boundary (CLI), on page 15

Example: Configuring an IP Multicast Boundary, on page 22

Multicast Routing and Switch Stacks

For all multicast routing protocols, the entire stack appears as a single router to the network and operates as a single multicast router.

In a switch stack, the active switch performs these functions:

- It is responsible for completing the IP multicast routing functions of the stack. It fully initializes and runs the IP multicast routing protocols.
- It builds and maintains the multicast routing table for the entire stack.
- It is responsible for distributing the multicast routing table to all stack members.

The stack members perform these functions:

- They act as multicast routing standby devices and are ready to take over if there is a active switch failure.

  If the active switch fails, all stack members delete their multicast routing tables. The newly elected active switch starts building the routing tables and distributes them to the stack members.
- They do not build multicast routing tables. Instead, they use the multicast routing table that is distributed by the active switch.

Default Multicast Routing Configuration

This table describes the default multicast routing configuration for the switch.

Table 1: Default Multicast Routing Configuration

Feature	Default Setting
Multicast routing	Disabled on all interfaces.

How to Configure Basic IP Multicast Routing

Configuring Basic IP Multicast Routing (CLI)

You must enable IP multicast routing and configure the PIM version and mode. After performing these tasks, the software can then forward multicast packets, and the switch can populate its multicast routing table.

You can configure an interface to be in PIM dense mode, sparse mode, or sparse-dense mode. The switch populates its multicast routing table and forwards multicast packets it receives from its directly connected LANs according to the mode setting. You must enable PIM in one of these modes for an interface to perform IP multicast routing.

Enabling PIM on an interface also enables IGMP operation on that interface.

Note If you enable PIM on multiple interfaces, when most of these interfaces are not on the outgoing interface list, and IGMP snooping is disabled, the outgoing interface might not be able to sustain line rate for multicast traffic because of the extra replication.

In populating the multicast routing table, dense-mode interfaces are always added to the table. Sparse-mode interfaces are added to the table only when periodic join messages are received from downstream devices or when there is a directly connected member on the interface.

When forwarding from a LAN, sparse-mode operation occurs if there is a rendezvous point (RP) known for the group. An RP acts as the meeting place for sources and receivers of multicast data. If an RP exists, the packets are encapsulated and sent toward the RP. When no RP is known, the packet is flooded in a dense-mode fashion. If the multicast traffic from a specific source is sufficient, the receiver's first-hop router might send join messages toward the source to build a source-based distribution tree.

By default, multicast routing is disabled, and there is no default mode setting.

This procedure is required.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **ip multicast-routing**
4. **interface** *interface-id*
5. **ip pim** {**dense-mode** | **sparse-mode** | **sparse-dense-mode**}
6. **end**
7. **show running-config**
8. **copy running-config startup-config**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** `Switch> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Switch# configure terminal`	Enters the global configuration mode.
Step 3	**ip multicast-routing** **Example:** `Switch(config)# ip multicast-routing`	Enables IP multicast routing. IP multicast routing is supported with Multicast Forwarding Information Base (MFIB) and Multicast Routing Information Base (MRIB).
Step 4	**interface** *interface-id* **Example:** `Switch(config)# interface gigabitethernet 1/0/1`	Specifies the Layer 3 interface on which you want to enable multicast routing, and enters interface configuration mode. The specified interface must be one of the following: • A routed port—A physical port that has been configured as a Layer 3 port by entering the **no switchport** interface configuration command. You will also need to enable IP PIM sparse-dense-mode on the interface, and join the interface as a statically connected member to an IGMP static group. For a configuration example, see Example: Interface Configuration as a Routed Port • An SVI—A VLAN interface created by using the **interface vlan** *vlan-id* global configuration command. You will also need to enable IP PIM sparse-dense-mode on the VLAN, join the VLAN as a statically connected member to an IGMP static group, and then enable IGMP snooping on

	Command or Action	Purpose
		the VLAN, the IGMP static group, and physical interface. For a configuration example, see Example: Interface Configuration as an SVI These interfaces must have IP addresses assigned to them.
Step 5	**ip pim** {**dense-mode** | **sparse-mode** | **sparse-dense-mode**} **Example:** `Switch(config-if)# ip pim sparse-dense-mode`	Enables a PIM mode on the interface. By default, no mode is configured. The keywords have these meanings: • **dense-mode—**Enables dense mode of operation. • **sparse-mode—**Enables sparse mode of operation. If you configure sparse mode, you must also configure an RP. • **sparse-dense-mode—**Causes the interface to be treated in the mode in which the group belongs. Sparse-dense mode is the recommended setting. • **state-refresh—**PM dense mode state-refresh configuration.
Step 6	**end** **Example:** `Switch(config-if)# end`	Returns to privileged EXEC mode.
Step 7	**show running-config** **Example:** `Switch# show running-config`	Verifies your entries.
Step 8	**copy running-config startup-config** **Example:** `Switch# copy running-config startup-config`	(Optional) Saves your entries in the configuration file.

