Explicit Tracking of Hosts, Group, and Channels for IGMP Version 3

Feature History

Release	Modification
12.0(19)S	This feature was introduced.

This document describes the Explicit Tracking of Hosts, Groups, and Channels for IGMP Version 3 feature in Cisco IOS Release 12.0(19)S. It includes the following sections:

Feature Overview

The Internet Group Management Protocol (IGMP) is used by IP hosts to report their multicast group memberships to neighboring multicast routers. IGMP is available in versions 1, 2, and 3. IGMP Version 3 (IGMPv3) is supported in Cisco IOS Release 12.0(15)S, 12.1(5)T, 12.1(8)E, and later releases.

The Explicit Tracking of Hosts, Groups, and Channels for IGMP Version 3 feature enables a multicast router to explicitly track the membership of all multicast hosts in a particular multiaccess network. This enhancement to the Cisco IOS implementation of IGMPv3 enables the router to keep track of each individual host that is joined to a particular group or channel. The main benefits of this feature are that it provides minimal leave latencies, faster channel changing, and improved diagnostics capabilities for IGMP.

For more information on IGMPv3 and related features such as Source Specific Multicast (SSM), refer to the *Cisco IOS IP Configuration Guide*, Release 12.2.

Benefits

Minimal Leave Latencies

The main benefit of the Explicit Tracking of Hosts, Groups, and Channels in IGMP Version 3 feature is to allow minimal leave latencies when a host leaves a multicast group or channel. A router configured with IGMPv3 and explicit tracking can immediately stop forwarding traffic if the last host to request to receive traffic from the router indicates that it no longer wants to receive traffic. The leave latency is thus bound only by the packet transmission latencies in the multiaccess network and the processing time in the router.

In IGMP Version 2, when a router receives an IGMP leave message from a host, it must first send an IGMP group-specific query to learn if other hosts on the same multiaccess network are still requesting to receive traffic. If after a specific time (in Cisco IOS software, the default value is approximately 3 seconds) no host replies to the query, the router will then stop forwarding the traffic. This query process is required because, in IGMP Version 1 and 2, IGMP membership reports are suppressed if the same report has already been sent by another host in the network. Therefore, it is impossible for the router to reliably know how many hosts on a multiaccess network are requesting to receive traffic.

Faster Channel Changing

In networks where bandwidth is constrained between multicast routers and hosts (like in xDSL deployments), the bandwidth between routers and hosts is typically large enough to only sustain, in general, N multicast streams to be received in parallel. In these deployments, each host will typically join to only one multicast stream and the overall number of allowed hosts will be limited to N. The effective leave latency in these environments defines the channel change time of the receiver application—a single host cannot receive the new multicast stream before forwarding of the old stream has stopped. If an application tries to change the channel faster than the leave latency, the application will overload the bandwidth of the access network, resulting in a temporary degradation of traffic flow for all hosts. The Explicit Tracking of Hosts, Groups, and Channels in IGMP Version 3 feature allows for minimal leave latencies, and thus allows for fast channel changing capabilities.

Improved Diagnostics Capabilities

The Explicit Tracking of Hosts, Groups, and Channels in IGMP Version 3 feature allows network administrators to easily determine which multicast hosts are joined to which multicast groups or channels.

Restrictions

No MIB support

There is no Simple Network Management Protocol (SNMP) MIB to track the IGMP membership of individual hosts. The MIBs supported by Cisco IOS software reflect only the aggregate membership of a particular interface on a router.

No Minimal Leave Latency for Groups with Legacy Hosts

If one or more hosts that supports only IGMP Version 1 or Version 2 are present on a network, the leave latencies for the multicast groups to which those hosts are joined will revert to the leave latencies of the IGMP version of the hosts—approximately 3 seconds for IGMP Version 2 and up to 180 seconds for IGMP Version 1. This condition affects only the multicast groups to which those legacy hosts are actually joined at any given point in time. In addition, the membership reports for these multicast groups sent by IGMPv3 hosts may revert to IGMP Version 1 or Version 2 membership reports, thus disabling explicit tracking of those host memberships.

