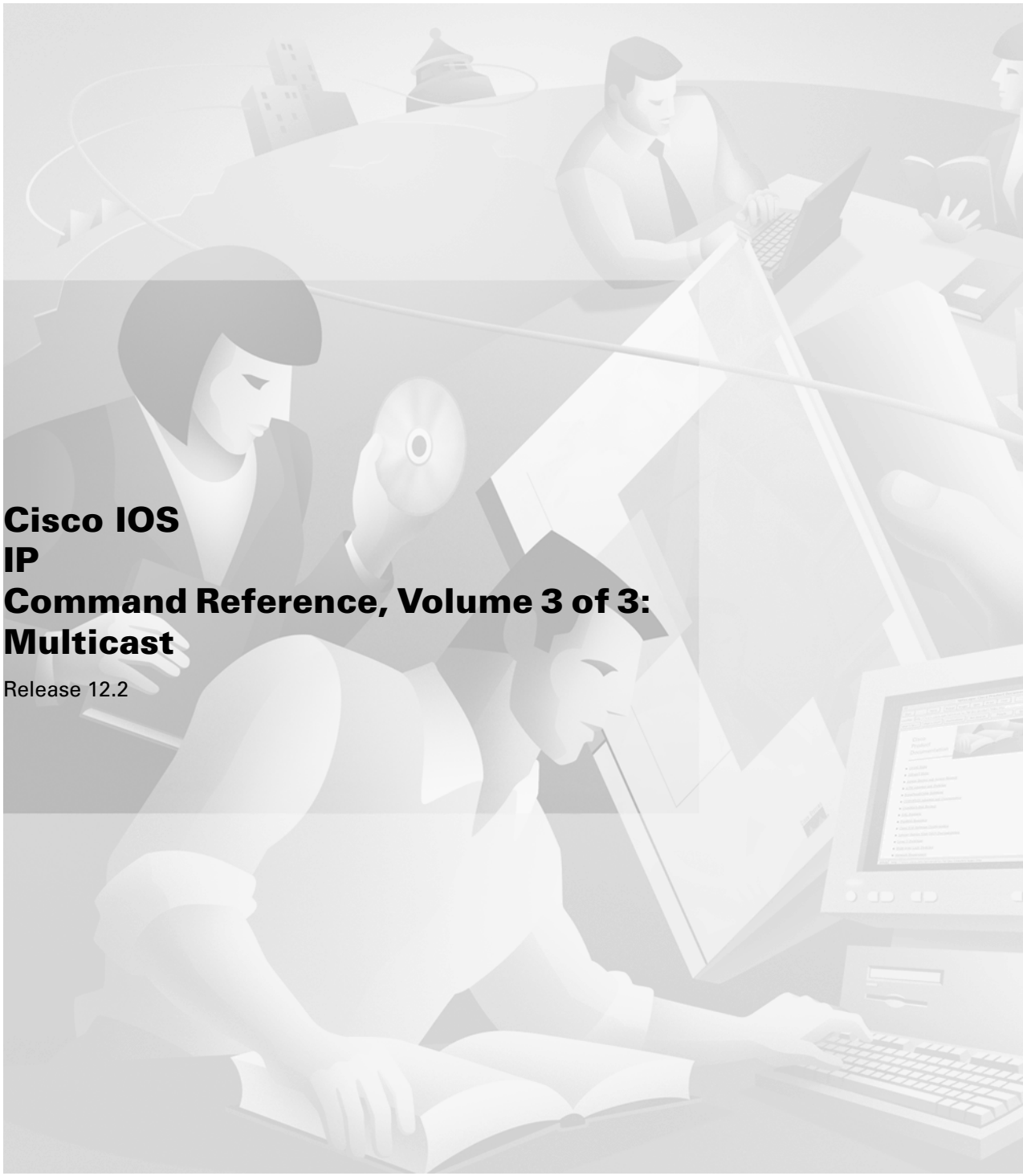

Cisco IOS IP Command Reference, Volume 3 of 3: Multicast

Release 12.2

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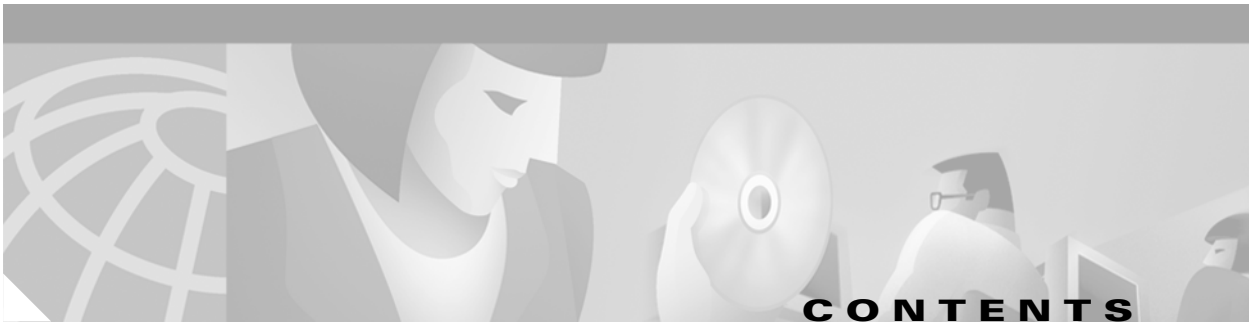
Cisco IOS IP Command Reference, Volume 3 of 3: Multicast



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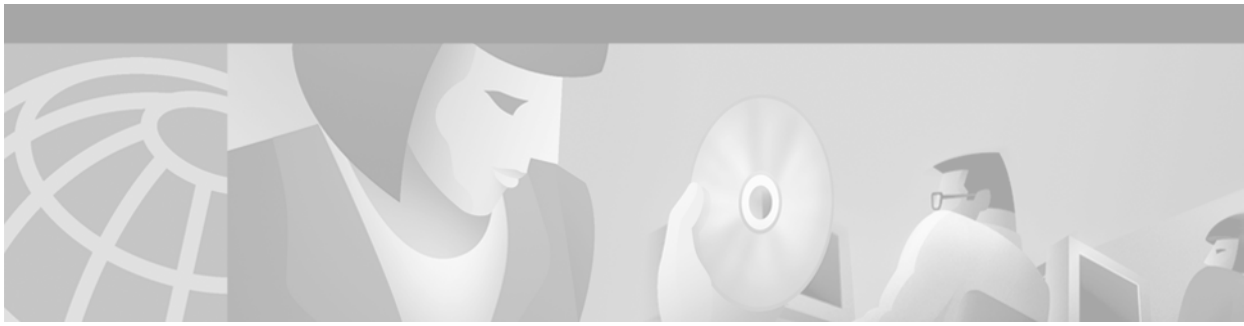


About Cisco IOS Software Documentation

This chapter discusses the objectives, audience, organization, and conventions of Cisco IOS software documentation. It also provides sources for obtaining documentation from Cisco Systems.

Documentation Objectives

Cisco IOS software documentation describes the tasks and commands necessary to configure and maintain Cisco networking devices.

Audience

The Cisco IOS software documentation set is intended primarily for users who configure and maintain Cisco networking devices (such as routers and switches) but who may not be familiar with the tasks, the relationship between tasks, or the Cisco IOS software commands necessary to perform particular tasks. The Cisco IOS software documentation set is also intended for those users experienced with Cisco IOS software who need to know about new features, new configuration options, and new software characteristics in the current Cisco IOS software release.

Documentation Organization

The Cisco IOS software documentation set consists of documentation modules and master indexes. In addition to the main documentation set, there are supporting documents and resources.

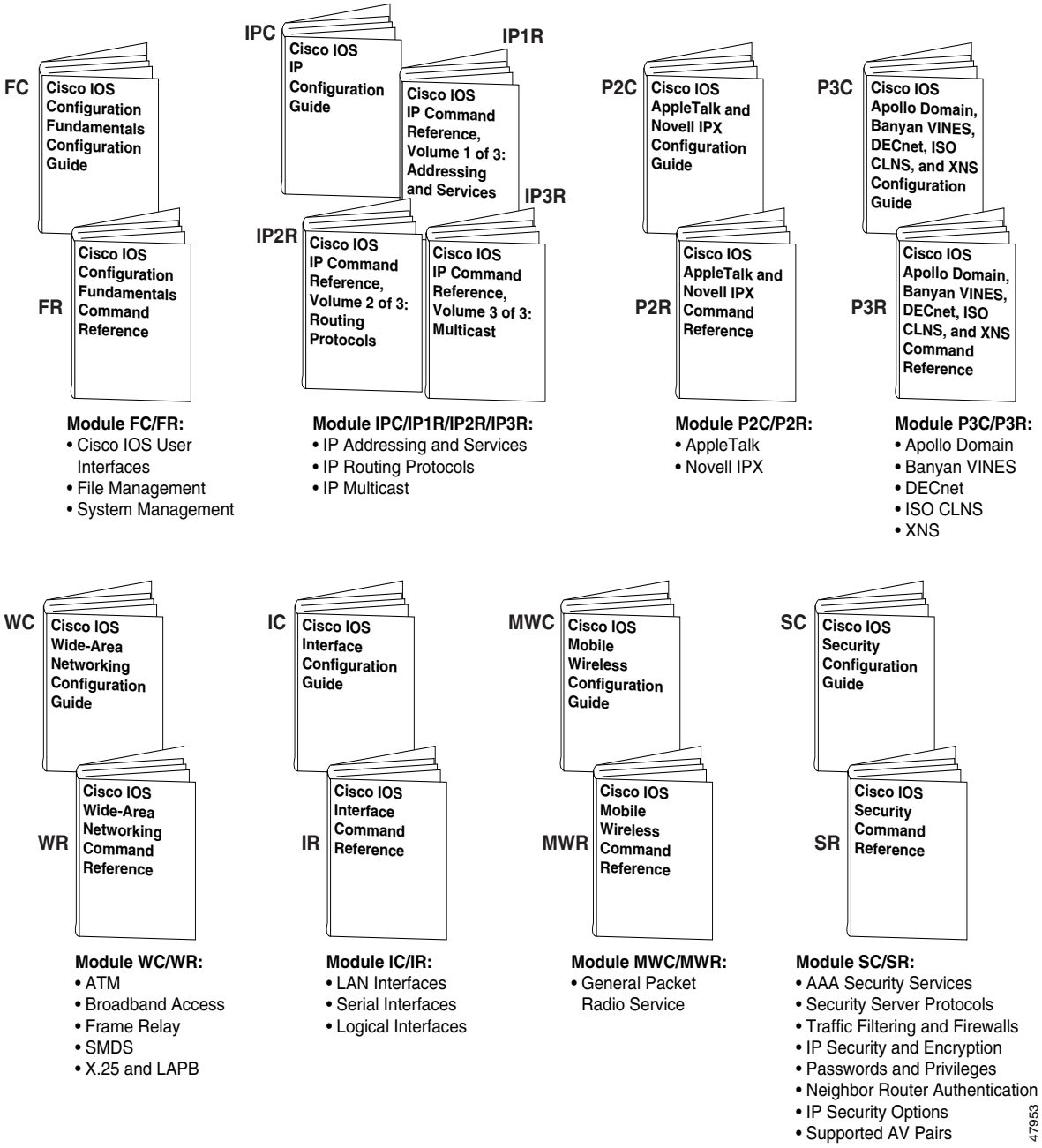
Documentation Modules

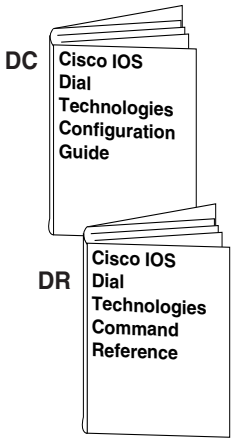
The Cisco IOS documentation modules consist of configuration guides and corresponding command reference publications. Chapters in a configuration guide describe protocols, configuration tasks, and Cisco IOS software functionality and contain comprehensive configuration examples. Chapters in a command reference publication provide complete Cisco IOS command syntax information. Use each configuration guide in conjunction with its corresponding command reference publication.

Figure 1 shows the Cisco IOS software documentation modules.

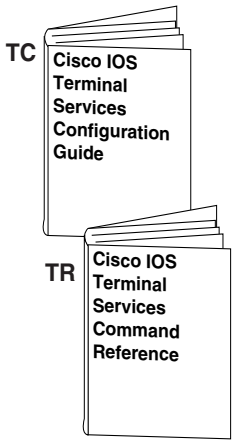
Note The abbreviations (for example, FC and FR) next to the book icons are page designators, which are defined in a key in the index of each document to help you with navigation. The bullets under each module list the major technology areas discussed in the corresponding books.

Figure 1 Cisco IOS Software Documentation Modules

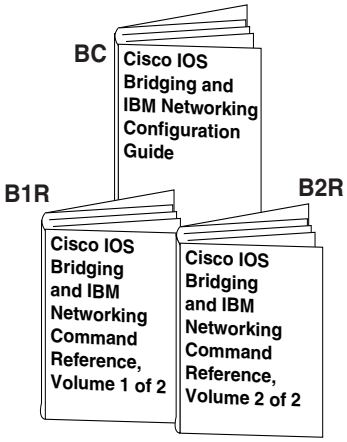




Module DC/DR:
- Preparing for Dial Access
- Modem and Dial Shelf Configuration and Management
- ISDN Configuration
- Signalling Configuration
- Dial-on-Demand Routing Configuration
- Dial-Backup Configuration
- Dial-Related Addressing Services
- Virtual Templates, Profiles, and Networks
- PPP Configuration
- Callback and Bandwidth Allocation Configuration
- Dial Access Specialized Features
- Dial Access Scenarios

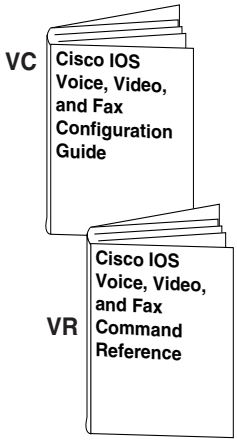


Module TC/TR:
- ARA
- LAT
- NASI
- Telnet
- TN3270
- XRemote
- X.28 PAD
- Protocol Translation

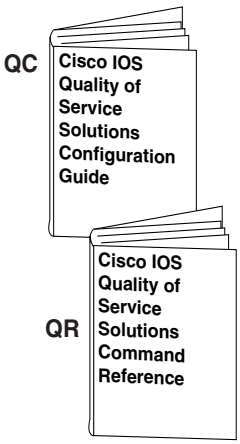


Module BC/B1R:
- Transparent Bridging
- SRB
- Token Ring Inter-Switch Link
- Token Ring Route Switch Module
- RSRB
- DLSw+
- Serial Tunnel and Block Serial Tunnel
- LLC2 and SDLC
- IBM Network Media Translation
- SNA Frame Relay Access
- NCIA Client/Server
- Airline Product Set

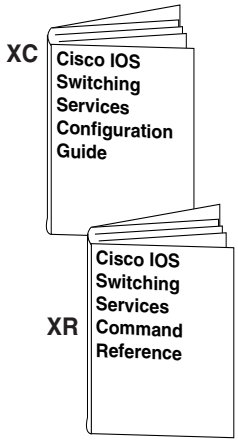
Module BC/B2R:
- DSPU and SNA Service Point
- SNA Switching Services
- Cisco Transaction Connection
- Cisco Mainframe Channel Connection
- CLAW and TCP/IP Offload
- CSNA, CMPC, and CMPC+
- TN3270 Server



Module VC/VR:
- Voice over IP
- Call Control Signalling
- Voice over Frame Relay
- Voice over ATM
- Telephony Applications
- Trunk Management
- Fax, Video, and Modem Support



Module QC/QR:
- Packet Classification
- Congestion Management
- Congestion Avoidance
- Policing and Shaping
- Signalling
- Link Efficiency Mechanisms



Module XC/XR:
- Cisco IOS Switching Paths
- NetFlow Switching
- Multiprotocol Label Switching
- Multilayer Switching
- Multicast Distributed Switching
- Virtual LANs
- LAN Emulation

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Master Indexes

Two master indexes provide indexing information for the Cisco IOS software documentation set: an index for the configuration guides and an index for the command references. Individual books also contain a book-specific index.

The master indexes provide a quick way for you to find a command when you know the command name but not which module contains the command. When you use the online master indexes, you can click the page number for an index entry and go to that page in the online document.

Supporting Documents and Resources

The following documents and resources support the Cisco IOS software documentation set:

- *Cisco IOS Command Summary* (two volumes)—This publication explains the function and syntax of the Cisco IOS software commands. For more information about defaults and usage guidelines, refer to the Cisco IOS command reference publications.
- *Cisco IOS System Error Messages*—This publication lists and describes Cisco IOS system error messages. Not all system error messages indicate problems with your system. Some are purely informational, and others may help diagnose problems with communications lines, internal hardware, or the system software.
- *Cisco IOS Debug Command Reference*—This publication contains an alphabetical listing of the **debug** commands and their descriptions. Documentation for each command includes a brief description of its use, command syntax, usage guidelines, and sample output.
- *Dictionary of Internetworking Terms and Acronyms*—This Cisco publication compiles and defines the terms and acronyms used in the internetworking industry.
- New feature documentation—The Cisco IOS software documentation set documents the mainline release of Cisco IOS software (for example, Cisco IOS Release 12.2). New software features are introduced in early deployment releases (for example, the Cisco IOS "T" release train for 12.2, 12.2(x)T). Documentation for these new features can be found in standalone documents called "feature modules." Feature module documentation describes new Cisco IOS software and hardware networking functionality and is available on Cisco.com and the Documentation CD-ROM.
- Release notes—This documentation describes system requirements, provides information about new and changed features, and includes other useful information about specific software releases. See the section "Using Software Release Notes" in the chapter "Using Cisco IOS Software" for more information.
- Caveats documentation—This documentation provides information about Cisco IOS software defects in specific software releases.
- RFCs—RFCs are standards documents maintained by the Internet Engineering Task Force (IETF). Cisco IOS software documentation references supported RFCs when applicable. The full text of referenced RFCs may be obtained on the World Wide Web at http://www.rfc-editor.org/.
- MIBs—MIBs are used for network monitoring. For lists of supported MIBs by platform and release, and to download MIB files, see the Cisco MIB website on Cisco.com at http://www.cisco.com/public/sw-center/netmgmt/cmtk/mibs.shtml.

New and Changed Information

The following is new or changed information since the last release of the Cisco IOS IP and IP routing publications:

- The title of the *Cisco IOS IP and IP Routing Configuration Guide* has been changed to *Cisco IOS IP Configuration Guide*.
- The *Cisco IOS IP and IP Routing Command Reference* has been divided into three separate publications with the following titles:
  - *Cisco IOS IP Command Reference, Volume 1 of 3: Addressing and Services*
  - *Cisco IOS IP Command Reference, Volume 2 of 3: Routing Protocols*
  - *Cisco IOS IP Command Reference, Volume 3 of 3: Multicast*
- The following new chapters were added to the *Cisco IOS IP Configuration Guide*:
  - "Configuring Server Load Balancing"
  - "Configuring Source Specific Multicast"
  - "Configuring Bidirectional PIM"
  - "Configuring Router-Port Group Management Protocol"
- The following new chapter was added to the *Cisco IOS IP Command Reference, Volume 1 of 3: Addressing and Services*:
  - "Server Load Balancing Commands"

Document Conventions

Within Cisco IOS software documentation, the term *router* is generally used to refer to a variety of Cisco products (for example, routers, access servers, and switches). Routers, access servers, and other networking devices that support Cisco IOS software are shown interchangeably within examples. These products are used only for illustrative purposes; that is, an example that shows one product does not necessarily indicate that other products are not supported.

The Cisco IOS documentation set uses the following conventions:

Convention	Description
^ or Ctrl	The ^ and Ctrl symbols represent the Control key. For example, the key combination ^D or Ctrl-D means hold down the Control key while you press the D key. Keys are indicated in capital letters but are not case sensitive.
string	A string is a nonquoted set of characters shown in italics. For example, when setting an SNMP community string to public, do not use quotation marks around the string or the string will include the quotation marks.

Command syntax descriptions use the following conventions:

Convention	Description
boldface	Boldface text indicates commands and keywords that you enter literally as shown.
italics	Italic text indicates arguments for which you supply values.
[x]	Square brackets enclose an optional element (keyword or argument).
|	A vertical line indicates a choice within an optional or required set of keywords or arguments.
[x | y]	Square brackets enclosing keywords or arguments separated by a vertical line indicate an optional choice.
{x | y}	Braces enclosing keywords or arguments separated by a vertical line indicate a required choice.

Nested sets of square brackets or braces indicate optional or required choices within optional or required elements. For example:

Convention	Description
[x {y | z}]	Braces and a vertical line within square brackets indicate a required choice within an optional element.

Examples use the following conventions:

Convention	Description
`screen`	Examples of information displayed on the screen are set in Courier font.
`boldface screen`	Examples of text that you must enter are set in Courier bold font.
< >	Angle brackets enclose text that is not printed to the screen, such as passwords.
!	An exclamation point at the beginning of a line indicates a comment line. (Exclamation points are also displayed by the Cisco IOS software for certain processes.)
[ ]	Square brackets enclose default responses to system prompts.

The following conventions are used to attract the attention of the reader:

Caution Means *reader be careful*. In this situation, you might do something that could result in equipment damage or loss of data.

Note Means *reader take note*. Notes contain helpful suggestions or references to materials not contained in this manual.

Timesaver Means the *described action saves time*. You can save time by performing the action described in the paragraph.

Obtaining Documentation

The following sections provide sources for obtaining documentation from Cisco Systems.

World Wide Web

The most current Cisco documentation is available on the World Wide Web at the following website:

http://www.cisco.com

Translated documentation is available at the following website:

http://www.cisco.com/public/countries_languages.html

Documentation CD-ROM

Cisco documentation and additional literature are available in a CD-ROM package, which ships with your product. The Documentation CD-ROM is updated monthly and may be more current than printed documentation. The CD-ROM package is available as a single unit or through an annual subscription.

Ordering Documentation

Cisco documentation can be ordered in the following ways:

- Registered Cisco Direct Customers can order Cisco product documentation from the Networking Products MarketPlace:

  http://www.cisco.com/cgi-bin/order/order_root.pl

- Registered Cisco.com users can order the Documentation CD-ROM through the online Subscription Store:

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

- Nonregistered Cisco.com users can order documentation through a local account representative by calling Cisco corporate headquarters (California, USA) at 408 526-7208 or, in North America, by calling 800 553-NETS(6387).

Documentation Feedback

If you are reading Cisco product documentation on the World Wide Web, you can submit technical comments electronically. Click **Feedback** in the toolbar and select **Documentation**. After you complete the form, click **Submit** to send it to Cisco.

You can e-mail your comments to bug-doc@cisco.com.

To submit your comments by mail, use the response card behind the front cover of your document, or write to the following address:

Cisco Systems, Inc.
Document Resource Connection
170 West Tasman Drive
San Jose, CA 95134-9883

We appreciate your comments.

Obtaining Technical Assistance

Cisco provides Cisco.com as a starting point for all technical assistance. Customers and partners can obtain documentation, troubleshooting tips, and sample configurations from online tools. For Cisco.com registered users, additional troubleshooting tools are available from the TAC website.

Cisco.com

Cisco.com is the foundation of a suite of interactive, networked services that provides immediate, open access to Cisco information and resources at anytime, from anywhere in the world. This highly integrated Internet application is a powerful, easy-to-use tool for doing business with Cisco.

Cisco.com provides a broad range of features and services to help customers and partners streamline business processes and improve productivity. Through Cisco.com, you can find information about Cisco and our networking solutions, services, and programs. In addition, you can resolve technical issues with online technical support, download and test software packages, and order Cisco learning materials and merchandise. Valuable online skill assessment, training, and certification programs are also available.

Customers and partners can self-register on Cisco.com to obtain additional personalized information and services. Registered users can order products, check on the status of an order, access technical support, and view benefits specific to their relationships with Cisco.

To access Cisco.com, go to the following website:

http://www.cisco.com

Technical Assistance Center

The Cisco TAC website is available to all customers who need technical assistance with a Cisco product or technology that is under warranty or covered by a maintenance contract.

Contacting TAC by Using the Cisco TAC Website

If you have a priority level 3 (P3) or priority level 4 (P4) problem, contact TAC by going to the TAC website:

http://www.cisco.com/tac

P3 and P4 level problems are defined as follows:

- P3—Your network performance is degraded. Network functionality is noticeably impaired, but most business operations continue.
- P4—You need information or assistance on Cisco product capabilities, product installation, or basic product configuration.

In each of the above cases, use the Cisco TAC website to quickly find answers to your questions.

To register for Cisco.com, go to the following website:

http://www.cisco.com/register/

If you cannot resolve your technical issue by using the TAC online resources, Cisco.com registered users can open a case online by using the TAC Case Open tool at the following website:

http://www.cisco.com/tac/caseopen

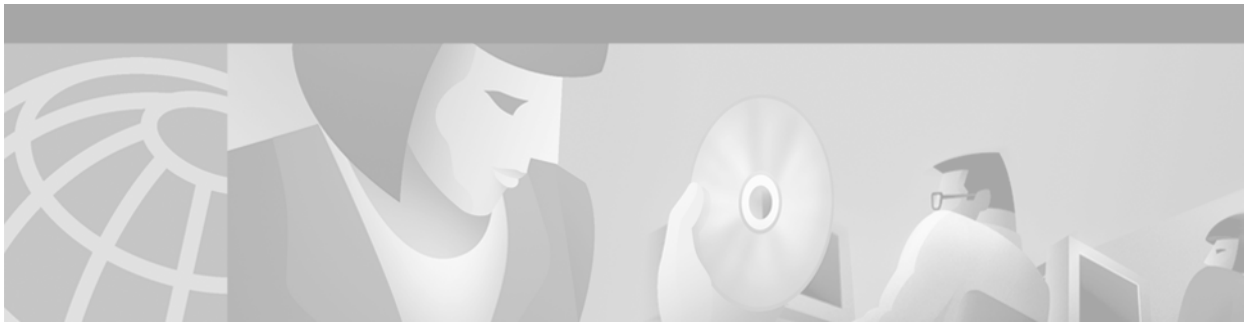
Contacting TAC by Telephone

If you have a priority level 1 (P1) or priority level 2 (P2) problem, contact TAC by telephone and immediately open a case. To obtain a directory of toll-free numbers for your country, go to the following website:

http://www.cisco.com/warp/public/687/Directory/DirTAC.shtml

P1 and P2 level problems are defined as follows:

- P1—Your production network is down, causing a critical impact to business operations if service is not restored quickly. No workaround is available.
- P2—Your production network is severely degraded, affecting significant aspects of your business operations. No workaround is available.



Using Cisco IOS Software

This chapter provides helpful tips for understanding and configuring Cisco IOS software using the command-line interface (CLI). It contains the following sections:

- Understanding Command Modes
- Getting Help
- Using the no and default Forms of Commands
- Saving Configuration Changes
- Filtering Output from the show and more Commands
- Identifying Supported Platforms

For an overview of Cisco IOS software configuration, refer to the *Cisco IOS Configuration Fundamentals Configuration Guide*.

For information on the conventions used in the Cisco IOS software documentation set, see the chapter "About Cisco IOS Software Documentation" located at the beginning of this book.

Understanding Command Modes

You use the CLI to access Cisco IOS software. Because the CLI is divided into many different modes, the commands available to you at any given time depend on the mode you are currently in. Entering a question mark (**?**) at the CLI prompt allows you to obtain a list of commands available for each command mode.

When you log in to the CLI, you are in user EXEC mode. User EXEC mode contains only a limited subset of commands. To have access to all commands, you must enter privileged EXEC mode, normally by using a password. From privileged EXEC mode you can issue any EXEC command—user or privileged mode—or you can enter global configuration mode. Most EXEC commands are one-time commands. For example, **show** commands show important status information, and **clear** commands clear counters or interfaces. The EXEC commands are not saved when the software reboots.

Configuration modes allow you to make changes to the running configuration. If you later save the running configuration to the startup configuration, these changed commands are stored when the software is rebooted. To enter specific configuration modes, you must start at global configuration mode. From global configuration mode, you can enter interface configuration mode and a variety of other modes, such as protocol-specific modes.

ROM monitor mode is a separate mode used when the Cisco IOS software cannot load properly. If a valid software image is not found when the software boots or if the configuration file is corrupted at startup, the software might enter ROM monitor mode.

Table 1 describes how to access and exit various common command modes of the Cisco IOS software. It also shows examples of the prompts displayed for each mode.

Table 1 Accessing and Exiting Command Modes

Command Mode	Access Method	Prompt	Exit Method
User EXEC	Log in.	`Router>`	Use the **logout** command.
Privileged EXEC	From user EXEC mode, use the **enable** EXEC command.	`Router#`	To return to user EXEC mode, use the **disable** command.
Global configuration	From privileged EXEC mode, use the **configure terminal** privileged EXEC command.	`Router(config)#`	To return to privileged EXEC mode from global configuration mode, use the **exit** or **end** command, or press **Ctrl-Z**.
Interface configuration	From global configuration mode, specify an interface using an **interface** command.	`Router(config-if)#`	To return to global configuration mode, use the **exit** command. To return to privileged EXEC mode, use the **end** command, or press **Ctrl-Z**.
ROM monitor	From privileged EXEC mode, use the **reload** EXEC command. Press the **Break** key during the first 60 seconds while the system is booting.	`>`	To exit ROM monitor mode, use the **continue** command.

For more information on command modes, refer to the "Using the Command-Line Interface" chapter in the *Cisco IOS Configuration Fundamentals Configuration Guide*.

Getting Help

Entering a question mark (**?**) at the CLI prompt displays a list of commands available for each command mode. You can also get a list of keywords and arguments associated with any command by using the context-sensitive help feature.

To get help specific to a command mode, a command, a keyword, or an argument, use one of the following commands:

Command	Purpose
help	Provides a brief description of the help system in any command mode.
*abbreviated-command-entry***?**	Provides a list of commands that begin with a particular character string. (No space between command and question mark.)
abbreviated-command-entry<**Tab**>	Completes a partial command name.
?	Lists all commands available for a particular command mode.
command **?**	Lists the keywords or arguments that you must enter next on the command line. (Space between command and question mark.)

Example: How to Find Command Options

This section provides an example of how to display syntax for a command. The syntax can consist of optional or required keywords and arguments. To display keywords and arguments for a command, enter a question mark (**?**) at the configuration prompt or after entering part of a command followed by a space. The Cisco IOS software displays a list and brief description of available keywords and arguments. For example, if you were in global configuration mode and wanted to see all the keywords or arguments for the **arap** command, you would type **arap ?**.

The <cr> symbol in command help output stands for "carriage return." On older keyboards, the carriage return key is the Return key. On most modern keyboards, the carriage return key is the Enter key. The <cr> symbol at the end of command help output indicates that you have the option to press **Enter** to complete the command and that the arguments and keywords in the list preceding the <cr> symbol are optional. The <cr> symbol by itself indicates that no more arguments or keywords are available and that you must press **Enter** to complete the command.

Table 2 shows examples of how you can use the question mark (**?**) to assist you in entering commands. The table steps you through configuring an IP address on a serial interface on a Cisco 7206 router that is running Cisco IOS Release 12.0(3).

Table 2 How to Find Command Options

Command	Comment

`Router> enable`
`Password: <password>`
`Router#`
	Enter the **enable** command and password to access privileged EXEC commands. You are in privileged EXEC mode when the prompt changes to `Router#`.

`Router# configure terminal`
`Enter configuration commands, one per line. End with CNTL/Z.`
`Router(config)#`
	Enter the **configure terminal** privileged EXEC command to enter global configuration mode. You are in global configuration mode when the prompt changes to `Router(config)#`.

`Router(config)# interface serial ?`
`  <0-6>  Serial interface number`
`Router(config)# interface serial 4 ?`
`  /`
`Router(config)# interface serial 4/ ?`
`  <0-3>  Serial interface number`
`Router(config)# interface serial 4/0`
`Router(config-if)#`
	Enter interface configuration mode by specifying the serial interface that you want to configure using the **interface serial** global configuration command.
	Enter **?** to display what you must enter next on the command line. In this example, you must enter the serial interface slot number and port number, separated by a forward slash.
	You are in interface configuration mode when the prompt changes to `Router(config-if)#`.

Table 2 How to Find Command Options (continued)

Command	Comment

`Router(config-if)# ?`
`Interface configuration commands:`
`  .`
`  .`
`  .`
`  ip  Interface Internet Protocol config commands`
`  keepalive  Enable keepalive`
`  lan-name  LAN Name command`
`  llc2  LLC2 Interface Subcommands`
`  load-interval  Specify interval for load calculation for an interface`
`  locaddr-priority  Assign a priority group`
`  logging  Configure logging for interface`
`  loopback  Configure internal loopback on an interface`
`  mac-address  Manually set interface MAC address`
`  mls  mls router sub/interface commands`
`  mpoa  MPOA interface configuration commands`
`  mtu  Set the interface Maximum Transmission Unit (MTU)`
`  netbios  Use a defined NETBIOS access list or enable name-caching`
`  no  Negate a command or set its defaults`
`  nrzi-encoding  Enable use of NRZI encoding`
`  ntp  Configure NTP`
`  .`
`  .`
`  .`
`Router(config-if)#`
	Enter **?** to display a list of all the interface configuration commands available for the serial interface. This example shows only some of the available interface configuration commands.

`Router(config-if)# ip ?`
`Interface IP configuration subcommands:`
`  access-group  Specify access control for packets`
`  accounting  Enable IP accounting on this interface`
`  address  Set the IP address of an interface`
`  authentication  authentication subcommands`
`  bandwidth-percent  Set EIGRP bandwidth limit`
`  broadcast-address  Set the broadcast address of an interface`
`  cgmp  Enable/disable CGMP`
`  directed-broadcast  Enable forwarding of directed broadcasts`
`  dvmrp  DVMRP interface commands`
`  hello-interval  Configures IP-EIGRP hello interval`
`  helper-address  Specify a destination address for UDP broadcasts`
`  hold-time  Configures IP-EIGRP hold time`
`  .`
`  .`
`  .`
`Router(config-if)# ip`
	Enter the command that you want to configure for the interface. This example uses the **ip** command.
	Enter **?** to display what you must enter next on the command line. This example shows only some of the available interface IP configuration commands.

Table 2 How to Find Command Options (continued)

Command	Comment

`Router(config-if)# ip address ?`
`  A.B.C.D  IP address`
`  negotiated  IP Address negotiated over PPP`
`Router(config-if)# ip address`
	Enter the command that you want to configure for the interface. This example uses the **ip address** command.
	Enter **?** to display what you must enter next on the command line. In this example, you must enter an IP address or the **negotiated** keyword.
	A carriage return (<cr>) is not displayed; therefore, you must enter additional keywords or arguments to complete the command.

`Router(config-if)# ip address 172.16.0.1 ?`
`  A.B.C.D  IP subnet mask`
`Router(config-if)# ip address 172.16.0.1`
	Enter the keyword or argument you want to use. This example uses the 172.16.0.1 IP address.
	Enter **?** to display what you must enter next on the command line. In this example, you must enter an IP subnet mask.
	A <cr> is not displayed; therefore, you must enter additional keywords or arguments to complete the command.

`Router(config-if)# ip address 172.16.0.1 255.255.255.0 ?`
`  secondary  Make this IP address a secondary address`
`  <cr>`
`Router(config-if)# ip address 172.16.0.1 255.255.255.0`
	Enter the IP subnet mask. This example uses the 255.255.255.0 IP subnet mask.
	Enter **?** to display what you must enter next on the command line. In this example, you can enter the **secondary** keyword, or you can press **Enter**.
	A <cr> is displayed; you can press **Enter** to complete the command, or you can enter another keyword.

`Router(config-if)# ip address 172.16.0.1 255.255.255.0` `Router(config-if)#`	In this example, Enter is pressed to complete the command.

Using the no and default Forms of Commands

Almost every configuration command has a **no** form. In general, use the **no** form to disable a function. Use the command without the **no** keyword to reenable a disabled function or to enable a function that is disabled by default. For example, IP routing is enabled by default. To disable IP routing, use the **no ip routing** command; to reenable IP routing, use the **ip routing** command. The Cisco IOS software command reference publications provide the complete syntax for the configuration commands and describe what the **no** form of a command does.

Configuration commands also can have a **default** form, which returns the command settings to the default values. Most commands are disabled by default, so in such cases using the **default** form has the same result as using the **no** form of the command. However, some commands are enabled by default and

have variables set to certain default values. In these cases, the **default** form of the command enables the command and sets the variables to their default values. The Cisco IOS software command reference publications describe the effect of the **default** form of a command if the command functions differently than the **no** form.

Saving Configuration Changes

Use the **copy system:running-config nvram:startup-config** command to save your configuration changes to the startup configuration so that the changes will not be lost if the software reloads or a power outage occurs. For example:

```
Router# copy system:running-config nvram:startup-config
Building configuration...
```

It might take a minute or two to save the configuration. After the configuration has been saved, the following output appears:

```
[OK]
Router#
```

On most platforms, this task saves the configuration to NVRAM. On the Class A Flash file system platforms, this task saves the configuration to the location specified by the CONFIG_FILE environment variable. The CONFIG_FILE variable defaults to NVRAM.

Filtering Output from the show and more Commands

In Cisco IOS Release 12.0(1)T and later releases, you can search and filter the output of **show** and **more** commands. This functionality is useful if you need to sort through large amounts of output or if you want to exclude output that you need not see.

To use this functionality, enter a **show** or **more** command followed by the "pipe" character (|); one of the keywords **begin**, **include**, or **exclude**; and a regular expression on which you want to search or filter (the expression is case-sensitive):

command | {**begin** | **include** | **exclude**} *regular-expression*

The output matches certain lines of information in the configuration file. The following example illustrates how to use output modifiers with the **show interface** command when you want the output to include only lines in which the expression "protocol" appears:

```
Router# show interface | include protocol

FastEthernet0/0 is up, line protocol is up
Serial4/0 is up, line protocol is up
Serial4/1 is up, line protocol is up
Serial4/2 is administratively down, line protocol is down
Serial4/3 is administratively down, line protocol is down
```

For more information on the search and filter functionality, refer to the "Using the Command-Line Interface" chapter in the *Cisco IOS Configuration Fundamentals Configuration Guide*.