Related Topics

Cisco's Implementation of IP Multicast Routing, on page 2

Configuring IP Multicast Forwarding (CLI)

You can use the following procedure to configure IPv4 Multicast Forwarding Information Base (MFIB) interrupt-level IP multicast forwarding of incoming packets or outgoing packets on the switch.

Note After you have enabled IP multicast routing by using the **ip multicast-routing** command, IPv4 multicast forwarding is enabled. Because IPv4 multicast forwarding is enabled by default, you can use the **no** form of the **ip mfib** command to disable IPv4 multicast forwarding.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **ip mfib**
4. **exit**
5. **show running-config**
6. **copy running-config startup-config**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** `Switch> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Switch# configure terminal`	Enters the global configuration mode.
Step 3	**ip mfib** **Example:** `Switch(config)# ip mfib`	Enables IP multicast forwarding.
Step 4	**exit** **Example:** `Switch(config)# exit`	Returns to privileged EXEC mode.
Step 5	**show running-config** **Example:** `Switch# show running-config`	Verifies your entries.

	Command or Action	Purpose
Step 6	**copy running-config startup-config** **Example:** `Switch# copy running-config startup-config`	(Optional) Saves your entries in the configuration file.

Related Topics

Multicast Forwarding Information Base Overview , on page 3

Configuring a Static Multicast Route (mroute) (CLI)

You can use the following procedure to configure static mroutes. Static mroutes are similar to unicast static routes but differ in the following ways:

- Static mroutes are used to calculate RPF information, not to forward traffic.
- Static mroutes cannot be redistributed.

Static mroutes are strictly local to the switch on which they are defined. Because Protocol Independent Multicast (PIM) does not have its own routing protocol, there is no mechanism to distribute static mroutes throughout the network. Consequently, the administration of static mroutes tends to be more complicated than the administration of unicast static routes.

When static mroutes are configured, they are stored on the switch in a separate table referred to as the static mroute table. When configured, the **ip mroute** command enters a static mroute into the static mroute table for the source address or source address range specified for the source-address and mask arguments. Sources that match the source address or that fall in the source address range specified for the source-address argument will RPF to either the interface associated with the IP address specified for the *rpf-address* argument or the local interface on the switch specified for the *interface-type* and *interface-number* arguments. If an IP address is specified for the *rpf-address* argument, a recursive lookup is done from the unicast routing table on this address to find the directly connected neighbor.

If there are multiple static mroutes configured, the switch performs a longest-match lookup of the mroute table. When the mroute with the longest match (of the source-address) is found, the search terminates and the information in the matching static mroute is used. The order in which the static mroutes are configured is not important.

The administrative distance of an mroute may be specified for the optional distance argument. If a value is not specified for the distance argument, the distance of the mroute defaults to zero. If the static mroute has the same distance as another RPF source, the static mroute will take precedence. There are only two exceptions to this rule: directly connected routes and the default unicast route.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **ip mroute** [**vrf** *vrf-name*] *source-address mask* { **fallback-lookup** {**global** | **vrf** *vrf-name* }[*protocol*] {*rpf-address* | *interface-type interface-number*}} [**distance**]
4. **exit**
5. **show running-config**
6. **copy running-config startup-config**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** `Switch> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Switch# configure terminal`	Enters the global configuration mode.
Step 3	**ip mroute** [**vrf** *vrf-name*] *source-address mask* { **fallback-lookup** {**global**	**vrf** *vrf-name* }[*protocol*] {*rpf-address*	*interface-type interface-number*}} [**distance**] **Example:** `Switch(configure)# ip mroute 10.1.1.1 255.255.255.255 10.2.2.2`	The source IP address 10.1.1.1 is configured to be reachable through the interface associated with IP address 10.2.2.2.
Step 4	**exit** **Example:** `Switch(config)# exit`	Returns to privileged EXEC mode.
Step 5	**show running-config** **Example:** `Switch# show running-config`	(Optional) Verifies your entries.