No Explicit Tracking Support for IGMP v3lite and URD

Explicit tracking of IGMP Version 3 lite (IGMP v3lite) or URL Rendezvous Directory (URD) channel membership reports is not supported in Release 12.0(19)S or earlier releases. Therefore, the leave latency for multicast groups sending traffic to hosts using IGMP v3lite or URD will be determined by the leave latency of the version of IGMP configured on the hosts (for IGMPv3, the leave latency is typically 3 seconds when explicit tracking is not configured).

Related Features and Technologies

The following Cisco IOS features are related to the Explicit Tracking of Hosts, Groups, and Channels for IGMP Version 3 feature:

- IGMP Version 3
- Source Specific Multicast
- IGMP Version 3 Lite
- URL Rendezvous Directory

Related Documents

- *Cisco IOS IP Configuration Guide,* Release 12.2
- *Cisco IOS IP Command Reference, Volume 3 of 3: Multicast*, Release 12.2

Supported Platforms

This feature runs on all platforms that support Cisco IOS Release 12.0(19)S and later releases.

Platform Support Through Feature Navigator

Cisco IOS software is packaged in feature sets that support specific platforms. To get updated information regarding platform support for this feature, access Feature Navigator. Feature Navigator dynamically updates the list of supported platforms as new platform support is added for the feature.

Feature Navigator is a web-based tool that enables you to quickly determine which Cisco IOS software images support a specific set of features and which features are supported in a specific Cisco IOS image.

To access Feature Navigator, you must have an account on Cisco.com. If you have forgotten or lost your account information, send a blank e-mail to cco-locksmith@cisco.com. An automatic check will verify that your e-mail address is registered with Cisco.com. If the check is successful, account details with a new random password will be e-mailed to you. Qualified users can establish an account on Cisco.com by following the directions at http://www.cisco.com/register.

Feature Navigator is updated when major Cisco IOS software releases and technology releases occur. As of May 2001, Feature Navigator supports M, T, E, S, and ST releases. You can access Feature Navigator at the following URL:

http://www.cisco.com/go/fn

Supported Standards, MIBs, and RFCs

Standards

No new or modified standards are supported by this feature.

MIBs

No new or modified MIBs are supported by this feature.

To obtain lists of supported MIBs by platform and Cisco IOS release, and to download MIB modules, go to the Cisco MIB website on Cisco.com at the following URL:

http://www.cisco.com/public/sw-center/netmgmt/cmtk/mibs.shtml

RFCs

No new or modified RFCs are supported by this feature.

Configuration Tasks

See the following sections for configuration tasks for the this feature. Each task in the list is identified as either required or optional:

- Enabling Explicit Tracking (required)
- Verifying Explicit Tracking (optional)

Enabling Explicit Tracking

To enable explicit tracking on an interface, use the folloing commands in interface configuration mode:

	Command	Purpose
Step 1	`Router (config-if)# ip igmp version 3`	Enables IGMP Version 3 on the interface. Version 2 is the default.
Step 2	`Router (config-if)# ip igmp explicit-tracking`	Enables explicit tracking on the interface.

Verifying Explicit Tracking

To verify configuration of explicit tracking, use the following **show** commands in EXEC mode:

- To verify that explicit tracking is enabled on an interface, use the **show ip igmp interface** command.
- To display IGMP membership information for multicast groups and (S, G) channels, use the **show ip igmp membership** command.

Note The display output of the **show ip igmp groups** command is not affected by the explicit tracking feature. When explicit tracking is enabled, this output will still display the aggregate membership information of an interface.