Identifying Supported Platforms

Cisco IOS software is packaged in feature sets consisting of software images that support specific platforms. The feature sets available for a specific platform depend on which Cisco IOS software images are included in a release. To identify the set of software images available in a specific release or to find out if a feature is available in a given Cisco IOS software image, see the following sections:

- Using Feature Navigator
- Using Software Release Notes

Using Feature Navigator

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

Feature Navigator is available 24 hours a day, 7 days a week. To access Feature Navigator, you must have an account on Cisco.com. If you have forgotten or lost your account information, e-mail the Contact Database Administration group at cdbadmin@cisco.com. If you do not have an account on Cisco.com, go to http://www.cisco.com/register and follow the directions to establish an account.

To use Feature Navigator, you must have a JavaScript-enabled web browser such as Netscape 3.0 or later, or Internet Explorer 4.0 or later. Internet Explorer 4.0 always has JavaScript enabled. To enable JavaScript for Netscape 3.x or Netscape 4.x, follow the instructions provided with the web browser. For JavaScript support and enabling instructions for other browsers, check with the browser vendor.

Feature Navigator is updated when major Cisco IOS software releases and technology releases occur. You can access Feature Navigator at the following URL:

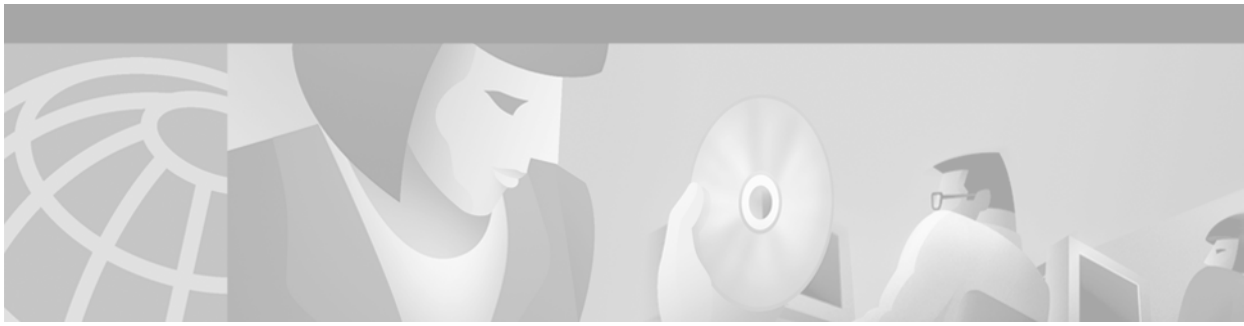
http://www.cisco.com/go/fn

Using Software Release Notes

Cisco IOS software releases include release notes that provide the following information:

- Platform support information
- Memory recommendations
- Microcode support information
- Feature set tables
- Feature descriptions
- Open and resolved severity 1 and 2 caveats for all platforms

Release notes are intended to be release-specific for the most current release, and the information provided in these documents may not be cumulative in providing information about features that first appeared in previous releases.



IP Multicast Routing Commands

This chapter describes the commands used to configure and monitor IP multicast routing. For IP multicast routing configuration information and examples, refer to the "Configuring IP Multicast Routing" chapter of the *Cisco IOS IP Configuration Guide*.

clear ip cgmp

To clear all group entries from the caches of Catalyst switches, use the **clear ip cgmp** command in EXEC mode.

clear ip cgmp [*type number*]

Syntax Description

type number	(Optional) Interface type and number.

Command Modes

EXEC

Command History

Release	Modification
11.1	This command was introduced.

Usage Guidelines

This command sends a Cisco Group Management Protocol (CGMP) leave message with a group address of 0000.0000.0000 and a unicast address of 0000.0000.0000. This message instructs the switches to clear all group entries they have cached.

If an interface type and number are specified, the leave message is sent only on that interface. Otherwise, it is sent on all CGMP-enabled interfaces.

Examples

The following example clears the CGMP cache:

```
Router# clear ip cgmp
```

Related Commands

Command	Description
ip cgmp	Enables CGMP on an interface of a router connected to a Catalyst 5000 switch.

clear ip dvmrp route

To delete routes from the Distance Vector Multicast Routing Protocol (DVMRP) routing table, use the **clear ip dvmrp route** command in EXEC mode.

clear ip dvmrp route {***** | *route*}

Syntax Description

*****	Clears all routes from the DVMRP table.
route	Clears the longest matched route. Can be an IP address, a network number, or an IP Domain Name System (DNS) name.

Command Modes

EXEC

Command History

Release	Modification
11.0	This command was introduced.

Examples

The following example deletes route 10.1.1.1 from the DVMRP routing table:

```
Router# clear ip dvmrp route 10.1.1.1
```

clear ip igmp group

To delete entries from the Internet Group Management Protocol (IGMP) cache, use the **clear ip igmp group** command in EXEC mode.

clear ip igmp group [*group-name* | *group-address* | *type number*]

Syntax Description

group-name	(Optional) Name of the multicast group, as defined in the Domain Name System (DNS) hosts table or with the **ip host** command.
group-address	(Optional) Address of the multicast group. This is a multicast IP address in four-part, dotted notation.
type number	(Optional) Interface type and number.

Defaults

When this command is used with no arguments, all entries are deleted from the IGMP cache.

Command Modes

EXEC

Command History

Release	Modification
10.0	This command was introduced.

Usage Guidelines

The IGMP cache contains a list of the multicast groups of which hosts on the directly connected LAN are members. If the router has joined a group, it is also listed in the cache.

To delete all entries from the IGMP cache, specify the **clear ip igmp group** command with no arguments.

Examples

The following example clears entries for the multicast group 224.0.255.1 from the IGMP cache:

```
Router# clear ip igmp group 224.0.255.1
```

Related Commands

Command	Description
ip host	Defines a static host name-to-address mapping in the host cache.
show ip igmp groups	Displays the multicast groups that are directly connected to the router and that were learned through IGMP.
show ip igmp interface	Displays multicast-related information about an interface.

clear ip mroute

To delete entries from the IP multicast routing table, use the **clear ip mroute** command in EXEC mode.

clear ip mroute {***** | *group-name* [*source-name* | *source-address*] | *group-address* [*source-name* | *source-address*]}

Syntax Description

*****	Deletes all entries from the IP multicast routing table.
group-name	Name of the multicast group, as defined in the Domain Name System (DNS) hosts table or with the **ip host** command.
group-address	IP address of the multicast group. This is a multicast IP address in four-part, dotted notation.
source-name | *source-address*	(Optional) If you specify a group name or address, you can also specify a name or address of a multicast source that is sending to the group. A source need not be a member of the group.

Command Modes

EXEC

Command History

Release	Modification
10.0	This command was introduced.

Examples

The following example deletes all entries from the IP multicast routing table:

```
Router# clear ip mroute *
```

The following example deletes from the IP multicast routing table all sources on the 10.3.0.0 subnet that are sending to the multicast group 224.2.205.42. Note that this example deletes all sources on network 10.3, not individual sources.

```
Router# clear ip mroute 224.2.205.42 10.3.0.0
```

Related Commands

Command	Description
ip host	Defines a static host name-to-address mapping in the host cache.
show ip mroute	Displays the contents of the IP multicast routing table.

clear ip pim auto-rp

The **clear ip pim auto-rp** command is replaced by the **clear ip pim rp-mapping** command. See the **clear ip pim rp-mapping** command for more information.

clear ip pim rp-mapping

To delete group-to-rendezvous point (RP) mapping entries from the RP mapping cache, use the **clear ip pim rp-mapping** command in privileged EXEC mode.

clear ip pim [**vrf** *vrf-name*] **rp-mapping** [*rp-address*]

Syntax Description

vrf	(Optional) Supports the multicast VPN routing and forwarding (VRF) instance.
vrf-name	(Optional) Name assigned to the VRF.
rp-address	(Optional) IP address of the RP about which to clear associated group-to-RP mappings. If this argument is omitted, all group-to-RP mapping entries are cleared.

Command Modes

Privileged EXEC

Command History

Release	Modification
11.3	This command was introduced.
12.1	The **clear ip pim auto-rp** command was deprecated and replaced by the **clear ip pim rp-mapping** command.
12.0(23)S	The **vrf** keyword and *vrf-name* argument were added.

Usage Guidelines

The **clear ip pim rp-mapping** command replaces the **clear ip pim auto-rp** command.

The **clear ip pim rp-mapping** command deletes group-to-RP mapping entries learned by Auto-RP or by a bootstrap router (BSR) from the RP mapping cache.

Use the **show ip pim rp** command to display active RPs that are cached with associated multicast routing entries.

Examples

The following example shows how to clear all group-to-RP entries from the RP mapping cache:

```
Router# clear ip pim rp-mapping
```

Related Commands

Command	Description
show ip pim rp	Displays active RPs that are cached with associated multicast routing entries.

clear ip rtp header-compression

To clear Real-Time Transport Protocol (RTP) header compression structures and statistics, use the **clear ip rtp header-compression** command in EXEC mode.

clear ip rtp header-compression [*type number*]

Syntax Description

type number	(Optional) Interface type and number.

Command Modes

EXEC

Command History

Release	Modification
11.3	This command was introduced.

Usage Guidelines

If this command is used without an interface type and number, it clears all RTP header compression structures and statistics.

Examples

The following example clears RTP header compression structures and statistics for serial interface 0:

```
Router# clear ip rtp header-compression serial 0
```

Related Commands

Command	Description
ip rtp header-compression	Enables RTP header compression.

clear ip sap

To delete a Session Announcement Protocol (SAP) cache entry or the entire SAP cache, use the **clear ip sap** command in EXEC mode.

clear ip sap [*group-address* | **"***session-name***"**]

Syntax Description

group-address	(Optional) Deletes all sessions associated with the IP group address.
"*session-name***"**	(Optional) Deletes only the SAP cache entry with the specified session name. The session name is enclosed in quotation marks (**" "**) that the user must enter.

Command Modes

EXEC

Command History

Release	Modification
11.1	The **clear ip sdr** command was introduced.
12.2	The **clear ip sdr** command was replaced by the **clear ip sap** command.

Usage Guidelines

If no arguments or keywords are used with this command, the system deletes the entire SAP cache.

Examples

The following example clears the SAP cache:

```
Router# clear ip sap "Sample Session"
```

Related Commands

Command	Description
ip sap cache-timeout	Limits how long a SAP cache entry stays active in the cache.
ip sap listen	Enables the Cisco IOS software to listen to session directory announcements.
show ip sap	Displays the SAP cache.

clear ip sdr

The **clear ip sdr** command is replaced by the **clear ip sap** command. See the description of the **clear ip sap** command in this chapter for more information.

frame-relay ip rtp compression-connections

To specify the maximum number of Real-Time Transport Protocol (RTP) header compression connections that can exist on a Frame Relay interface, use the **frame-relay ip rtp compression-connections** command in interface configuration mode. To restore the default, use the **no** form of this command.

frame-relay ip rtp compression-connections *number*

no frame-relay ip rtp compression-connections

Syntax Description

number	Maximum number of RTP header compression connections. The range is from 3 to 256.

Defaults

No default behavior or values.

Command Modes

Interface configuration

Command History

Release	Modification
12.1(2)T	This command was introduced.

Usage Guidelines

Before you can configure the maximum number of connections, RTP header compression must be configured on the interface using the **frame-relay ip rtp header-compression** command.

The number of RTP header compression connections must be set to the same value at each end of the connection.

Examples

The following example shows the configuration of a maximum of 150 RTP header compression connections on serial interface 0:

```
interface serial 0
 encapsulation frame-relay
 frame-relay ip rtp header-compression
 frame-relay ip rtp compression-connections 150
```

Related Commands

Command	Description
frame-relay ip rtp header-compression	Enables RTP header compression for all Frame Relay maps on a physical interface.
frame-relay map ip compress	Enables both RTP and TCP header compression on a link.
frame-relay map ip rtp header-compression	Enables RTP header compression per DLCI.
show frame-relay ip rtp header-compression	Displays RTP header compression statistics for Frame Relay.

frame-relay ip rtp header-compression

To enable Real-Time Transport Protocol (RTP) header compression for all Frame Relay maps on a physical interface, use the **frame-relay ip rtp header-compression** command in interface configuration mode. To disable the compression, use the **no** form of this command.

frame-relay ip rtp header-compression [**active** | **passive**]

no frame-relay ip rtp header-compression [**active** | **passive**]

Syntax Description

active	(Optional) Compresses all outgoing RTP packets. This is the default.
passive	(Optional) Compresses the outgoing RTP/User Datagram Protocol (UDP)/IP header only if an incoming packet had a compressed header.

Defaults

Disabled.

If the command is configured, **active** is the default keyword.

Command Modes

Interface configuration

Command History

Release	Modification
11.3	This command was introduced.

Usage Guidelines

When this command is used on the physical interface, all the interface maps inherit the command; that is, all maps will perform IP/UDP/RTP header compression.

Examples

The following example enables RTP header compression for all Frame Relay maps on a physical interface:

```
frame-relay ip rtp header-compression
```

Related Commands

Command	Description
frame-relay ip rtp compression-connections	Specifies maximum number of RTP header compression connections on a Frame Relay interface.
frame-relay map ip nocompress	Disables both RTP and TCP header compression on a link.
show frame-relay ip rtp header-compression	Displays RTP header compression statistics for Frame Relay.

frame-relay map ip compress

To enable both Real-Time Transport Protocol (RTP) and TCP header compression on a link, use the **frame-relay map ip compress** command in interface configuration mode.

frame-relay map ip *ip-address dlci* [**broadcast**] **compress** [**active** | **passive**] [**connections** *number*]

Syntax Description

ip-address	IP address of the destination or next hop.
dlci	Data-link connection identifier (DLCI) number.
broadcast	(Optional) Forwards broadcasts to the specified IP address.
active	(Optional) Compresses all outgoing RTP and TCP packets. This is the default.
passive	(Optional) Compresses the outgoing RTP and TCP header only if an incoming packet had a compressed header.
connections *number*	(Optional) Specifies the maximum number of RTP and TCP header compression connections. The range is from 3 to 256.

Defaults

Disabled.

The default maximum number of header compression connections is 256.

Command Modes

Interface configuration

Command History

Release	Modification
11.3	This command was introduced.
12.1(2)T	This command was modified to enable the configuration of the maximum number of header compression connections.

Examples

The following example enables both RTP and TCP header compression on serial interface 1 and sets the maximum number of RTP and TCP header connections at 16:

```
interface serial 1
 encapsulation frame-relay
 ip address 10.108.175.110 255.255.255.0
 frame-relay map ip 10.108.175.220 180 compress connections 16
```

Related Commands

Command	Description
frame-relay ip rtp compression-connections	Specifies the maximum number of RTP header compression connections on a Frame Relay interface.
frame-relay ip tcp header-compression	Enables TCP header compression for all Frame Relay maps on a physical interface.
frame-relay map ip nocompress	Disables both RTP and TCP header compression on a link.
frame-relay map ip rtp header-compression	Enables RTP header compression for all Frame Relay maps on a physical interface.
show frame-relay ip rtp header-compression	Displays RTP header compression statistics for Frame Relay.
show frame-relay ip tcp header-compression	Displays statistics and TCP/IP header compression information for the interface.

frame-relay map ip nocompress

To disable both Real-Time Transport Protocol (RTP) and TCP header compression on a link, use the **frame-relay map ip nocompress** command in interface configuration mode.

frame-relay map ip *ip-address dlci* [**broadcast**] **nocompress**

Syntax Description

ip-address	IP address of the destination or next hop.
dlci	Data-link connection identifier (DLCI) number.
broadcast	(Optional) Forwards broadcasts to the specified IP address.

Defaults

No default behaviors or values.

Command Modes

Interface configuration

Command History

Release	Modification
11.3	This command was introduced.

Examples

The following example disables RTP and TCP header compression on DLCI 180:

```
interface serial 1
 encapsulation frame-relay
 frame-relay map ip 10.108.175.220 180 nocompress
```

Related Commands

Command	Description
frame-relay ip rtp header-compression	Enables RTP header compression for all Frame Relay maps on a physical interface.
frame-relay ip tcp header-compression	Enables TCP header compression for all Frame Relay maps on a physical interface.
frame-relay map ip compress	Enables RTP and TCP header compression on a link.
show frame-relay ip rtp header-compression	Displays RTP header compression statistics for Frame Relay.
show frame-relay ip tcp header-compression	Displays statistics and TCP/IP header compression information for the interface.

frame-relay map ip rtp header-compression

To enable Real-Time Transport Protocol (RTP) header compression per data-link connection identifier (DLCI), use the **frame-relay map ip rtp header-compression** command in interface configuration mode.

frame-relay map ip *ip-address dlci* [**broadcast**] **rtp header-compression** [**active** | **passive**] [**connections** *number*]

Syntax Description

ip-address	IP address of the destination or next hop.
dlci	DLCI number.
broadcast	(Optional) Forwards broadcasts to the specified IP address.
active	(Optional) Compresses outgoing RTP packets. This is the default.
passive	(Optional) Compresses the outgoing RTP/UDP/IP header only if an incoming packet had a compressed header.
connections *number*	(Optional) Specifies the maximum number of RTP header compression connections. The range is from 3 to 256.

Defaults

Disabled.

If the command is configured, **active** is the default keyword.

The default maximum number of header compression connections is 256.

Command Modes

Interface configuration

Command History

Release	Modification
11.3	This command was introduced.
12.1(2)T	This command was modified to enable the configuration of the maximum number of header compression connections.

Usage Guidelines

When this command is configured, the specified maps inherit RTP header compression. You can have multiple Frame Relay maps, with and without RTP header compression. If you do not specify the number of RTP header compression connections, the map will inherit the current value from the interface.

Examples

The following example enables RTP header compression on serial interface 1 and sets the maximum number of RTP header compression connections at 64:

```
interface serial 1
 encapsulation frame-relay
 ip address 10.108.175.110 255.255.255.0
 frame-relay map ip 10.108.175.220 180 rtp header-compression connections 64
```

Related Commands

Command	Description
frame-relay ip rtp compression-connections	Specifies the maximum number of RTP header compression connections on a Frame Relay interface.
frame-relay ip rtp header-compression	Enables RTP header compression for all Frame Relay maps on a physical interface.
frame-relay map ip compress	Enables both RTP and TCP header compression on a link.
show frame-relay ip rtp header-compression	Displays RTP header compression statistics for Frame Relay.

ip cgmp

To enable Cisco Group Management Protocol (CGMP) on an interface of a router connected to a Cisco Catalyst 5000 family switch, use the **ip cgmp** command in interface configuration mode. To disable CGMP routing, use the **no** form of this command.

ip cgmp [**proxy** | **router-only**]

no ip cgmp

Syntax Description

proxy	(Optional) Enables CGMP and the CGMP proxy function.
router-only	(Optional) Enables the router to send only CGMP self-join and CGMP self-leave messages.

Defaults

CGMP is disabled.

Command Modes

Interface configuration

Command History

Release	Modification
11.1	This command was introduced.
12.2	The **router-only** keyword was added.

Usage Guidelines

When enabled on an interface, this command triggers a CGMP join message. This command should be used only on 802 media (that is, Ethernet, FDDI, or Token Ring) or ATM. When a **no ip cgmp** command is issued, a triggered CGMP leave message is sent for the MAC address on the interface for group 0000.0000.0000 (all groups). CGMP can run on an interface only if Protocol Independent Multicast (PIM) is configured on the same interface.

A Cisco router will send CGMP join messages in response to receiving Internet Group Management Protocol (IGMP) reports from IGMP-capable members. Only the CGMP querier Cisco router sends these CGMP join messages on behalf of hosts.

The **ip cgmp router-only** command enables the routers in a VLAN to send only CGMP self-join and CGMP self-leave messages—no other types of CGMP messages will be sent. This feature allows other CGMP-capable routers to learn about multicast router ports. If the **ip cgmp router-only** command is not available on any of the external routers in the network, the **ip cgmp** command can be used instead. Issuing the **ip cgmp** command on a router enables that router to send CGMP self-join and CGMP self-leave messages as well as other types of CGMP messages.

When the **proxy** keyword is specified, the CGMP proxy function is also enabled. That is, any router that is not CGMP-capable will be advertised by the proxy router. The proxy router advertises the existence of other non-CGMP-capable routers by sending a CGMP join message with the MAC address of the non-CGMP-capable router and a group address of 0000.0000.0000.

Initially supported is Distance Vector Multicast Routing Protocol (DVMRP) proxying. If a DVMRP report is received from a router that is not a PIM router, a Cisco IGMP querier will advertise the MAC address of the DVMRP router in a CGMP join message with the group address 0000.0000.0000.

To perform CGMP proxy, a Cisco router must be the IGMP querier. If you configure the **ip cgmp proxy** command, you must manipulate the IP addresses so that a Cisco router will be the IGMP querier, which might be the highest or lowest IP address, depending on which version of IGMP is being run on the network. An IGMP Version 2 querier is selected based on the lowest IP addressed router on the interface. An IGMP Version 1 querier is selected based on the multicast routing protocol used on the interface.

When multiple Cisco routers are connected to a switched network and the **ip cgmp proxy** command is needed, we recommend that all routers be configured in the following manner:

- With the same CGMP option.
- To have precedence of becoming IGMP querier over non-Cisco routers.

Examples

The following example enables CGMP:

```
ip cgmp
```

The following example enables CGMP and CGMP proxy:

```
ip cgmp proxy
```

ip dvmrp accept-filter

To configure an acceptance filter for incoming Distance Vector Multicast Routing Protocol (DVMRP) reports, use the **ip dvmrp accept-filter** command in interface configuration mode. To disable this filter, use the **no** form of this command.

ip dvmrp accept-filter *access-list* [*distance* | **neighbor-list** *access-list*]

no ip dvmrp accept-filter *access-list* [*distance* | **neighbor-list** *access-list*]

Syntax Description

access-list	Access list number or name. A value of 0 means that all sources are accepted with the configured distance.
distance	(Optional) Administrative distance to the destination.
neighbor-list *access-list*	(Optional) Number of a neighbor list. DVMRP reports are accepted only by those neighbors on the list.

Defaults

All destination reports are accepted with a distance of 0. Default settings accept reports from all neighbors.

Command Modes

Interface configuration

Command History

Release	Modification
10.0	This command was introduced.
11.2	The **neighbor-list** keyword and *access-list-number* argument were added.

Usage Guidelines

Any sources that match the access list are stored in the DVMRP routing table with the *distance* argument.

The *distance* value is used to compare with the same source in the unicast routing table. The route with the lower distance (either the route in the unicast routing table or that in the DVMRP routing table) takes precedence when computing the Reverse Path Forwarding (RPF) interface for a source of a multicast packet.

By default, the administrative distance for DVMRP routes is 0, which means that they always take precedence over unicast routing table routes. If you have two paths to a source, one through unicast routing (using Protocol Independent Multicast [PIM] as the multicast routing protocol) and another path using DVMRP (unicast and multicast routing), and if you want to use the PIM path, use the **ip dvmrp accept-filter** command to increase the administrative distance for DVMRP routes.

Examples

The following example shows how to apply an access list such that the RPF interface used to accept multicast packets will be through an Enhanced Interior Gateway Routing Protocol (IGRP)/PIM path. The Enhanced IGRP unicast routing protocol has a default administrative distance of 90.

```
 ip dvmrp accept-filter 1 100
access-list 1 permit 0.0.0.0 255.255.255.255
```

The following example applies access list 57 to the interface and sets a distance of 4:

```
access-list 57 permit 131.108.0.0 0.0.255.255
access-list 57 permit 198.92.37.0 0.0.0.255
access-list 57 deny 0.0.0.0 255.255.255.255
 ip dvmrp accept-filter 57 4
```

Related Commands

Command	Description
distance (IP)	Defines an administrative distance.
ip dvmrp metric	Configures the metric associated with a set of destinations for DVMRP reports.
show ip dvmrp route	Displays the contents of the DVMRP routing table.
tunnel mode	Sets the encapsulation mode for the tunnel interface.

ip dvmrp auto-summary

To enable Distance Vector Multicast Routing Protocol (DVMRP) automatic summarization if it was disabled, use the **ip dvmrp auto-summary** command in interface configuration mode. To disable the feature, use the **no** form of this command.

ip dvmrp auto-summary

no ip dvmrp auto-summary

Syntax Description

This command has no arguments or keywords.

Defaults

Enabled

Command Modes

Interface configuration

Command History

Release	Modification
11.2	This command was introduced.

Usage Guidelines

DVMRP automatic summarization occurs when a unicast subnet route is collapsed into a classful network number route. This situation occurs when the subnet is a different network number than the IP address of the interface (or tunnel) over which the advertisement is sent. If the interface is unnumbered, the network number of the numbered interface the unnumbered interface points to is compared to the subnet.

Disable this feature if the information you want to send using the **ip dvmrp summary-address** command is the same as the information that would be sent using DVMRP automatic-summarization.

Examples

The following example disables DVMRP automatic summarization:

```
no ip dvmrp auto-summary
```

Related Commands

Command	Description
ip dvmrp summary-address	Configures a DVMRP summary address to be advertised out the interface.

ip dvmrp default-information

To advertise network 0.0.0.0 to Distance Vector Multicast Routing Protocol (DVMRP) neighbors on an interface, use the **ip dvmrp default-information** command in interface configuration mode. To prevent the advertisement, use the **no** form of this command.

ip dvmrp default-information {**originate** | **only**}

no ip dvmrp default-information {**originate** | **only**}

Syntax Description

originate	Other routes more specific than 0.0.0.0 may be advertised.
only	No DVMRP routes other than 0.0.0.0 are advertised.

Defaults

Disabled

Command Modes

Interface configuration

Command History

Release	Modification
10.3	This command was introduced.

Usage Guidelines

This command should only be used when the router is a neighbor to mrouted version 3.6 devices. The mrouted protocol is a public domain implementation of DVMRP.

You can use the **ip dvmrp metric** command with the **ip dvmrp default-information** command to tailor the metric used when advertising the default route 0.0.0.0. By default, metric 1 is used.

Examples

The following example configures the Cisco IOS software to advertise network 0.0.0.0, in addition to other networks, to DVMRP neighbors:

```
ip dvmrp default-information originate
```

Related Commands

Command	Description
ip dvmrp metric	Configures the metric associated with a set of destinations for DVMRP reports.

ip dvmrp metric

To configure the metric associated with a set of destinations for Distance Vector Multicast Routing Protocol (DVMRP) reports, use the appropriate form of the **ip dvmrp metric** command in interface configuration mode. To disable this function, use the appropriate **no** form of this command.

ip dvmrp metric *metric* [**list** *access-list*] [**route-map** *map-name*] [**mbgp**] [*protocol process-id*]

no ip dvmrp metric *metric* [**list** *access-list*] [**route-map** *map-name*] [**mbgp**] [*protocol process-id*]

Syntax Description

metric	Metric associated with a set of destinations for DVMRP reports. It can be a value from 0 to 32. A value of 0 means that the route is not advertised. A value of 32 is equivalent to infinity (unreachable).
list *access-list*	(Optional) Number name of an access list. If you specify this argument, only the multicast destinations that match the access list are reported with the configured metric. Any destinations not advertised because of split horizon do not use the configured metric.
route-map *map-name*	(Optional) Name of the route map. Only the destinations that match the route map are reported with the configured metric. Unicast routes are subject to route map conditions before being injected into DVMRP. Route maps cannot be used for DVMRP routes.
mbgp	(Optional) Configures redistribution of only IP version 4 (IPv4) multicast routes into DVMRP.
protocol	(Optional) Name of unicast routing protocol, such as **bgp**, **eigrp**, **igrp**, **isis**, **ospf**, **rip**, **static**, or **dvmrp**. If you specify these arguments, only routes learned by the specified routing protocol are advertised in DVMRP report messages.
process-id	(Optional) Process ID number of the unicast routing protocol.

Defaults

No metric is preconfigured. Only directly connected subnets and networks are advertised to neighboring DVMRP routers.

Command Modes

Interface configuration

Command History

Release	Modification
10.2	This command was introduced.
11.1	The **route-map** keyword was added.
12.1	The **mbgp** keyword was added.

Usage Guidelines

When Protocol Independent Multicast (PIM) is configured on an interface and DVMRP neighbors are discovered, the Cisco IOS software sends DVMRP report messages for directly connected networks. The **ip dvmrp metric** command enables DVMRP report messages for multicast destinations that match the access list. Usually, the metric for these routes is 1. Under certain circumstances, you might want to tailor the metric used for various unicast routes. This command lets you configure the metric associated with a set of destinations for report messages sent out this interface.

You can use the *access-list-number* argument in conjunction with the *protocol process-id* arguments to selectively list the destinations learned from a given routing protocol.

To display DVMRP activity, use the **debug ip dvmrp** command.

Examples

The following example connects a PIM cloud to a DVMRP cloud. Access list 1 permits the sending of DVMRP reports to the DVMRP routers advertising all sources in the 198.92.35.0 network with a metric of 1. Access list 2 permits all other destinations, but the metric of 0 means that no DVMRP reports are sent for these destinations.

```
access-list 1 permit 198.92.35.0 0.0.0.255
access-list 1 deny 0.0.0.0 255.255.255.255
access-list 2 permit 0.0.0.0 255.255.255.255
interface tunnel 0
 ip dvmrp metric 1 list 1
 ip dvmrp metric 0 list 2
```

The following example redistributes IPv4 multicast routes into DVMRP neighbors with a metric of 1:

```
interface tunnel 0
 ip dvmrp metric 1 mbgp
```

Related Commands

Command	Description
debug ip dvmrp	Displays information on DVMRP packets received and sent.
ip dvmrp accept-filter	Configures an acceptance filter for incoming DVMRP reports.

ip dvmrp metric-offset

To change the metrics of advertised Distance Vector Multicast Routing Protocol (DVMRP) routes and thus favor or not favor a certain route, use the **ip dvmrp metric-offset** command in interface configuration mode. To restore the default values, use the **no** form of this command.

ip dvmrp metric-offset [**in** | **out**] *increment*

no ip dvmrp metric-offset

Syntax Description

in	(Optional) The *increment* value is added to incoming DVMRP reports and is reported in mrinfo replies. The default for **in** is 1.
out	(Optional) The *increment* value is added to outgoing DVMRP reports for routes from the DVMRP routing table. The default for **out** is 0.
increment	Value added to the metric of a DVMRP route advertised in a report message.

Defaults

If neither **in** nor **out** is specified, **in** is the default.

The default for **in** is 1.

The default for **out** is 0.

Command Modes

Interface configuration

Command History

Release	Modification
11.0	This command was introduced.

Usage Guidelines

Use this command to influence which routes are used, as you prefer. The DVMRP metric is in hop count.

Examples

The following example adds 10 to the incoming DVMRP reports:

```
ip dvmrp metric-offset 10
```

ip dvmrp output-report-delay

To configure an interpacket delay of a Distance Vector Multicast Routing Protocol (DVMRP) report, use the **ip dvmrp output-report-delay** command in interface configuration mode. To restore the default values, use the **no** form of this command.

ip dvmrp output-report-delay *milliseconds* [*burst*]

no ip dvmrp output-report-delay *milliseconds* [*burst*]

Syntax Description

milliseconds	Number of milliseconds that elapse between transmissions of a set of DVMRP report packets. The number of packets in the set is determined by the *burst* argument. The default number of milliseconds is 100 milliseconds.
burst	(Optional) The number of packets in the set being sent. The default is 2 packets.

Defaults

milliseconds: 100 milliseconds

burst: 2 packets

Command Modes

Interface configuration

Command History

Release	Modification
11.3	This command was introduced.

Usage Guidelines

The delay is the number of milliseconds that elapse between transmissions of sets of packets that constitute a report. The number of packets in the set is determined by the *burst* value.

You might want to change the default values, depending on the CPU and buffering of the mrouted machine.

Examples

The following example sets the interpacket delay to 200 milliseconds and the burst size to 3 packets. Therefore, at the periodic DVMRP report interval, if six packets are built, three packets will be sent, then a delay of 200 milliseconds will occur, and then the next three packets will be sent.

```
ip dvmrp output-report-delay 200 3
```

ip dvmrp reject-non-pruners

To configure the router so that it will not peer with a Distance Vector Multicast Routing Protocol (DVMRP) neighbor if that neighbor does not support DVMRP pruning or grafting, use the **ip dvmrp reject-non-pruners** command in interface configuration mode. To disable the function, use the **no** form of this command.

ip dvmrp reject-non-pruners

no ip dvmrp reject-non-pruners

Syntax Description

This command has no arguments or keywords.

Defaults

Disabled

Command Modes

Interface configuration

Command History

Release	Modification
11.0	This command was introduced.

Usage Guidelines

By default, the router accepts all DVMRP neighbors as peers, regardless of their DVMRP capability or lack thereof.

Use this command to prevent a router from peering with a DVMRP neighbor if that neighbor does not support DVMRP pruning or grafting. If the router receives a DVMRP probe or report message without the Prune-Capable flag set, the router logs a syslog message and discards the message.

Note that this command prevents peering with neighbors only. If there are any nonpruning routers multiple hops away (downstream toward potential receivers) that are not rejected, then a nonpruning DVMRP network might still exist.

Examples

The following example configures the router not to peer with DVMRP neighbors that do not support pruning or grafting:

```
ip dvmrp reject-non-pruners
```

ip dvmrp routehog-notification

To change the number of Distance Vector Multicast Routing Protocol (DVMRP) routes allowed before a syslog warning message is issued, use the **ip dvmrp routehog-notification** command in global configuration mode. To restore the default value, use the **no** form of this command.

ip dvmrp routehog-notification *route-count*

no ip dvmrp routehog-notification

Syntax Description

route-count	Number of routes allowed before a syslog message is triggered. The default is 10,000 routes.

Defaults

10,000 routes

Command Modes

Global configuration

Command History

Release	Modification
10.2	This command was introduced.

Usage Guidelines

This command configures how many DVMRP routes are accepted on each interface within an approximate one-minute period before a syslog message is issued, warning that there might be a route surge occurring. The warning is typically used to detect quickly when routers have been misconfigured to inject a large number of routes into the multicast backbone (MBONE).

The **show ip igmp interface** command displays a running count of routes. When the count is exceeded, an "*** ALERT ***" is appended to the line.

Examples

The following example lowers the threshold to 8000 routes:

```
ip dvmrp routehog-notification 8000
```

Related Commands

Command	Description
show ip igmp interface	Displays multicast-related information about an interface.

ip dvmrp route-limit

To change the limit on the number of Distance Vector Multicast Routing Protocol (DVMRP) routes that can be advertised over an interface enabled to run DVMRP, use the **ip dvmrp route-limit** command in global configuration mode. To configure no limit, use the **no** form of this command.

ip dvmrp route-limit *count*

no ip dvmrp route-limit

Syntax Description

count	Number of DVMRP routes that can be advertised. The default is 7000 routes.

Defaults

7000 routes

Command Modes

Global configuration

Command History

Release	Modification
11.0	This command was introduced.

Usage Guidelines

Interfaces enabled to run DVMRP include a DVMRP tunnel, an interface where a DVMRP neighbor has been discovered, and an interface configured to run the **ip dvmrp unicast-routing** command.

The **ip dvmrp route-limit** command is automatically generated to the configuration file when at least one interface is enabled for multicast routing. This command is necessary to prevent misconfigured **ip dvmrp metric** commands from causing massive route injection into the multicast backbone (MBONE).

Examples

The following example changes the limit to 5000 DVMRP routes allowed to be advertised:

```
ip dvmrp route-limit 5000
```

Related Commands

Command	Description
ip dvmrp unicast-routing	Enables DVMRP unicast routing on an interface.

ip dvmrp summary-address

To configure a Distance Vector Multicast Routing Protocol (DVMRP) summary address to be advertised out the interface, use the **ip dvmrp summary-address** command in interface configuration mode. To remove the summary address, use the **no** form of this command.

ip dvmrp summary-address *summary-address mask* [**metric** *value*]

no ip dvmrp summary-address *summary-address mask* [**metric** *value*]

Syntax Description

summary-address	Summary IP address that is advertised instead of the more specific route.
mask	Mask on the summary IP address.
metric *value*	(Optional) Metric that is advertised with the summary address. The default is 1.

Defaults

metric *value*: 1

Command Modes

Interface configuration

Command History

Release	Modification
11.2	This command was introduced.

Usage Guidelines

If there is at least a single, more specific route in the unicast routing table that matches the specified *address* and *mask* arguments, the summary is advertised. Routes in the DVMRP routing table are not candidates for summarization.

When the **metric** keyword is specified, the summary is advertised with that metric value.

Multiple summary address can be configured on an interface. When multiple overlapping summary addresses are configured on an interface, the one with the longest mask takes preference.

Examples

The following example configures the DVMRP summary address 171.69.0.0 to be advertised out the interface:

```
ip dvmrp summary-address 171.69.0.0 255.255.0.0 metric 1
```

Related Commands

Command	Description
ip dvmrp auto-summary	Enables DVMRP automatic summarization if it was disabled.

ip dvmrp unicast-routing

To enable Distance Vector Multicast Routing Protocol (DVMRP) unicast routing on an interface, use the **ip dvmrp unicast-routing** command in interface configuration mode. To disable the feature, use the **no** form of this command.

ip dvmrp unicast-routing

no ip dvmrp unicast-routing

Syntax Description

This command has no arguments or keywords.

Defaults

Disabled

Command Modes

Interface configuration

Command History

Release	Modification
10.3	This command was introduced.

Usage Guidelines

Enabling DVMRP unicast routing means that routes in DVMRP report messages are cached by the router in a DVMRP routing table. When Protocol Independent Multicast (PIM) is running, these routes may get preference over routes in the unicast routing table. This capability allows PIM to run on the multicast backbone (MBONE) topology when it is different from the unicast topology.