	Command or Action	Purpose
Step 6	**copy running-config startup-config** **Example:** `Switch# copy running-config startup-config`	(Optional) Saves your entries in the configuration file.

Configuring sdr Listener Support

The MBONE is the small subset of Internet routers and hosts that are interconnected and capable of forwarding IP multicast traffic. Other multimedia content is often broadcast over the MBONE. Before you can join a multimedia session, you need to know what multicast group address and port are being used for the session, when the session is going to be active, and what sort of applications (audio, video, and so forth) are required on your workstation. The MBONE Session Directory Version 2 (sdr) tool provides this information. This freeware application can be downloaded from several sites on the World Wide Web, one of which is http://www.video.ja.net/mice/index.html.

SDR is a multicast application that listens to a well-known multicast group address and port for Session Announcement Protocol (SAP) multicast packets from SAP clients, which announce their conference sessions. These SAP packets contain a session description, the time the session is active, its IP multicast group addresses, media format, contact person, and other information about the advertised multimedia session. The information in the SAP packet is displayed in the SDR Session Announcement window.

Enabling sdr Listener Support (CLI)

By default, the switch does not listen to session directory advertisements.

This procedure is optional.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **interface** *interface-id*
4. **ip sap listen**
5. **end**
6. **show running-config**
7. **copy running-config startup-config**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** `Switch> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Switch# configure terminal`	Enters the global configuration mode.
Step 3	**interface** *interface-id* **Example:** `Switch(config)# interface gigabitethernet 1/0/1`	Specifies the interface to be enabled for sdr, and enters interface configuration mode. The specified interface must be one of the following: • A routed port—A physical port that has been configured as a Layer 3 port by entering the **no switchport** interface configuration command. You will also need to enable IP PIM sparse-dense-mode on the interface, and join the interface as a statically connected member to an IGMP static group. For a configuration example, see Example: Interface Configuration as a Routed Port • An SVI—A VLAN interface created by using the **interface vlan** *vlan-id* global configuration command. You will also need to enable IP PIM sparse-dense-mode on the VLAN, join the VLAN as a statically connected member to an IGMP static group, and then enable IGMP snooping on the VLAN, the IGMP static group, and physical interface. For a configuration example, see Example: Interface Configuration as an SVI These interfaces must have IP addresses assigned to them.
Step 4	**ip sap listen** **Example:** `Switch(config-if)# ip sap listen`	Enables the switch software to listen to session directory announcements.
Step 5	**end** **Example:** `Switch(config-if)# end`	Returns to privileged EXEC mode.

	Command or Action	Purpose
Step 6	**show running-config** **Example:** `Switch# show running-config`	Verifies your entries.
Step 7	**copy running-config startup-config** **Example:** `Switch# copy running-config startup-config`	(Optional) Saves your entries in the configuration file.

Limiting How Long an sdr Cache Entry Exists (CLI)

By default, entries are never deleted from the sdr cache. You can limit how long the entry remains active so that if a source stops advertising SAP information, old advertisements are not unnecessarily kept.

This procedure is optional.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **ip sap cache-timeout** *minutes*
4. **end**
5. **show running-config**
6. **show ip sap**
7. **copy running-config startup-config**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** `Switch> enable`	Enables privileged EXEC mode. • Enter your password if prompted.

	Command or Action	Purpose
Step 2	**configure terminal** **Example:** `Switch# configure terminal`	Enters the global configuration mode.
Step 3	**ip sap cache-timeout** *minutes* **Example:** `Switch(config)# ip sap cache-timeout 30`	Limits how long a Session Announcement Protocol (SAP) cache entry stays active in the cache. By default, entries are never deleted from the cache. For *minutes*, the range is 1 to 1440 minutes (24 hours).
Step 4	**end** **Example:** `Switch(config)# end`	Returns to privileged EXEC mode.
Step 5	**show running-config** **Example:** `Switch# show running-config`	Verifies your entries.
Step 6	**show ip sap** **Example:** `Switch# show ip sap`	Displays the SAP cache.
Step 7	**copy running-config startup-config** **Example:** `Switch# copy running-config startup-config`	(Optional) Saves your entries in the configuration file.