Configuration Examples

The following example shows a basic configuration for enabling IP multicast with Source Specific Multicast (SSM), IGMPv3, and explicit tracking:

```
ip multicast routing

interface ethernet 0
 description access network to desktop systems
 ip address 10.1.0.1 255.255.255.0
 ip pim sparse-dense-mode
 ip mroute-cache
 ip igmp version 3
 ip igmp explicit-tracking
 ip igmp v3lite
 ip urd

interface ethernet 1
 description backbone interface !No hosts connected
 ip address 10.10.0.1 255.255.255.0
 ip pim sparse-dense-mode
 ip mroute-cache

ip pim ssm default
```

Command Reference

This section documents new commands. All other commands used with this feature are documented in the Cisco IOS Release 12.2 command reference publications.

- **ip igmp explicit-tracking**
- **show ip igmp membership**

ip igmp explicit-tracking

To enable explicit tracking of hosts, groups, and channels for IGMP Version 3 (IGMPv3), use the **ip igmp explicit-tracking** command in interface configuration mode. To disable this feature, use the **no** form of this command.

ip igmp explicit-tracking

no ip igmp explicit-tracking

Syntax Description   This command has no arguments or keywords.

Defaults   Disabled

Command Modes   Interface

Command History

Release	Modification
12.0(19)S	This command was introduced.

Usage Guidelines   This command can be configured on an interface only if IGMPv3 is first configured on the same interface. To configure IGMPv3, use the **ip igmp version 3** command in interface configuration mode.

When explicit tracking is enabled on a router, the router can individually track the IGMP membership state of all reporting hosts. This feature allows the router to achieve minimal leave latencies when hosts leave a multicast group or channel. To monitor IGMP membership of hosts, use the **show ip igmp membership** command in EXEC mode.

When explicit tracking is enabled, the router uses more memory than if explicit tracking is disabled because the router must store the membership state of all hosts on the interface.

Examples   The following example shows a basic configuration for enabling IP multicast with Source Specific Multicast (SSM), IGMPv3, and explicit tracking:

```
ip multicast routing

interface ethernet 0
 description access network to desktop systems
 ip address 10.1.0.1 255.255.255.0
 ip pim sparse-dense-mode
 ip mroute-cache
 ip igmp version 3
 ip igmp explicit-tracking
 ip igmp v3lite
 ip urd
```

```
interface ethernet 1
 description backbone interface !No hosts connected
 ip address 10.10.0.1 255.255.255.0
 ip pim sparse-dense-mode
 ip mroute-cache

ip pim ssm default
```

Related Commands	Command	Description
	ip igmp version	Configures the version of IGMP that the router uses.
	show ip igmp membership	Displays the IGMP membership information for multicast groups and (S, G) channels.

show ip igmp membership

To display Internet Group Management Protocol (IGMP) membership information for multicast groups or (S, G) channels, use the **show ip igmp membership** command in EXEC mode.

show ip igmp membership [*group-address | group-name*] [**tracked**] [**all**]

Syntax Description

group-address	(Optional) Specifies the IP address of the multicast group for which to display IGMP membership information.
group-name	(Optional) Specifies the name of the multicast group, as defined in the Domain Name System (DNS) hosts table, for which to display IGMP membership information.
tracked	(Optional) Displays the multicast groups with the explicit tracking feature enabled.
all	(Optional) Displays the detailed information about the multicast groups with and without the explicit tracking feature enabled.

Command Modes   EXEC

Command History

Release	Modification
12.0(19)S	This command was introduced.

Usage Guidelines   Unlike the **show ip igmp groups** command, this command allows you to display detailed information about multicast channels and explicit tracking information.