DVMRP unicast routing can run on all interfaces, including generic routing encapsulation (GRE) tunnels. On DVMRP tunnels, it runs by virtue of DVMRP multicast routing. This command does not enable DVMRP multicast routing among Cisco routers. However, if there is a DVMRP-capable multicast router, the Cisco router will do PIM/DVMRP multicast routing interaction.

Examples

The following example enables DVMRP unicast routing:

```
ip dvmrp unicast-routing
```

Related Commands

Command	Description
ip dvmrp route-limit	Changes the limit on the number of DVMRP routes that can be advertised over an interface enabled to run DVMRP.

ip igmp access-group

To control the multicast groups that hosts on the subnet serviced by an interface can join, use the **ip igmp access-group** command in interface configuration mode. To disable groups on an interface, use the **no** form of this command.

ip igmp access-group *access-list version*

no ip igmp access-group *access-list version*

Syntax Description

access-list	Number or name of a standard IP access list. The access list can be a number from 1 to 99.
version	Changes Internet Group Management Protocol (IGMP) version. Default is version 2.

Defaults

All groups are allowed on an interface.

Command Modes

Interface configuration

Command History

Release	Modification
10.0	This command was introduced.

Examples

In the following example, hosts serviced by Ethernet interface 0 can join the group 225.2.2.2 only:

```
access-list 1 225.2.2.2 0.0.0.0
interface ethernet 0
 ip igmp access-group 1
```

Related Commands

Command	Description
ip igmp join-group	Causes the router to join a multicast group.

ip igmp helper-address

To cause the system to forward all Internet Group Management Protocol (IGMP) host reports and leave messages received on the interface to the specified IP address, use the **ip igmp helper-address** command in interface configuration mode. To disable such forwarding, use the **no** form of this command.

ip igmp helper-address *ip-address*

no ip igmp helper-address

Syntax Description

ip-address	IP address to which IGMP host reports and leave messages are forwarded. Specify the IP address of an interface on the central router.

Defaults

Disabled

Command Modes

Interface configuration

Command History

Release	Modification
11.2 F	This command was introduced.

Usage Guidelines

This command and the **ip pim neighbor-filter** command together enable stub multicast routing. The IGMP host reports and leave messages are forwarded to the IP address specified. The reports are re-sent out the next hop interface toward the IP address, with the source address of that interface. This command enables a type of "dense-mode" join, allowing stub sites not participating in Protocol Independent Multicast (PIM) to indicate membership in IP multicast groups.

Examples

The following example enables stub multicast routing on Router A, which has an outgoing interface with IP address 10.0.0.1. Router B is a central router with an incoming interface with address 10.0.0.2. Access list 1 filters PIM messages from the source (stub Router A).

Router A Configuration

```
ip multicast-routing
 ip pim dense-mode
 ip igmp helper-address 10.0.0.2
```

Router B Configuration

```
ip multicast-routing
 ip pim dense-mode : or ip pim sparse-mode
 ip pim neighbor-filter 1
access-list 1 deny 10.0.0.1
```

Related Commands

Command	Description
ip pim neighbor-filter	Prevents a router from participating in PIM (for example, to configure stub multicast routing).

ip igmp immediate-leave

To minimize the leave latency of Internet Group Management Protocol (IGMP) memberships when IGMP Version 2 is used and only one receiver host is connected to each interface, use the **ip igmp immediate-leave** command in global or interface configuration mode. To disable this feature, use the **no** form of this command.

ip igmp immediate-leave group-list *access-list*

no ip igmp immediate-leave

Syntax Description

group-list *access-list*	Standard access list number or name that defines multicast groups in which the immediate leave feature is enabled.

Defaults

Disabled

Command Modes

Global configuration
Interface configuration

Command History

Release	Modification
12.1	This command was introduced.

Usage Guidelines

You cannot configure this command in both interface and global configuration mode.

When this command is not configured, the router will send an IGMP group-specific query message upon receipt of an IGMP Version 2 (IGMPv2) group leave message. The router will stop forwarding traffic for that group only if no host replies to the query within the timeout period. The timeout period is determined by the **ip igmp last-member-query-interval** command and the IGMP robustness variable, which is defined by the IGMP specification. By default, the timeout period in Cisco IOS is approximately 2.5 seconds.

If this command is configured, the router assumes that only one host has joined the group and stops forwarding the group's traffic immediately upon receipt of an IGMPv2 group leave message.

Global Configuration Mode

When this command is configured in global configuration mode, it applies to all IGMP-enabled interfaces. Any existing configuration of this command in interface configuration mode will be removed from the configuration. Also, any new configuration of this command in interface configuration mode will be ignored.

Interface Configuration Mode

When this command is configured in interface configuration mode, it applies to an individual interface. Configure this command on an interface if only one IGMP-enabled neighbor is connected to the interface. The neighbor can be either a host or switch running IGMP Snooping. When the **ip igmp immediate-leave** command is enabled on an interface, the router will not send IGMP group-specific host

queries when an IGMP Version 2 leave group message is received from that interface. Instead, the router will immediately remove the interface from the IGMP cache for that group and send Protocol Independent Multicast (PIM) prune messages toward sources if this interface was the last one to join that group.

Examples

The following example shows how to enable the immediate leave feature on all interfaces for all multicast groups:

```
ip multicast-routing
igmp immediate-leave group-list all-groups

interface ethernet 0
  ip address 10.0.10.1 255.255.255.0
  ip pim sparse-dense mode

 ip access-list standard all-groups
permit 224.0.0.0 15.255.255.255
```

The following example shows how to enable the immediate leave feature on an interface for a specific range of multicast groups. In this example, the router assumes that the tv-groups access list consists of groups that have only one host membership at a time per interface:

```
ip multicast-routing

interface ethernet 0
  ip address 10.0.10.1 255.255.255.0
  ip pim sparse-dense-mode
  igmp immediate-leave group-list tv-groups

 ip access-list standard tv-groups
permit 239.192.20.0 0.0.0.255
```

Related Commands

Command	Description
ip igmp last-member-query-interval	Configures the frequency at which the router sends IGMP group-specific host query messages.

ip igmp join-group

To have the router join a multicast group, use the **ip igmp join-group** command in interface configuration mode. To cancel membership in a multicast group, use the **no** form of this command.

ip igmp join-group *group-address*

no ip igmp join-group *group-address*

Syntax Description

group-address	Address of the multicast group. This is a multicast IP address in four-part, dotted notation.

Defaults

No multicast group memberships are predefined.

Command Modes

Interface configuration

Command History

Release	Modification
10.0	This command was introduced.

Usage Guidelines

IP packets that are addressed to the group address are passed to the IP client process in the Cisco IOS software.

If all the multicast-capable routers and access servers that you administer are members of a multicast group, pinging that group causes all routers to respond, which can be a useful administrative and debugging tool.

Another reason to have a router join a multicast group is when other hosts on the network have a bug in Interior Gateway Routing Protocol (IGRP) that prevents them from correctly answering IGMP queries. Having the router join the multicast group causes upstream routers to maintain multicast routing table information for that group and keep the paths for that group active.

Examples

In the following example, the router joins multicast group 225.2.2.2:

```
ip igmp join-group 225.2.2.2
```

Related Commands

Command	Description
ip igmp access-group	Controls the multicast groups that hosts on the subnet serviced by an interface can join.
ping (privileged)	Diagnoses basic network connectivity (in privileged EXEC mode) on Apollo, AppleTalk, CLNS, DECnet, IP, Novell IPX, VINES, or XNS networks.
ping (user)	Diagnoses basic network connectivity (in user EXEC mode) on Apollo, AppleTalk, CLNS, DECnet, IP, Novell IPX, VINES, or XNS networks.

ip igmp last-member-query-count

To configure the number of times that the router sends Internet Group Management Protocol (IGMP) group-specific or group-source-specific (with IGMP version 3) query messages in response to receiving a group-specific or group-source-specific leave message, use the **ip igmp last-member-query-count** command in interface configuration mode. To set this interval to the default value, use the **no** form of this command.

ip igmp last-member-query-count *lmqc*

no ip igmp last-member-query-count *lmqc*

Syntax Description

lmqc	Last member query count. The number of times, from 1 through 7, that the router sends group- or group-source-specific queries upon receipt of a message indicating a leave.

Defaults

LMQC is 2

Command Modes

Interface configuration

Command History

Release	Modification
12.1	This command was introduced.

Usage Guidelines

When a router receives an IGMP version 2 (IGMPv2) or IGMP version 3 (IGMPv3) message indicating that a host wants to leave a group, source, or channel, it sends last-member-query-count group- or group-source-specific IGMP query messages at intervals of igmp-last-member-interval milliseconds. If no response is received after this period, the router stops forwarding for the group, source, or channel.

Caution Do not set the LMQC to 1, because in this situation the loss of a single packet—the query packet from the router to the host or the report packet from the host to the router—may result in traffic forwarding being stopped, even there is still a receiver. Traffic will continue to be forwarded after the next general query sent by the router, but the interval during which a receiver may not receive the query could be as long as 1 minute (with the default query interval).

The leave latency in Cisco IOS software may increase by up to one last member query interval (LMQI) value when the router is processing more than one leave within a LMQI. In this case, the average leave latency is determined by the (LMQC + 0.5) * LMQI. The result is that the default leave latency can range from 2.0 to 3.0 seconds with an average of 2.5 seconds under a higher load of IGMP leave processing. The leave latency under load for the minimum LMQI value of 100 msec and a LMQC of 1 is from 100 to 200 milliseconds, with an average of 150 milliseconds. This is done to limit the impact of higher rates of IGMP leave messages.

If no response is received after this period, the router will stop forwarding traffic for that group, source, or channel only if no host replies to the query within the timeout period. The timeout period is determined by the **ip igmp last-member-query-interval** and the **ip igmp last-member-query-count** commands.

Examples

The following example changes the number of times that the router sends group-specific or group-source-specific query messages to 5:

```
interface tunnel 0
 ip igmp last-member-query-count 5:
```

Related Commands

Command	Description
ip igmp explicit-tracking	Enables explicit tracking of hosts, groups, and channels for IGMPv3.
ip igmp immediate-leave	Minimizes the leave latency of IGMP memberships when IGMPv2 is used and only one receiver host is connected to each interface.
ip igmp last-member-query-interval	Configures the interval at which the router sends IGMP group-specific or group-source-specific (with IGMPv3) query messages

ip igmp last-member-query-interval

To configure the interval at which the router sends Internet Group Management Protocol (IGMP) group-specific or group-source-specific (with IGMP Version 3) query messages, use the **ip igmp last-member-query-interval** command in interface configuration mode. To set this interval to the default value, use the **no** form of this command.

ip igmp last-member-query-interval *interval*

no ip igmp last-member-query-interval *interval*

Syntax Description

interval	Interval, in milliseconds, at which IGMP group-specific host query messages are sent. The interval value is an integer from 100 to 25,500. The *interval* argument in 12.0 S, 12.1 E, 12.2, and 12.2 S releases is an integer from 100 through 65,535.

Defaults

interval: 1000 milliseconds (1 second)

Command Modes

Interface configuration

Command History

Release	Modification
12.1	This command was introduced.
12.2(4)T	The highest *interval* integer value accepted was changed from 65,535 to 25,500.

Usage Guidelines

When a router receives an IGMP Version 2 (IGMPv2) or IGMP Version 3 (IGMPv3) message indicating that a host wants to leave a group, source, or channel, it sends last-member-query-count group, group-specific, or source-specific IGMP query messages at intervals set by the **ip igmp last-member-query-interval** command. If no response is received after this period, the router stops forwarding for the group, source, or channel.

The leave latency in Cisco IOS software may increase by up to one last member query interval (LMQI) value when the router is processing more than one leave within a LMQI. In this case, the average leave latency is determined by the (last member query count + 0.5) * LMQI. The result is that the default leave latency can range from 2.0 to 3.0 seconds with an average of 2.5 seconds under a higher load of IGMP leave processing. The leave latency under load for the minimum LMQI value of 100 msec and a last member query count of 1 is from 100 to 200 milliseconds, with an average of 150 milliseconds. This is done to limit the impact of higher rates of IGMP leave messages.

If no response is received after this period, the router will stop forwarding traffic for that group, source, or channel only if no host replies to the query within the timeout period. The timeout period is determined by the **ip igmp last-member-query-interval** and the **ip igmp last-member-query-count** commands.

Examples

The following example changes the IGMP group-specific host query message interval to 2000 milliseconds (2 seconds):

```
interface tunnel 0
 ip igmp last-member-query-interval 2000
```

Related Commands

Command	Description
ip igmp explicit-tracking	Enables explicit tracking of hosts, groups, and channels for IGMPv3.
ip igmp immediate-leave	Minimizes the leave latency of IGMP memberships when IGMPv2 is used and only one receiver host is connected to each interface.
ip igmp last-member-query-count	Configures the number of times that the router sends IGMP group-specific or group-source-specific (with IGMP version 3) query messages.

ip igmp query-interval

To configure the frequency at which Cisco IOS software sends Internet Group Management Protocol (IGMP) host query messages, use the **ip igmp query-interval** command in interface configuration mode. To return to the default frequency, use the **no** form of this command.

ip igmp query-interval *seconds*

no ip igmp query-interval

Syntax Description

seconds	Frequency, in seconds, at which to send IGMP host query messages. It can be a number from 0 to 65535. The default is 60 seconds.

Defaults

60 seconds

Command Modes

Interface configuration

Command History

Release	Modification
10.2	This command was introduced.

Usage Guidelines

Multicast routers send host membership query messages (host query messages) to discover which multicast groups have members on the attached networks of the router. Hosts respond with IGMP report messages indicating that they wish to receive multicast packets for specific groups (that is, indicating that the host wants to become a member of the group). Host query messages are addressed to the all-hosts multicast group, which has the address 224.0.0.1, and has an IP time-to-live (TTL) value of 1.

The designated router for a LAN is the only router that sends IGMP host query messages:

- For IGMP Version 1, the designated router is elected according to the multicast routing protocol that runs on the LAN.
- For IGMP Version 2, the designated querier is the lowest IP-addressed multicast router on the subnet.

If the router hears no queries for the timeout period (controlled by the **ip igmp query-timeout** command), it becomes the querier.

Caution Changing this value may severely impact multicast forwarding.

Examples

The following example changes the frequency at which the designated router sends IGMP host-query messages to 2 minutes:

```
interface tunnel 0
 ip igmp query-interval 120
```

Related Commands

Command	Description
ip pim query-interval	Configures the frequency of PIM router query messages.
show ip igmp groups	Displays the multicast groups that are directly connected to the router and that were learned through IGMP.

ip igmp query-max-response-time

To configure the maximum response time advertised in Internet Group Management Protocol (IGMP) queries, use the **ip igmp query-max-response-time** command in interface configuration mode. To restore the default value, use the **no** form of this command.

ip igmp query-max-response-time *seconds*

no ip igmp query-max-response-time

Syntax Description

seconds	Maximum response time, in seconds, advertised in IGMP queries. The default value is 10 seconds.

Defaults

10 seconds

Command Modes

Interface configuration

Command History

Release	Modification
11.1	This command was introduced.

Usage Guidelines

This command is valid only when IGMP Version 2 is running.

This command controls the period during which the responder can respond to an IGMP query message before the router deletes the group.

Examples

The following example configures a maximum response time of 8 seconds:

```
ip igmp query-max-response-time 8
```

Related Commands

Command	Description
ip pim query-interval	Configures the frequency of PIM router-query messages.
show ip igmp groups	Displays the multicast groups that are directly connected to the router and that were learned through IGMP.

ip igmp query-timeout

To configure the timeout period before the router takes over as the querier for the interface after the previous querier has stopped querying, use the **ip igmp query-timeout** command in interface configuration mode. To restore the default value, use the **no** form of this command.

ip igmp query-timeout *seconds*

no ip igmp query-timeout

Syntax Description

seconds	Number of seconds that the router waits after the previous querier has stopped querying and before it takes over as the querier.

Defaults

Two times the query interval

Command Modes

Interface configuration

Command History

Release	Modification
11.1	This command was introduced.

Usage Guidelines

This command requires IGMP Version 2.

By default, the router waits twice the query interval specified by the **ip igmp query-interval** command, after which, if it has heard no queries, it becomes the querier. By default, the **ip igmp query-interval** defaults to 60 seconds, which means the **ip igmp query-timeout** defaults to 120 seconds.

Examples

The following example configures the router to wait 30 seconds from the time it received the last query before it takes over as the querier for the interface:

```
ip igmp query-timeout 30
```

Related Commands

Command	Description
ip igmp query-interval	Configures the frequency at which Cisco IOS software sends IGMP host query messages.

ip igmp static-group

To configure the router to be a statically connected member of the specified group on the interface, or to statically forward for a multicast group onto the interface, use the **ip igmp static-group** command in interface configuration mode. To remove the router as a member of the group, use the **no** form of this command.

ip igmp static-group {***** | *group-address* [**source** {*source-address* | **ssm-map**}]}

no ip igmp static-group {***** | *group-address* [**source** {*source-address* | **ssm-map**}]}

Syntax Description

*****	Places the interface into all newly created multicast route (mroute) entries.
group-address	IP multicast group address of a group to which the router belongs.
source	(Optional) Statically forwards a (S, G) channel out of the interface.
source-address	(Optional) IP address of a system where multicast data packets originate.
ssm-map	(Optional) Configures Source Specific Multicast (SSM) mapping to be used to determine the source associated with this group. The resulting (S, G) channels are statically forwarded.

Defaults

A router is not a statically connected member of an IP multicast group.

Command Modes

Interface configuration

Command History

Release	Modification
11.2	This command was introduced.
12.3(2)T	The **source** and the **ssm-map** keywords were added.
12.2(27)SBC	This command was integrated into Cisco IOS Release 12.2(27)SBC.

Usage Guidelines

When you configure the **ip igmp static-group** command, packets to the group are fast-switched out the interface, provided that packets were received on the correct reverse path forwarding (RPF) interface.

Configuring the **ip igmp static-group** command is unlike configuring the **ip igmp join-group** command, which allows the router to join the multicast group. This configuration of the **ip igmp static-group** command would cause the upstream routers to maintain the multicast routing table information for that group, which would ensure that all the paths to that multicast group are active.

If you configure the **ip igmp join-group** command for the same group address as the **ip igmp static-group** command, the **ip igmp join-group** command takes precedence, and the group behaves like a locally joined group.

The use of SSM mapping determines the source or sources associated with a specific source (S) and group (G) combination and puts the particular interface in the outging interface list (OIL) for that (S, G) entry. Traffic coming from source S destined toward group G will be forwarded out that interface regardless of a receiver joining the group on that interface.

Examples

The following example configures group address 192.168.2.2 on Ethernet interface 0:

```
interface ethernet 0
 ip igmp static-group 192.168.2.2
```

The following example shows how to configure group address 192.168.2.3 to use SSM mapping for statically forwarded groups on Ethernet interface 0:

```
interface ethernet 0
 ip igmp static-group 192.168.2.3 source ssm-map
```

Related Commands

Command	Description
ip igmp join-group	Causes the router to join a multicast group.
ip igmp ssm-map enable	Enables SSM mapping for groups in a configured SSM range.
ip igmp ssm-map query dns	Configures DNS-based SSM mapping.
ip igmp ssm-map static	Enables static SSM mapping.
ip pim ssm	Defines the SSM range of IP multicast addresses.

ip igmp v3lite

To enable acceptance and processing of Internet Group Management Protocol Version 3 lite (IGMP v3lite) membership reports on an interface, use the **ip igmp v3lite** command in interface configuration mode. To disable IGMP v3lite, use the **no** form of this command.

ip igmp v3lite

no ip igmp v3lite

Syntax Description

This command has no arguments or keywords.

Defaults

Disabled

Command Modes

Interface configuration

Command History

Release	Modification
12.1(3)T	This command was introduced.

Usage Guidelines

To use this command, you must define a Source Specific Multicast (SSM) range of IP addresses using the **ip pim ssm** global configuration command. When IGMP v3lite is enabled, it is supported in the SSM range of addresses only.

Examples

The following example shows how to configure IGMP v3lite on Ethernet interface 3/1:

```
interface ethernet 3/1
ip igmp v3lite
```

Related Commands

Command	Description
ip pim ssm	Defines the SSM range of IP multicast addresses.

ip igmp version

To configure which version of Internet Group Management Protocol (IGMP) the router uses, use the **ip igmp version** command in interface configuration mode. To restore the default value, use the **no** form of this command.

ip igmp version {**1** | **2** | **3**}

no ip igmp version

Syntax Description

1	IGMP Version 1.
2	IGMP Version 2.
3	IGMP Version 3.

Defaults

Version 2

Command Modes

Interface configuration

Command History

Release	Modification
11.1	This command was introduced.
12.1(5)T	The **3** keyword was added.

Usage Guidelines

All routers on the subnet must support the same version. The router does not automatically detect Version 1 routers and switch to Version 1 as did earlier releases of the Cisco IOS software. Hosts can have any IGMP version (1, 2, or 3) and the router will correctly detect their presence and query them appropriately.

Some commands require IGMP Version 2 or 3, such as the **ip igmp query-max-response-time** and **ip igmp query-timeout** commands.

Examples

The following example configures the router to use IGMP Version 3:

```
ip igmp version 3
```

Related Commands

Command	Description
ip igmp query-max-response-time	Configures the maximum response time advertised in IGMP queries.
ip igmp query-timeout	Configures the timeout time before the router takes over as the querier for the interface, after the previous querier has stopped querying.
show ip igmp groups	Displays the multicast groups that are directly connected to the router and that were learned through IGMP.
show ip igmp interface	Displays multicast-related information about an interface.

ip mroute

To configure a multicast static route (mroute), use the **ip mroute** command in global configuration mode. To remove the route, use the **no** form of this command.

ip mroute *source-address mask* [*protocol as-number*] {*rpf-address* | *type number*} [*distance*]

no ip mroute *source mask* [*protocol as-number*] {*rpf-address* | *type number*} [*distance*]

Syntax Description

source-address	IP address of the multicast source.
mask	Mask on the IP address of the multicast source.
protocol	(Optional) Unicast routing protocol that you are using.
as-number	(Optional) Autonomous system number of the routing protocol you are using, if applicable.
rpf-address	Incoming interface for the mroute. If the Reverse Path Forwarding (RPF) address *rpf-address* is a Protocol Independent Multicast (PIM) neighbor, PIM join, graft, and prune messages are sent to it. The *rpf-address* argument can be a host IP address of a directly connected system or a network/subnet number. When it is a route, a recursive lookup is done from the unicast routing table to find a directly connected system. If the *rpf-address* argument is not specified, the interface *type number* value is used as the incoming interface.
type number	Interface type and number for the mroute.
distance	(Optional) Determines whether a unicast route, a Distance Vector Multicast Routing Protocol (DVMRP) route, or a static mroute should be used for the RPF lookup. The lower distances have better preference. If the static mroute has the same distance as the other two RPF sources, the static mroute will take precedence. The default is 0.

Defaults

distance: 0

Command Modes

Global configuration

Command History

Release	Modification
11.0	This command was introduced.

Usage Guidelines

This command allows you to statically configure where multicast sources are located (even though the unicast routing table shows something different).

When a source range is specified, the *rpf-address* argument applies only to those sources.

Examples

The following example configures all sources via a single interface (in this case, a tunnel):

```
ip mroute 0.0.0.0 0.0.0.0 tunnel0
```

The following example configures all specific sources within a network number to be reachable through 172.30.10.13:

```
ip mroute 172.16.0.0 255.255.0.0 172.30.10.13
```

The following example causes this multicast static route to take effect if the unicast routes for any given destination go away:

```
ip mroute 0.0.0.0 0.0.0.0 serial0 200
```

ip mroute-cache

To configure IP multicast fast switching or multicast distributed switching (MDS), use the **ip mroute-cache** command in interface configuration mode. To disable either of these features, use the **no** form of this command.

ip mroute-cache [**distributed**]

no ip mroute-cache [**distributed**]

Syntax Description

distributed	(Optional) Enables MDS on the interface. In the case of RSP, this keyword is optional; if it is omitted, fast switching occurs. On the GSR, this keyword is required because the GSR does only distributed switching.

Defaults

On the RSP, IP multicast fast switching is enabled; MDS is disabled.

On the GSR, MDS is disabled.

Command Modes

Interface configuration

Command History

Release	Modification
10.0	This command was introduced.
11.2(11)GS	The **distributed** keyword was added.

Usage Guidelines

On the RSP

If multicast fast switching is disabled on an incoming interface for a multicast routing table entry, the packet will be sent at process level for all interfaces in the outgoing interface list.

If multicast fast switching is disabled on an outgoing interface for a multicast routing table entry, the packet is process-level switched for that interface, but may be fast switched for other interfaces in the outgoing interface list.

When multicast fast switching is enabled (like unicast routing), debug messages are not logged. If you want to log debug messages, disable fast switching.

If MDS is not enabled on an incoming interface that is capable of MDS, incoming multicast packets will not be distributed switched; they will be fast switched at the Route Processor (RP) as before. Also, if the incoming interface is not capable of MDS, packets will get fast switched or process-switched at the RP as before.

If MDS is enabled on the incoming interface, but at least one of the outgoing interfaces cannot fast switch, packets will be process-switched. We recommend that you disable fast switching on any interface when MDS is enabled.

On the GSR

On the GSR, all interfaces should be configured for MDS because that is the only switching mode.

Examples

The following example enables IP multicast fast switching on the interface:

```
ip mroute-cache
```

The following example disables IP multicast fast switching on the interface:

```
no ip mroute-cache
```

The following example enables MDS on the interface:

```
ip mroute-cache distributed
```

The following example disables MDS and IP multicast fast switching on the interface:

```
no ip mroute-cache distributed
```

ip msdp cache-rejected-sa

To track rejected Source-Active (SA) request messages from a Multicast Source Discovery Protocol (MSDP) peer, use the **ip msdp cache-rejected-sa** command in global configuration mode. To stop tracking SA request messages, use the **no** form of this command.

ip msdp cache-rejected-sa *number-of-entries*

no ip msdp cache-rejected-sa *number-of-entries*

Syntax Description

number-of-entries	Number of entries that need to be cached. The range is from 1 to 32766.

Defaults

Rejected SA request messages are not tracked.

Command Modes

Global configuration

Command History

Release	Modification
12.0(22)S	This command was introduced.
12.1E	This command was integrated into Cisco IOS Release 12.1E.
12.2	This command was integrated into Cisco IOS Release 12.2.

Usage Guidelines

The **ip msdp cache-rejected-sa** command displays the history of SA messages that have been recently received from an MSDP peer but were rejected by the local router. If the cache overflows, entries are overwritten, starting from the first entry.

Examples

The following example enables the MSDP peer to track rejected MSDP SA request messages:

```
Router(config)# ip msdp cache-rejected-sa 200
```

Related Commands

Command	Description
show snmp engineID	Displays the identification of the local SNMP engine and all remote engines that have been configured on the router.
snmp-server host	Specifies the recipient (SNMP manager) of an SNMP trap notification.

ip multicast boundary

To configure an administratively scoped boundary, use the **ip multicast boundary** command in interface configuration mode. To remove the boundary, use the **no** form of this command.

ip multicast boundary *access-list* [**filter-autorp**]

no ip multicast boundary [**filter-autorp**]

Syntax Description

access-list	Number or name identifying an access list that controls the range of group addresses affected by the boundary.
filter-autorp	(Optional) Filters Auto-RP messages denied by the boundary access control list (ACL).

Defaults

There is no boundary.

Command Modes

Interface configuration

Command History

Release	Modification
11.1	This command was introduced.
12.0(22)S	The **filter-autorp** keyword was added.
12.1(12c)E	The **filter-autorp** keyword was integrated into Cisco IOS Release 12.1(12c)E.
12.2(11)	The **filter-autorp** keyword was integrated into Cisco IOS Release 12.2(11).
12.2(13)T	The **filter-autorp** keyword was integrated into Cisco IOS Release 12.2(13)T.

Usage Guidelines

Use this command to configure an administratively scoped boundary on an interface to filter multicast group addresses in the range defined by the *access-list* argument. A standard access list defines the range of addresses affected. When this command is configured, no multicast data packets are allowed to flow across the boundary from either direction. Restricting multicast data packet flow enables reuse of the same multicast group address in different administrative domains.

If you configure the **filter-autorp** keyword, the administratively scoped boundary also examines Auto-RP discovery and announcement messages and removes any Auto-RP group range announcements from the Auto-RP packets that are denied by the boundary ACL. An Auto-RP group range announcement is permitted and passed by the boundary only if all addresses in the Auto-RP group range are permitted by the boundary ACL. If any address is not permitted, the entire group range is filtered and removed from the Auto-RP message before the Auto-RP message is forwarded.

Examples

The following example sets up a boundary for all administratively scoped addresses:

```
access-list 1 deny 239.0.0.0 0.255.255.255
access-list 1 permit 224.0.0.0 15.255.255.255
interface ethernet 0
```

```
ip multicast boundary 1
```

Related Commands

Command	Description
access-list (IP standard)	Defines a standard IP access list.

ip multicast cache-headers

To allocate a circular buffer to store IP multicast packet headers that the router receives, use the **ip multicast cache-headers** command in global configuration mode. To remove the buffer, use the **no** form of this command.

ip multicast [**vrf** *vrf-name*] **cache-headers** [**rtp**]

no ip multicast [**vrf** *vrf-name*] **cache-headers** [**rtp**]

Syntax Description

vrf	(Optional) Supports the multicast Virtual Private Network (VPN) routing and forwarding (VRF) instance.
vrf-name	(Optional) Name assigned to the VRF.
rtp	(Optional) Caches Real-Time Transport Protocol (RTP) headers.

Defaults

The command is disabled.

Command Modes

Global configuration

Command History

Release	Modification
11.1	This command was introduced.
12.1	The **rtp** keyword was added.
12.0(23)S	The **vrf** keyword and *vrf-name* argument were added.
12.2(13)T	The **vrf** keyword and *vrf-name* argument were added.

Usage Guidelines

You can store IP multicast packet headers in a cache and then display them to determine the following information:

- Who is sending IP multicast packets to which groups
- Interpacket delay
- Duplicate IP multicast packets (if any)
- Multicast forwarding loops in your network (if any)
- Scope of the group
- User Datagram Protocol (UDP) port numbers
- Packet length

Note This command allocates a circular buffer of approximately 32 KB. Do not configure this command if you are low on memory.

Use the **show ip mpacket** command to display the buffer.

Examples

The following example allocates a buffer to store IP multicast packet headers:

```
ip multicast cache-headers
```

Related Commands

Command	Description
show ip mpacket	Displays the contents of the circular cache header buffer.
show ip mpacket quality	Displays an RTP data quality based on packets captured in the IP multicast cache header buffer.

ip multicast heartbeat

To monitor the health of multicast delivery and be alerted when the delivery fails to meet certain parameters, use the **ip multicast heartbeat** command in global configuration mode. To disable the heartbeat, use the **no** form of the command.

ip multicast heartbeat *group-address minimum-number window-size interval*

no ip multicast heartbeat *group-address minimum-number window-size interval*

Syntax Description

group-address	A multicast group address (Class D address, from 224.0.0.0 to 239.255.255.255)
minimum-number	Minimal number of intervals where the heartbeats must be seen. The number must be less than or equal to the window size.
window-size	Number of intervals to monitor for the heartbeat.
interval	Number of seconds interval to receive packet. Value must be a multiple of 10.

Defaults

Disabled

Command Modes

Global configuration

Command History

Release	Modification
12.1(3)T	This command was introduced.

Usage Guidelines

The subject group is joined at the subject interface so that multicast data for the subject group will be attracted toward the subject router.

The router monitors multicast packets destined to the group address at the *interval* value. This is a binary decision. That is, the number of packets seen in this period is not as important as whether any packet for the group is seen.

If multicast packets were observed in less than the *minimum-number* value out of the last *window-size* value intervals, a Simple Network Management Protocol (SNMP) trap would be sent from this router to a network management station to indicate a loss of heartbeat exception. This trap will be defined in CISCO-IPMROUTE-MIB.my.

The *interval* value must be a multiple of 10. In multicast distributed switching (MDS), statistics from the Versatile Interface Processor (in the Route Switch Processor) or the Label Controller (in the Gigabit Switch Router) are passed to the routing processor once every 10 seconds. Monitoring packets not in intervals of multiple of 10 seconds may lead to incorrect decisions.

This command does not create any multicast routing entries that are necessary for the monitoring of the heartbeat packets. These entries can be created by either the downstream members of the group, or with the **ip pim join-group** or **ip pim static-group** command. If a multicast routing entry corresponding to a group address expires due to lack of interest from the downstream members, the monitoring for the subject group would not work; that is, no more SNMP traps would be sent.

Examples

The following is an example configuration of the **ip multicast heartbeat** command:

```
snmp-server enable traps ipmulticast-heartbeat
ip multicast heartbeat 224.0.1.53 1 1 10
```

In this example, multicast packets forwarded through this router to group address 224.0.1.53 will be monitored. If no packet for this group is received in a 10-second interval, an SNMP trap will be sent to a designated SNMP management station.

Note It may take about 20 seconds of losing the multicast feed before the SNMP trap is sent.

Related Commands

Command	Description
debug ip mhbeat	Monitors the action of the heartbeat trap.
snmp-server enable traps	Enables the router to send SNMP traps.

ip multicast helper-map

To allow IP multicast routing in a multicast-capable internetwork between two broadcast-only internetworks, use the **ip multicast helper-map** command in interface configuration mode. To disable this function, use the **no** form of this command.

ip multicast helper-map {*group-address broadcast-address* | **broadcast** *multicast-address*} *access-list*

no ip multicast helper-map {*group-address broadcast-address* | **broadcast** *multicast-address*} *access-list*

Syntax Description

group-address	Multicast group address of traffic to be converted to broadcast traffic. Use this with the *broadcast-address* value.
broadcast-address	Address to which broadcast traffic is sent. Use this with the *group-address* value.
broadcast	Specifies the traffic is being converted from broadcast to multicast. Use this with the *multicast-address* value.
multicast-address	IP multicast address to which the converted traffic is directed. Use this with the **broadcast** keyword.
access-list	IP extended access list number or name that controls which broadcast packets are translated, based on the User Datagram Protocol (UDP) port number.

Defaults

No conversion between broadcast and multicast occurs.

Command Modes

Interface configuration

Command History

Release	Modification
11.1	This command was introduced.

Usage Guidelines

When a multicast-capable internetwork is between two broadcast-only internetworks, you can convert broadcast traffic to multicast at the first hop router, and convert it back to broadcast at the last hop router before delivering the packets to the broadcast clients. However, broadcast packets with the IP source address of 0.0.0.0 (such as a Dynamic Host Configuration Protocol [DHCP] request) will not be translated to any multicast group.

Thus, you can take advantage of the multicast capability of the intermediate multicast internetwork. This feature prevents unnecessary replication at the intermediate routers and allows multicast fast switching in the multicast internetwork.

If you need to send a directed broadcast to the subnet, the outgoing interface of the last hop router can be configured with an IP broadcast address of x.x.x.255, where x.x.x.0 is the subnet that you are trying to reach; otherwise the packet will be converted to 255.255.255.255.

Examples

The following example illustrates how a helper address on two routers converts from broadcast to multicast and back to broadcast.

The configuration on the first hop router converts a broadcast stream arriving at incoming interface Ethernet interface 0 destined to UDP port 4000 to a multicast stream. The access list denies other traffic from being forwarded into the multicast cloud. The traffic is sent to group address 224.5.5.5. Because fast switching does not perform such a conversion, the **ip forward-protocol** command causes the proper process level to perform the conversion.

The configuration on the last hop router converts the multicast stream at incoming interface Ethernet interface 1 back to broadcast. All multicast traffic emerging from the multicast cloud should not be converted to broadcast, only the traffic destined for UDP port 4000.

First Hop Router Configuration

```
interface ethernet 0
 ip directed-broadcast
 ip multicast helper-map broadcast 224.5.5.5 120
 ip pim dense-mode
!
access-list 120 permit any any udp 4000
access-list 120 deny any any udp
 ip forward-protocol udp 4000
```

Last Hop Router Configuration

```
interface ethernet 1
 ip directed-broadcast
 ip broadcast-address 172.16.0.0
 ip multicast helper-map 224.5.5.5 172.16.0.0
 ip pim dense-mode
!
access-list 135 permit any any udp 4000
access-list 135 deny any any udp
 ip forward-protocol udp 4000
```

Related Commands

Command	Description
ip directed-broadcast	Enables the translation of directed broadcast to physical broadcasts.
ip forward-protocol	Specifies which protocols and ports the router forwards when forwarding broadcast packets.

ip multicast multipath

To enable load splitting of IP multicast traffic across multiple equal-cost paths, use the **ip multicast multipath** command in global configuration mode. To disable this configuration, use the **no** form of this command.

ip multicast [**vrf** *vrf-name*] **multipath**

no ip multicast [**vrf** *vrf-name*] **multipath**

Syntax Description

vrf	(Optional) Supports the multicast VPN routing and forwarding (VRF) instance.
vrf-name	(Optional) Name assigned to the VRF.

Defaults

By default, if multiple equal-cost paths exist, multicast traffic will not be load split across these paths.

Command Modes

Global configuration

Command History

Release	Modification
12.0(8)T	This command was introduced.
12.0(5)S	This command was integrated into Cisco IOS Release 12.0(5)S.
12.0(23)S	The **vrf** keyword and *vrf-name* argument were added.
12.2(13)T	The **vrf** keyword and *vrf-name* argument were added.

Usage Guidelines

If the **ip multicast multipath** command is configured and multiple equal-cost paths exist, load splitting will occur across the equal-cost paths for multicast traffic from different sources to the same multicast group, but not for traffic from the same source to different multicast groups. Because this command changes the way a Reverse Path Forwarding (RPF) neighbor is selected, it must be configured consistently on all routers in a redundant topology to avoid looping.