Configuring an IP Multicast Boundary (CLI)

This procedure is optional.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **access-list** {*access-list-number 1-99* | *access-list-number 100-199* | *access-list-number 1300-1999* |*access-list-number 2000-2699* | **dynamic-extended** | **rate-limit**}
4. **interface** *interface-id*
5. **ip multicast boundary** *access-list-number*
6. **end**
7. **show running-config**
8. **copy running-config startup-config**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** `Switch> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Switch# configure terminal`	Enters the global configuration mode.
Step 3	**access-list** {*access-list-number 1-99* | *access-list-number 100-199* | *access-list-number 1300-1999* |*access-list-number 2000-2699* | **dynamic-extended** | **rate-limit**} **Example:** `Switch(config)# access-list 99 permit any`	Creates a standard access list, repeating the command as many times as necessary. • For *access-list-number*, the ranges are as follows: ◦ access-list-number 1—99 (IP standard access list) ◦ access-list-number 100—199 (IP extended access list) ◦ access-list-number 1300—1999 (IP standard access list - expanded range) ◦ access-list-number 2000—2699 (IP extended access list - expanded range) • The **dynamic-extended** keyword extends the dynamic ACL absolute timer. • The **rate-limit** keyword permits a simple rate-limit specific access list. The access list is always terminated by an implicit deny statement for everything.
Step 4	**interface** *interface-id*	Specifies the interface to be configured, and enters interface configuration mode.

	Command or Action	Purpose
	Example: `Switch(config)# interface gigabitEthernet1/0/1`	The specified interface must be one of the following: • A routed port—A physical port that has been configured as a Layer 3 port by entering the **no switchport** interface configuration command. You will also need to enable IP PIM sparse-dense-mode on the interface, and join the interface as a statically connected member to an IGMP static group. For a configuration example, see Example: Interface Configuration as a Routed Port • An SVI—A VLAN interface created by using the **interface vlan** *vlan-id* global configuration command. You will also need to enable IP PIM sparse-dense-mode on the VLAN, join the VLAN as a statically connected member to an IGMP static group, and then enable IGMP snooping on the VLAN, the IGMP static group, and physical interface. For a configuration example, see Example: Interface Configuration as an SVI These interfaces must have IP addresses assigned to them.
Step 5	**ip multicast boundary** *access-list-number* **Example:** `Switch(config-if)# ip multicast boundary 99`	Configures the boundary, specifying the access list you created in Step 2. Additional command options include: • For *access-list-number*, the ranges are as follows: ◦ access-list-number 1—99 (IP standard access list) ◦ access-list-number 100—199 (IP extended access list) ◦ access-list-number 1300—1999 (IP standard access list - expanded range) ◦ access-list-number 2000—2699 (IP extended access list - expanded range) • *Word*—IP named access list. • **filter-autorp**—Filter AutoRP packet contents. • **in**—Restrict (s,g) creation when this interface is the RPF. • **out**—Restrict interface addition to outgoing list.
Step 6	**end** **Example:** `Switch(config-if)# end`	Returns to privileged EXEC mode.
Step 7	**show running-config** **Example:** `Switch# show running-config`	Verifies your entries.

	Command or Action	Purpose
Step 8	**copy running-config startup-config** **Example:** `Switch# copy running-config startup-config`	(Optional) Saves your entries in the configuration file.

What to Do Next

Proceed to the other supported IP multicast routing procedures.

Related Topics

Multicast Boundaries, on page 4
Multicast Group Concept, on page 4
Example: Configuring an IP Multicast Boundary, on page 22

Monitoring and Maintaining IP Multicast Routing

Clearing Caches, Tables, and Databases

You can remove all contents of a particular cache, table, or database. Clearing a cache, table, or database might be necessary when the contents of the particular structure are or suspected to be invalid.

You can use any of the privileged EXEC commands in the following table to clear IP multicast caches, tables, and databases.

Table 2: Commands for Clearing Caches, Tables, and Databases

Command	Purpose
clear ip igmp group {**group** [*hostname* | *IP address*] | **vrf** *name* **group** [*hostname* | *IP address*] }	Deletes entries from the IGMP cache.
clear ip mfib { **counters** [*group* | *source*] | **global counters** [*group* | *source*] | **vrf** * }	Clears all active IPv4 Multicast Forwarding Information Base (MFIB) traffic counters.
clear ip mrm {**status-report** [*source*] }	IP multicast routing clear commands.
clear ip mroute { * | [*hostname* | *IP address*] | **vrf** *name* **group** [*hostname* | *IP address*] }	Deletes entries from the IP multicast routing table.