Examples   The following is sample output from the **show ip igmp membership** command. Each entry in the output shows the aggregate membership information (indicated by the A flag) for a particular multicast group or channel from the IGMP cache. If the entry is prepended with a forward slash ("/") flag, the entry is a filtering entry that is blocking the data forwarding of the multicast group or channel.

```
Router> show ip igmp membership

Flags:A  - aggregate, T - tracked
      L  - Local, S - static, V - virtual, R - Reported through v3
      I - v3lite, D - Urd, M - SSM (S,G) channel
      1,2,3 - The version of IGMP, the group is in
Channel/Group-Flags:
      / - Filtering entry (Exclude mode (S,G), Include mode (*,G))
Reporter:
      <ip-address> - last reporter if group is not explicitly tracked
      <n>/<m>      - <n> reporter in include mode,<m> reporter in exclude

 Channel/Group               Reporter         Uptime  Exp.  Flags  Interface
 *,224.0.1.40                10.10.0.1        00:01:34 02:41 2LA    Et2/0
 *,239.1.1.1                 2/0              00:00:10 stop  3AT    Et2/0
```

The following is sample output from the **show ip igmp membership** command with the multicast group address 239.1.1.1 and the **tracked** keyword specified:

```
Router> show ip igmp membership 239.1.1.1 tracked

Flags:A  - aggregate, T - tracked
      L  - Local, S - static, V - virtual, R - Reported through v3
      I - v3lite, D - Urd, M - SSM (S,G) channel
      1,2,3 - The version of IGMP, the group is in
Channel/Group-Flags:
      / - Filtering entry (Exclude mode (S,G), Include mode (*,G))
Reporter:
      <ip-address> - last reporter if group is not explicitly tracked
      <n>/<m>       - <n> reporter in include mode,<m> reporter in exclude

 Channel/Group                  Reporter        Uptime   Exp.  Flags  Interface
 *,239.1.1.1                    2/0             00:00:11 stop  3AT    Et2/0
 10.30.0.100,239.1.1.1         10.10.0.10      00:00:11 02:48 RT     Et2/0
 10.30.0.101,239.1.1.1         10.10.0.20      00:00:03 02:56 RT     Et2/0
 10.30.0.101,239.1.1.1         10.10.0.10      00:00:11 02:48 RT     Et2/0
 10.30.0.102,239.1.1.1         10.10.0.20      00:00:03 02:56 RT     Et2/0
```

Table 1 describes the significant fields shown in the displays.

Table 1   *show ip igmp membership Field Descriptions*

Field	Description
Channel/Group	(S, G) channel or multicast group filtering entry.
Reporter	Displays information about the the hosts reporting membership with the (S, G) channel or multicast group entry.
Uptime	The Uptime timer is how long (in weeks, days, and seconds) the entry has been known.
Exp.	The Exp. timer is how long (in minutes and seconds) until the entry expires.
Flags	Provides information about the entry.
A - aggregate	Indicates that the aggregate information for the (S, G) channel or multicast group is being displayed.
T - tracked	Indicates that the multicast group is configured with the explicit tracking feature.
L - Local	Indicates that the router itself is interested in receiving the traffic for this multicast group or channel. In order for the application to receive this traffic, the packets are sent to the process level of the router. When the **ip igmp join-group** command is configured for a multicast group, the L flag is set.
S - static	Indicates that the multicast group or channel is forwarded on the interface. When the **ip igmp static-group** command is configured on the interface, the S flag is set.
V - virtual	Indicates that there is a service such as Hoot and Holler running on the router requesting the traffic for the multicast group or channel. These services can process IP multicast traffic in the fast switching path. The L flag will not be set by these applications.
R - Reported through v3	Indicates that an IGMPv3 report was received for this entry.

Table 1 *show ip igmp membership Field Descriptions (continued)*

Field	Description
I - v3lite	Indicates that an IGMP v3lite report was received for this entry.
D - Urd	Indicates that a URL Rendezvous Directory (URD) report was received for this entry.
M - SSM (S, G) channel	Indicates that the multicast group address is in the Source Specific Multicast (SSM) range.
1,2,3 - The version of IGMP...	The version of IGMP that the multicast group is running.
/	
Interface	Interface type and number.

Related Commands

Command	Description
ip igmp version	Configures the version of IGMP that the router uses.
ip igmp explicit-tracking	Enables explicit tracking of hosts, groups, and channels for IGMP Version 3.
show ip igmp groups	Displays the multicast groups with receivers that are directly connected to the router and that were learned through IGMP.