Examples

The following example shows how to configure the **ip multicast multipath** command:

```
ip multicast multipath
```

Related Commands

Command	Description
show ip rpf	Displays how IP multicast routing does RPF.

ip multicast rate-limit

To control the rate a sender from the source list can send to a multicast group in the group list, use the **ip multicast rate-limit** command in interface configuration mode. To remove the control, use the **no** form of this command.

ip multicast rate-limit {**in** | **out**} [**video** | **whiteboard**] [**group-list** *access-list*] [**source-list** *access-list*] *kbps*

no ip multicast rate-limit {**in** | **out**} [**video** | **whiteboard**] [**group-list** *access-list*] [**source-list** *access-list*] *kbps*

Syntax Description

in	Accepts only packets at the rate of the *kbps* value or slower on the interface.
out	Sends only a maximum of the *kbps* value on the interface.
video	(Optional) Performs rate limiting based on the User Datagram Protocol (UDP) port number used by video traffic. Video traffic is identified by consulting the Session Announcement Protocol (SAP) cache.
whiteboard	(Optional) Performs rate limiting based on the UDP port number used by whiteboard traffic. Whiteboard traffic is identified by consulting the SAP cache.
group-list *access-list*	(Optional) Specifies the access list number or name that controls which multicast groups are subject to the rate limit.
source-list *access-list*	(Optional) Specifies the access list number or name that controls which senders are subject to the rate limit.
kbps	Transmission rate (in kbps). Any packets sent at greater than this value are silently discarded. The default value is 0, meaning that no traffic is permitted. Therefore, set this to a positive value.

Defaults

If this command is not configured, there is no rate limit.
If this command is configured, the *kbps* value defaults to 0, meaning that no traffic is permitted.

Command Modes

Interface configuration

Command History

Release	Modification
11.0	This command was introduced.

Usage Guidelines

If a router receives a packet the user has sent over the limit, the packet is dropped; otherwise, it is forwarded.

For the **video** or **whiteboard** keyword to work, the **ip sap listen** command must be enabled so that the port number can be obtained from the SAP cache. If the **ip sap listen** command is not enabled, or the group address is not in the SAP cache, no rate-limiting is done for the group.

Examples

In the following example, packets to any group from sources in network 172.16.0.0 will have their packets rate-limited to 64 kbps:

```
interface serial 0
 ip multicast rate-limit out group-list 1 source-list 2 64
access-list 1 permit 0.0.0.0 255.255.255.255
access-list 2 permit 172.16.0.0 0.0.255.255
```

Related Commands

Command	Description
ip sap listen	Enables the Cisco IOS software to listen to session directory advertisements.

ip multicast ttl-threshold

To configure the time-to-live (TTL) threshold of packets being forwarded out an interface, use the **ip multicast ttl-threshold** command in interface configuration mode. To return to the default TTL threshold, use the **no** form of this command.

ip multicast ttl-threshold *ttl-value*

no ip multicast ttl-threshold *ttl-value*

Syntax Description

ttl-value	Time-to-live value, in hops. It can be a value from 0 to 255. The default value is 0, which means that all multicast packets are forwarded out the interface.

Defaults

The default TTL value is 0, which means that all multicast packets are forwarded out the interface.

Command Modes

Interface configuration

Command History

Release	Modification
11.0	This command was introduced.

Usage Guidelines

Only multicast packets with a TTL value greater than the threshold are forwarded out the interface.

You should configure the TTL threshold only on border routers. Conversely, routers on which you configure a TTL threshold value automatically become border routers.

This command replaces the **ip multicast-threshold** command.

Examples

The following example sets the TTL threshold on a border router to 200, which is a very high value. In this example multicast packets must have a TTL greater than 200 in order to be forwarded out this interface. Multicast applications generally set this value well below 200. Therefore, setting a value of 200 means that no packets will be forwarded out the interface.

```
interface tunnel 0
 ip multicast ttl-threshold 200
```

ip multicast use-functional

To enable the mapping of IP multicast addresses to the Token Ring functional address 0xc000.0004.0000, use the **ip multicast use-functional** command in interface configuration mode. To disable the function, use the **no** form of this command.

ip multicast use-functional

no ip multicast use-functional

Syntax Description

This command has no arguments or keywords.

Defaults

IP multicast address are mapped to the MAC-layer address 0xFFFF.FFFF.FFFF.

Command Modes

Interface configuration

Command History

Release	Modification
11.1	This command was introduced.

Usage Guidelines

This command is accepted only on a Token Ring interface.

Neighboring devices on the Token Ring on which this feature is used should also use the same functional address for IP multicast traffic.

Because there are a limited number of Token Ring functional addresses, other protocols may be assigned to the Token Ring functional address 0xc000.0004.0000. Therefore, not every frame sent to the functional address is necessarily an IP multicast frame.

Examples

The following example configures any IP multicast packets going out Token Ring interface 0 to be mapped to MAC address 0xc000.0004.0000:

```
interface token 0
 ip address 1.1.1.1 255.255.255.0
 ip pim dense-mode
 ip multicast use-functional
```

ip pim

To enable Protocol Independent Multicast (PIM) on an interface, use the **ip pim** command in interface configuration mode. To disable PIM on the interface, use the **no** form of this command.

ip pim {**sparse-mode** | **sparse-dense-mode** | **dense-mode** [**proxy-register** {**list** *access-list* | **route-map** *map-name*}]}

no ip pim {**sparse-mode** | **sparse-dense-mode** | **dense-mode** [**proxy-register** {**list** *access-list* | **route-map** *map-name*}]}

Syntax Description

sparse-mode	Enables sparse mode of operation.
sparse-dense-mode	Treats the interface in either sparse mode or dense mode of operation, depending on which mode the multicast group operates in.
dense-mode	Enables dense mode of operation.
proxy-register	(Optional) Enables proxy registering on the interface of a designated router (DR) (leading toward the bordering dense mode region) for multicast traffic from sources not connected to the DR.
list *access-list*	(Optional) Defines the extended access list number or name.
route-map *map-name*	(Optional) Defines the route map.

Defaults

IP multicast routing is disabled on all interfaces.

Command Modes

Interface configuration

Command History

Release	Modification
10.0	This command was introduced.
11.1	The **sparse-dense-mode** keyword was added.
12.0 S	The following keywords and arguments were added: • **proxy-register** • **list** *access-list* • **route-map** *map-name*

Usage Guidelines

Enabling PIM on an interface also enables Internet Group Management Protocol (IGMP) operation on that interface. An interface can be configured to be in dense mode, sparse mode, or sparse-dense mode. The mode describes how the Cisco IOS software populates its multicast routing table and how the software forwards multicast packets it receives from its directly connected LANs. Dense mode interfaces are always added to the table when the multicast routing table is populated. Sparse mode interfaces are added to the table only when periodic join messages are received from downstream routers, or there is a directly connected member on the interface.

Dense Mode

Initially, a dense mode interface forwards multicast packets until the router determines that there are group members or downstream routers, or until a prune message is received from a downstream router. Then, the dense mode interface periodically forwards multicast packets out the interface until the same conditions occur. Dense mode assumes that multicast group members are present. Dense mode routers never send a join message. They do send prune messages as soon as they determine they have no members or downstream PIM routers. A dense mode interface is subject to multicast flooding by default.

Dense Mode with Proxy Registering

For a router in a PIM sparse mode (PIM-SM) domain configured to operate in sparse mode or sparse-dense mode, the **ip pim dense-mode proxy-register** command must be configured on the interface leading toward the bordering dense mode region. This configuration will enable the router to register traffic from the dense mode region with the rendezvous point (RP) in the sparse mode domain.

Prior to Cisco IOS Release 12.0 S, an RP needed to be running on the border router leading toward a dense mode region so that the RP could learn about traffic from sources in the dense mode region.

This command requires an extended access list or route map argument specifying which traffic the router needs to register with the RP. This command applies only to sources reachable through a PIM router. Cisco IOS software will always register traffic from remote sources if it arrives on a dense mode interface and if the Reverse Path Forwarding (RPF) neighbor leading toward the source is a Distance Vector Multicast Routing Protocol (DVMRP) but not a PIM router. This functionality has existed since Cisco IOS Release 10.0 and cannot be modified (restricted) with an access list or route map.

Sparse Mode

A sparse mode interface is used for multicast forwarding only if a join message is received from a downstream router or if group members are directly connected to the interface. Sparse mode assumes that no other multicast group members are present. When sparse mode routers want to join the shared path, they periodically send join messages toward the RP. When sparse mode routers want to join the source path, they periodically send join messages toward the source; they also send periodic prune messages toward the RP to prune the shared path.

Sparse-Dense Mode

An alternative to choosing just dense mode or just sparse mode is to run PIM in a single region in sparse mode for some groups and dense mode for other groups.

In sparse-dense mode, if the group is in dense mode, the interface will be treated as dense mode. If the group is in sparse mode, the interface will be treated in sparse mode. The group is “sparse” if the router knows about an RP for that group.

When an interface is treated in dense mode, it is populated in the outgoing interface list of the multicast routing table when either of the following conditions is true:

- Members or DVMRP neighbors are on the interface.
- Any of the PIM neighbors on the interface have not pruned for the group.

When an interface is treated in sparse mode, it is populated in the outgoing interface list of the multicast routing table when either of the following conditions is true:

- Members or DVMRP neighbors are on the interface.
- A PIM neighbor on the interface has received an explicit join message.

Examples

The following example shows how to enable PIM-SM on tunnel interface 0 and set the address of the RP router to 226.0.0.8:

```
ip pim rp-address 226.0.0.8
interface tunnel 0
  ip pim sparse-mode
```

The following example shows how to enable PIM dense mode (PIM-DM) on Ethernet interface 1:

```
interface ethernet 1
  ip pim dense-mode
```

The following example shows how to enable PIM sparse-dense mode on Ethernet interface 1:

```
interface ethernet 1
  ip pim sparse-dense-mode
```

The following example shows how to register the multicast traffic for any source and any multicast group:

```
interface ethernet 0
  ip address 172.16.0.0 255.255.255.0
  description Ethernet interface towards the PIM sparse-mode domain
  ip pim sparse-dense-mode
!
interface ethernet 1
  ip address 192.44.81.5 255.255.255.0
  description Ethernet interface towards the PIM dens-mode region
  ip pim dense-mode proxy-register list 100
!
access-list 100 permit ip any any
```

Related Commands

Command	Description
ip multicast-routing	Enables IP multicast routing or multicast distributed switching.
ip pim rp-address	Configures the address of a PIM RP for a particular group.
show ip pim interface	Displays information about interfaces configured for PIM.

ip pim accept-register

To configure a candidate rendezvous point (RP) router to filter Protocol Independent Multicast (PIM) register messages, use the **ip pim accept-register** command in global configuration mode. To disable this function, use the **no** form of this command.

ip pim [**vrf** *vrf-name*] **accept-register** {**list** *access-list* | **route-map** *map-name*}

no ip pim [**vrf** *vrf-name*] **accept-register** {**list** *access-list* | **route-map** *map-name*}

Syntax Description

vrf	(Optional) Supports the multicast Virtual Private Network (VPN) routing and forwarding (VRF) instance.
vrf-name	(Optional) Name assigned to the VRF.
list *access-list*	Defines the extended access list number or name.
route-map *map-name*	Defines the route map.

Defaults

The command is disabled.

Command Modes

Global configuration

Command History

Release	Modification
12.0(7)T	This command was introduced.
12.0(23)S	The **vrf** keyword and *vrf-name* argument were added.
12.2(13)T	The **vrf** keyword and *vrf-name* argument were added.

Usage Guidelines

Use this command to prevent unauthorized sources from registering with the RP. If an unauthorized source sends a register message to the RP, the RP will immediately send back a register-stop message.

Examples

The following example shows how to restrict the RP from allowing sources in the Source Specific Multicast (SSM) range of addresses to register with the RP. These statements need to be configured only on the RP.

```
ip pim accept-register list no-ssm-range

ip access-list extended no-ssm-range
 deny ip any 232.0.0.0 0.255.255.255
 permit ip any any
```

ip pim accept-rp

To configure a router to accept join or prune messages destined for a specified rendezvous point (RP) and for a specific list of groups, use the **ip pim accept-rp** command in global configuration mode. To remove that check, use the **no** form of this command.

ip pim [**vrf** *vrf-name*] **accept-rp** {*rp-address* | **auto-rp**} [*access-list*]

no ip pim [**vrf** *vrf-name*] **accept-rp** {*rp-address* | **auto-rp**} [*access-list*]

Syntax Description

vrf	(Optional) Supports the multicast Virtual Private Network (VPN) routing and forwarding (VRF) instance.
vrf-name	(Optional) Name assigned to the VRF.
rp-address	RP address of the RP allowed to send join messages to groups in the range specified by the group access list.
auto-rp	Accepts join and register messages only for RPs that are in the Auto-RP cache.
access-list	(Optional) Access list number or name that defines which groups are subject to the check.

Defaults

The command is disabled, so all join messages and prune messages are processed.

Command Modes

Global configuration

Command History

Release	Modification
10.2	This command was introduced.
12.0(23)S	The **vrf** keyword and *vrf-name* argument were added.
12.2(13)T	The **vrf** keyword and *vrf-name* argument were added.

Usage Guidelines

This command causes the router to accept only (*, G) join messages destined for the specified RP address. Additionally, the group address must be in the range specified by the access list.

When the *rp-address* argument is one of the addresses of the system, the system will be the RP only for the specified group range specified by the access list. When the group address is not in the group range, the RP will not accept join or register messages and will respond immediately to register messages with register-stop messages.

Examples

The following example states that the router will accept join or prune messages destined for the RP at address 172.17.1.1 for the multicast group 224.2.2.2:

```
ip pim accept-rp 172.17.1.1 3
access-list 3 permit 224.2.2.2
```

Related Commands

Command	Description
access-list (IP standard)	Defines a standard IP access list.

ip pim autorp listener

To cause IP multicast traffic for the two Auto-RP groups 224.0.1.39 and 224.0.1.40 to be Protocol Independent Multicast (PIM) dense mode flooded across interfaces operating in PIM sparse mode, use the **ip pim autorp listener** command in global configuration mode. To disable this feature, use the **no** form of this command.

ip pim autorp listener

no ip pim autorp listener

Syntax Description

This command has no arguments or keywords.

Defaults

Disabled

Command Modes

Global configuration

Command History

Release	Modification
12.2(7)	This command was introduced.

Usage Guidelines

Use the **ip pim autorp listener** command with interfaces configured for PIM sparse mode operation in order to establish a network configuration where Auto-RP operates in PIM dense mode and multicast traffic can operate in sparse mode, bidirectional mode, or source specific multicast (SSM) mode.

Examples

The following example enables IP multicast routing and the Auto-RP listener feature on a router. It also configures the router as a Candidate RP for the multicast groups 239.254.2.0 through 239.254.2.255.

```
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
access-list 1 permit 239.254.2.0 0.0.0.255
```

ip pim bidir-enable

To enable bidirectional Protocol Independent Multicast (bidir-PIM), use the **ip pim bidir-enable** command in global configuration mode. To disable bidir-PIM, use the **no** form of this command.

ip pim [**vrf** *vrf-name*] **bidir-enable**

no ip pim [**vrf** *vrf-name*] **bidir-enable**

Syntax Description

vrf	(Optional) Supports the multicast Virtual Private Network (VPN) routing and forwarding (VRF) instance.
vrf-name	(Optional) Name assigned to the VRF.

Defaults

The command is enabled.

Command Modes

Global configuration

Command History

Release	Modification
12.0(18)ST	This command was introduced.
12.0(23)S	The **vrf** keyword and *vrf-name* argument were added.
12.2	This command was integrated into Cisco IOS Release 12.2.
12.2(13)T	This command was integrated into Cisco IOS Release 12.2(13)T.

Usage Guidelines

Bidir-PIM is disabled by default to ensure complete backward compatibility when upgrading a router to Cisco IOS Release 12.0(18)ST or a later release.

When bidir-PIM is disabled, the router will behave similarly to a router without bidir-PIM support. The following conditions will apply:

- PIM hello messages sent by the router will not contain the bidirectional mode option.
- The router will not send designated forwarder (DF) election messages and will ignore DF election messages it receives.
- The **ip pim rp-address, ip pim send-rp-announce**, and **ip pim rp-candidate** global configuration commands will be treated as follows:
  - If these commands are configured when bidir-PIM is disabled, bidirectional mode will not be a configuration option.
  - If these commands are configured with the bidirectional mode option when bidir-PIM is enabled and then bidir-PIM is disabled, these commands will be removed from the command-line interface (CLI). In this situation, these commands must be configured again with the bidirectional mode option when bidir-PIM is reenabled.
- The **df** keyword for the **show ip pim interface** user EXEC or privileged EXEC command and **debug ip pim** privileged EXEC command is not supported.

Examples

The following example shows how to configure a rendezvous point (RP) for both sparse mode and bidirectional mode groups: 224/8 and 227/8 are bidirectional groups, 226/8 is sparse mode, and 225/8 is dense mode. The RP must be configured to use different IP addresses for the sparse mode and bidirectional mode operations. Two loopback interfaces are used to allow this configuration. The addresses of these loopback interfaces must be routed throughout the PIM domain such that the other routers in the PIM domain can receive Auto-RP announcements and communicate with the RP.

```
ip multicast-routing !Enable IP multicast routing
ip pim bidir-enable  !Enable bidir-PIM
!
interface loopback 0
description One Loopback adddress for this routers Bidir Mode RP function
ip address 10.0.1.1 255.255.255.0
 ip pim sparse-dense-mode
!
interface loopback 1
 description One Loopback adddress for this routers Sparse Mode RP function
 ip address 10.0.2.1 255.255.255.0
 ip pim sparse-dense-mode

ip pim send-rp-announce Loopback0 scope 10 group-list 45 bidir
ip pim send-rp-announce Loopback1 scope 10 group-list 46
ip pim send-rp-discovery scope 10

access-list 45 permit 224.0.0.0 0.255.255.255
access-list 45 permit 227.0.0.0 0.255.255.255
access-list 45 deny   225.0.0.0 0.255.255.255

access-list 46 permit 226.0.0.0 0.255.255.255
```

Related Commands

Command	Description
debug ip pim	Displays PIM packets received and sent, and to display PIM-related events.
ip pim rp-address	Configures the address of a PIM RP for a particular group.
ip pim rp-candidate	Configures the router to advertise itself as a PIM Version 2 candidate RP to the BSR.
ip pm send-rp-announce	Uses Auto-RP to configure for which groups the router is willing to act as RP.

ip pim border

The **ip pim border** command is replaced by the **ip pim bsr-border** command. See the description of the **ip pim bsr-border** command in this chapter for more information.

ip pim bsr-border

To prevent bootstrap router (BSR) messages from being sent or received through an interface, use the **ip pim bsr-border** command in interface configuration mode. To disable this configuration, use the **no** form of this command.

ip pim bsr-border

no ip pim bsr-border

Syntax Description

This command has no arguments or keywords.

Defaults

Disabled

Command Modes

Interface configuration

Command History

Release	Modification
11.3 T	The **ip pim border** command was introduced.
12.0(8)	The **ip pim border** command was replaced by the **ip pim bsr-border** command.

Usage Guidelines

When this command is configured on an interface, no PIM Version 2 BSR messages will be sent or received through the interface. Configure an interface bordering another PIM domain with this command to avoid BSR messages from being exchanged between the two domains. BSR messages should not be exchanged between different domains, because routers in one domain may elect rendezvous points (RPs) in the other domain, resulting in protocol malfunction or loss of isolation between the domains.

Note This command does not set up multicast boundaries. It only sets up a PIM domain BSR message border.

Examples

The following example configures the interface to be the PIM domain border:

```
interface ethernet 1
ip pim bsr-border
```

Related Commands

Command	Description
ip multicast boundary	Configures an administratively scoped boundary.
ip pim bsr-candidate	Configures the router to announce its candidacy as a BSR.

ip pim bsr-candidate

To configure the router to announce its candidacy as a bootstrap router (BSR), use the **ip pim bsr-candidate** command in global configuration mode. To remove this router as a candidate for being a bootstrap router, use the **no** form of this command.

ip pim [**vrf** *vrf-name*] **bsr-candidate** *interface-type interface-number* [*hash-mask-length*] [*priority*]

no ip pim [**vrf** *vrf-name*] **bsr-candidate** *interface-type interface-number* [*hash-mask-length*] [*priority*]

Syntax Description

vrf	(Optional) Supports the multicast Virtual Private Network (VPN) routing and forwarding (VRF) instance.
vrf-name	(Optional) Name assigned to the VRF.
interface-type interface-number	Interface type and number on this router from which the BSR address is derived, to make it a candidate. This interface must be enabled with Protocol Independent Multicast (PIM).
hash-mask-length	(Optional) Length of a mask (32 bits maximum) that is to be ANDed with the group address before the hash function is called. All groups with the same seed hash (correspond) to the same RP. For example, if this value is 24, only the first 24 bits of the group addresses matter. This fact allows you to get one RP for multiple groups.
priority	(Optional) Priority of the candidate BSR. Integer from 0 to 255. The BSR with the larger priority is preferred. If the priority values are the same, the router with the larger IP address is the BSR. The default value is 0.

Defaults

The command is disabled.
priority: 0

Note The Cisco IOS implementation of PIM BSR uses the value 0 as the default priority for candidate RPs and BSRs. This implementation predates the draft-ietf-pim-sm-bsr IETF draft, the first IETF draft to specify 192 as the default priority value. The Cisco IOS implementation, thus, deviates from the IETF draft. To comply with the default priority value specified in the draft, you must explicitly set the priority value to 192.

Command Modes

Global configuration

Command History

Release	Modification
11.3 T	This command was introduced.
12.0(23)S	The **vrf** keyword and *vrf-name* argument were added.
12.2(13)T	The **vrf** keyword and *vrf-name* argument were added.

Usage Guidelines

This command causes the router to send bootstrap messages to all its PIM neighbors, with the address of the designated interface as the BSR address. Each neighbor compares the BSR address with the address it had from previous bootstrap messages (not necessarily received on the same interface). If the current address is the same or higher address, it caches the current address and forwards the bootstrap message. Otherwise, it drops the bootstrap message.

This router continues to be the BSR until it receives a bootstrap message from another candidate BSR saying that it has a higher priority (or if the same priority, a higher IP address).

Use this command only in backbone routers that have good connectivity to all parts of the PIM domain. That is, a stub router that relies on an on-demand dialup link to connect to the rest of the PIM domain is not a good candidate BSR.

Examples

The following example shows how to configure the IP address of the router on Ethernet interface 0/0 to be a candidate BSR with priority of 192:

```
ip pim bsr-candidate ethernet 0/0 192
```

Related Commands

Command	Description
ip pim border	Configures the interface to be the PIM domain border.
ip pim rp-candidate	Configures the router to advertise itself as a PIM Version 2 candidate RP to the BSR.
ip pim send-rp-discovery	Configures the router to be an RP-mapping agent.
show ip pim bsr	Displays the BSR information.
show ip pim rp	Displays active RPs that are cached with associated multicast routing entries.

ip pim dr-priority

To set the priority for which a router is elected as the designated router (DR), use the **ip pim dr-priority** command in interface configuration mode. To disable this function, use the **no** form of this command.

ip pim dr-priority *priority-value*

no ip pim dr-priority *priority-value*

Syntax Description

priority-value	Value in the range from 0 to 4294967294 used to determine the priority of the router to be selected as the DR.

Defaults

Disabled

Command Modes

Interface configuration

Command History

Release	Modification
12.1(2)T	This command was introduced.

Usage Guidelines

When a DR is elected, the following conditions apply:

- The router with the highest priority value configured on an interface will be elected as the DR. If this priority value is the same on multiple routers, then the router with the highest IP address configured on an interface will be elected as the DR.
- If a router does not advertise a priority value in its hello messages, the router is regarded as having the highest priority and will be elected as the DR. If there are multiple routers with this priority status, then the router with the highest IP address configured on an interface will be elected as the DR.

Examples

The following example sets the DR priority value of the Ethernet0 interface to 200:

```
interface Ethernet0
  ip address 10.0.1.2 255.255.255.0
  ip pim dr-priority 200
```

ip pim minimum-vc-rate

To configure the minimum traffic rate to keep virtual circuits (VCs) from being idled, use the **ip pim minimum-vc-rate** command in interface configuration mode. To restore the default value, use the **no** form of this command.

ip pim minimum-vc-rate *pps*

no ip pim minimum-vc-rate [*pps*]

Syntax Description

pps	Rate, in packets per second, below which a VC is eligible for idling. The default value is 0, which means all VCs are eligible for idling. The range is from 0 to 4294967295.

Defaults

0 pps, which indicates all VCs are eligible for idling.

Command Modes

Interface configuration

Command History

Release	Modification
11.3	This command was introduced.

Usage Guidelines

This command applies to an ATM interface only and also requires IP Protocol Independent Multicast sparse mode (PIM-SM).

An idling policy uses the **ip pim vc-count** *number* command to limit the number of VCs created by PIM. When the router stays at or below this number, no idling policy is in effect. When the next VC to be opened will exceed the number, an idling policy is exercised. Any virtual circuits with a traffic rate lower than the **ip pim minimum-vc-rate** command are subject to the idling policy, which is described in the section "Limit the Number of Virtual Circuits" in the "Configuring IP Multicast Routing" chapter of the *Cisco IOS IP Configuration Guide*.

Examples

The following example configures a minimum rate of 2500 pps over a VC, below which the VC is eligible for idling:

```
ip pim minimum-vc-rate 2500
```

Related Commands

Command	Description
ip pim vc-count	Changes the maximum number of VCs that PIM can open.

ip pim multipoint-signalling

To enable Protocol Independent Multicast (PIM) to open ATM multipoint switched virtual circuits (VCs) for each multicast group that a receiver joins, use the **ip pim multipoint-signalling** command in interface configuration mode. To disable the feature, use the **no** form of this command.

ip pim multipoint-signalling

no ip pim multipoint-signalling

Syntax Description

This command has no arguments or keywords.

Defaults

Disabled.

All multicast traffic goes to the static map multipoint VC as long as the **atm multipoint-signalling** command is configured.

Command Modes

Interface configuration

Command History

Release	Modification
11.3	This command was introduced.

Usage Guidelines

This command is accepted only on an ATM interface. It allows optimal multicast trees to be built down to ATM switch granularity. This command can enhance router performance and link utilization because packets are not replicated and sent multiple times over the ATM interface.

Examples

The following example enables PIM to open ATM multipoint switched VCs for each multicast group that is joined:

```
ip pim multipoint-signalling
```

Related Commands

Command	Description
atm multipoint-signalling	Enables point-to-multipoint signalling to the ATM switch.
ip pim minimum-vc-rate	Configures the minimum traffic rate to keep VCs from being idled.
ip pim vc-count	Changes the maximum number of VCs that PIM can open.
show ip pim vc	Displays ATM virtual circuit status information for multipoint VCs opened by PIM.

ip pim nbma-mode

To configure a multiaccess WAN interface to be in nonbroadcast multiaccess (NBMA) mode, use the **ip pim nbma-mode** command in interface configuration mode. To disable this function, use the **no** form of this command.

ip pim nbma-mode

no ip pim nbma-mode

Syntax Description

This command has no arguments or keywords.

Defaults

Disabled

Command Modes

Interface configuration

Command History

Release	Modification
11.0	This command was introduced.

Usage Guidelines

Use this command on Frame Relay, Switched Multimegabit Data Service (SMDS), or ATM only, especially when these media do not have native multicast available. Do not use this command on multicast-capable LANs such as Ethernet or FDDI.

When this command is configured, each Protocol Independent Multicast (PIM) join message is tracked in the outgoing interface list of a multicast routing table entry. Therefore, only PIM WAN neighbors that have joined for the group will get packets sent as data-link unicasts. This command should only be used when the **ip pim sparse-mode** command is configured on the interface. This command is not recommended for LANs that have natural multicast capabilities.

Examples

The following example configures an interface to be in NBMA mode:

```
ip pim nbma-mode
```

Related Commands

Command	Description
ip pim	Enables PIM on an interface.

ip pim neighbor-filter

To prevent a router from participating in Protocol Independent Multicast (PIM) (for example, to configure stub multicast routing), use the **ip pim neighbor-filter** command in interface configuration mode. To remove the restriction, use the **no** form of this command.

ip pim neighbor-filter *access-list*

no ip pim neighbor-filter *access-list*

Syntax Description

access-list	Number or name of a standard IP access list that denies PIM packets from a source.

Defaults

Disabled

Command Modes

Interface configuration

Command History

Release	Modification
11.3	This command was introduced.

Examples

The following example enables stub multicast routing on Router A, which has an outgoing interface with IP address 10.0.0.1. Router B is a central router with an incoming interface with address 10.0.0.2. Access list 1 filters PIM messages from the source (stub Router A).

Router A Configuration

```
ip multicast-routing
ip pim dense-mode
ip igmp helper-address 10.0.0.2
```

Router B Configuration

```
ip multicast-routing
 ip pim dense-mode : or ip pim sparse-mode
 ip pim neighbor-filter 1
access-list 1 deny 10.0.0.1
```

Related Commands

Command	Description
access-list (IP standard)	Defines a standard IP access list.
ip igmp helper-address	Causes the system to forward all IGMP host reports and leave messages received on the interface to the specified IP address.

ip pim query-interval

To configure the frequency of Protocol Independent Multicast (PIM) router query messages, use the **ip pim query-interval** command in interface configuration mode. To return to the default interval, use the **no** form of this command.

ip pim query-interval *seconds*

no ip pim query-interval [*seconds*]

Syntax Description

seconds	Interval, in seconds, at which periodic PIM router query messages are sent. It can be a number from 1 to 65535. The default is 30 seconds.

Defaults

30 seconds

Command Modes

Interface configuration

Command History

Release	Modification
10.0	This command was introduced.

Usage Guidelines

Routers configured for IP multicast send PIM router query messages to determine which router will be the designated router for each LAN segment (subnet). The designated router is responsible for sending Internet Group Management Protocol (IGMP) host query messages to all hosts on the directly connected LAN. When operating in sparse mode, the designated router is responsible for sending source registration messages to the RP. The designated router is the router with the largest IP address.

Examples

The following example changes the PIM router query message interval to 45 seconds:

```
interface tunnel 0
 ip pim query-interval 45
```

Related Commands

Command	Description
ip igmp query-interval	Configures the frequency at which the Cisco IOS software sends IGMP host query messages.

ip pim register-rate-limit

To set a limit on the maximum number of Protocol Independent Multicast sparse mode (PIM-SM) register messages sent per second for each (S, G) routing entry, use the **ip pim register-rate-limit** command in global configuration mode. To disable this limit, use the **no** form of this command.

ip pim [**vrf** *vrf-name*] **register-rate-limit** *rate*

no ip pim [**vrf** *vrf-name*] **register-rate-limit** *rate*

Syntax Description

vrf	(Optional) Supports the multicast Virtual Private Network (VPN) routing and forwarding (VRF) instance.
vrf-name	(Optional) Name assigned to the VRF.
rate	Maximum number of register messages sent per second by the router. If no limit is defined, the router will not limit the rate of register messages sent.

Defaults

No limit is defined.

Command Modes

Global configuration

Command History

Release	Modification
11.3 T	This command was introduced.
12.0(23)S	The **vrf** keyword and *vrf-name* argument were added.
12.2(13)T	The **vrf** keyword and *vrf-name* argument were added.

Usage Guidelines

Use this command to limit the number of register messages that the designated router (DR) will allow for each (S, G) entry. Enabling this command will limit the load on the DR and RP at the expense of dropping those register messages that exceed the set limit. Receivers may experience data packet loss within the first second in which register messages are sent from bursty sources.

If the **ip pim dense-mode proxy-register** command is configured, then the **ip pim register-rate-limit** command must be configured because of the potentially large number of sources from the dense mode area that may send data into the sparse mode region (and thus need registering in the border router).

This command applies only to sparse mode (S, G) multicast routing entries.

Examples

The following example shows how to configure the **ip pim register-rate-limit** command with a maximum rate of two register messages per second:

```
ip pim register-rate-limit 2
```

Related Commands

Command	Description
ip pim	Enables PIM on an interface.

ip pim register-source

To configure the IP source address of a register message to an interface address other than the outgoing interface address of the designated router (DR) leading toward the rendezvous point (RP), use the **ip pim register-source** command in global configuration mode. To disable this configuration, use the **no** form of this command.

ip pim [**vrf** *vrf-name*] **register-source** *interface-type interface-number*

no ip pim [**vrf** *vrf-name*] **register-source** *interface-type interface-number*

Syntax Description

vrf	(Optional) Supports the multicast Virtual Private Network (VPN) routing and forwarding (VRF) instance.
vrf-name	(Optional) Name assigned to the VRF.
interface-type interface-number	Interface type and interface number that identify the IP source address of a register message.

Defaults

By default, the IP address of the outgoing interface of the DR leading toward the RP is used as the IP source address of a register message.

Command Modes

Global configuration

Command History

Release	Modification
12.0(8)T	This command was introduced.
12.0(23)S	The **vrf** keyword and *vrf-name* argument were added.
12.2(13)T	The **vrf** keyword and *vrf-name* argument were added.

Usage Guidelines

This command is required only when the IP source address of a register message is not a uniquely routed address to which the RP can send packets. This situation may occur if the source address is filtered such that packets sent to it will not be forwarded or if the source address is not unique to the network. In these cases, the replies sent from the RP to the source address will fail to reach the DR, resulting in Protocol Independent Multicast sparse mode (PIM-SM) protocol failures.

If no IP source address is configured or if the configured source address is not in service, the IP address of the outgoing interface of the DR leading toward the RP is used as the IP source address of the register message. Therefore, we recommend using a loopback interface with an IP address that is uniquely routed throughout the PIM-SM domain.

Examples

The following example shows how to configure the IP source address of the register message to the loopback 3 interface of a DR:

```
ip pim register-source loopback 3
```

ip pim rp-address

To configure the address of a Protocol Independent Multicast (PIM) rendezvous point (RP) for a particular group, use the **ip pim rp-address** command in global configuration mode. To remove an RP address, use the **no** form of this command.

ip pim rp-address *rp-address* [*access-list*] [**override**] [**bidir**]

no ip pim rp-address *rp-address* [*access-list*] [**override**] [**bidir**]

Syntax Description

rp-address	IP address of a router to be a PIM RP. This is a unicast IP address in four-part dotted-decimal notation.
access-list	(Optional) Number or name of an access list that defines for which multicast groups the RP should be used.
override	(Optional) Indicates that if there is a conflict, the RP configured with this command prevails over the RP learned by Auto-RP.
bidir	(Optional) Indicates that the multicast groups specified by the *access-list* argument are to operate in bidirectional mode. If the command is configured without this option, the groups specified will operate in PIM sparse mode.

Defaults

No PIM RPs are preconfigured.

Command Modes

Global configuration

Command History

Release	Modification
10.2	This command was introduced.
11.1	The **override** keyword was added.
12.1(2)T	The **bidir** keyword was added.

Usage Guidelines

In the Cisco IOS implementation of PIM, each multicast group individually operates in one of the following modes: dense mode, sparse mode, or bidirectional mode. Groups in sparse mode or bidirectional mode need to have the IP address of one router to operate as the RP for the group. All routers in a PIM domain need to have a consistent configuration for the mode and RP addresses of the multicast groups.

The Cisco IOS software learns the mode and RP addresses of multicast groups via the following three mechanisms: static configuration, Auto-RP, and bootstrap router (BSR). Use the **ip pim rp-address** command to statically define the mode of operations and RP address for multicast groups that are to operate in sparse mode or bidirectional mode. By default, groups will operate in dense mode. No commands explicitly define groups to operate in dense mode.

You can configure the Cisco IOS software to use a single RP for more than one group. The conditions specified by the access list determine for which groups the RP can be used. If no access list is configured, the RP is used for all groups. A PIM router can use multiple RPs, but only one per group.

If multiple **ip pim rp-address** commands are configured, the following rules apply to a multicast group:

- Highest RP IP address selection: If a group is matched by the access list of more than one **ip pim rp-address** command whose prefix masks are all the same lengths, then the mode and RP for the group are determined by the **ip pim rp-address** command with the highest RP address parameter.
- Static evaluation: The mode and RP selection for a group are static and do not depend on the reachability of the individual RPs. The router will not start using an RP with a lower IP address or a shorter prefix length match if the better RP is not reachable. Use Auto-RP, BSR, or Anycast-RP to configure redundancy.
- One IP address per command: An IP address can be used as a parameter for only one **ip pim rp-address** command. If an **ip pim rp-address** command is configured with an IP address parameter that was previously used to configure an older **ip pim rp-address** command, then this old command will be replaced with the newly configured command. This restriction also means that only one IP address can be used to provide RP functions for either sparse mode or bidirectional mode groups. Use different IP addresses of the same router to provide RP functions for both sparse mode and bidirectional mode from the same router.
- One access list per command: A specific access list can be used as a parameter for only one **ip pim rp-address** command. If an **ip pim rp-address** command is configured with an access list parameter that was previously used to configure an older **ip pim rp-address** command, then this old command will be replaced with the newly configured command.

Static definitions for the group mode and RP address of the **ip pim rp-address** command may be used together with dynamically learned group mode and RP address mapping through Auto-RP or BSR. The following rules apply to a multicast group:

- Group mode and RP address mappings learned through Auto-RP and BSR take precedence over mappings statistically defined by the **ip pim rp-address** command without the **override** keyword. Commands with the **override** keyword take precedence over dynamically learned mappings.
- If you are using Auto-RP to distribute group-to-RP mappings, use the **bidir** keyword with the **ip pim send-rp-announce** command.
- If you are using the PIM Version 2 bootstrap mechanism to distribute group-to-RP mappings, use the **bidir** keyword with the **ip pim rp-candidate** command.

Examples

The following example sets the PIM RP address to 192.168.0.0 for all multicast groups and defines all groups to operate in sparse mode:

```
ip pim rp-address 192.168.0.0
```

Note The same RP cannot be used for both bidirectional and sparse mode groups.