Command	Purpose
clear ip msdp { **peer** | **sa-cache** | **statistics** | **vrf** }	Clears the Multicast Source Discovery Protocol (MSDP) cache.
clear ip multicast { **limit** | **redundancy statistics** }	Clears the IP multicast information.
clear ip pim { **df** [**int** | **rp** *rp address*] | **interface** | **rp-mapping** [*rp address*] | **vrf** *vpn name* { **df** | **interface** | **rp-mapping** }	Clears the PIM cache.
clear ip sap [*group-address* | "*session-name*"]	Deletes the Session Directory Protocol Version 2 cache or an sdr cache entry.

Displaying System and Network Statistics

You can display specific statistics, such as the contents of IP routing tables, caches, and databases.

Note This release does not support per-route statistics.

You can display information to learn resource usage and solve network problems. You can also display information about node reachability and discover the routing path that packets of your device are taking through the network.

You can use any of the privileged EXEC commands in the following table to display various routing statistics.

Table 3: Commands for Displaying System and Network Statistics

Command	Purpose
ping [*group-name* | *group-address*]	Sends an ICMP Echo Request to a multicast group address.
show ip igmp filter	Displays IGMP filter information.
show ip igmp groups [*type-number* | *detail*]	Displays the multicast groups that are directly connected to the switch and that were learned through IGMP.
show ip igmp interface [*type number*]	Displays multicast-related information about an interface.
show ip igmp membership [*name/group address* | **all** | **tracked**]	Displays IGMP membership information for forwarding.
show ip igmp profile [profile_number]	Displays IGMP profile information.

Command	Purpose
show ip igmp ssm-mapping [*hostname/IP address*]	Displays IGMP SSM mapping information.
show ip igmp static-group {**class-map** [**interface** [type]]	Displays static group information.
show ip igmp vrf	Displays the selected VPN Routing/Forwarding instance by name.
show ip mfib [*type number*]	Displays the IP multicast forwarding information base.
show ip mrib { **client** | **route** | **vrf** }	Displays the multicast routing information base.
show ip mrm { **interface** | **manager** | **status-report** }	Displays the IP multicast routing monitor information.
show ip mroute [*group-name* | *group-address*] [*source*] [**count** | **interface** | **proxy** | **pruned** | **summary** | **verbose**]	Displays the contents of the IP multicast routing table.
show ip msdp { **count** | **peer** | **rpf-peer** | **sa-cache** | **summary** | **vrf** }	Displays the Multicast Source Discovery Protocol (MSDP) information.
show ip multicast [**interface** | **limit** | **mpls** | **redundancy** | **vrf**]	Displays global multicast information.
show ip pim interface [*type number*] [**count** | **detail** | **df** | **stats**]	Displays information about interfaces configured for PIM. This command is available in all software images.
show ip pim all-vrfs { **tunnel** }	Display all VRFs.
show ip pim autorp	Display global auto-RP information.
show ip pim boundary [*type number*]	Displays boundary information.
show ip pim bsr-router	Display bootstrap router information (version 2).
show ip pim interface [*type number*]	Displays PIM interface information.
show ip pim mdt [**bgp**]	Displays multicast tunnel information.
show ip pim neighbor [*type number*]	Lists the PIM neighbors discovered by the switch. This command is available in all software images.
show ip pim rp [*group-name* | *group-address*]	Displays the RP routers associated with a sparse-mode multicast group. This command is available in all software images.

Command	Purpose
show ip pim rp-hash [*group-name* | *group-address*]	Displays the RP to be chosen based upon the group selected.
show ip pim tunnel [*tunnel* | *verbose*]	Displays the registered tunnels.
show ip pim vrf *name*	Displays VPN routing and forwarding instances.
show ip rpf {*source-address* | *name*}	Displays how the switch is doing Reverse-Path Forwarding (that is, from the unicast routing table, DVMRP routing table, or static mroutes). Command parameters include: • *Host name* or *IP address*—IP name or group address. • **Select**—Group-based VRF select information. • **vrf**—Selects VPN Routing/Forwarding instance.
show ip sap [*group* | "*session-name*" | **detail**]	Displays the Session Announcement Protocol (SAP) Version 2 cache. Command parameters include: • *A.B.C.D*—IP group address. • *WORD*—Session name (in double quotes). • **detail**—Session details.