The following example sets the PIM RP address to 172.16.0.0 for the multicast group 225.2.2.2 only:

```
access list 1 225.2.2.2 0.0.0.0
 ip pim rp-address 172.16.0.0
```

Related Commands

Command	Description
access-list (IP standard)	Defines a standard IP access list.
ip pim rp-candidate	Configures the router to advertise itself as a PIM Version 2 candidate RP to the bootstrap router.
ip pim send-rp-announce	Uses Auto-RP to configure for which groups the router is willing to act as RP.

ip pim rp-announce-filter

To filter incoming Auto-RP announcement messages coming from the rendezvous point (RP), use the **ip pim rp-announce-filter** command in global configuration mode. To remove the filter, use the **no** form of this command.

ip pim [**vrf** *vrf-name*] **rp-announce-filter rp-list** *access-list* **group-list** *access-list*

no ip pim [**vrf** *vrf-name*] **rp-announce-filter rp-list** *access-list* **group-list** *access-list*

Syntax Description

vrf	(Optional) Supports the multicast Virtual Private Network (VPN) routing and forwarding (VRF) instance.
vrf-name	(Optional) Name assigned to the VRF.
rp-list *access-list*	Specifies the number or name of a standard access list of RP addresses that are allowable for the group ranges supplied in the **group-list** *access-list* combination.
group-list *access-list*	Specifies the number or name of a standard access list that describes the multicast groups the RPs serve.

Defaults

All RP announcements are accepted.

Command Modes

Global configuration

Command History

Release	Modification
11.1	This command was introduced.
12.0(23)S	The **vrf** keyword and *vrf-name* argument were added.
12.2(13)T	The **vrf** keyword and *vrf-name* argument were added.

Usage Guidelines

Configure this command on the Protocol Independent Multicast (PIM) RP mapping agent. We recommend that if you use more than one RP mapping agent, make the filters among them consistent so that there are no conflicts in mapping state when the announcing agent goes down.

Examples

The following example configures the router to accept RP announcements from RPs in access list 1 for group ranges described in access list 2:

```
ip pim rp-announce-filter rp-list 1 group-list 2
access-list 1 permit 10.0.0.1
access-list 1 permit 10.0.0.2
access-list 2 permit 224.0.0.0 192.168.255.255
```

Related Commands

Command	Description
access-list (IP standard)	Defines a standard IP access list.

ip pim rp-candidate

To configure the router to advertise itself to the bootstrap router (BSR) as a Protocol Independent Multicast (PIM) Version 2 candidate rendezvous point (RP), use the **ip pim rp-candidate** command in global configuration mode. To remove this router as an RP candidate, use the **no** form of this command.

ip pim [**vrf** *vrf-name*] **rp-candidate** *interface-type interface-number* [**bidir**] [**group-list** *access-list*] [**interval** *seconds*] [**priority** *value*]

no ip pim [**vrf** *vrf-name*] **rp-candidate**

Syntax Description

vrf	(Optional) Supports the multicast Virtual Private Network (VPN) routing and forwarding (VRF) instance.
vrf-name	(Optional) Name assigned to the VRF.
interface-type interface-number	The IP address associated with this interface type and number is advertised as a candidate RP address.
bidir	(Optional) Indicates that the multicast groups specified by the *access-list* argument are to operate in bidirectional mode. If the command is configured without this option, the groups specified will operate in PIM sparse mode.
group-list *access-list*	(Optional) Specifies the standard IP access list number or name that defines the group prefixes that are advertised in association with the RP address. The access list name cannot contain a space or quotation mark, and must begin with an alphabetic character to avoid confusion with numbered access lists.
interval *seconds*	(Optional) Indicates the RP candidate advertisement interval. The range is from 1 to 16383 seconds. The default value is 60 seconds.
priority *value*	(Optional) Indicates the RP priority value. The range is from 0 to 255. The default value is 0.

Defaults

The command is disabled.
seconds: 60
priority: 0

Note The Cisco IOS implementation of PIM BSR uses the value 0 as the default priority for candidate RPs and BSRs. This implementation predates the draft-ietf-pim-sm-bsr IETF draft, the first IETF draft to specify 192 as the default priority value. The Cisco IOS implementation, thus, deviates from the IETF draft. To comply with the default priority value specified in the draft, you must explicitly set the priority value to 192.

Command Modes

Global configuration

Command History

Release	Modification
11.3 T	This command was introduced.
12.1(2)T	The **bidir** keyword was added.

Release	Modification
12.0(23)S	The **vrf** keyword and *vrf-name* argument were added.
12.2(13)T	The **vrf** keyword and *vrf-name* argument were added.

Usage Guidelines

This command causes the router to send a PIM Version 2 message advertising itself as a candidate RP to the BSR. The addresses allowed by the access list, together with the router identified by the type and number, constitute the RP and its range of addresses for which it is responsible.

Use this command only in backbone routers that have good connectivity to all parts of the PIM domain. That is, a stub router that relies on an on-demand dialup link to connect to the rest of the PIM domain is not a good candidate RP.

Use this command with the **bidir** keyword when you want bidirectional forwarding and you are using the PIM Version 2 BSR mechanism to distribute group-to-RP mappings. Other options are as follows:

- If you are using Auto-RP to distribute group-to-RP mappings, use the **bidir** keyword with the **ip pim send-rp-announce** command.
- If you are not distributing group-to-RP mappings using either Auto-RP or the PIM Version 2 BSR mechanism, use the **bidir** keyword with the **ip pim rp-address** command.

When the **interval** keyword is specified, the candidate RP advertisement interval is set to a value specified by the *seconds* argument. The default interval is 60 seconds. Reducing this interval to a time of less than 60 seconds can reduce the time required to fail over to a secondary RP at the expense of generating more PIM Version 2 messages.

Examples

The following example shows how to configure the router to advertise itself as a candidate RP to the BSR in its PIM domain. Standard access list number 4 specifies the group prefix associated with the RP that has the address identified by Ethernet interface 2. That RP is responsible for the groups with the prefix 239.

```
ip pim rp-candidate ethernet 2 group-list 4
 access-list 4 permit 239.0.0.0 0.255.255.255
```

Related Commands

Command	Description
ip pim bsr-candidate	Configures the router to announce its candidacy as a BSR.
ip pim rp-address	Configures the address of a PIM RP for a particular group.
ip pim rp-announce-filter	Filters incoming Auto-RP announcement messages coming from the RP.
ip pim send-rp-announce	Uses Auto-RP to configure for which groups the router is willing to act as RP.

ip pim send-rp-announce

To use Auto-RP to configure groups for which the router will act as a rendezvous point (RP), use the **ip pim send-rp-announce** command in global configuration mode. To unconfigure this router as an RP, use the **no** form of this command.

ip pim [**vrf** *vrf-name*] **send-rp-announce** *interface-type interface-number* **scope** *ttl-value* [**group-list** *access-list*] [**interval** *seconds*] [**bidir**]

no ip pim [**vrf** *vrf-name*] **send-rp-announce** *interface-type interface-number* **scope** *ttl-value* [**group-list** *access-list*] [**interval** *seconds*] [**bidir**]

Syntax Description

vrf	(Optional) Supports the multicast Virtual Private Network (VPN) routing and forwarding (VRF) instance.
vrf-name	(Optional) Name assigned to the VRF.
interface-type interface-number	Interface type and number that is used to define the RP address. No space is required between the values.
scope *ttl-value*	Specifies the time-to-live (TTL) value that limits the number of Auto-RP announcements.
group-list *access-list*	(Optional) Specifies the standard IP access list number or name that defines the group prefixes that are advertised in association with the RP address. The access list name cannot contain a space or quotation mark, and must begin with an alphabetic character to avoid confusion with numbered access lists.
interval *seconds*	(Optional) Specifies the interval between RP announcements in seconds. The total holdtime of the RP announcements is automatically set to three times the value of the interval. The default interval is 60 seconds.
bidir	(Optional) Indicates that the multicast groups specified by the *access-list* argument are to operate in bidirectional mode. If the command is configured without this option, the groups specified will operate in Protocol Independent Multicast sparse mode (PIM-SM).

Defaults

Auto-RP is disabled.
seconds: 60

Command Modes

Global configuration

Command History

Release	Modification
11.1	This command was introduced.
12.1(2)T	The following keywords and argument were added: • **interval** *seconds* • **bidir**
12.0(23)S	The **vrf** keyword and *vrf-name* argument were added.
12.2(13)T	The **vrf** keyword and *vrf-name* argument were added.

Usage Guidelines

Use this command in the router you want to be an RP. When you are using Auto-RP to distribute group-to-RP mappings, this command causes the router to send an Auto-RP announcement message to the well-known group CISCO-RP-ANNOUNCE (224.0.1.39). This message announces the router as a candidate RP for the groups in the range described by the access list.

Use this command with the **bidir** keyword when you want bidirectional forwarding and you are using Auto-RP to distribute group-to-RP mappings. Other options are as follows:

- If you are using the PIM Version 2 bootstrap router (PIMv2 BSR) mechanism to distribute group-to-RP mappings, use the **bidir** keyword with the **ip pim rp-candidate** command.
- If you are not distributing group-to-RP mappings using either Auto-RP or the PIMv2 BSR mechanism, use the **bidir** keyword with the **ip pim rp-address** command.

Examples

The following example sends RP announcements out all Protocol Independent Multicast (PIM)-enabled interfaces for a maximum of 31 hops. The IP address by which the router wants to be identified as RP is the IP address associated with Ethernet interface 0. Access list 5 describes the groups for which this router serves as RP.

```
ip pim send-rp-announce ethernet0 scope 31 group-list 5
 access-list 5 permit 224.0.0.0 15.255.255.255
```

Related Commands

Command	Description
access-list (IP standard)	Defines a standard IP access list.
ip pim rp-address	Configures the address of a PIM RP for a particular group.
ip pim rp-candidate	Configures the router to advertise itself as a PIM Version 2 candidate RP to the BSR.

ip pim send-rp-discovery

To configure the router to be a rendezvous point (RP) mapping agent, use the **ip pim send-rp-discovery** command in global configuration mode. To restore the default value, use the **no** form of this command.

ip pim [**vrf** *vrf-name*] **send-rp-discovery** [*interface-type interface-number*] **scope** *ttl-value*

no ip pim [**vrf** *vrf-name*] **send-rp-discovery** [*interface-type interface-number*] **scope** *ttl-value*

Syntax Description

vrf	(Optional) Supports the multicast Virtual Private Network (VPN) routing and forwarding (VRF) instance.
vrf-name	(Optional) Name assigned to the VRF.
interface-type interface-number	(Optional) Interface type and number that is used to define the RP mapping agent address.
scope *ttl-value*	Specifies the time-to-live (TTL) value in the IP header that keeps the discovery messages within this number of hops.

Defaults

The router is not an RP mapping agent.

Command Modes

Global configuration

Command History

Release	Modification
11.1	This command was introduced.
12.0(23)S	The **vrf** keyword and *vrf-name* argument were added.
12.2(13)T	The **vrf** keyword and *vrf-name* argument were added.

Usage Guidelines

Configure this command on the router designated as an RP mapping agent. Specify a TTL large enough to cover your Protocol Independent Multicast (PIM) domain.

When Auto-RP is used, the following events occur:

1. The RP mapping agent listens on well-known group address CISCO-RP-ANNOUNCE (224.0.1.39), which candidate RPs send to.
2. The RP mapping agent sends RP-to-group mappings in an Auto-RP discovery message to the well-known group CISCO-RP-DISCOVERY (224.0.1.40). The TTL value limits how many hops the message can take.
3. PIM designated routers listen to this group and use the RPs they learn about from the discovery message.

Examples

The following example limits Auto-RP RP discovery messages to 20 hops:

```
ip pim send-rp-discovery scope 20
```

ip pim spt-threshold

To configure when a Protocol Independent Multicast (PIM) leaf router should join the shortest path source tree for the specified group, use the **ip pim spt-threshold** command in global configuration mode. To restore the default value, use the **no** form of this command.

ip pim [**vrf** *vrf-name*] **spt-threshold** {*kbps* | **infinity**} [**group-list** *access-list*]

no ip pim [**vrf** *vrf-name*] **spt-threshold** {*kbps* | **infinity**} [**group-list** *access-list*]

Syntax Description

vrf	(Optional) Supports the multicast Virtual Private Network (VPN) routing and forwarding (VRF) instance.
vrf-name	(Optional) Name assigned to the VRF.
kbps	Traffic rate (in kbps).
infinity	Causes all sources for the specified group to use the shared tree.
group-list *access-list*	(Optional) Indicates which groups the threshold applies to. Must be an IP standard access list number or name. If the value is 0 or is omitted, the threshold applies to all groups.

Defaults

When this command is not used, the PIM leaf router joins the shortest path tree immediately after the first packet arrives from a new source.

Command Modes

Global configuration

Command History

Release	Modification
11.1	This command was introduced.
12.0(23)S	The **vrf** keyword and *vrf-name* argument were added.
12.2(13)T	The **vrf** keyword and *vrf-name* argument were added.

Usage Guidelines

If a source sends at a rate greater than or equal to traffic rate (the *kbps* value), a PIM join message is triggered toward the source to construct a source tree.

If the **infinity** keyword is specified, all sources for the specified group will use the shared tree. Specifying a group list access list indicates the groups to which the threshold applies.

If the traffic rate from the source drops below the threshold traffic rate, the leaf router will switch back to the shared tree and send a prune message toward the source.

Examples

The following example sets a threshold of 4 kbps, above which traffic to a group from a source will cause the router to switch to the shortest path tree to that source:

```
ip pim spt-threshold 4
```

ip pim ssm

To define the Source Specific Multicast (SSM) range of IP multicast addresses, use the **ip pim ssm** command in global configuration mode. To disable the SSM range, use the **no** form of this command.

ip pim [**vrf** *vrf-name*] **ssm** {**default** | **range** *access-list*}

no ip pim [**vrf** *vrf-name*] **ssm** {**default** | **range** *access-list*}

Syntax Description

vrf	(Optional) Supports the multicast Virtual Private Network (VPN) routing and forwarding (VRF) instance.
vrf-name	(Optional) Name assigned to the VRF.
default	Defines the SSM range access list to 232/8.
range *access-list*	Specifies the standard IP access list number or name defining the SSM range.

Defaults

The command is disabled.

Command Modes

Global configuration

Command History

Release	Modification
12.1(3)T	This command was introduced.
12.0(23)S	The **vrf** keyword and *vrf-name* argument were added.
12.2(13)T	The **vrf** keyword and *vrf-name* argument were added.

Usage Guidelines

When an SSM range of IP multicast addresses is defined by the **ip pim ssm** command, no Multicast Source Discovery Protocol (MSDP) Source-Active (SA) messages will be accepted or originated in the SSM range.

Examples

The following example shows how to configure SSM service for the IP address range defined by access list 4:

```
access-list 4 permit 224.2.151.141
 ip pim ssm range 4
```

Related Commands

Command	Description
ip igmp v3lite	Enables the acceptance and processing of IGMP v3lite membership reports on an interface.
ip urd	Enables interception of TCP packets sent to the reserved URD port 659 on an interface and processing of URD channel subscription reports.

ip pim state-refresh disable

To disable the processing and forwarding of PIM dense mode state refresh control messages on a Protocol Independent Multicast (PIM) router, use the **ip pim state-refresh disable** command in global configuration mode. To reenable the processing and forwarding of PIM dense mode state refresh control messages, use the **no** form of this command.

ip pim [**vrf** *vrf-name*] **state-refresh disable**

no ip pim [**vrf** *vrf-name*] **state-refresh disable**

Syntax Description

vrf	(Optional) Supports the multicast Virtual Private Network (VPN) routing and forwarding (VRF) instance.
vrf-name	(Optional) Name assigned to the VRF.

Defaults

The processing and forwarding of PIM dense mode state refresh control messages is enabled on PIM routers that are running a Cisco IOS software release that supports the PIM dense mode state refresh feature.

Command Modes

Global configuration

Command History

Release	Modification
12.1(5)T	This command was introduced.
12.0(23)S	The **vrf** keyword and *vrf-name* argument were added.
12.2(13)T	The **vrf** keyword and *vrf-name* argument were added.

Usage Guidelines

Configuring this command removes PIM dense mode state refresh information from PIM hello messages.

Examples

The following example disables the periodic forwarding of the PIM dense mode state refresh control message down a source-based IP multicast distribution tree:

```
ip pim state-refresh disable
```

Related Commands

Command	Description
ip pim state-refresh origination-interval	Configures the origination of and the interval for the PIM dense mode state refresh control messages on a PIM router.
show ip pim interface	Displays information about interfaces configured for PIM.
show ip pim neighbor	Lists the PIM neighbors discovered by the Cisco IOS software.

ip pim state-refresh origination-interval

To configure the origination of and the interval for PIM dense mode state refresh control messages on a Protocol Independent Multicast (PIM) router, use the **ip pim state-refresh origination-interval** command in interface configuration mode. To stop the origination of the PIM dense mode state refresh control message, use the **no** form of this command.

ip pim state-refresh origination-interval [*interval*]

no ip pim state-refresh origination-interval [*interval*]

Syntax Description

interval	(Optional) The number of seconds between PIM dense mode state refresh control messages. The default is 60 seconds. The available interval range is from 4 to 100 seconds.

Defaults

PIM dense mode state refresh control message origination is disabled. By default, all PIM routers that are running a Cisco IOS software release that supports PIM dense mode state refresh process and forward PIM dense mode state refresh control messages.

Command Modes

Interface configuration

Command History

Release	Modification
12.1(5)T	This command was introduced.

Usage Guidelines

Configure this command on the interfaces of the first hop, PIM dense mode routers that are directly connected to sources for PIM-DM multicast groups.

By default, the processing and forwarding of PIM dense mode state refresh control messages is enabled on PIM routers that are running a Cisco IOS software release that supports PIM dense mode state refresh.

Examples

The following example configures the origination of the state refresh control message on Ethernet interface 0 of a PIM dense mode router with an interval of 80 seconds:

```
interface ethernet 0
 ip pim state-refresh origination-interval 80
```

Related Commands

Command	Description
ip pim state-refresh disable	Disables the processing and forwarding of PIM dense mode state refresh feature control messages on a PIM router.
show ip pim interface	Displays information about interfaces configured for PIM.
show ip pim neighbor	Lists the PIM neighbors discovered by the Cisco IOS software.

ip pim vc-count

To change the maximum number of virtual circuits (VCs) that Protocol Independent Multicast (PIM) can open, use the **ip pim vc-count** command in interface configuration mode. To restore the default value, use the **no** form of this command.

ip pim vc-count *number*

no ip pim vc-count

Syntax Description

number	Maximum number of VCs that PIM can open. The default is 200 VCs. The range is from 1 to 65535.

Defaults

200 VCs per ATM interface or subinterface

Command Modes

Interface configuration

Command History

Release	Modification
11.3	This command was introduced.

Examples

The following example allows PIM to open a maximum of 250 VCs:

```
ip pim vc-count 250
```

Related Commands

Command	Description
ip pim minimum-vc-rate	Configures the minimum traffic rate to keep VCs from being idled.
ip pim multipoint-signalling	Enables PIM to open ATM multipoint switched VCs for each multicast group that a receiver joins.
ip pim	Enables PIM on an interface.
show ip pim vc	Displays ATM VCs status information for multipoint VCs opened by PIM.

ip pim version

To configure the Protocol Independent Multicast (PIM) version of the interface, use the **ip pim version** command in interface configuration mode. To restore the default value, use the **no** form of this command.

ip pim version [**1** | **2**]

no ip pim version

Syntax Description

1	(Optional) Configures PIM Version 1.
2	(Optional) Configures PIM Version 2.

Defaults

Version 2

Command Modes

Interface configuration

Command History

Release	Modification
11.3 T	This command was introduced.

Usage Guidelines

An interface in Version 2 mode automatically downgrades to Version 1 mode if that interface has a PIM Version 1 neighbor. The interface returns to Version 2 mode after all Version 1 neighbors disappear (that is, they are shut down or upgraded).

Examples

The following example configures the interface to operate in PIM Version 1 mode:

```
interface ethernet 0
 ip address 1.1.1.1 255.0.0.0
 ip pim sparse-dense-mode
 ip pim version 1
```

ip rgmp

To enable the Router-Port Group Management Protocol (RGMP) on Ethernet, Fast Ethernet, and Gigabit Ethernet interfaces, use the **ip rgmp** command in interface configuration mode. To disable RGMP on the interfaces, use the **no** form of this command.

ip rgmp

no ip rgmp

Syntax Description

This command has no arguments or keywords.

Defaults

RGMP is not enabled.

Command Modes

Interface configuration

Command History

Release	Modification
12.0(10)S	This command was introduced.
12.1(1)E	This command was integrated into Cisco IOS Release 12.1(1)E.
12.1(5)T	This command was integrated into Cisco IOS Release 12.1(5)T.

Usage Guidelines

RGMP is supported only on Ethernet, Fast Ethernet, and Gigabit Ethernet interfaces.

Before enabling RGMP, the following features must be enabled on your router:

- IP routing
- IP multicast
- PIM in sparse mode, sparse-dense mode, source specific mode, or bidirectional mode

If your router is in a bidirectional group, make sure to enable RGMP only on interfaces that do not function as a designated forwarder (DF). If you enable RGMP on an interface that functions as a DF, the interface will not forward multicast packets up the bidirectional shared tree to the rendezvous point (RP).

The following features must be enabled on your switch:

- IP multicast
- IGMP snooping

Examples

The following example enables RGMP on Ethernet interface 1/0:

```
interface ethernet 1/0
 ip rgmp
```

Related Commands

Command	Description
debug ip rgmp	Logs debug messages sent by an RGMP-enabled router.
show ip igmp interface	Displays multicast-related information about an interface.

ip rtp compression-connections

To specify the total number of Real-Time Transport Protocol (RTP) header compression connections that can exist on an interface, use the **ip rtp compression-connections** command in interface configuration mode. To restore the default value, use the **no** form of this command.

ip rtp compression-connections *number*

no ip rtp compression-connections

Syntax Description

number	Number of RTP header compression connections the cache supports, in the range from 3 to 1000. The default is 32 connections (16 calls).

Defaults

32 connections

Command Modes

Interface configuration

Command History

Release	Modification
11.3	This command was introduced.
12.0(7)T	For PPP and High-Level Data Link Control (HDLC) encapsulation, the maximum number of connections increased from 256 to 1000. For Frame Relay encapsulation, the maximum number of connections increased to 256. The maximum value for Frame Relay is fixed, not configurable.

Examples

The following example changes the number of RTP header compression connections supported to 150:

```
interface serial 0
 encapsulation ppp
 ip rtp header-compression
 ip rtp compression-connections 150
```

Related Commands

Command	Description
frame-relay ip rtp header-compression	Enables RTP header compression for all Frame Relay maps on a physical interface.
frame-relay map ip rtp header-compression	Enables RTP header compression per DLCI.
ip rtp header-compression	Enables RTP header compression.
ip tcp header-compression	Enables TCP header compression.
show ip rtp header-compression	Displays RTP header compression statistics.

ip rtp header-compression

To enable Real-Time Transport Protocol (RTP) header compression, use the **ip rtp header-compression** command in interface configuration mode. To disable RTP header compression, use the **no** form of this command.

ip rtp header-compression [**passive**]

no ip rtp header-compression [**passive**]

Syntax Description

passive	(Optional) Compresses outgoing RTP packets only if incoming RTP packets on the same interface are compressed.

Defaults

Disabled

Command Modes

Interface configuration

Command History

Release	Modification
11.3	This command was introduced.

Usage Guidelines

If you use this command without the **passive** keyword, the software compresses all RTP traffic.

You can compress IP/User Datagram Protocol (UDP)/RTP headers to reduce the size of your packets. Compressing headers is especially useful for RTP, because RTP payload size can be as small as 20 bytes, and the uncompressed header is 40 bytes.

RTP header compression is supported on serial lines using Frame Relay, High-Level Data Link Control (HDLC), or PPP encapsulation. You must enable compression on both ends of a serial connection.

This command can compress unicast or multicast RTP packets, and hence multicast backbone (MBONE) traffic can also be compressed over slow links. The compression scheme is beneficial only when you have small payload sizes, as in audio traffic.

Examples

The following example enables RTP header compression on serial interface 0 and limits the number of RTP header compression connections to 10:

```
interface serial 0
 encapsulation ppp
 ip rtp header-compression
 ip rtp compression-connections 10
```

Related Commands

Command	Description
clear ip rtp header-compression	Clears RTP header compression structures and statistics.
ip rtp compression-connections	Specifies the total number of RTP header compression connections that can exist on an interface.
show ip rtp header-compression	Displays RTP header compression statistics.

ip sap cache-timeout

To limit how long a Session Announcement Protocol (SAP) cache entry stays active in the cache, use the **ip sap cache-timeout** command in global configuration mode. To restore the default value, use the **no** form of this command.

ip sap cache-timeout *minutes*

no ip sap cache-timeout

Syntax Description

minutes	Time (in minutes) that a SAP cache entry is active in the cache.

Defaults

By default, session announcements remain for 1440 minutes (24 hours) in the cache.

Command Modes

Global configuration

Command History

Release	Modification
11.2	The **ip sdr cache-timeout** command was introduced.
12.2	The **ip sdr cache-timeout** command was replaced by the **ip sap cache-timeout** command.

Usage Guidelines

This command defines how long session announcements are cached by the router. Active session announcements are periodically re-sent by the originating site, refreshing the cached state in the router. The minimum interval between announcements for a single group is 5 minutes. Setting the cache timeout to a value less than 30 minutes is not recommended. Set the cache timeout to 0 to keep entries in the cache indefinitely.

Examples

The following example causes SAP cache entries to remain in the cache for 30 minutes:

```
ip sap cache-timeout 30
```

Related Commands

Command	Description
clear ip sap	Deletes a SAP cache entry or the entire SAP cache.
show ip sap	Displays the SAP cache.

ip sap listen

To enable the Cisco IOS software to listen to session directory announcements, use the **ip sap listen** command in interface configuration mode. To disable the function, use the **no** form of this command.

ip sap listen

no ip sap listen

Syntax Description

This command has no arguments or keywords.

Defaults

Disabled

Command Modes

Interface configuration

Command History

Release	Modification
11.1	The **ip sdr listen** command was introduced.
12.2	The **ip sdr listen** command was replaced by the **ip sap listen** command.

Usage Guidelines

Cisco IOS software can receive and store Session Description Protocol (SDP) and Session Announcement Protocol (SAP) session announcements.

SAP is a protocol used to announce multicast multimedia conferences and other multicast sessions, and it is used to communicate session setup information to prospective participants. A SAP announcer periodically sends an announcement packet to a well-known multicast address and port. The announcement is sent via multicast with the same scope as the session it is announcing to ensure that the recipients of the announcement can also be recipients of the session the announcement describes. SAP should be used for sessions of public interest where participants are not known in advance.

When the **ip sap listen** command is configured on an interface, the well-known session directory groups on that interface can receive and store session announcements. Each announcer listens to other announcements in order to determine the total number of sessions being announced on a particular group, and the interfaces are put into the outgoing interface list for the IP SAP group. The announcements can be displayed with the **show ip sap** command. The **ip multicast rate-limit** command uses stored session announcements. To configure the period of time after which received announcements will expire, use the **ip sap cache-timeout** command.

When the **no ip multicast routing** command is configured, announcements are only stored if they are received on an interface configured with the **ip sap listen** command. When a system is configured as a multicast router, it is sufficient to configure the **ip sap listen** command on only a single multicast-enabled interface. The well-known session directory groups are handled as local joined groups after the **ip sap listen** command is first configured. (See the L flag of the **show ip mroute** command.) This configuration causes announcements received from all multicast-enabled interfaces to be routed and stored within the system.

Examples

The following example shows how to enable a router to listen to session directory announcements:

```
ip routing

interface loopback 0
ip address 10.0.0.51 255.255.255.0
ip pim sparse-dense mode
ip sap listen
```

Related Commands

Command	Description
clear ip sap	Deletes a SAP cache entry or the entire SAP cache.
ip multicast rate-limit	Controls the rate a sender from the source list can send to a multicast group in the group list.
ip sap cache-timeout	Limits how long a SAP cache entry stays active in the cache.
show ip sap	Displays the SAP cache.

ip sdr cache-timeout

The **ip sdr cache-timeout** command is replaced by the **ip sap cache-timeout** command. See the description of the **ip sap cache-timeout** command in this chapter for more information.

ip sdr listen

The **ip sdr listen** command is replaced by the **ip sap listen** command. See the description of the **ip sap listen** command in this chapter for more information.

ip urd

To enable interception of TCP packets sent to the reserved URL Rendezvous Directory (URD) port 465 on an interface and processing of URD channel subscription reports, use the **ip urd** command in interface configuration mode. To disable URD on an interface, use the **no** form of this command.

ip urd [**proxy**]

no ip urd [**proxy**]

Syntax Description

proxy	(Optional) Allows an interface to accept URL requests from any TCP connection sent to that interface. If the **proxy** keyword is not configured, the interface will accept URL requests from TCP connections only if the requests originated from directly connected hosts. The **proxy** option must be enabled on an interface if it is unnumbered or if it has downstream routers configured with Internet Group Managment Protocol (IGMP) proxy routing. To prevent users on the backbone from creating URD state on your router, do not enable the **proxy** option on a backbone interface of your router.

Defaults

Disabled

Command Modes

Interface configuration

Command History

Release	Modification
12.1(3)T	This command was introduced.

Usage Guidelines

To use this command, you must first define a Source Specific Multicast (SSM) range of IP addresses using the **ip pim ssm** global configuration command. When URD is enabled, it is supported in the SSM range of addresses only. We recommend that you not enable URD on backbone interfaces, but only on interfaces connecting to hosts.

URD functionality is available for multicast process switching, fast switching, and distributed fast-switching paths.

Examples

The following example shows how to configure URD on Ethernet interface 3/3:

```
interface ethernet 3/3
ip urd
```

Related Commands

Command	Description
ip pim ssm	Defines the SSM range of IP multicast addresses.

show frame-relay ip rtp header-compression

To show Frame Relay Real-Time Transport Protocol (RTP) header compression statistics, use the **show frame-relay ip rtp header-compression** command in EXEC mode.

show frame-relay ip rtp header-compression [**interface** *type number*]

Syntax Description

interface *type number*	(Optional) Interface type and number.

Command Modes

EXEC

Command History

Release	Modification
11.3	This command was introduced.

Examples

The following is sample output from the **show frame-relay ip rtp header-compression** command:

```
Router# show frame-relay ip rtp header-compression

DLCI 17  Link/Destination info: ip 165.3.3.2
  Interface Serial0:
    Rcvd:    0 total, 0 compressed, 0 errors
             0 dropped, 0 buffer copies, 0 buffer failures
    Sent:    6000 total, 5998 compressed,
             227922 bytes saved, 251918 bytes sent
             1.90 efficiency improvement factor
    Connect: 16 rx slots, 16 tx slots, 2 long searches, 2 misses
             99% hit ratio, five minute miss rate 0 misses/sec, 0 max
```

Table 3 describes the significant fields shown in the display.

Table 3 show frame-relay ip rtp header-compression Field Descriptions

Field	Description
Interface Serial0	Type and number of the interface.
Rcvd: total	Number of packets received on the interface.
compressed	Number of packets with compressed header.
errors	Number of errors.
dropped	Number of dropped packets.
buffer copies	Number of buffers that were copied.
buffer failures	Number of failures in allocating buffers.
Sent: total	Total number of packets sent.
compressed	Number of packets sent with compressed header.
bytes saved	Total savings in bytes due to compression.
bytes sent	Total bytes sent after compression.

Table 3 show frame-relay ip rtp header-compression Field Descriptions (continued)

Field	Description
efficiency improvement factor	Compression efficiency.
Connect: rx slots	Total number of receive slots.
tx slots	Total number of transmit slots.
long searches	Searches that needed more than one lookup.
misses	Number of new states that were created.
hit ratio	Number of times existing states were revised.
five minute miss rate	Average miss rate.
max	Maximum miss rate.

Related Commands

Command	Description
frame-relay ip rtp compression-connections	Specifies maximum number of RTP header compression connections on a Frame Relay interface.
frame-relay ip rtp header-compression	Enables RTP header compression for all Frame Relay maps on a physical interface.
frame-relay map ip compress	Enables both RTP and TCP header compression on a link.
frame-relay map ip nocompress	Disables both RTP and TCP header compression on a link.
frame-relay map ip rtp header-compression	Enables RTP header compression per DLCI.
show ip rtp header-compression	Displays RTP header compression statistics.

show ip dvmrp route

To display the contents of the Distance Vector Multicast Routing Protocol (DVMRP) routing table, use the **show ip dvmrp route** command in EXEC mode.

show ip dvmrp route [*name* | *ip-address* | *type number*]

Syntax Description

name | *ip-address*	(Optional) Name or IP address of an entry in the DVMRP routing table.
type number	(Optional) Interface type and number.

Command Modes

EXEC

Command History

Release	Modification
10.3	This command was introduced.

Examples

The following is sample output of the **show ip dvmrp route** command:

```
Router# show ip dvmrp route

DVMRP Routing Table - 1 entry
171.68.0.0/16 [100/11] uptime 07:55:50, expires 00:02:52
    via 137.39.3.93, Tunnel3
```

Table 4 describes the significant fields shown in the display.

Table 4 show ip dvmrp route Field Descriptions

Field	Description
1 entry	Number of entries in the DMVRP routing table.
171.68.0.0/16	Source network.
[100/11]	Administrative distance/metric.
uptime	How long (in hours, minutes, and seconds) that the route has been in the DVMRP routing table.
expires	How long (in hours, minutes, and seconds) until the entry is removed from the DVMRP routing table.
via 137.39.3.93	Next hop router to the source network.
Tunnel3	Interface to the source network.

Related Commands

Command	Description
ip dvmrp accept-filter	Configures an acceptance filter for incoming DVMRP reports.

show ip igmp groups

To display the multicast groups with receivers that are directly connected to the router and that were learned through Internet Group Management Protocol (IGMP), use the **show ip igmp groups** command in EXEC mode.

show ip igmp groups [*group-name* | *group-address* | *type number*] [**detail**]

Syntax Description

group-name	(Optional) Name of the multicast group, as defined in the Domain Name System (DNS) hosts table.
group-address	(Optional) Address of the multicast group. This is a multicast IP address in four-part, dotted notation.
type	(Optional) Interface type.
number	(Optional) Interface number.
detail	(Optional) Provides a detailed description of the sources known through IGMP Version 3 (IGMPv3), IGMP v3lite, or URL Rendezvous Directory (URD).

Command Modes

EXEC

Command History

Release	Modification
10.0	This command was introduced.
12.1(3)T	Fields were added to the output of this command to support the Source Specific Multicast (SSM) feature.
12.1(5)T	The **detail** keyword was added.

Usage Guidelines

If you omit all optional arguments and keywords, the **show ip igmp groups** command displays by group address, interface type, and interface number all directly connected multicast groups.

Examples

The following is sample output from the **show ip igmp groups** command:

```
Router# show ip igmp groups

IGMP Connected Group Membership
Group Address     Interface         Uptime      Expires     Last Reporter
239.255.255.254   Ethernet3/1       1w0d        00:02:19    172.21.200.159
224.0.1.40        Ethernet3/1       1w0d        00:02:15    172.21.200.1
224.0.1.40        Ethernet3/3       1w0d        never       171.69.214.251
224.0.1.1         Ethernet3/1       1w0d        00:02:11    172.21.200.11
224.9.9.2         Ethernet3/1       1w0d        00:02:10    172.21.200.155
232.1.1.1         Ethernet3/1       5d21h       stopped     172.21.200.206
```

The following is sample output from the **show ip igmp groups** command with the *group-address* argument and **detail** keyword:

```
Router# show ip igmp groups 232.1.1.1 detail
```

```
Interface:      Ethernet3/2
Group:          232.1.1.1
Uptime:         01:58:28
Group mode:     INCLUDE
Last reporter:  10.0.119.133
CSR Grp Exp:    00:02:38
Group source list: (C - Cisco Src Report, U - URD, R - Remote)
  Source Address   Uptime    v3 Exp    CSR Exp   Fwd  Flags
  171.69.214.1     01:58:28  stopped   00:02:31  Yes  C
```

Table 5 describes the significant fields shown in the displays.

Table 5 show ip igmp groups Field Descriptions

Field	Description
Group Address	Address of the multicast group.
Interface	Interface through which the group is reachable.
Uptime	How long (in weeks, days, hours, minutes, and seconds) this multicast group has been known.
Expires	How long (in hours, minutes, and seconds) until the entry expires. If an entry expires, then it will (for a short period) show the word “now” before it is removed. The word “never” indicates that the entry will not time out, because a local receiver is on this router for this entry. The word “stopped” indicates that timing out of this entry is not determined by this expire timer. If the router is in INCLUDE mode for a group, then the whole group entry will time out after the last source entry has timed out (unless the mode is changed to EXCLUDE mode before it times out).
Last Reporter	Last host to report being a member of the multicast group. Both IGMP v3lite and URD require a v2-report.
Group mode:	Can be either INCLUDE or EXCLUDE. The group mode is based on the type of membership reports received on the interface for the group. In the output for the **show ip igmp groups detail** command, the EXCLUDE mode also shows the “Expires:” field for the group entry (not shown in the output).
CSR Grp Exp	This field is shown for multicast groups in the Source Specific Multicast (SSM) range. It indicates the time (in hours, minutes, and seconds) since the last received group membership report was received. Cisco IOS software needs to use these reports for the operation of URD and IGMP v3lite, but they do not indicate group membership by themselves.
Group source list:	Provides details of which sources have been requested by the multicast group.
Source Address	IP address of the source.
Uptime	Indicates the time since the source state was created.

Table 5 show ip igmp groups Field Descriptions (continued)

Field	Description
v3 Exp	Indicates the time (in hours, minutes, and seconds) until the membership for the source will time out according to IGMP operations. The word “stopped” is shown if no member uses IGMPv3 (but only IGMP v3lite or URD).
CSR Exp	Indicates the time (in hours, minutes, and seconds) until the membership for the source will time out according to IGMP v3lite or URD reports. The word “stopped” is shown if members use only IGMPv3.
Fwd	Indicates whether the router is forwarding multicast traffic due to this entry.
Flags	Information about the entry. The Remote flag indicates that an IGMPv3 report has been received by this source. The C flag indicates that an IGMP v3lite or URD report was received by this source. The U flag indicates that a URD report was received for this source.

Related Commands

Command	Description
ip igmp query-interval	Configures the frequency at which the Cisco IOS software sends IGMP host query messages.

show ip igmp interface

To display multicast-related information about an interface, use the **show ip igmp interface** command in EXEC mode.

show ip igmp interface [*type number*]

Syntax Description

type	(Optional) Interface type.
number	(Optional) Interface number.

Command Modes

EXEC

Command History

Release	Modification
10.0	This command was introduced.

Usage Guidelines

If you omit the optional arguments, the **show ip igmp interface** command displays information about all interfaces.

This command also displays information about dynamically learned Distance Vector Multicast Routing Protocol (DVMRP) routers on the interface.

Examples

The following is sample output from the **show ip igmp interface** command:

```
Router# show ip igmp interface

Ethernet0 is up, line protocol is up
  Internet address is 198.92.37.6, subnet mask is 255.255.255.0
  IGMP is enabled on interface
  IGMP query interval is 60 seconds
  Inbound IGMP access group is not set
  Multicast routing is enabled on interface
  Multicast TTL threshold is 0
  Multicast designated router (DR) is 198.92.37.33
  No multicast groups joined
Ethernet1 is up, line protocol is up
  Internet address is 198.92.36.129, subnet mask is 255.255.255.0
  IGMP is enabled on interface
  IGMP query interval is 60 seconds
  Inbound IGMP access group is not set
  Multicast routing is enabled on interface
  Multicast TTL threshold is 0
  Multicast designated router (DR) is 198.92.36.131
  Multicast groups joined: 225.2.2.2 226.2.2.2
```

```
Tunnel0 is up, line protocol is up
  Internet address is 10.1.37.2, subnet mask is 255.255.0.0
  IGMP is enabled on interface
  IGMP query interval is 60 seconds
  Inbound IGMP access group is not set
  Multicast routing is enabled on interface
  Multicast TTL threshold is 0
  No multicast groups joined
```

Table 6 describes the significant fields shown in the display.

Table 6 show ip igmp interface Field Descriptions

Field	Description
Ethernet0 is up, line protocol is up	Interface type, number, and status.
Internet address is... subnet mask is...	Internet address of the interface and subnet mask being applied to the interface, as specified with the **ip address** command.
IGMP is enabled on interface	Indicates whether IGMP has been enabled on the interface with the **ip pim** command.
IGMP query interval is 60 seconds	Interval at which the Cisco IOS software sends Protocol Independent Multicast (PIM) router query messages, as specified with the **ip igmp query-interval** command.
Inbound IGMP access group is not set	Indicates whether an IGMP access group has been configured with the **ip igmp access-group** command.
Multicast routing is enabled on interface	Indicates whether multicast routing has been enabled on the interface with the **ip pim** command.
Multicast TTL threshold is 0	Packet time-to-threshold, as specified with the **ip multicast ttl-threshold** command.
Multicast designated router (DR) is...	IP address of the designated router for this LAN segment (subnet).
No multicast groups joined	Indicates whether this interface is a member of any multicast groups and, if so, lists the IP addresses of the groups.

Related Commands

Command	Description
ip address	Sets a primary or secondary IP address for an interface.
ip igmp access-group	Controls the multicast groups that hosts on the subnet serviced by an interface can join.
ip igmp query-interval	Configures the frequency at which the Cisco IOS software sends IGMP host query messages.
ip multicast ttl-threshold	Configures the TTL threshold of packets being forwarded out an interface.
ip pim	Enables PIM on an interface.

show ip mcache

To display the contents of the IP fast-switching cache, use the **show ip mcache** command in EXEC mode.

show ip mcache [*group-address* | *group-name*] [*source-address* | *source-name*]

Syntax Description

group-address | *group-name*	(Optional) Displays the fast-switching cache for the single group. Can be either a Class D IP address or a Domain Name System (DNS) name.
source-address | *source-name*	(Optional) If the source address or name is also specified, displays a single multicast cache entry. Can be either a unicast IP address or a DNS name.

Command Modes

EXEC

Command History

Release	Modification
11.0	This command was introduced.

Examples

The following is sample output from the **show ip mcache** command. This entry shows a specific source (wrn-source 204.62.246.73) sending to the World Radio Network group (224.2.143.24).

```
Router# show ip mcache wrn wrn-source

IP Multicast Fast-Switching Cache
(204.62.246.73/32, 224.2.143.24), Fddi0, Last used: 00:00:00
  Ethernet0       MAC Header: 01005E028F1800000C1883D30800
  Ethernet1       MAC Header: 01005E028F1800000C1883D60800
  Ethernet2       MAC Header: 01005E028F1800000C1883D40800
  Ethernet3       MAC Header: 01005E028F1800000C1883D70800
```

The following is sample output from the **show ip mcache** command when multicast distributed switching (MDS) is in effect.

```
Router# show ip mcache

IP Multicast Fast-Switching Cache
(*, 224.2.170.73), Fddi3/0/0, Last used: mds
  Tunnel3         MAC Header: 5000602F9C150000603E473F60AAAA030000000800 (Fddi3/0/0)
  Tunnel0         MAC Header: 5000602F9C150000603E473F60AAAA030000000800 (Fddi3/0/0)
  Tunnel1         MAC Header: 5000602F9C150000603E473F60AAAA030000000800 (Fddi3/0/0)
```

Table 7 describes the significant fields shown in the display.

Table 7 show ip mcache Field Descriptions

Field	Description
204.62.246.73/32 and *	Source address. The asterisk (*) refers to all source addresses.
224.2.143.24 and 224.2.170.73	Destination address.

Table 7 show ip mcache Field Descriptions (continued)

Field	Description
Fddi0	Incoming or expected interface on which the packet should be received.
Last used:	Latest time the entry was accessed for a packet that was successfully fast switched. The word "Semi-fast" indicates that the first part of the outgoing interface list is fast switched and the rest of the list is process level switched.
Ethernet0 MAC Header:	Outgoing interface list and respective MAC header that is used when rewriting the packet for output. If the interface is a tunnel, the MAC header will show the real next hop MAC header and then, in parentheses, the real interface name.

show ip mpacket

To display the contents of the circular cache-header buffer, use the **show ip mpacket** command in EXEC mode.

show ip mpacket [*group-address* | *group-name*] [*source-address* | *source-name*] [**detail**]

Syntax Description

group-address | *group-name*	(Optional) Displays cache headers matching the specified group address or group name.
source-address | *source-name*	(Optional) Displays cache headers matching the specified source address or source name.
detail	(Optional) In addition to the summary information, displays the rest of the IP header fields on an additional line, plus the first 8 bytes after the IP header (usually the User Datagram Protocol [UDP] port numbers).

Command Modes

EXEC

Command History

Release	Modification
11.1	This command was introduced.

Usage Guidelines

This command is only applicable when the **ip multicast cache-headers** command is in effect.

Each time this command is entered, a new buffer is allocated. The summary display (when the **detail** keyword is omitted) shows the IP packet identifier, time-to-live (TTL), source and destination IP addresses, and a local time stamp when the packet was received.

The two arguments and one keyword can be used in the same command in any combination.

Examples

The following is sample output of the **show ip mpacket** command with the *group-name* argument:

```
Router # show ip mpacket smallgroup

IP Multicast Header Cache - entry count:6, next index: 7
Key: id/ttl timestamp (name) source group

D782/117 206416.908 (ABC-xy.company.com) 198.15.228.10 224.5.6.7
7302/113 206417.908 (school.edu) 147.12.2.17 224.5.6.7
6CB2/114 206417.412 (MSSRS.company.com) 154.2.19.40 224.5.6.7
D782/117 206417.868 (ABC-xy.company.com) 198.15.228.10 224.5.6.7
E2E9/123 206418.488 (Newman.com) 211.1.8.10 224.5.6.7
1CA7/127 206418.544 (teller.company.com) 192.4.6.10 224.5.6.7
```

Table 8 describes the significant fields shown in the display.

Table 8 show ip mpacket Field Descriptions

Field	Description
entry count	Number of packets cached (one packet for each line in the display). The cache has lines numbered from 0 to 1024.
next index	The index for the next element in the cache.
id	Identification number of the IP packet.
ttl	Current TTL of the packet.
timestamp	Time stamp sequence number of the packet.
(name)	Domain Name System (DNS) name of the source sending to the group. Name appears in parentheses.
source	IP address of the source sending to the group.
group	Multicast group address that the packet is sent to. In this example, the group address is the group name “smallgroup.”

Related Commands

Command	Description
ip multicast cache-headers	Allocates a circular buffer to store IP multicast packet headers that the router receives.

show ip mroute

To display the contents of the IP multicast routing table, use the **show ip mroute** command in EXEC mode.

show ip mroute [*group-address* | *group-name*] [*source-address* | *source-name*] [*type number*] [**summary**] [**count**] [**active** *kbps*]

Syntax Description

group-address | *group-name*	(Optional) IP address or name multicast group as defined in the Domain Name System (DNS) hosts table.
source-address | *source-name*	(Optional) IP address or name of a multicast source.
type number	(Optional) Interface type and number.
summary	(Optional) Displays a one-line, abbreviated summary of each entry in the IP multicast routing table.
count	(Optional) Displays statistics about the group and source, including number of packets, packets per second, average packet size, and bytes per second.
active *kbps*	(Optional) Displays the rate that active sources are sending to multicast groups. Active sources are those sending at the *kbps* value or higher. The *kbps* argument defaults to 4 kbps.

Defaults

The **show ip mroute** command displays all groups and sources.

The **show ip mroute active** command displays all sources sending at a rate greater than or equal to 4 kbps.

Command Modes

EXEC

Command History

Release	Modification
10.0	This command was introduced.
12.0(5)T	The H flag for Multicast Multilayer Switching (MMLS) was added in the output display.
12.1(3)T	The U, s, and I flags for Source Specific Multicast (SSM) were added in the output display.

Usage Guidelines

If you omit all optional arguments and keywords, the **show ip mroute** command displays all entries in the IP multicast routing table.

The Cisco IOS software populates the multicast routing table by creating (S, G) entries from (*, G) entries. The asterisk (*) refers to all source addresses, the “S” refers to a single source address, and the “G” is the destination multicast group address. In creating (S, G) entries, the software uses the best path to that destination group found in the unicast routing table (that is, through Reverse Path Forwarding [RPF]).

The output for the **show ip mroute** command with the **active** keyword will display either positive or negative numbers for the rate pps. The router displays negative numbers when RPF packets fail or when the router observes RPF packtets with an empty OIF list. This type of activity may indicate a multicast routing problem.

Examples

The following is sample output from the **show ip mroute** command for a router operating in dense mode. This output displays the contents of the IP multicast routing table for the multicast group named cbone-audio.

```
Router# show ip mroute cbone-audio

IP Multicast Routing Table
Flags: D - Dense, S - Sparse, C - Connected, L - Local, P - Pruned
       R - RP-bit set, F - Register flag, T - SPT-bit set
Timers: Uptime/Expires
Interface state: Interface, Next-Hop, State/Mode

(*, 224.0.255.1), uptime 0:57:31, expires 0:02:59, RP is 0.0.0.0, flags: DC
  Incoming interface: Null, RPF neighbor 0.0.0.0, Dvmrp
  Outgoing interface list:
    Ethernet0, Forward/Dense, 0:57:31/0:02:52
    Tunnel0, Forward/Dense, 0:56:55/0:01:28

(198.92.37.100/32, 224.0.255.1), uptime 20:20:00, expires 0:02:55, flags: C
  Incoming interface: Tunnel0, RPF neighbor 10.20.37.33, Dvmrp
  Outgoing interface list:
    Ethernet0, Forward/Dense, 20:20:00/0:02:52
```

The following is sample output from the **show ip mroute** command for a router operating in sparse mode:

```
Router# show ip mroute

IP Multicast Routing Table
Flags: D - Dense, S - Sparse, C - Connected, L - Local, P - Pruned
       R - RP-bit set, F - Register flag, T - SPT-bit set
Timers: Uptime/Expires
Interface state: Interface, Next-Hop, State/Mode

(*, 224.0.255.3), uptime 5:29:15, RP is 198.92.37.2, flags: SC
  Incoming interface: Tunnel0, RPF neighbor 10.3.35.1, Dvmrp
  Outgoing interface list:
    Ethernet0, Forward/Sparse, 5:29:15/0:02:57

(198.92.46.0/24, 224.0.255.3), uptime 5:29:15, expires 0:02:59, flags: C
  Incoming interface: Tunnel0, RPF neighbor 10.3.35.1
  Outgoing interface list:
    Ethernet0, Forward/Sparse, 5:29:15/0:02:57
```

The following is sample output from the **show ip mroute** command that shows the virtual circuit descriptor (VCD) value, because an ATM interface with PIM multipoint signalling is enabled:

```
Router# show ip mroute 224.1.1.1

IP Multicast Routing Table
Flags:D - Dense, S - Sparse, B - Bidir Group, s - SSM Group, C -
Connected, L - Local, P - Pruned, R - RP-bit set, F - Register flag, T - SPT-bit set, J -
Join SPT, M - MSDP created entry, X - Proxy Join Timer Running, A - Advertised via MSDP, U
- URD, I - Received Source Specific Host Report
Outgoing interface flags:H - Hardware switched
Timers:Uptime/Expires
```

```
Interface state:Interface, Next-Hop or VCD, State/Mode

(*, 224.1.1.1), 00:03:57/00:02:54, RP 130.4.101.1, flags: SJ
  Incoming interface: Null, RPF nbr 0.0.0.0
  Outgoing interface list:
    ATM0/0, VCD 14, Forward/Sparse, 00:03:57/00:02:53
```

The following is sample output from the **show ip mroute** command with the **summary** keyword:

```
Router# show ip mroute summary

IP Multicast Routing Table
Flags:D - Dense, S - Sparse, B - Bidir Group, s - SSM Group, C -
Connected, L - Local, P - Pruned, R - RP-bit set, F - Register flag, T - SPT-bit set, J -
Join SPT, M - MSDP created entry, X - Proxy Join Timer Running, A - Advertised via MSDP, U
- URD, I - Received Source Specific Host Report
Outgoing interface flags:H - Hardware switched
Timers:Uptime/Expires
Interface state:Interface, Next-Hop or VCD, State/Mode

(*, 224.255.255.255), 2d16h/00:02:30, RP 171.69.10.13, flags: SJPC

(*, 224.2.127.253), 00:58:18/00:02:00, RP 171.69.10.13, flags: SJC

(*, 224.1.127.255), 00:58:21/00:02:03, RP 171.69.10.13, flags: SJC

(*, 224.2.127.254), 2d16h/00:00:00, RP 171.69.10.13, flags: SJCL
  (128.9.160.67/32, 224.2.127.254), 00:02:46/00:00:12, flags: CLJT
  (129.48.244.217/32, 224.2.127.254), 00:02:15/00:00:40, flags: CLJT
  (130.207.8.33/32, 224.2.127.254), 00:00:25/00:02:32, flags: CLJT
  (131.243.2.62/32, 224.2.127.254), 00:00:51/00:02:03, flags: CLJT
  (140.173.8.3/32, 224.2.127.254), 00:00:26/00:02:33, flags: CLJT
  (171.69.60.189/32, 224.2.127.254), 00:03:47/00:00:46, flags: CLJT
```

The following is sample output from the **show ip mroute** command with the **active** keyword:

```
Router# show ip mroute active

Active IP Multicast Sources - sending >= 4 kbps

Group: 224.2.127.254, (sdr.cisco.com)
   Source: 146.137.28.69 (mbone.ipd.anl.gov)
     Rate: 1 pps/4 kbps(1sec), 4 kbps(last 1 secs), 4 kbps(life avg)

Group: 224.2.201.241, ACM 97
   Source: 130.129.52.160 (webcast3-e1.acm97.interop.net)
     Rate: 9 pps/93 kbps(1sec), 145 kbps(last 20 secs), 85 kbps(life avg)

Group: 224.2.207.215, ACM 97
   Source: 130.129.52.160 (webcast3-e1.acm97.interop.net)
     Rate: 3 pps/31 kbps(1sec), 63 kbps(last 19 secs), 65 kbps(life avg)
```

The following is sample output from the **show ip mroute** command with the **active** keyword. However, this sample shows negative numbers for the rate pps. The router displays negative numbers when RPF packets fail or for RPF packets with an empty OIF list. The question marks that follow the group and source IP addresses indicate that the domain name could not be resolved.

```
Router# show ip mroute active
Active IP Multicast Sources - sending >= 4 kbps
Group: 239.254.1.0, (?)
   Source: 126.32.1.51 (?)
     Rate: -3373 pps/964 kbps(1sec), 964 kbps(last 0 secs), 163 kbps(life avg)

Group: 239.254.1.1, (?)
   Source: 126.32.1.52 (?)
     Rate: -3373 pps/964 kbps(1sec), 964 kbps(last 0 secs), 163 kbps(life avg)

Group: 239.254.1.2, (?)
   Source: 126.32.1.53 (?)
     Rate: -3832 pps/964 kbps(1sec), 964 kbps(last 0 secs), 162 kbps(life avg)

Group: 239.254.1.4, (?)
   Source: 126.32.65.51 (?)
     Rate: -2579 pps/807 kbps(1sec), 0 kbps(last 10 secs), 141 kbps(life avg)

Group: 239.254.1.5, (?)
   Source: 126.32.65.52 (?)
     Rate: 3061 pps/1420 kbps(1sec), 0 kbps(last 10 secs), 247 kbps(life avg)

Group: 239.254.1.6, (?)
   Source: 126.32.65.53 (?)
     Rate: -2356 pps/807 kbps(1sec), 0 kbps(last 10 secs), 141 kbps(life avg)
```

The following is sample output from the **show ip mroute** command for a router supporting SSM services:

```
Router# show ip mroute 232.6.6.6

IP Multicast Routing Table
Flags:D - Dense, S - Sparse, B - Bidir Group, s - SSM Group, C -
Connected, L - Local, P - Pruned, R - RP-bit set, F - Register flag, T - SPT-bit set, J -
Join SPT, M - MSDP created entry, X - Proxy Join Timer Running, A - Advertised via MSDP, U
- URD, I - Received Source Specific Host Report
Outgoing interface flags:H - Hardware switched
Timers:Uptime/Expires
Interface state:Interface, Next-Hop or VCD, State/Mode

(*, 232.6.6.6), 00:01:20/00:02:59, RP 0.0.0.0, flags:sSJP
  Incoming interface:Null, RPF nbr 0.0.0.0
  Outgoing interface list:Null

(2.2.2.2, 232.6.6.6), 00:01:20/00:02:59, flags:CTI
  Incoming interface:Ethernet3/3, RPF nbr 0.0.0.0
  Outgoing interface list:
    Ethernet3/1, Forward/Sparse-Dense, 00:00:36/00:02:35
```

Table 9 describes the significant fields shown in the displays.

Table 9 show ip mroute Field Descriptions

Field	Description
Flags:	Provides information about the entry.
D - Dense	Entry is operating in dense mode.
S - Sparse	Entry is operating in sparse mode.
B - Bidir Group	Indicates that a multicast group is operating in bidirectional mode.
s - SSM Group	Indicates that a multicast group is within the SSM range of IP addresses. This flag is reset if the SSM range changes.
C - Connected	A member of the multicast group is present on the directly connected interface.
L - Local	The router itself is a member of the multicast group. Groups are joined locally by the **ip igmp join-group** command (for the configured group), the **ip sap listen** command (for the well-known session directory groups), and rendezvous point (RP) mapping (for the well-known groups 224.0.1.39 and 224.0.1.40). Locally joined groups are not fast switched.
P - Pruned	Route has been pruned. The Cisco IOS software keeps this information so that a downstream member can join the source.
R - RP-bit set	Indicates that the (S, G) entry is pointing toward the RP. This is typically prune state along the shared tree for a particular source.
F - Register flag	Indicates that the software is registering for a multicast source.
T - SPT-bit set	Indicates that packets have been received on the shortest path source tree.

Table 9 show ip mroute Field Descriptions (continued)

Field	Description

J - Join SPT	For (*, G) entries, indicates that the rate of traffic flowing down the shared tree is exceeding the SPT-Threshold set for the group. (The default SPT-Threshold setting is 0 kbps.) When the J - Join shortest path tree (SPT) flag is set, the next (S, G) packet received down the shared tree triggers an (S, G) join in the direction of the source, thereby causing the router to join the source tree.
	
	For (S, G) entries, indicates that the entry was created because the SPT-Threshold for the group was exceeded. When the J - Join SPT flag is set for (S, G) entries, the router monitors the traffic rate on the source tree and attempts to switch back to the shared tree for this source if the traffic rate on the source tree falls below the SPT-Threshold of the group for more than 1 minute.
	
	Note The router measures the traffic rate on the shared tree and compares the measured rate to the SPT-Threshold of the group once every second. If the traffic rate exceeds the SPT-Threshold, the J - Join SPT flag is set on the (*, G) entry until the next measurement of the traffic rate. The flag is cleared when the next packet arrives on the shared tree and a new measurement interval is started.
	
	If the default SPT-Threshold value of 0 kbps is used for the group, the J - Join SPT flag is always set on (*, G) entries and is never cleared. When the default SPT-Threshold value is used, the router immediately switches to the shortest path source tree when traffic from a new source is received.

M - MSDP created entry	Indicates that a (*, G) entry was learned through a Multicast Source Discovery Protocol (MSDP) peer. This flag is only applicable for a rendezvous point (RP) running MSDP.
X - Proxy Join Timer Running	Indicates that the proxy join timer is running. This flag is only set for (S, G) entries of an RP or “turnaround” router. A “turnaround” router is located at the intersection of a shared path (*, G) tree and the shortest path from the source to the RP.
A - Advertised via MSDP	Indicates that an (S, G) entry was advertised through an MSDP peer. This flag is only applicable for an RP running MSDP.
U - URD	Indicates that a URL Rendezvous Directory (URD) channel subscription report was received for the (S, G) entry.
I - Received Source Specific Host Report	Indicates that an (S, G) entry was created by an (S, G) report. This (S, G) report could have been created by Internet Group Management Protocol Version 3 (IGMPv3), URD, or IGMP v3lite. This flag is only set on the designated router (DR).
Outgoing interface flags:	Provides information about the entry.
H - Hardware switched	Indicates that a Multicast Multilayer Switching (MMLS) forwarding path has been established for this entry.

Table 9 show ip mroute Field Descriptions (continued)

Field	Description
Timers:Uptime/Expires	"Uptime" indicates per interface how long (in hours, minutes, and seconds) the entry has been in the IP multicast routing table. "Expires" indicates per interface how long (in hours, minutes, and seconds) until the entry will be removed from the IP multicast routing table.
Interface state:	Indicates the state of the incoming or outgoing interface.
Interface	Indicates the type and number of the interface listed in the incoming or outgoing interface list.
Next-Hop or VCD	"Next-hop" specifies the IP address of the downstream neighbor. "VCD" specifies the virtual circuit descriptor number. "VCD0" means the group is using the static map virtual circuit.
State/Mode	"State" indicates that packets will either be forwarded, pruned, or null on the interface depending on whether there are restrictions due to access lists or a Time To Live (TTL) threshold. "Mode" indicates whether the interface is operating in dense, sparse, or sparse-dense mode.
(*, 224.0.255.1) and (198.92.37.100/32, 224.0.255.1)	Entry in the IP multicast routing table. The entry consists of the IP address of the source router followed by the IP address of the multicast group. An asterisk (*) in place of the source router indicates all sources. Entries in the first format are referred to as (*, G) or "star comma G" entries. Entries in the second format are referred to as (S, G) or "S comma G" entries. (*, G) entries are used to build (S, G) entries.
RP	Address of the RP router. For routers and access servers operating in sparse mode, this address is always 0.0.0.0.
flags:	Information about the entry.
Incoming interface:	Expected interface for a multicast packet from the source. If the packet is not received on this interface, it is discarded.
RPF neighbor or RPF nbr	IP address of the upstream router to the source. Tunneling indicates that this router is sending data to the RP encapsulated in register packets. The hexadecimal number in parentheses indicates to which RP it is registering. Each bit indicates a different RP if multiple RPs per group are used. If an asterisk (*) appears after the IP address in this field, the RPF neighbor has been learned through an assert.
Dvmrp	Indicates if the RPF information is obtained from the Distance Vector Multicast Routing Protocol (DVMRP) routing table. If "Mroute" is displayed, the RPF information is obtained from the static mroutes configuration.
Outgoing interface list:	Interfaces through which packets will be forwarded. When the **ip pim nbma-mode** command is enabled on the interface, the IP address of the Protocol Independent Multicast (PIM) neighbor is also displayed.

The following is sample output from the **show ip mroute** command with the **count** keyword:

```
Router# show ip mroute count

IP Multicast Statistics
4045 routes using 2280688 bytes of memory
41 groups, 97.65 average sources per group
Forwarding Counts:Pkt Count/Pkts per second/Avg Pkt Size/Kilobits per second
Other counts:Total/RPF failed/Other drops(OIF-null, rate-limit etc)

Group:239.0.18.1, Source count:200, Packets forwarded:348232, Packets received:348551
  RP-tree:Forwarding:12/0/218/0, Other:12/0/0
  Source:10.1.1.1/32, Forwarding:1763/1/776/9, Other:1764/0/1
  Source:10.1.1.2/32, Forwarding:1763/1/777/9, Other:1764/0/1
  Source:10.1.1.3/32, Forwarding:1763/1/783/10, Other:1764/0/1
  Source:10.1.1.4/32, Forwarding:1762/1/789/10, Other:1763/0/1
  Source:10.1.1.5/32, Forwarding:1762/1/768/10, Other:1763/0/1
  Source:10.1.1.6/32, Forwarding:1793/1/778/10, Other:1794/0/1
  Source:10.1.1.7/32, Forwarding:1793/1/763/10, Other:1794/0/1
  Source:10.1.1.8/32, Forwarding:1793/1/785/10, Other:1794/0/1
  Source:10.1.1.9/32, Forwarding:1793/1/764/9, Other:1794/0/1
  Source:10.1.1.10/32, Forwarding:1791/1/774/10, Other:1792/0/1
  Source:10.1.2.1/32, Forwarding:1689/1/780/10, Other:1691/0/2
  Source:10.1.2.2/32, Forwarding:1689/1/782/10, Other:1691/0/2
  Source:10.1.2.3/32, Forwarding:1689/1/776/9, Other:1691/0/2
.
.
.

Group:239.0.18.132, Source count:0, Packets forwarded:8810, Packets received:8810
  RP-tree:Forwarding:8810/7/780/49, Other:8810/0/0

Group:239.0.17.132, Source count:0, Packets forwarded:704491, Packets received:704491
  RP-tree:Forwarding:704491/639/782/4009, Other:704491/0/0

Group:239.0.17.133, Source count:0, Packets forwarded:704441, Packets received:704441
  RP-tree:Forwarding:704441/639/782/3988, Other:704441/0/0

Group:239.0.18.133, Source count:0, Packets forwarded:8810, Packets received:8810
  RP-tree:Forwarding:8810/8/786/49, Other:8810/0/0

Group:239.0.18.193, Source count:0, Packets forwarded:0, Packets received:0

Group:239.0.17.193, Source count:0, Packets forwarded:0, Packets received:0

Group:239.0.18.134, Source count:0, Packets forwarded:8803, Packets received:8803
  RP-tree:Forwarding:8803/8/774/49, Other:8803/0/0
```

Note The RP-tree: field is displayed only for non-Source Specific Multicast (SSM) groups that have a (*, G) entry and a positive packet received count.

Table 10 describes the significant fields shown in the display.

Table 10 show ip mroute count Field Descriptions

Field	Description
Group:	Summary statistics for traffic on an IP multicast group G. This row is displayed only for non-SSM groups.
Forwarding Counts:	Statistics on the packets that are received and forwarded to at least one interface. **Note** There is no specific command to clear only the forwarding counters; you can clear only the actual multicast forwarding state with the **clear ip mroute** command. Issuing this command will cause interruption of traffic forwarding.
Pkt Count/	Total number of packets received and forwarded since the multicast forwarding state to which this counter applies was created.
Pkts per second/	Number of packets received and forwarded per second. On an IP multicast fast-switching platform, this number is the number of packets during the last second. Other platforms may use a different approach to calculate this number. Please refer to the platform documentation for more information.
Avg Pkt Size/	Total number of bytes divided by the total number of packets for this multicast forwarding state. There is no direct display for the total number of bytes. You can calculate the total number of bytes by multiplying the average packet size by the packet count.
Kilobits per second	Bytes per second divided by packets per second divided by 1000. On an IP multicast fast switching platform, the number of packets per second is the number of packets during the last second. Other platforms may use a different approach to calculate this number. Please refer to the platform documentation for more information.
Other counts:	Statistics on the received packets. These counters include statistics about the packets received and forwarded and packets received but not forwarded.
Total/	Total number of packets received.
RPF failed/	Number of packets not forwarded due to a failed RPF or acceptance check (when bidir-PIM is configured).
Other drops(OIF-null, rate-limit etc)	Number of packets not forwarded for reasons other than an RPF or acceptance check (such as the OIF list was empty or because the packets were discarded because of a configuration, such as **ip multicast rate-limit**, was enabled).
Group:	Summary information about counters for (*, G) and the range of (S, G) states for one particular group G. The following RP-tree: and Source: output fields contain information about the individual states belonging to this group. **Note** For SSM range groups, the Group: displays are statistical. All SSM range (S, G) states are individual, unrelated SSM channels.

Table 10 show ip mroute count Field Descriptions (continued)

Field	Description
Source count:	Number of (S, G) states for this group G. Individual (S, G) counters are detailed in the Source: output field rows.
Packets forwarded:	The sum of the packets detailed in the Forwarding Counts: fields for this IP multicast group G. This field is the sum of the RP-tree and all Source: fields for this group G.
Packets received:	The sum of packets detailed in the Other counts fields for this IP multicast group G. This field is the sum of the Other count: Pkt Count fields of the RP-tree: and Source: rows for this group G.
RP-tree:	Counters for the (*, G) state of this group G. These counters are displayed only for groups that have a forwarding mode that do not forward packets on the shared tree. These (*,G) groups are bidir-PIM and PIM-SM groups. There are no RP-tree displays for PIM-DM and SSM range groups.
Source:	Counters for an individual (S, G) state of this group G. There are no (S, G) states for bidir-PIM groups.

Related Commands

Command	Description
ip multicast-routing	Enables IP multicast routing or multicast distributed switching.
ip pim	Enables PIM on an interface.
ip pim ssm	Defines the SSM range of IP multicast addresses.

show ip pim bsr

To display the bootstrap router (BSR) information, use the **show ip pim bsr** command in EXEC mode.

show ip pim bsr

Syntax Description

This command has no arguments or keywords.

Command Modes

EXEC

Command History

Release	Modification
11.3 T	This command was introduced.

Usage Guidelines

The output includes elected BSR information and information about the locally configured candidate rendezvous point (RP) advertisement.

Examples

The following is sample output from the **show ip pim bsr** command:

```
Router# show ip pim bsr

PIMv2 Bootstrap information
This system is the Bootstrap Router (BSR)
  BSR address: 171.69.143.28
  Uptime: 04:37:59, BSR Priority: 4, Hash mask length: 30
  Next bootstrap message in 00:00:03 seconds

Next Cand_RP_advertisement in 00:00:03 seconds.
  RP: 171.69.143.28(Ethernet0), Group acl: 6
```

Table 11 describes the significant fields shown in the display.

Table 11 show ip pim bsr Field Descriptions

Field	Description
BSR address	IP address of the BSR.
Uptime	Length of time that this router has been up, in hours:minutes:seconds.
BSR Priority	Priority as configured in the **ip pim bsr-candidate** command.
Hash mask length	Length of a mask (32 bits maximum) that is to be ANDed with the group address before the hash function is called. This value is configured in the **ip pim bsr-candidate** command.
Next bootstrap message in	Time (in hours, minutes, and seconds) in which the next bootstrap message is due from this BSR.
Next Cand_RP_advertisement in	Time (in hours, minutes, and seconds) in which the next candidate RP advertisement will be sent.

Table 11 show ip pim bsr Field Descriptions (continued)

Field	Description
RP	List of IP addresses of RPs.
Group acl	Standard IP access list number that defines the group prefixes that are advertised in association with the RP address. This value is configured in the **ip pim rp-candidate** command.

Related Commands

Command	Description
ip pim bsr-candidate	Configures the router to announce its candidacy as a BSR.
ip pim rp-candidate	Configures the router to advertise itself as a PIM Version 2 candidate RP to the BSR.
show ip pim neighbor	Displays active RPs that are cached with associated multicast routing entries.
show ip pim rp-hash	Displays which RP is being selected for a specified group.

show ip pim interface

To display information about interfaces configured for Protocol Independent Multicast (PIM), use the **show ip pim interface** command in user EXEC or privileged EXEC mode.

show ip pim [**vrf** *vrf-name*] **interface** [*interface-type interface-number*] [**df** | **count**] [*rp-address*] [**detail**]

Syntax Description

vrf	(Optional) Supports the multicast VPN routing and forwarding (VRF) instance. A space is not required between the values.
vrf-name	(Optional) Name assigned to the VRF.
interface-type interface-number	(Optional) Interface type and number. A space is not required between the values.
df	(Optional) When bidirectional PIM (bidir-PIM) is used, displays the IP address of the elected designated forwarder (DF) for each rendezvous point (RP) of an interface.
count	(Optional) Specifies the number of packets received and sent out the interface.
rp-address	(Optional) RP IP address.
detail	(Optional) Displays PIM details of each interface.

Defaults

If no interface is specified, all interfaces are displayed.

Command Modes

User EXEC
Privileged EXEC

Command History

Release	Modification
10.0	This command was introduced.
11.2(11)GS	This command was integrated into Cisco IOS Release 11.2(11)GS.
12.0(5)T	The flag “H” was added in the output display to indicate that an outgoing interface is hardware-switched in the case of IP multicast Multilayer Switching (MMLS).
12.0(18)ST	This command was integrated into Cisco IOS Release 12.0(18)ST.
12.1(2)T	The **df** keyword and *rp-address* argument were added.
12.1(5)T	The **detail** keyword was added.
12.0(22)S	The command output changed to show when the query interval is set to milliseconds.
12.0(23)S	The **vrf** keyword and *vrf-name* argument were added.
12.2(13)T	The **vrf** keyword and *vrf-name* argument were added.
12.2(14)S	This command was integrated into Cisco IOS Release 12.2(14)S.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.

Usage Guidelines

This command works only on interfaces that are configured for PIM.

Use the **show ip pim interface count** command to display switching counts for Multicast Distributed Switching (MDS) and other fast-switching statistics.

Examples

The following is sample output from the **show ip pim interface** command:

```
Router# show ip pim interface

Address          Interface                Ver/   Nbr    Query  DR     DR
                                          Mode   Count  Intvl  Prior
10.1.0.1         GigabitEthernet0/0       v2/SD  0      30     1      10.1.0.1
10.6.0.1         GigabitEthernet0/1       v2/SD  1      30     1      10.6.0.2
10.2.0.1         ATM1/0.1                 v2/SD  1      30     1      0.0.0.0
```

The following is sample output from the **show ip pim interface** command when an interface is specified:

```
Router# show ip pim interface Ethernet1/0

Address          Interface                Ver/   Nbr    Query  DR     DR
                                          Mode   Count  Intvl  Prior
172.16.1.4       Ethernet1/0              v2/S   1      100 ms 1      172.16.1.4
```

The following is sample output from the **show ip pim interface** command when the **count** keyword is specified:

```
Router# show ip pim interface count

Address          Interface          FS  Mpackets In/Out
172.16.121.35    Ethernet0          *   548305239/13744856
172.16.121.35    Serial0.33         *   8256/67052912
192.168.12.73    Serial0.1719       *   219444/862191
```

The following is sample output from the **show ip pim interface** command when the **count** keyword is specified and IP MMLS is enabled. The example lists the PIM interfaces that are fast switched and process switched, and the packet counts for these interfaces. The H flag is added to interfaces where IP MMLS is enabled.

```
Router# show ip pim interface count

States: FS - Fast Switched, H - Hardware Switched
Address          Interface          FS  Mpackets In/Out
192.168.10.2       Vlan10             * H 40886/0
192.168.11.2       Vlan11             * H 0/40554
192.168.12.2       Vlan12             * H 0/40554
192.168.23.2       Vlan23             *   0/0
192.168.24.2       Vlan24             *   0/0
```

The following are two sample outputs from the **show ip pim interface** command when the **df** keyword is specified:

```
Router# show ip pim interface df

Interface          RP              DF Winner        Metric          Uptime
Ethernet3/3        10.10.0.2       10.4.0.2         0               00:03:49
                   10.10.0.3       10.4.0.3         0               00:01:49
                   10.10.0.5       10.4.0.4         409600          00:01:49
Ethernet3/4        10.10.0.2       10.5.0.2         0               00:03:49
                   10.10.0.3       10.5.0.2         409600          00:02:32
                   10.10.0.5       10.5.0.2         435200          00:02:16
```

```
Loopback0          10.10.0.2       10.10.0.2       0               00:03:49
                   10.10.0.3       10.10.0.2       409600          00:02:32
                   10.10.0.5       10.10.0.2       435200          00:02:16

Router# show ip pim interface Ethernet3/3 df 10.10.0.3

Designated Forwarder election for Ethernet3/3, 10.4.0.2, RP 10.10.0.3
  State                           Non-DF
  Offer count is                  0
  Current DF ip address           10.4.0.3
  DF winner up time               00:02:33
  Last winner metric preference   0
  Last winner metric              0
```

Table 12 describes the significant fields shown in the displays.