Monitoring IP Multicast Routing

You can use the privileged EXEC commands in the following table to monitor IP multicast routers, packets, and paths.

Table 4: Commands for Monitoring IP Multicast Routing

Command	Purpose
mrinfo { [*hostname* | *address*] | **vrf** }	Queries a multicast router or multilayer switch about which neighboring multicast devices are peering with it.
mstat { [*hostname* | *address*] | **vrf** }	Displays IP multicast packet rate and loss information.

Command	Purpose
mtrace { [*hostname* | *address*] | **vrf** }	Traces the path from a source to a destination branch for a multicast distribution tree for a given group.

Configuration Examples for IP Multicast Routing

Example: Configuring an IP Multicast Boundary

This example shows how to set up a boundary for all administratively-scoped addresses:

```
Switch(config)# access-list 1 deny 239.0.0.0 0.255.255.255
Switch(config)# access-list 1 permit 224.0.0.0 15.255.255.255
Switch(config)# interface gigabitethernet1/0/1
Switch(config-if)# ip multicast boundary 1
```

Related Topics

Configuring an IP Multicast Boundary (CLI), on page 15
Multicast Boundaries, on page 4
Multicast Group Concept, on page 4

Example: Responding to mrinfo Requests

The software answers mrinfo requests sent by mrouted systems and Cisco routers and multilayer switches. The software returns information about neighbors through DVMRP tunnels and all the routed interfaces. This information includes the metric (always set to 1), the configured TTL threshold, the status of the interface, and various flags. You can also use the **mrinfo** privileged EXEC command to query the router or switch itself, as in this example:

```
Switch# mrinfo
  171.69.214.27 (mm1-7kd.cisco.com) [version cisco 11.1] [flags: PMS]:
  171.69.214.27 -> 171.69.214.26 (mm1-r7kb.cisco.com) [1/0/pim/querier]
  171.69.214.27 -> 171.69.214.25 (mm1-45a.cisco.com) [1/0/pim/querier]
  171.69.214.33 -> 171.69.214.34 (mm1-45c.cisco.com) [1/0/pim]
  171.69.214.137 -> 0.0.0.0 [1/0/pim/querier/down/leaf]
  171.69.214.203 -> 0.0.0.0 [1/0/pim/querier/down/leaf]
  171.69.214.18 -> 171.69.214.20 (mm1-45e.cisco.com) [1/0/pim]
  171.69.214.18 -> 171.69.214.19 (mm1-45c.cisco.com) [1/0/pim]
  171.69.214.18 -> 171.69.214.17 (mm1-45a.cisco.com) [1/0/pim]
```

Where to Go Next for IP Multicast

You can configure the following:

- IGMP

- Wireless Multicast
- PIM
- SSM
- Service Discovery Gateway

Additional References

Related Documents

Related Topic	Document Title
For complete syntax and usage information for the commands used in this chapter.	*IP Multicast Routing Command Reference (Catalyst 3650 Switches)*
For information on configuring the Multicast Source Discovery Protocol (MSDP).	*Routing Command Reference (Catalyst 3650 Switches)*
Platform-independent configuration information	• *IP Multicast: PIM Configuration Guide, Cisco IOS XE Release 3SE (Catalyst 3650 Switches)* • *IP Multicast: IGMP Configuration Guide, Cisco IOS XE Release 3SE (Catalyst 3650 Switches)* • *IP Multicast: Multicast Optimization Configuration Guide, Cisco IOS XE Release 3SE (Catalyst 3650 Switches)*

Error Message Decoder

Description	Link
To help you research and resolve system error messages in this release, use the Error Message Decoder tool.	https://www.cisco.com/cgi-bin/Support/Errordecoder/index.cgi

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 4601	*Protocol-Independent Multicast-Sparse Mode (PIM-SM): Protocol Specification*

MIBs

MIB	MIBs Link
All supported MIBs for this release.	To locate and download MIBs for selected platforms, Cisco IOS 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 website provides extensive online resources, including documentation and tools for troubleshooting and resolving technical issues with Cisco products and technologies. To receive security and technical information about your products, you can subscribe to various services, such as the Product Alert Tool (accessed from Field Notices), the Cisco Technical Services Newsletter, and Really Simple Syndication (RSS) Feeds. Access to most tools on the Cisco Support website requires a Cisco.com user ID and password.	http://www.cisco.com/support

Feature History and Information for IP Multicast

Release	Modification
Cisco IOS XE 3.3SE	This feature was introduced.