Table 12 show ip pim interface Field Descriptions

Field	Description
Address	Interface IP address of the next hop router.
Interface	Interface type and number that is configured to run PIM.
Ver/Mode	PIM version and multicast mode in which the Cisco IOS software is operating.
Nbr Count	Number of PIM neighbors that have been discovered through this interface. If the Neighbor Count is 1 for a DVMRP tunnel, the neighbor is active (receiving probes and reports).
Query Interval	Frequency, in seconds, of PIM hello messages, as set by the **ip pim query-interval** interface configuration command. The default is 30 seconds.
DR	IP address of the designated router (DR) on a network. **Note** Point-to-point interfaces do not have designated routers, so the IP address would be shown as 0.0.0.0.
FS	An asterisk (*) in this column indicates that fast switching is enabled.
Mpackets In/Out	Number of packets into and out of the interface since the router has been up.
RP	IP address of the RP.
DF Winner	IP address of the elected DF.
Metric	Unicast routing metric to the RP announced by the DF.
Uptime	Length of time the RP has been up, in days and hours. If less than 1 day, time is shown in hours:minutes:seconds.
State	Indicates whether the specified interface is an elected DF.
Offer count is	Number of PIM DF election offer messages that the router has sent out the interface during the current election interval.
Current DF ip address	IP address of the current DF.
DF winner up time	Length of time the current DF has been up, in days and hours. If less than 1 day, time is shown in hours:minutes:seconds.
Last winner metric preference	The preference value used for selecting the unicast routing metric to the RP announced by the DF.
Last winner metric	Unicast routing metric to the RP announced by the DF.

The following is sample output from the **show ip pim interface** command with the **detail** keyword for Fast Ethernet interface 0/1:

```
Router# show ip pim interface fastethernet 0/1 detail

FastEthernet0/1 is up, line protocol is up
  Internet address is 172.16.8.1/24
  Multicast switching:process
  Multicast packets in/out:0/0
  Multicast boundary:not set
  Multicast TTL threshold:0
  PIM:enabled
    PIM version:2, mode:dense
    PIM DR:172.16.8.1 (this system)
    PIM neighbor count:0
    PIM Hello/Query interval:30 seconds
    PIM State-Refresh processing:enabled
    PIM State-Refresh origination:enabled, interval:60 seconds
    PIM NBMA mode:disabled
    PIM ATM multipoint signalling:disabled
    PIM domain border:disabled
  Multicast Tagswitching:disabled
```

Table 13 describes the significant fields shown in the display.

Table 13 show ip pim interface detail Field Descriptions

Field	Description
Internet address	IP address of the specified interface.
Multicast switching:	The type of multicast switching enabled on the interface: process, fast, or distributed.
Multicast boundary:	Indicates whether an administratively scoped boundary is configured.
Multicast TTL threshold:	The time-to-live (TTL) threshold of multicast packets being forwarded out the interface.
PIM:	Indicates whether PIM is enabled or disabled.
PIM version:	Indicates whether PIM version 1 or version 2 is configured.
PIM mode:	Indicates whether PIM sparse mode, dense mode, or sparse-dense mode is configured.
PIM DR:	The IP address of the DR.
PIM State-Refresh processing:	Indicates whether the processing of PIM state refresh control messages is enabled.
PIM State-Refresh origination:	Indicates whether the origination of the PIM state refresh control messages is enabled.
interval:	Indicates the configured interval for the origination of the PIM state refresh control messages. The available interval range is from 4 to 100 seconds.
PIM NBMA mode:	Indicates whether the interface is enabled for nonbroadcast multiaccess (NBMA) mode.
PIM ATM multipoint signalling:	Indicates whether the interface is enabled for ATM multipoint signaling.

Table 13 show ip pim interface detail Field Descriptions (continued)

Field	Description
PIM domain border:	Indicates whether the interface is enabled as a PIM domain border.
Multicast Tagswitching:	Indicates whether multicast tag switching is enabled.

Related Commands

Command	Description
ip pim	Enables PIM on an interface.
ip pim query-interval	Configures the frequency of PIM router query messages.
ip pim state-refresh disable	Disables the processing and forwarding of PIM dense mode state refresh control messages on a PIM router.
ip pim state-refresh origination-interval	Configures the origination of and the interval for PIM dense mode state refresh control messages on a PIM router.
show ip pim neighbor	Displays information about PIM neighbors.

show ip pim neighbor

To list the Protocol Independent Multicast (PIM) neighbors discovered by the Cisco IOS software, use the **show ip pim neighbor** command in user EXEC or privileged EXEC mode.

show ip pim [**vrf** *vrf-name*] **neighbor** [*interface-type interface-number*]

Syntax Description

vrf	(Optional) Supports the multicast VPN routing and forwarding (VRF) instance.
vrf-name	(Optional) Name assigned to the VRF.
interface-type	(Optional) Interface type.
interface-number	(Optional) Interface number.

Command Modes

User EXEC
Privileged EXEC

Command History

Release	Modification
10.0	This command was introduced.
12.0(22)S	The command output was updated to display the PIM protocol version.
12.0(23)S	The **vrf** keyword and *vrf-name* argument were added.
12.2(13)T	The **vrf** keyword and *vrf-name* argument were added.
12.2(14)S	This command was integrated into Cisco IOS Release 12.2(14)S.

Usage Guidelines

Use this command to determine which routers on the LAN are configured for PIM.

Examples

The following is sample output from the **show ip pim neighbor** command:

```
Router# show ip pim neighbor

PIM Neighbor Table
Neighbor          Interface                Uptime/Expires Ver  DR
Address                                                       Prio/Mode
126.1.33.11       GigabitEthernet2/1     1d11h/00:00:02   v2   N / DR
126.1.34.12       GigabitEthernet2/1     1d11h/00:00:02   v2   N / DR
126.104.20.56     Serial4/1/0/1:0.104    1d11h/00:00:02   v2   1 / S
126.105.20.58     Serial4/1/0/2:0.105    1d00h/00:01:31   v2   1 / S
```

Table 14 describes the significant fields shown in the display.

Table 14 show ip pim neighbor Field Descriptions

Field	Description
Neighbor Address	IP address of the PIM neighbor.
Interface	Interface type and number on which the neighbor is reachable.

Table 14 show ip pim neighbor Field Descriptions (continued)

Field	Description
Uptime/Expires	Uptime shows how long (in hours:minutes:seconds) the entry has been in the PIM neighbor table. Expires shows how long (in hours:minutes:seconds or in milliseconds) until the entry will be removed from the IP multicast routing table.
Ver	PIM protocol version.
DR Prio/Mode	Priority and mode of the designated router (DR). Possible modes are S (state refresh capable), B (bidirectional PIM capable), and N (neighbor doesn't include the DR-Priority Option in its Hello messages).

Related Commands

Command	Description
ip pim state-refresh disable	Disables the processing and forwarding of PIM dense mode state refresh control messages on a PIM router.
ip pim state-refresh origination-interval	Configures the origination of and the interval for the PIM dense mode state refresh control messages on a PIM router.
show ip pim interface	Displays information about interfaces configured for PIM.

show ip pim rp

To display active rendezvous points (RPs) that are cached with associated multicast routing entries, use the **show ip pim rp** command in EXEC mode.

show ip pim rp [**mapping** | [**elected** | **in-use**] | **metric**] [*rp-address*]

Syntax Description

mapping	(Optional) Displays all group-to-RP mappings of which the router is aware (either configured or learned from Auto-RP).
elected	(Optional) Displays only the elected Auto RPs.
in-use	(Optional) Displays the learned RPs in use.
metric	(Optional) Displays the unicast routing metric to the RPs configured statically or learned via Auto-RP or the bootstrap router (BSR).
rp-address	(Optional) RP IP address.

Defaults

If no RP is specified, all active RPs are displayed.

Command Modes

EXEC

Command History

Release	Modification
10.2	This command was introduced.
12.1(2)T	The **metric** keyword and *rp-address* argument were added.

Usage Guidelines

The Protocol Independent Multicast (PIM) version known for an RP influences the type of PIM register messages (version 1 or version 2) that the router sends when acting as the designated router (DR) for an active source. If an RP is statically configured, the PIM version of the RP is not set and the router, if required to send register packets, first tries to send PIM version 2 register packets. If that fails, the router sends PIM version 1 register packets.

The version of the RP displayed in the **show ip pim rp** command output can change according to the operations of the router. When the group is created, the version shown is for the RP in the RP mapping cache. Later, the version displayed by this command may change. If this router is acting as a DR for an active source, the router sends PIM register messages. The PIM register messages are answered by the RP with PIM register stop messages. The router learns from these PIM register stop messages the actual PIM version of the RP. Once the actual PIM version of the RP is learned, this command displays only this version. If the router is not acting as a DR for active sources on this group, then the version shown for the RP of the group does not change. In this case, the PIM version of the RP is irrelevant to the router because the version of the RP influences only the PIM register messages that this router must send.

When you enter the **show ip pim rp mapping** command, the version of the RP displayed in the output is determined only by the method through which an RP is learned. If the RP is learned from Auto-RP then the RP displayed is either “v1” or “v2, v1.” If the RP is learned from a static RP definition, the RP version is undetermined and no RP version is displayed in the output. If the RP is learned from the BSR, the RP version displayed is “v2.”

Use the **elected** keyword on an Auto-RP Mapping Agent to limit the output to only the elected RPs that the mapping agent will advertise to all other routers in the network via Auto-RP. This is useful when comparing the output of the **show ip pim rp mapping** command on non mapping agent routers with the output of the **show ip pim rp mapping elected** command on a mapping agent to verify that the Group-to-RP mapping information is consistent.

Examples

The following is sample output from the **show ip pim rp** command:

```
Router# show ip pim rp

Group:227.7.7.7, RP:10.10.0.2, v2, v1, next RP-reachable in 00:00:48
```

The following is sample output from the **show ip pim rp** command when the **mapping** keyword is specified:

```
Router# show ip pim rp mapping

PIM Group-to-RP Mappings
This system is an RP (Auto-RP)
This system is an RP-mapping agent

Group(s) 227.0.0.0/8
  RP 10.10.0.2 (?), v2v1, bidir
    Info source:10.10.0.2 (?), via Auto-RP
         Uptime:00:01:42, expires:00:00:32
Group(s) 228.0.0.0/8
  RP 10.10.0.3 (?), v2v1, bidir
    Info source:10.10.0.3 (?), via Auto-RP
         Uptime:00:01:26, expires:00:00:34
Group(s) 229.0.0.0/8
  RP 10.10.0.5 (mcast1.cisco.com), v2v1, bidir
    Info source:10.10.0.5 (mcast1.cisco.com), via Auto-RP
         Uptime:00:00:52, expires:00:00:37
Group(s) (-)230.0.0.0/8
  RP 10.10.0.5 (mcast1.cisco.com), v2v1, bidir
    Info source:10.10.0.5 (mcast1.cisco.com), via Auto-RP
         Uptime:00:00:52, expires:00:00:37
```

The following is sample output from the **show ip pim rp** command when the **metric** keyword is specified:

```
Router# show ip pim rp metric

RP Address      Metric Pref    Metric       Flags   RPF Type    Interface
10.10.0.2       0              0              L     unicast     Loopback0
10.10.0.3       90             409600         L     unicast     Ethernet3/3
10.10.0.5       90             435200         L     unicast     Ethernet3/3
```

Table 15 describes the significant fields shown in the displays.

Table 15 show ip pim rp Field Descriptions

Field	Description
Group	Address of the multicast group about which to display RP information.
RP	Address of the RP for that group.
v2	Indicates that the RP is running PIM version 2.
v1	Indicates the RP is running PIM version 1.

Table 15 show ip pim rp Field Descriptions (continued)

Field	Description
next RP-reachable in...	Indicates the time the next RP-reachable message will be sent. Time is expressed in hours:minutes:seconds.
bidir	Indicates that the RP is operating in bidirectional mode.
Info source	RP mapping agent that advertised the mapping.
(?)	Indicates that no Domain Name System (DNS) name has been specified.
via Auto-RP	Indicates that RP was learned via Auto-RP.
Uptime	Length of time the RP has been up (in days and hours). If less than 1 day, time is expressed in hours:minutes:seconds.
expires	Time in (hours: minutes: and seconds) in which the entry will expire.
Metric Pref	The preference value used for selecting the unicast routing metric to the RP announced by the designated forwarder (DF).
Metric	Unicast routing metric to the RP announced by the DF.
Flags	Indicates the flags set for the specified RP. The following are descriptions of possible flags: • C—RP is configured. • L—RP learned via Auto-RP or the BSR.
RPF Type	Routing table from which this route was obtained, either unicast, Distance Vector Multicast Routing Protocol (DVMRP), or static mroute.
Interface	Interface type and number that is configured to run PIM.

show ip pim rp-hash

To display which rendezvous point (RP) is being selected for a specified group, use the **show ip pim rp-hash** command in EXEC mode.

show ip pim rp-hash {*group-address* | *group-name*}

Syntax Description

group-address | *group-name*	Displays the RP information for the specified group address or name as defined in the Domain Name System (DNS) hosts table.

Command Modes

EXEC

Command History

Release	Modification
11.3 T	This command was introduced.

Usage Guidelines

This command displays which RP was selected for the group specified. It also shows whether this RP was selected by Auto-RP or the PIM version 2 bootstrap mechanism.

Examples

The following is sample output from the **show ip pim rp-hash** command with the group address 239.1.1.1 specified:

```
Router# show ip pim rp-hash 239.1.1.1

RP 172.21.24.12 (mt1-47a.cisco.com), v2
    Info source: 172.21.24.12 (mt1-47a.cisco.com), via bootstrap
         Uptime: 05:15:33, expires: 00:02:01
```

Table 16 describes the significant fields shown in the display.

Table 16 show ip pim rp-hash Field Descriptions

Field	Description
RP 172.21.24.12 (mt1-47a.cisco.com), v2	Address of the RP for the group specified (239.1.1.1). Within parentheses is the Domain Name System (DNS) name of the RP. If the address of the RP is not registered in the DNS, a question mark (?) is displayed. PIM version 2 configured.
Info source: 172.21.24.12 (mt1-47a.cisco.com), via bootstrap	Indicates from which system the router learned this RP information, along with the DNS name of the source. RP was selected by the bootstrap mechanism. In this case, the BSR is also the RP.

Table 16 show ip pim rp-hash Field Descriptions (continued)

Field	Description
Uptime	Length of time (in hours, minutes, and seconds) that the router has known about this RP.
expires	Time (in hours, minutes, and seconds) after which the information about this RP expires. If the router does not receive any refresh messages in this time, it will discard information about this RP.

show ip pim vc

To display ATM virtual circuit (VC) status information for multipoint VCs opened by Protocol Independent Multicast (PIM), use the **show ip pim vc** command in EXEC mode.

show ip pim vc [*group-address* | *group-name*] [*type number*]

Syntax Description

group-address | *group-name*	(Optional) IP multicast group or name. Displays only the single group.
type number	(Optional) Interface type and number. Displays only the single ATM interface.

Defaults

Displays VC status information for all ATM interfaces.

Command Modes

EXEC

Command History

Release	Modification
11.3	This command was introduced.

Examples

The following is sample output for the **show ip pim vc** command:

```
Router# show ip pim vc

IP Multicast ATM VC Status
ATM0/0 VC count is 5, max is 200
Group            VCD   Interface    Leaf Count  Rate
224.2.2.2        26    ATM0/0       1           0 pps
224.1.1.1        28    ATM0/0       1           0 pps
224.4.4.4        32    ATM0/0       2           0 pps
224.5.5.5        35    ATM0/0       1           0 pps
```

Table 17 describes the significant fields shown in the display.

Table 17 show ip pim vc Field Descriptions

Field	Description
ATM0/0	ATM slot and port number on the interface.
VC count	Number of VCs opened by PIM.
max	Maximum number of VCs that PIM is allowed to open, as configured by the **ip pim vc-count** command.
Group	IP address of the multicast group to which the router is multicasting.
VCD	Virtual circuit descriptor.
Interface	Outgoing interface.

Table 17 show ip pim vc Field Descriptions (continued)

Field	Description
Leaf Count	Number of routers that have joined the group and are a member of that multipoint VC.
Rate	Rate (in packets per second) as configured by the **ip pim minimum-vc-rate** command.

Related Commands

Command	Description
ip pim multipoint-signalling	Enables PIM to open ATM multipoint switched VCs for each multicast group that a receiver joins.

show ip rpf

To display how IP multicast routing does Reverse Path Forwarding (RPF), use the **show ip rpf** command in EXEC mode.

show ip rpf {*source-address* | *source-name*} [**metric**]

Syntax Description

source-address | *source-name*	Displays the RPF information for the specified source address or name.
metric	(Optional) Displays the unicast routing metric.

Defaults

If no source is specified, all sources are displayed.

Command Modes

EXEC

Command History

Release	Modification
11.0	This command was introduced.
12.1(2)T	The **metric** keyword was added.

Usage Guidelines

The router can reverse path forward from multiple routing tables (that is, the unicast routing table, Distance Vector Multicast Routing Protocol (DVMRP) routing table, or static mroutes). This command tells you from where the information is retrieved.

Examples

The following is sample output of the **show ip rpf** command:

```
Router# show ip rpf 171.69.10.13

RPF information for sj-eng-mbone.cisco.com (171.69.10.13)
  RPF interface: BRI0
  RPF neighbor: eng-isdn-pri3.cisco.com (171.69.121.10)
  RPF route/mask: 171.69.0.0/255.255.0.0
  RPF type: unicast
  RPF recursion count: 0
  Doing distance-preferred lookups across tables
```

The following is sample output of the **show ip rpf** command when the **metric** keyword is specified:

```
Router# show ip rpf 171.69.10.13 metric

RPF information for sj-eng-mbone.cisco.com (171.69.10.13)
  RPF interface: BRI0
  RPF neighbor: eng-isdn-pri3.cisco.com (171.69.121.10)
  RPF route/mask: 171.69.0.0/255.255.0.0
  RPF type: unicast
  RPF recursion count: 0
  Doing distance-preferred lookups across tables
  Metric preference: 110
  Metric: 11
```

Table 18 describes the significant fields shown in the display.

Table 18 show ip rpf Field Descriptions

Field	Description
RPF information for <host name (source address)>	Host name and source address that this information concerns.
RPF interface	For the given source, interface from which the router expects to get packets.
RPF neighbor	For given source, neighbor from which the router expects to get packets.
RPF route/mask	Route number and mask that matched against this source.
RPF type	Routing table from which this route was obtained, either unicast, DVMRP, or static mroutes.
RPF recursion count	Indicates the number of times the route is recursively resolved.
Doing distance-preferred...	Indicates whether RPF was determined based on distance or length of mask.
Metric preference	The preference value used for selecting the unicast routing metric to the RP announced by the designated forwarder (DF).
Metric	Unicast routing metric to the RP announced by the DF.

show ip rtp header-compression

To show Real-Time Transport Protocol (RTP) header compression statistics, use the **show ip rtp header-compression** command in EXEC mode.

show ip rtp header-compression [*type number*] [**detail**]

Syntax Description

type number	(Optional) Interface type and number.
detail	(Optional) Displays details of each connection.

Command Modes

EXEC

Command History

Release	Modification
11.3	This command was introduced.
12.1(5)T	The command output was modified to include information related to the Distributed Compressed Real-Time Transport Protocol (dCRTP) feature.

Usage Guidelines

The **detail** keyword is not available with the **show ip rtp header-compression** command on a Route Switch Processor (RSP). However, the **detail** keyword is available with the **show ip rtp header-compression** command on a Versatile Interface Processor (VIP). Enter the **show ip rtp header-compression** *type number* **detail** command on a VIP to retrieve detailed information regarding RTP header compression on a specific interface.

Examples

The following is sample output from the **show ip rtp header-compression** command:

```
Router# show ip rtp header-compression

RTP/UDP/IP header compression statistics:
 Interface Serial1:
  Rcvd: 0 total, 0 compressed, 0 errors
     0 dropped, 0 buffer copies, 0 buffer failures
  Sent: 430 total 429 compressed,
     15122 bytes saved, 139318 bytes sent
     1.10 efficiency improvement factor
  Connect: 16 rx slots, 16 tx slots, 1 long searches, 1 misses
     99% hit ratio, five minute miss rate 0 misses/sec, 0 max.
```

Table 19 describes the significant fields shown in the display.

Table 19 show ip rtp header-compression Field Descriptions

Field	Description
Interface Serial1	Type and number of interface.
Rcvd: total	Number of packets received on the interface.
compressed	Number of packets with compressed header.

Table 19 show ip rtp header-compression Field Descriptions (continued)

Field	Description
errors	Number of errors.
dropped	Number of dropped packets.
buffer copies	Number of buffers that were copied.
buffer failures	Number of failures in allocating buffers.
Sent: total	Total number of packets sent.
compressed	Number of packets sent with compressed header.
bytes saved	Total savings in bytes due to compression.
bytes sent	Total bytes sent after compression.
efficiency improvement factor	Compression efficiency.
Connect: rx slots	Total number of receive slots.
tx slots	Total number of transmit slots.
long searches	Searches that needed more than one lookup.
misses	Number of new states that were created.
hit ratio	Number of times existing states were revised.
five minute miss rate	Average miss rate.
max.	Maximum miss rate.

Related Commands

Command	Description
ip rtp header-compression	Enables RTP header compression.
ip rtp compression-connections	Specifies the total number of RTP header compression connections supported on the interface.

show ip sap

To display the Session Announcement Protocol (SAP) cache, use the **show ip sap** command in EXEC mode.

show ip sap [*group-address* | **"***session-name***"** | **detail**]

Syntax Description

group-address	(Optional) Displays the sessions defining the specified multicast group address.
"*session-name***"**	(Optional) Displays the single session in detail format. The session name is enclosed in quotation marks (**" "**) that the user must enter.
detail	(Optional) Displays all sessions in detail format.

Command Modes

EXEC

Command History

Release	Modification
11.1	The **show ip sdr** command was introduced.
12.2	The **show ip sdr** command was replaced by the **show ip sap** command.

Usage Guidelines

If the router is configured to be a member of multicast group 224.2.127.254 (the default session directory group), it will cache SAP announcements.

If no arguments or keywords are used with this command, the system displays a sorted list of session names.

Examples

The following is sample output of the **show ip sap** command for a session using multicast group 224.2.197.250:

```
Router# show ip sap 224.2.197.250

SAP Cache - 198 entries
Session Name: The Sample Channel
   Description: This broadcast is brought to you courtesy of Sample Research Center.
   Group: 0.0.0.0, ttl: 0, Contiguous allocation: 1
   Lifetime: from 10:00:00 PDT Jul 4 1999 until 10:00:00 PDT Aug 1 1999
   Uptime: 4d05h, Last Heard: 00:01:40
   Announcement source: 128.102.84.134
   Created by: sample 3136541828 3139561476 IN IP4 128.102.84.134
   Phone number: Sample Digital Video Lab (555) 555-5555
   Email: Sample Digital Video Lab <sample@email.com>
   URL: http://sample.com/
   Media: audio 20890 RTP/AVP 0
     Media group: 224.2.197.250, ttl: 127
     Attribute: ptime:40
   Media: video 62806 RTP/AVP 31
     Media group: 224.2.190.243, ttl: 127
```

Table 20 describes the significant fields shown in the display.

Table 20 show ip sap Field Descriptions

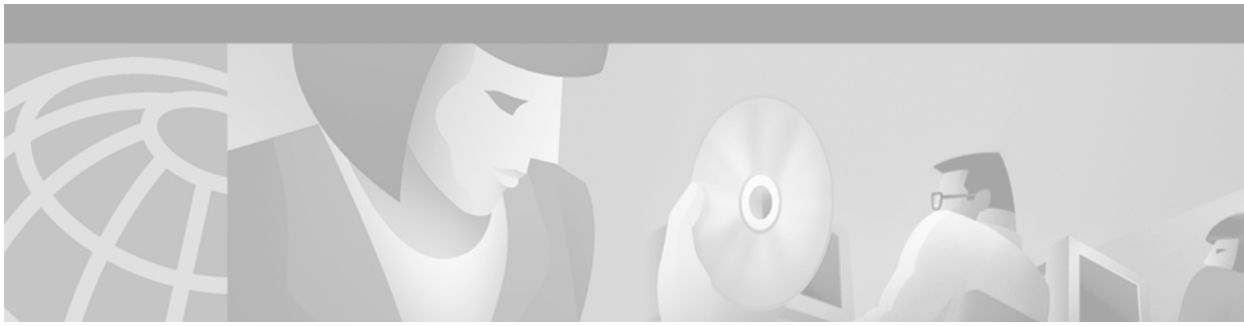
Field	Description
SAP Cache - <x> entries	Number of entries (sessions) in the cache.
Session Name:	Name of session.
Decription:	Description of the session. Individual media may have their own Description field.
Group:	IP multicast group addresses used for this session. The 0.0.0.0 IP address is displayed if individual media define separate multicast groups.
ttl:	The time-to-live (TTL) value associated with the multicast groups.
Contiguous Allocation:	Number of continuously ascending IP multicast group addresses allocated to this session.
Lifetime:	Period of time during which this session is presumed to carry traffic in the network.
Uptime:	How long (in hours, minutes, and seconds) this announcement has been stored.
Last Heard:	How long ago (in hours, minutes, and seconds) this announcement was last heard. This time is always less than the timeout value configured using the **sap cache-timeout** command.
Announcement source:	IP address of the host from which this session announcement was received.
Created by:	Information for identifying and tracking the session announcement.
Phone number:	Telephone number of the person or entity responsible for the session.
Email:	E-mail address of the person or entity responsible for the session.
URL:	URL for the location where further information about this session can be found.
Media:	Indicates the media type (audio, video, or data), transport port that the media stream is sent to, transport protocol used for these media (common values are User Datagram Protocol [UDP] and Real-Time Transport Protocol [RTP]/AVP), and list of media formats that each media instance can use. The first media format is the default format. Format identifiers are specific to the transport protocol used.
Media group:	Indicates the IP multicast group address over which the media instance is sent.
Attribute:	Indicates attributes specific to each media instance.

Related Commands

Command	Description
clear ip sap	Deletes a SAP cache entry or the entire SAP cache.
ip sap cache-timeout	Limits how long a SAP cache entry stays active in the cache.
ip sap listen	Enables the Cisco IOS software to listen to session directory announcements.

show ip sdr

The **show ip sdr** command is replaced by the **show ip sap** command. See the description of the **show ip sap** command in this chapter for more information.



Multicast Source Discovery Protocol Commands

Use the commands in this chapter to configure and monitor Multicast Source Discovery Protocol (MSDP). For configuration information and examples of MSDP, refer to the "Configuring Multicast Source Discovery Protocol" chapter of the *Cisco IOS IP Configuration Guide*.

clear ip msdp peer

To clear the TCP connection to the specified Multicast Source Discovery Protocol (MSDP) peer, use the **clear ip msdp peer** command in EXEC mode.

clear ip msdp peer {*peer-address* | *peer-name*}

Syntax Description

peer-address | *peer-name*	IP address or name of the MSDP peer to which the TCP connection is cleared.

Command Modes

EXEC

Command History

Release	Modification
12.0(7)T	This command was introduced.

Usage Guidelines

This command closes the TCP connection to the peer, resets all the MSDP peer statistics, and clears the input and output queues to and from the MSDP peer.

Examples

The following example clears the TCP connection to the MSDP peer at 10.3.32.154:

```
Router# clear ip msdp peer 10.3.32.154
```

Related Commands

Command	Description
ip msdp peer	Configures an MSDP peer.

clear ip msdp sa-cache

To clear Multicast Source Discovery Protocol (MSDP) Source-Active (SA) cache entries, use the **clear ip msdp sa-cache** command in EXEC mode.

clear ip msdp sa-cache [*group-address* | *group-name*]

Syntax Description

group-address | *group-name*	(Optional) Multicast group address or name for which Source-Active entries are cleared from the Source-Active cache.

Command Modes

EXEC

Command History

Release	Modification
12.0(7)T	This command was introduced.

Usage Guidelines

In order to have any SA entries in the cache to clear, SA caching must have been enabled with the **ip msdp cache-sa-state** command

If no multicast group is identified by group address or name, all SA cache entries are cleared.

Examples

The following example clears the SA entries for the multicast group 10.3.53.154 from the cache:

```
Router# clear ip msdp sa-cache 10.3.53.154
```

Related Commands

Command	Description
ip msdp cache-sa-state	Enables the router to create SA state.
show ip msdp sa-cache	Displays (S,G) state learned from MSDP peers.

clear ip msdp statistics

To clear statistics counters for one or all of the Multicast Source Discovery Protocol (MSDP) peers without resetting the sessions, use the **clear ip msdp statistics** command in EXEC mode.

clear ip msdp statistics [*peer-address* | *peer-name*]

Syntax Description

peer-address | *peer-name*	(Optional) Address or name of the MSDP peers whose statistics counters, reset count, and input/output count are cleared.

Command Modes

EXEC

Command History

Release	Modification
12.0(7)T	This command was introduced.

Examples

The following example clears the counters for the peer named sanjose:

```
Router# clear ip msdp statistics sanjose
```

ip msdp border

To configure a router that borders a Protocol Independent Multicast (PIM) sparse mode region and dense mode region to use Multicast Source Discovery Protocol (MSDP), use the **ip msdp border** command in global configuration mode. To prevent this action, use the **no** form of this command.

ip msdp border sa-address *type number*

no ip msdp border sa-address *type number*

Syntax Description

sa-address	Active source IP address.
type number	Interface type and number from which the IP address is derived and used as the rendezvous point (RP) address in Source-Active (SA) messages. Thus, MSDP peers can forward SA messages away from this border. The IP address of the interface is used as the originator ID, which is the RP field in the MSDP SA message.

Defaults

The active sources in the dense mode region will not participate in MSDP.

Command Modes

Global configuration

Command History

Release	Modification
12.0(7)T	This command was introduced.

Usage Guidelines

Use this command if you want the router to send SA messages for sources active in the PIM dense mode region to MSDP peers.

Note We recommend configuring the border router in the sparse mode domain to proxy-register sources in the dense mode domain, and have the sparse mode domain use standard MSDP procedures to advertise these sources.

Note If you use this command, you MUST constrain the sources advertised by using the **ip msdp redistribute** command. Configure the **ip msdp redistribute** command to apply to only local sources. Be aware that this configuration can result in (S, G) state remaining long after a source in the dense mode domain has stopped sending.

Note The **ip msdp originator-id** command also identifies an interface type and number to be used as the RP address. If both the **ip msdp border** and the **ip msdp originator-id** command are configured, the latter command prevails. That is, the address derived from the **ip msdp originator-id** command determines the address of the RP.

Examples

In the following example, the local router is not an RP. It borders a PIM sparse mode region with a dense mode region. It uses the IP address of Ethernet interface 0 as the "RP" address in SA messages.

```
ip msdp border sa-address ethernet0
```

Related Commands

Command	Description
ip msdp originator-id	Allows an MSDP speaker that originates an SA message to use the IP address of its interface as the RP address in the SA message.
ip msdp redistribute	Configures which (S,G) entries from the multicast routing table are advertised in SA messages originated to MSDP peers.

ip msdp cache-rejected-sa

To cache Source-Active (SA) request messages rejected from Multicast Source Discovery Protocol (MSDP) peers, use the **ip msdp cache-rejected-sa** command in global configuration mode. To stop tracking SA request messages, use the **no** form of this command.

ip msdp cache-rejected-sa *number-of-entries*

no ip msdp cache-rejected-sa *number-of-entries*

Syntax Description

number-of-entries	Number of entries to be cached. The range is from 1 to 32766.

Defaults

Rejected SA request messages are not stored.

Command Modes

Global configuration

Command History

Release	Modification
12.0(22)S	This command was introduced.
12.1E	This command was integrated into Cisco IOS Release 12.1E.
12.2	This command was integrated into Cisco IOS Release 12.2.

Usage Guidelines

Use the **ip msdp cache-rejected-sa** command to configure the router to store SA messages that have been recently received from an MSDP peer but were rejected. Once this command is enabled, the router will maintain a rejected SA cache that stores the most recent rejected SA messages. The number of rejected SA message entries to be stored in the rejected SA cache is configured with the *number-of-entries* argument. If the rejected SA cache overflows, entries are overwritten, starting from the first entry.

Note Enabling the **ip msdp cache-rejected-sa** command will not impact the performance of MSDP.

Use the **show ip msdp sa-cache** command with the **rejected-sa** keyword to display SA messages rejected from MSDP peers.

Examples

The following example shows how to enable the router to store a maximum of 200 messages rejected from MSDP peers:

```
Router(config)# ip msdp cache-rejected-sa 200
```

Related Commands

Command	Description
show ip msdp sa-cache	Displays the (S, G) state learned from MSDP peers.

ip msdp cache-sa-state

To have the router create Source-Active (SA) state, use the **ip msdp cache-sa-state** command in global configuration mode.

ip msdp cache-sa-state [**vrf** *vrf-name*]

Syntax Description

vrf	(Optional) Supports the multicast VPN routing and forwarding (VRF) instance.
vrf-name	(Optional) Name assigned to the VRF.

Defaults

The router creates SA state for all Multicast Source Discovery Protocol (MSDP) SA messages it receives.

Command Modes

Global configuration

Command History

Release	Modification
12.0(7)T	This command was introduced.
12.1(7)	This command was modified such that it is enabled by default and cannot be disabled.
12.0(23)S	The **vrf** keyword and *vrf-name* argument were added.
12.2(13)T	The **vrf** keyword and *vrf-name* argument were added.

Usage Guidelines

This command is automatically configured if at least one MSDP peer is configured. It cannot be disabled.

If you are running a version of Cisco IOS software prior to Release 12.1(7), we recommend enabling the **ip msdp cache-sa-state** command.

Examples

The following example shows how the **ip msdp cache-sa-state** command is enabled when an MSDP peer is configured:

```
.
.
.
ip classless
ip msdp peer 192.168.1.2 connect-source Loopback0
ip msdp peer 192.169.1.7
ip msdp mesh-group outside-test 192.168.1.2
ip msdp cache-sa-state
ip msdp originator-id Loopback0
.
.
.
```

Related Commands

Command	Description
clear ip msdp sa-cache	Clears MSDP SA cache entries.
ip msdp sa-request	Configures the router to send SA request messages to the MSDP peer when a new joiner from the group becomes active.
show ip msdp sa-cache	Displays (S, G) state learned from MSDP peers.

ip msdp default-peer

To define a default peer from which to accept all Multicast Source Discovery Protocol (MSDP) Source-Active (SA) messages, use the **ip msdp default-peer** command in global configuration mode. To remove the default peer, use the **no** form of this command.

ip msdp default-peer {*peer-address* | *peer-name*} [**prefix-list** *list*]

no ip msdp default-peer

Syntax Description

peer-address | *peer-name*	IP address or Domain Name System (DNS) name of the MSDP default peer.
prefix-list *list*	(Optional) Border Gateway Protocol (BGP) prefix list that specifies the peer will be a default peer only for the prefixes listed in the list specified by the *list* argument. A BGP prefix list must be configured for this **prefix-list** *list* keyword and argument to have any effect.

Defaults

No default MSDP peer exists.

Command Modes

Global configuration

Command History

Release	Modification
12.0(7)T	This command was introduced.

Usage Guidelines

Use the **ip msdp default-peer** command if you do not want to configure your MSDP peer to be a BGP peer also.

If only one MSDP peer is configured (with the **ip msdp peer** command), it will be used as a default peer. Therefore, you need not configure a default peer with this command.

If the **prefix-list** *list* keyword and argument are not specified, all SA messages received from the configured default peer are accepted.

Remember to configure a BGP prefix list if you intend to configure the **prefix-list** *list* keyword and argument with the **ip msdp default-peer** command.

If the **prefix-list** *list* keyword and argument are specified, SA messages originated from rendezvous points (RPs) covered by the **prefix-list** *list* keyword and argument will be accepted from the configured default peer. If the **prefix-list** *list* keyword and argument are specified but no prefix list is configured, the default peer will be used for all prefixes.

You can enter multiple **ip msdp default-peer** commands, with or without the **prefix-list** keyword, as follows. However, all commands must either have the keyword or all must not have the keyword.

- When you use multiple **ip msdp default-peer** commands with the **prefix-list** keyword, you use all the default peers at the same time for different RP prefixes. This syntax is typically used in a service provider cloud that connects stub site clouds.
- When you use multiple **ip msdp default-peer** commands without the **prefix-list** keyword, you use a single active peer to accept all SA messages. If that peer goes down, then you move to the next configured default peer to accept all SA messages. This syntax is typically used at a stub site.

Examples

The following example configures the router at IP address 192.168.1.3 as the default peer to the local router:

```
ip msdp peer 192.168.1.3
ip msdp peer 192.168.3.5
ip msdp default-peer 192.168.1.3
```

The following example configures two default peers:

```
ip msdp peer 172.18.2.3
ip msdp peer 172.19.3.5
ip msdp default-peer 172.18.2.3 prefix-list site-c
ip prefix-list site-a permit 172.18.0.0/16
ip msdp default-peer 172.19.3.5 prefix-list site-a
ip prefix-list site-c permit 172.19.0.0/16
```

Related Commands

Command	Description
ip msdp peer	Configures an MSDP peer.
ip prefix-list	Creates a prefix list.

ip msdp description

To add descriptive text to the configuration for a Multicast Source Discovery Protocol (MSDP) peer, use the **ip msdp description** command in global configuration mode. To remove the description, use the **no** form of this command.

ip msdp description {*peer-name* | *peer-address*} *text*

no ip msdp description {*peer-name* | *peer-address*}

Syntax Description

peer-name | *peer-address*	Peer name or address to which this description applies.
text	Description of the MSDP peer.

Defaults

No description is associated with an MSDP peer.

Command Modes

Global configuration

Command History

Release	Modification
12.0(7)T	This command was introduced.

Usage Guidelines

Configure a description to make the MSDP peer easier to identify. This description is visible in the output of the **show ip msdp peer** command.

Examples

The following example configures the router at the IP address 172.17.1.2 with a description indicating it is a router at customer A:

```
ip msdp description 172.17.1.2 router at customer a
```

ip msdp filter-sa-request

To configure the router to send Source-Active (SA) request messages to the Multicast Source Discovery Protocol (MSDP) peer when a new joiner from a group becomes active, use the **ip msdp filter-sa-request** command in global configuration mode. To prevent this action, use the **no** form of this command.

ip msdp filter-sa-request {*peer-address* | *peer-name*} [**list** *access-list*]

no ip msdp filter-sa-request {*peer-address* | *peer-name*}

Syntax Description

peer-address | *peer-name*	IP address or name of the MSDP peer from which the local router requests SA messages when a new joiner for the group becomes active.
list *access-list*	(Optional) Standard IP access list number or name that describes a multicast group address. If no access list is specified, all SA request messages are ignored.

Defaults

If this command is not configured, all SA request messages are honored. If this command is configured but no access list is specified, all SA request messages are ignored.

Command Modes

Global configuration

Command History

Release	Modification
12.0(7)T	This command was introduced.

Usage Guidelines

By default, the router honors all SA request messages from peers. Use this command if you want to control exactly which SA request messages the router will honor.

If no access list is specified, all SA request messages are ignored. If an access list is specified, only SA request messages from those groups permitted will be honored, and all others will be ignored.

Examples

The following example configures the router to filter SA request messages from the MSDP peer at 172.16.2.2. SA request messages from sources on the network 192.168.22.0 pass access list 1 and will be honored; all others will be ignored.

```
ip msdp filter sa-request 172.16.2.2 list 1
access-list 1 permit 192.4.22.0 0.0.0.255
```

Related Commands

Command	Description
ip msdp peer	Configures an MSDP peer.

ip msdp mesh-group

To configure a Multicast Source Discovery Protocol (MSDP) peer to be a member of a mesh group, use the **ip msdp mesh-group** command in global configuration mode. To remove an MSDP peer from a mesh group, use the **no** form of this command.

ip msdp mesh-group *mesh-name* {*peer-address* | *peer-name*}

no ip msdp mesh-group *mesh-name* {*peer-address* | *peer-name*}

Syntax Description

mesh-name	Name of the mesh group.
peer-address | *peer-name*	IP address or name of the MSDP peer to be a member of the mesh group.

Defaults

The MSDP peers do not belong to a mesh group.

Command Modes

Global configuration

Command History

Release	Modification
12.0(7)T	This command was introduced.

Usage Guidelines

A mesh group is a group of MSDP speakers that have fully meshed MSDP connectivity among themselves. Source-Active (SA) messages received from a peer in a mesh group are not forwarded to other peers in the same mesh group.

Mesh groups can be used to achieve two goals:

- To reduce SA message flooding
- To simplify peer-Reverse Path Forwarding (RPF) flooding (no need to run Border Gateway Protocol [BGP] or multiprotocol BGP among MSDP peers)

Examples

The following example configures the MSDP peer at address 192.168.1.3 to be a member of the mesh group named internal:

```
ip msdp mesh-group internal 192.168.1.3
```

ip msdp originator-id

To allow a Multicast Source Discovery Protocol (MSDP) speaker that originates a Source-Active (SA) message to use the IP address of the interface as the rendezvous point (RP) address in the SA message, use the **ip msdp originator-id** command in global configuration mode. To prevent the RP address from being derived in this way, use the **no** form of this command.

ip msdp originator-id *type number*

no ip msdp originator-id *type number*

Syntax Description

type number	Interface type and number on the local router, whose IP address is used as the RP address in SA messages.

Defaults

The RP address is used as the originator ID.

Command Modes

Global configuration

Command History

Release	Modification
12.0(7)T	This command was introduced.

Usage Guidelines

The **ip msdp originator-id** command identifies an interface type and number to be used as the RP address in an SA message.

Use this command if you want to configure a logical RP. Because only RPs and MSDP border routers originate SAs, there are times when it is necessary to change the ID used for this purpose.

If both the **ip msdp border** and the **ip msdp originator-id** commands are configured, the latter command prevails. That is, the address derived from the **ip msdp originator-id** command determines the address of the RP to be used in the SA message.

Examples

The following example configures the IP address of Ethernet interface 1 as the RP address in SA messages:

```
ip msdp originator-id ethernet1
```

Related Commands

Command	Description
ip msdp border	Configures a router that borders a PIM sparse mode region and dense mode region to use MSDP.

ip msdp peer

To configure a Multicast Source Discovery Protocol (MSDP) peer, use the **ip msdp peer** command in global configuration mode. To remove the peer relationship, use the **no** form of this command.

ip msdp peer {*peer-name* | *peer-address*} [**connect-source** *type number*] [**remote-as** *as-number*]

no ip msdp peer {*peer-name* | *peer-address*}

Syntax Description

peer-name | *peer-address*	Domain Name System (DNS) name or IP address of the router that is to be the MSDP peer.
connect-source *type number*	(Optional) Interface type and number whose primary address becomes the source IP address for the TCP connection. This interface is on the router being configured.
remote-as *as-number*	(Optional) Autonomous system number of the MSDP peer. This is used for display purposes only. There are cases where a peer might appear to be in another autonomous system (other than the one it really resides in) when you have an MSDP peering session but do not have a BGP peer session with that peer. In this case, if the prefix of the peer is injected by another autonomous system, it is displayed as the autonomous system number of the peer (and is misleading).

Defaults

No MSDP peer is configured.

Command Modes

Global configuration

Command History

Release	Modification
12.0(7)T	This command was introduced.

Usage Guidelines

The router specified should also be configured as a BGP neighbor.

If you are also BGP peering with this MSDP peer, you should use the same IP address for MSDP as you do for BGP. However, you are not required to run BGP or multiprotocol BGP with the MSDP peer, as long as there is a BGP or MBGP path between the MSDP peers. If there is no path, you must configure the **ip msdp default-peer** command.

Examples

The following example configures the router at the IP address 192.168.1.2 as an MSDP peer to the local router. The neighbor belongs to autonomous system 109.

```
ip msdp peer 192.168.1.2 connect-source ethernet 0/0
router bgp 110
 network 192.168.0.0
 neighbor 192.168.1.2 remote-as 109
```

```
 neighbor 192.168.1.2 update-source ethernet 0/0
```

The following example configures the router at the IP address 192.168.1.3 as an MSDP peer to the local router:

```
ip msdp peer 192.168.1.3
```

The following example configures the router at the IP address 192.168.1.4 to be an MSDP peer in autonomous system 109. The primary address of Ethernet interface 0/0 is used as the source address for the TCP connection.

```
ip msdp peer 192.168.1.4 connect-source ethernet 0/0 remote-as 109
```

Related Commands

Command	Description
neighbor remote-as	Adds an entry to the BGP neighbor table.

ip msdp redistribute

To configure which (S, G) entries from the multicast routing table are advertised in Source-Active (SA) messages originated to Multicast Source Discovery Protocol (MSDP) peers, use the **ip msdp redistribute** command in global configuration mode. To remove the filter, use the **no** form of this command.

ip msdp redistribute [**list** *access-list*] [**asn** *as-access-list*] [**route-map** *map-name*]

no ip msdp redistribute

Syntax Description

list *access-list*	(Optional) Standard or extended IP access list number or name that controls which local sources are advertised and to which groups they send.
asn *as-access-list*	(Optional) Standard or extended IP access list number in the range from 1 to 199. This access list number must also be configured in the **ip as-path** command.
route-map *map-name*	(Optional) Defines the route map.

Defaults

If no portion of this command is configured, only local sources are advertised, provided they send to groups for which the router is a rendezvous point (RP).

If no portion of this command is configured and if the **ip msdp border sa-address** command is configured, all local sources are advertised.

If the **ip msdp redistribute** command is configured with no keywords, no multicast sources are advertised.

Command Modes

Global configuration

Command History

Release	Modification
12.0(7)T	This command was introduced.

Usage Guidelines

This command affects SA message origination, not SA message forwarding. If you want to filter which SA messages are forwarded to MSDP peers, use the **ip msdp sa-filter in** or **ip msdp sa-filter out** command.

The **ip msdp redistribute** command controls which (S, G) pairs the router advertises from the multicast routing table. By default, only sources within the local domain are advertised. Use the following guidelines for the **ip msdp redistribute** command:

- If you specify the **list** *access-list-name* keyword and argument only, you filter which local sources are advertised and to what groups they send. The access list specifies a source address, source mask, group address, and group mask.
- If you specify the **asn** *aspath-access-list-number* keyword and argument only, you advertise all sources sending to any group which pass through the autonomous system path access list. The autonomous system path access list number refers to the **ip as-path** command, which specifies an access list. If the **asn 0** keyword is specified, sources from all autonomous systems are advertised. The **asn 0** keyword is useful when connecting dense mode domains to a sparse mode domain running MSDP, or when using MSDP in a router that is not configured with Border Gateway Protocol (BGP). In these cases, you do not know if a source is local.
- If you specify the **route-map** *map* keyword and argument only, you advertise all sources that satisfy the **match** criteria in the route map *map* argument.
- If you specify all three keywords (**list**, **asn**, and **route-map**), all conditions must be true before any multicast source is advertised in an SA message.
- If you specify the **ip multicast redistribute** command with no other keywords or arguments, no multicast sources are advertised.

Examples

The following example configures which (S, G) entries from the multicast routing table are advertised in SA messages originated to MSDP peers:

```
ip msdp redistribute route-map customer-sources

route-map customer-sources permit
match as-path customer-as

ip as-path access-list ^109$
```

Related Commands

Command	Description
ip as-path	Defines a BGP-related access list.
ip msdp border	Configures a router that borders a PIM sparse mode region and dense mode region to use MSDP.

ip msdp sa-filter in

To configure an incoming filter list for Source-Active (SA) messages received from the specified Multicast Source Discovery Protocol (MSDP) peer, use the **ip msdp sa-filter in** command in global configuration mode. To remove the filter, use the **no** form of this command.

ip msdp sa-filter in {*peer-address* | *peer-name*} [**list** *access-list*] [**route-map** *map-name*]

no ip msdp sa-filter in {*peer-address* | *peer-name*} [**list** *access-list*] [**route-map** *map-name*]

Syntax Description

peer-address | *peer-name*	IP address or name of the MSDP peer from which the SA messages are filtered.
list *access-list*	(Optional) IP access list number or name. If no access list is specified, all source/group pairs from the peer are filtered.
route-map *map-name*	(Optional) Route map name. From the specified MSDP peer, passes only those SA messages that meet the match criteria in the route map *map-name* argument. If all match criteria are true, a **permit** keyword from the route map will pass routes through the filter. A **deny** keyword will filter routes.

Defaults

If this command is not configured, no incoming messages are filtered; all SA messages are accepted from the peer.

If the command is configured, but no access list or route map is specified, all source/group pairs from the peer are filtered.

If both the **list** and the **route-map** keywords are used, all conditions must be true to pass any (S, G) pair in incoming SA messages.

Command Modes

Global configuration

Command History

Release	Modification
12.0(7)T	This command was introduced.

Examples

The following example configures the router to filter all SA messages from the peer at 192.168.1.3:

```
ip msdp peer 192.168.1.3 connect-source Ethernet0/0
ip msdp sa-filter in 192.168.1.3
```

Related Commands

Command	Description
ip msdp peer	Configures an MSDP peer.
ip msdp sa-filter out	Configures an outgoing filter list for SA messages sent to the specified MSDP peer.

ip msdp sa-filter out

To configure an outgoing filter list for Source-Active (SA) messages sent to the specified Multicast Source Discovery Protocol (MSDP) peer, use the **ip msdp sa-filter out** command in global configuration mode. To remove the filter, use the **no** form of this command.

ip msdp sa-filter out {*peer-address* | *peer-name*} [**list** *access-list*] [**route-map** *map-name*]

no ip msdp sa-filter out {*peer-address* | *peer-name*} [**list** *access-list*] [**route-map** *map-name*]

Syntax Description

peer-address | *peer-name*	IP address or DNS name of the MSDP peer to which the SA messages are filtered.
list *access-list*	(Optional) Extended IP access list number or name. If no access list is specified, all source/group pairs are filtered. To the specified MSDP peer, passes only those SA messages that pass the extended access list. If both the **list** and the **route-map** keywords are used, all conditions must be true to pass any (S, G) pairs in outgoing SA messages.
route-map *map-name*	(Optional) Route map name. To the specified MSDP peer, passes only those SA messages that meet the match criteria in the route map *map-name* argument. If all match criteria are true, a **permit** keyword from the route map will pass routes through the filter. A **deny** keyword will filter routes.

Defaults

If this command is not configured, no outgoing messages are filtered; all SA messages received are forwarded to the peer.

If the command is configured, but no access list or route map is specified, all source/group pairs are filtered.

If both the **list** and the **route-map** keywords are used, all conditions must be true to pass any (S, G) pairs in outgoing SA messages.

Command Modes

Global configuration

Command History

Release	Modification
12.0(7)T	This command was introduced.

Examples

The following example allows only (S, G) pairs that pass access list 100 to be forwarded in an SA message to the peer at the IP address 192.168.1.5:

```
ip msdp peer 192.168.1.5 connect-source ethernet 0/0
ip msdp sa-filter out 192.168.1.5 list 100
access-list 100 permit ip 172.1.0.0 0.0.255.255 224.2.0.0 0.0.255.255
```

Related Commands

Command	Description
ip msdp peer	Configures an MSDP peer.
ip msdp sa-filter in	Configures an incoming filter list for SA messages received from the specified MSDP peer.

ip msdp sa-limit

To limit the number of Source-Active (SA) messages from a Multicast Source Discovery Protocol (MSDP) peer that the router will allow in the SA cache, use the **ip msdp sa-limit** command in global configuration mode. To remove this limit, use the **no** form of this command.

ip msdp sa-limit {*peer-name* | *peer-address*} *sa-limit*

no ip msdp sa-limit {*peer-name* | *peer-address*} *sa-limit*

Syntax Description

peer-name | *peer-address*	Domain Name System (DNS) name or IP address of the router that is to be the MSDP peer.
sa-limit	Maximum number of SA messages from an MSDP peer allowed in the SA cache.

Defaults

By default, no SA message limit is set.

Command Modes

Global configuration

Command History

Release	Modification
12.1(7)	This command was introduced.

Usage Guidelines

Use this command to prevent distributed denial of service attacks. We recommend configuring this command on all MSDP peer connections.

The output of the **show ip msdp count**, **show ip msdp peer**, and **show ip msdp summary** commands will display the number of SA messages from each MSDP peer that is in the SA cache. If the **ip msdp sa-limit** command is configured, the output of the **show ip msdp peer** command will also display the value of the SA message limit for each MSDP peer.

Examples

The following example configures the SA message limit to 100 for the MSDP peer with IP address 172.16.10.2:

```
ip msdp sa-limit 172.16.10.2 100
```

Related Commands

Command	Description
show ip msdp count	Displays the number of sources and groups originated in MSDP SA messages.
show ip msdp peer	Displays detailed information about the MSDP peer.
show ip msdp summary	Displays MSDP peer status.

ip msdp sa-request

To configure the router to send Source-Active (SA) request messages to the Multicast Source Discovery Protocol (MSDP) peer when a new joiner from the group becomes active, use the **ip msdp sa-request** command in global configuration mode. To prevent this action, use the **no** form of this command.

ip msdp sa-request {*peer-address* | *peer-name*}

no ip msdp sa-request {*peer-address* | *peer-name*}

Syntax Description

peer-address | *peer-name*	IP address or name of the MSDP peer from which the local router requests SA messages when a new joiner for the group becomes active.

Defaults

The router does not send SA request messages to the MSDP peer.

Command Modes

Global configuration

Command History

Release	Modification
12.0(7)T	This command was introduced.

Usage Guidelines

By default, the router does not send any SA request messages to its MSDP peers when a new member joins a group and wants to receive multicast traffic. The new member waits to receive any SA messages that eventually arrive.

Use this command if you want a new member of a group to learn the current, active multicast sources in a connected Protocol Independent Multicast sparse mode (PIM-SM) domain that are sending to a group. The router will send SA request messages to the specified MSDP peer when a new member joins a group. The peer replies with the information in its SA cache. If the peer does not have a cache configured, this command provides nothing.

An alternative to this command is using the **ip msdp cache-sa-state** command to have the router cache messages.

Examples

The following example configures the router to send SA request messages to the MSDP peer at 172.16.10.2:

```
ip msdp sa-request 172.16.10.2
```

Related Commands

Command	Description
ip msdp cache-sa-state	Enables the router to create SA state.
ip msdp peer	Configures an MSDP peer.

ip msdp shutdown

To administratively shut down a configured Multicast Source Discovery Protocol (MSDP) peer, use the **ip msdp shutdown** command in global configuration mode. To bring the peer back up, use the **no** form of this command.

ip msdp shutdown {*peer-address* | *peer-name*}

no ip msdp shutdown {*peer-address* | *peer-name*}

Syntax Description

peer-address | *peer-name*	IP address or name of the MSDP peer to shut down.

Defaults

No action is taken to shut down an MSDP peer.

Command Modes

Global configuration

Command History

Release	Modification
12.0(7)T	This command was introduced.

Examples

The following example shuts down the MSDP peer at IP address 192.168.7.20:

```
ip msdp shutdown 192.168.7.20
```

Related Commands

Command	Description
ip msdp peer	Configures an MSDP peer.

ip msdp ttl-threshold

To limit which multicast data packets are sent in Source-Active (SA) messages to a Multicast Source Discovery Protocol (MSDP) peer, use the **ip msdp ttl-threshold** command in global configuration mode. To restore the default value, use the **no** form of this command.

ip msdp ttl-threshold {*peer-address* | *peer-name*} *ttl-value*

no ip msdp ttl-threshold {*peer-address* | *peer-name*}

Syntax Description

peer-address | *peer-name*	IP address or name of the MSDP peer to which the *ttl* argument applies.
ttl-value	Time-to-live (TTL) value. The default value of the *ttl* argument is 0, meaning all multicast data packets are forwarded to the peer until the TTL is exhausted.

Defaults

ttl-value: 0

Command Modes

Global configuration

Command History

Release	Modification
12.0(7)T	This command was introduced.

Usage Guidelines

This command limits which multicast data packets are sent in data-encapsulated SA messages. Only multicast packets with an IP header TTL greater than or equal to the *ttl* argument are sent to the MSDP peer specified by the IP address or name.

Use this command if you want to use TTL to scope your multicast data traffic. For example, you could limit internal traffic to a TTL of 8. If you want other groups to go to external locations, you would need to send those packets with a TTL greater than 8.

Examples

The following example configures a TTL threshold of 8 hops:

```
ip msdp ttl-threshold 192.168.1.5 8
```

Related Commands

Command	Description
ip msdp peer	Configures an MSDP peer.

show ip msdp count

To display the number of sources and groups originated in Multicast Source Discovery Protocol (MSDP) Source-Active (SA) messages and the number of SA messages from an MSDP peer in the SA cache, use the **show ip msdp count** command in EXEC mode.

show ip msdp count [*as-number*]

Syntax Description

as-number	(Optional) Displays the number of sources and groups originated in SA messages from the specified autonomous system number.

Command Modes

EXEC

Command History

Release	Modification
12.0(7)T	This command was introduced.
12.1(7)	This command was modified to display information about the number of SA messages from each MSDP peer in the SA cache.

Usage Guidelines

The **ip msdp cache-sa-state** command must be configured for this command to have any output.

Examples

The following is sample output of the **show ip msdp count** command:

```
Router# show ip msdp count

SA State per Peer Counters, <Peer>: <# SA learned>
 192.135.250.116: 24
 144.228.240.253: 3964
 172.17.253.19: 10
 172.17.170.110: 11

SA State per ASN Counters, <asn>: <# sources>/<# groups>
 Total entries: 4009
 ?: 198/98, 9: 1/1, 14: 107/57, 17: 7/5
 18: 4/3, 25: 23/17, 26: 39/27, 27: 2/2
 32: 19/7, 38: 2/1, 52: 4/4, 57: 1/1
 68: 4/4, 73: 12/8, 81: 19/1, 87: 9/6
 .
 .
 .
```

Table 21 describes the significant fields shown in the display.

Table 21 show ip msdp count Field Descriptions

Field	Description
192.135.250.116: 24	MSDP peer with IP address 192.135.250.116: 24 SA messages from the MSDP peer in the SA cache.
Total entries	Total number of SA entries in the SA cache.
9: 1/1	Autonomous system 9: 1 source/1 group

Related Commands

Command	Description
ip msdp cache-sa-state	Enables the router to create SA state.

show ip msdp peer

To display detailed information about the Multicast Source Discovery Protocol (MSDP) peer, use the **show ip msdp peer** command in EXEC mode.

show ip msdp peer [*peer-address* | *peer-name*] [**accepted-sas** | **advertised-sas**]

Syntax Description

peer-address | *peer-name*	(Optional) Domain Name System (DNS) name or IP address of the MSDP peer for which information is displayed.
accepted-sas	(Optional) SAs accepted from this peer.
advertised-sas	(Optional) SAs advertised to this peer.

Command Modes

EXEC

Command History

Release	Modification
12.0(7)T	This command was introduced.
12.1(7)	This command was modified to display information about the SA message limit configured using the the **ip msdp sa-limit** command.

Examples

The following is sample output of the **show ip msdp peer** command:

```
Router# show ip msdp peer 192.135.250.116

MSDP Peer 192.135.250.116 (rtp5-rp1.cisco.com), AS 109 (configured AS)
Description:
 Connection status:
   State: Up, Resets: 9, Connection source: Loopback2 (204.69.199.17)
   Uptime(Downtime): 1d10h, Messages sent/received: 436765/429062
   Output messages discarded: 0
   Connection and counters cleared 1w2d     ago
 SA Filtering:
   Input (S,G) filter: none, route-map: none
   Input RP filter: none, route-map: none
   Output (S,G) filter: none, route-map: none
   Output RP filter: none, route-map: none
 SA-Requests:
   Input filter: none
   Sending SA-Requests to peer: disabled
 Peer ttl threshold: 0
 SAs learned from this peer: 32, SAs limit: 500
 Input queue size: 0, Output queue size: 0
```

Table 22 describes the significant fields shown in the display.

Table 22 show ip msdp peer Field Descriptions

Field	Description
MSDP Peer	IP address of the MSDP peer.
AS	Autonomous system to which the MSDP peer belongs.
State:	State of the MSDP peer.
Connection source:	Interface used to obtain the IP address for the TCP local connection address.
Uptime(Downtime):	Days and hours the MSDP peer is up or down. If the time is less than 24 hours, it is shown in terms of hours:minutes:seconds.
Messages sent/received:	Number of SA messages sent to the MSDP peer/number of SA messages received from the MSDP peer.
SA Filtering:	Information regarding access list filtering of SA input and output, if any.
SA-Requests:	Information regarding access list filtering of SA requests, if any.
SAs learned from this peer:	Number of SA messages from the MSDP peer in the SA cache.
SAs limit:	SA message limit for this MSDP peer.

Related Commands

Command	Description
ip msdp peer	Configures an MSDP peer.

show ip msdp sa-cache

To display the (S,G) state learned from Multicast Source Discovery Protocol (MSDP) peers, use the **show ip msdp sa-cache** command in user EXEC or privileged EXEC mode.

show ip msdp [**vrf** *vrf-name*] **sa-cache** [*group-address* | *source-address* | *group-name* | *source-name*] [*group-address* | *source-address* | *group-name* | *source-name*] [*as-number*] [**rejected-sa** [**detail**] [**read-only**]]

Syntax Description

vrf	(Optional) Supports the multicast VPN routing and forwarding (VRF) instance.
vrf-name	(Optional) Name assigned to the VRF.
group-address | *source-address* | *group-name* | *source-name*	(Optional) Group address, source address, group name, or source name of the group or source about which (S, G) state information is displayed. If two addresses or names are specified, an (S, G) entry corresponding to those addresses is displayed. If only one group address is specified, all sources for that group are displayed. If no options are specified, the entire Source-Active (SA) cache is displayed.
as-number	(Optional) Autonomous system (AS) number from which the SA message originated.
rejected-sa	(Optional) Displays the most recently received and rejected MSDP SA messages.
detail	(Optional) Displays detailed information about the IP address of the MSDP peer that sent the SA message and the reason that the SA message was rejected.
read-only	(Optional) Checkpoints the rejected SA cache. Once checkpointed, the rejected SA cache is emptied.

Command Modes

User EXEC
Privileged EXEC

Command History

Release	Modification
12.0(7)T	This command was introduced.
12.0(23)S	The **vrf** keyword and *vrf-name* argument were added.
12.2(13)T	The **vrf** keyword and *vrf-name* argument were added.

Usage Guidelines

By default, (S,G) state is cached.

Rejected SA messages are cached only if the **ip msdp cache-rejected-sa** command is configured.

Use the **show ip msdp sa-cache** with the optional **rejected-sa** keyword to display SA messages stored in the rejected SA cache. When the **detail** keyword is added to the command string, the output includes the IP address of the MSDP peer router that sent the SA message and the reason that the SA message was rejected.

When the optional **read-only** keyword is added to the command string, the router checkpoints the rejected SA cache, which ensures that a consistent snapshot of the rejected SA cache is displayed in the output. After being checkpointed, the rejected SA cache is cleared.

Note Checkpointing the rejected SA cache requires that the router make a second copy of the rejected SA cache, which could cause the command to fail if the router is low on memory.

When the optional **read-only** keyword is not added to the command string, the router displays rejected MSDP SA messages out of the active rejected SA cache, which could result in inconsistent display output if rejected SA message entries are overwritten by rejected SA message entries that are captured as the output is being processed for display.

Examples

The following is sample output from the **show ip msdp sa-cache** command:

```
Router# show ip msdp sa-cache

MSDP Source-Active Cache - 2398 entries
(172.16.41.33, 238.105.148.0), RP 172.16.3.111, MBGP/AS 704, 2d10h/00:05:33
(172.16.112.8, 224.2.0.1), RP 192.168.200.65, MBGP/AS 10888, 00:03:21/00:02:38
(172.16.10.13, 227.37.32.1), RP 192.168.3.92, MBGP/AS 704, 05:22:20/00:03:32
(172.16.66.18, 233.0.0.1), RP 192.168.3.111, MBGP/AS 704, 2d10h/00:05:35
(172.16.66.148, 233.0.0.1), RP 192.168.3.111, MBGP/AS 704, 2d10h/00:05:35
(172.16.10.13, 227.37.32.2), RP 192.168.3.92, MBGP/AS 704, 00:44:30/00:01:31
(172.16.70.203, 224.2.236.2), RP 192.168.253.7, MBGP/AS 3582, 02:34:16/00:05:49
(172.18.42.104, 236.195.56.2), RP 192.168.3.92, MBGP/AS 704, 04:21:13/00:05:22
(172.16.10.13, 227.37.32.3), RP 192.168.3.92, MBGP/AS 704, 00:44:30/00:02:31
(172.18.15.43, 224.0.92.3), RP 192.168.200.65, MBGP/AS 10888, 6d09h/00:05:35
(172.18.15.111, 224.0.92.3), RP 192.168.200.65, MBGP/AS 10888, 16:18:08/00:05:35
(172.18.21.45, 224.0.92.3), RP 192.168.200.65, MBGP/AS 10888, 16:18:08/00:05:35
(172.18.15.75, 224.0.92.3), RP 192.168.200.65, MBGP/AS 10888, 08:40:52/00:05:35
(172.18.15.100, 224.0.92.3), RP 192.168.200.65, MBGP/AS 10888, 08:40:52/00:05:35
(172.16.10.13, 227.37.32.6), RP 192.168.3.92, MBGP/AS 704, 00:45:30/00:05:31
(172.18.41.33, 224.247.228.10), RP 192.168.3.111, MBGP/AS 704, 2d10h/00:05:35
(172.18.222.210, 224.2.224.13), RP 192.168.3.92, MBGP/AS 704, 01:51:53/00:05:22
(172.18.41.33, 229.231.124.13), RP 192.168.3.111, MBGP/AS 704, 2d10h/00:05:33
(172.18.32.138, 224.2.200.23), RP 192.168.253.7, MBGP/AS 3582, 21:33:40/00:05:49
(172.18.75.244, 224.2.200.23), RP 192.168.253.7, MBGP/AS 3582, 21:33:40/00:05:49
```

Table 23 describes the significant fields shown in the display.

Table 23 show ip msdp sa-cache Field Descriptions

Field	Description
(172.16.41.33, 238.105.148.0)	The first address (source) is sending to the second address (group).
RP 172.16.3.111	IP address of the Rendezvous point (RP) where the SA message originated.

Table 23 show ip msdp sa-cache Field Descriptions (continued)

Field	Description
MBGP/AS 704	The RP from which the SA message originated is in AS 704 according to multiprotocol Border Gateway Protocol (BGP).
2d10h/00:05:33	The route has been cached for 2 days and 10 hours. If no SA message is received in 5 minutes and 33 seconds, the route will be removed from the SA cache.

The following is sample output from the **show ip msdp sa-cache** command with the **rejected**, **detail**, and **read-only** keywords specified:

```
Router# show ip msdp sa-cache rejected detail read-only

MSDP Rejected SA Cache
 35 rejected SAs received over 02:50:01, cache size: 50 entries
 Timestamp (source, group)
 2832.248, (10.10.10.4, 227.7.7.12), RP: 10.10.10.4, Peer: 10.10.10.4,
     Reason: sa-limit-exceeded
 2915.232, (10.10.10.8, 224.1.1.1), RP: 10.11.11.11, Peer: 10.10.10.8,
     Reason: in-filter
 3509.584, (10.12.12.2, 225.5.5.5), RP: 10.15.15.1, Peer: 10.12.12.2,
           Reason: rpf-fail
 .
 .
 .
```

Table 24 describes the significant fields shown in the display.

Table 24 show ip msdp sa-cache rejected detail read-only Field Descriptions

Field	Description
35 rejected SAs received over 02:50:01	The number of rejected SA message entries received in the length of time indicated in HH:MM:SS.
cache size:	Indicates the size of the rejected SA cache. This field is controlled by the **ip msdp rejected-sa-cache** command. If the rejected SA cache overflows, entries are overwritten, starting from the first entry.
Timestamp	Indicates the router uptime in *seconds.milliseconds.*
(source, group)	The (S, G) information advertised in the rejected SA message.
RP:	Indicates the IP address of the Rendezvous Point (RP) that originated the SA message.

Table 24 show ip msdp sa-cache rejected detail read-only Field Descriptions (continued)

Field	Description
Peer:	Indicates the IP address of the MSDP peer that sent the rejected SA message.
Reason:	Indicates the reason that the router rejected the SA message. The possible reasons are as follows: • autorp-group—Indicates that the SA message was rejected because it included one of the two AutoRP groups (224.0.1.39 and 224.0.1.40). • in-filter—Indicates that the SA message was rejected because it was filtered by a configured incoming filter list (configured by the **ip msdp sa-filter in** command). • no-memory—Indicates that the SA message was rejected because the router ran out of memory while allocating storage for the MSDP SA message. • rpf-fail—Indicates that the SA message was rejected because it failed the Reverse Path Forwarding (RPF) check. • rp-filter—Indicates that the SA message was rejected because it was filtered by a configured incoming RP filter list (configured by the **ip msdp sa-filter in** command). • sa-limit-exceeded—Indicates that the SA message was rejected because the maximum number of SA cache entries (controlled by the **ip msdp sa-limit** command) was already exhausted when the SA message was received. • ssm-range—Indicates that the SA message was rejected because it indicated a group in the SSM range.

Related Commands

Command	Description
clear ip msdp sa-cache	Clears MSDP SA cache entries.
ip msdp cache-sa-state	Enables the router to create SA state.

show ip msdp summary

To display Multicast Source Discovery Protocol (MSDP) peer status, use the **show ip msdp summary** command in EXEC mode.

show ip msdp summary

Syntax Description

This command has no arguments or keywords.

Command Modes

EXEC

Command History

Release	Modification
12.0(7)T	This command was introduced.
12.1(7)	This command was modified to display information about the number of SA messages from each MSDP peer in the SA cache.

Examples

The following is sample output of the **show ip msdp summary** command:

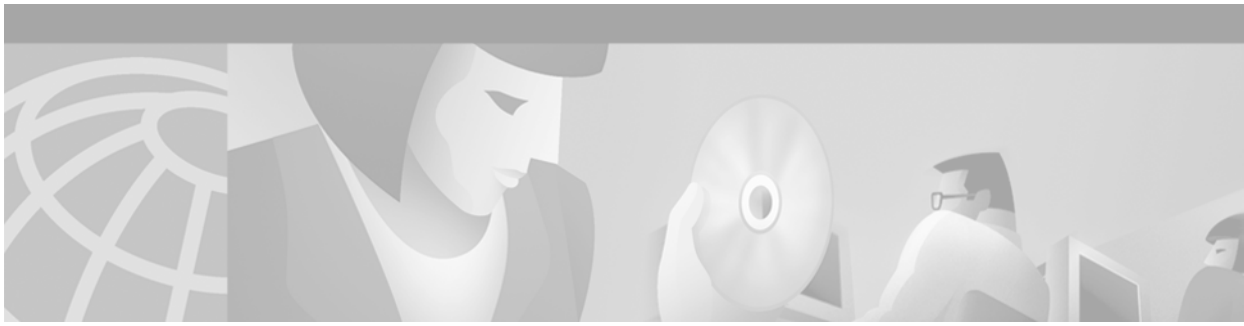
```
Router# show ip msdp summary

MSDP Peer Status Summary
Peer Address     AS    State    Uptime/  Reset SA    Peer Name
                                Downtime Count Count
192.135.250.116  109   Up       1d10h    9     111   rtp5-rp1
*144.228.240.253 1239  Up       14:24:00 5     4010  sl-rp-stk
172.17.253.19    109   Up       12:36:17 5     10    shinjuku-rp1
172.17.170.110   109   Up       1d11h    9     12    ams-rp1
```

Table 25 describes the significant fields shown in the display.

Table 25 show ip msdp summary Field Descriptions

Field	Description
Peer Address	IP address of the MSDP peer.
AS	Autonomous system to which the MSDP peer belongs.
State	State of the MSDP peer.
Uptime/Downtime	Days and hours the MSDP peer is up or down, per state shown in the previous column. If the time is less than 24 hours, it is shown in terms of hours:minutes:seconds.
SA Count	Number of SA messages from this MSDP peer in the SA cache.
Peer Name	Name of the MSDP peer.



PGM Host and Router Assist Commands

Use the commands in this chapter to configure and monitor the Pragmatic General Multicast (PGM) Host and Router Assist features. For configuration information and examples of PGM Host and Router Assist, refer to the "Configuring PGM Host and Router Assist" chapter in the *Cisco IOS IP Configuration Guide*.

clear ip pgm host

Note Support for the PGM Host feature has been removed. Use of this command is not recommended.

To reset Pragmatic General Multicast (PGM) Host connections to their default values and to clear traffic statistics, use the **clear ip pgm host** command in privileged EXEC mode.

clear ip pgm host {**defaults** | **traffic**}

Syntax Description

defaults	Resets all PGM Host connections to their default values.
traffic	Clears all PGM Host traffic statistics.

Defaults

No default behavior or values.

Command Modes

Privileged EXEC

Command History

Release	Modification
12.1(1)T	This command was introduced.

Usage Guidelines

This command should be used only in rare cases or during debugging. A reason to reset all PGM Host connections to their default values is to eliminate configuration errors in one step. A reason to clear traffic statistics is to make diagnostic testing easier.

Examples

The following example resets all PGM Host connections to their default values:

```
Router# clear ip pgm host defaults
```

The following example clears all PGM Host traffic statistics:

```
Router# clear ip pgm host traffic
```

Related Commands

Command	Description
ip pgm host	Enables PGM Host.
show ip pgm host defaults	Displays default values for PGM Host traffic.
show ip pgm host traffic	Displays PGM Host traffic statistics.

clear ip pgm router

To clear Pragmatic General Multicast (PGM) traffic statistics, use the **clear ip pgm router** command in EXEC mode.

clear ip pgm router [[**traffic** [*type number*]] | [**rtx-state** [*group-address*]]]

Syntax Description

traffic [*type number*]	(Optional) Interface type and number whose PGM traffic statistics are cleared. If no interface type and number are provided, all traffic statistics are cleared.
rtx-state [*group-address*]	(Optional) IP address of the multicast group whose PGM resend state is cleared. If no group address is provided, all resend state is cleared. Clearing resend state means the router will not forward any retransmissions corresponding to that state.

Command Modes

EXEC

Command History

Release	Modification
12.0(5)T	This command was introduced.

Usage Guidelines

This command should be used only in rare cases or during debugging. Normally, the resend state memory is freed automatically when the information is no longer useful. Also, using this command briefly affects the normal PGM behavior.

A reason to clear traffic statistics is to make diagnostic testing easier.

A reason to clear state might be to free the memory consumed by such state. PGM resend state times out if no traffic keeps it alive.

Examples

The following example clears all PGM resend state from the router:

```
Router# clear ip pgm router rtx-state
```

Related Commands

Command	Description
ip pgm router	Enables PGM Router Assist and thereby allows PGM to operate more efficiently on the router.
show ip pgm router	Displays PGM Reliable Transport Protocol state and statistics.

ip pgm host

Note Support for the PGM Host feature has been removed. Use of this command is not recommended.

To enable Pragmatic General Multicast (PGM) Host, use the **ip pgm host** command in global configuration mode. To disable PGM Host and close all open PGM Host traffic sessions, use the **no** form of this command.

ip pgm host [**source-interface** {*type number*} | *connection-parameter*]

no ip pgm host

Syntax Description

source-interface *type number*	(Optional) Interface type and number on which to run PGM Host.
connection-parameter	(Optional) Configures advanced PGM Host connection parameters. The optional configuration parameters should only be configured by experts in PGM technology. See Table 26 for a comprehensive list of the optional connection parameters and their definitions.

Defaults

PGM Host is not enabled.

Command Modes

Global configuration

Command History

Release	Modification
12.1(1)T	This command was introduced.

Usage Guidelines

Using the **ip pgm host** command without a keyword or an argument enables PGM Host on the router and configures the router to source PGM packets through a virtual host interface (vif).

Specifying a physical or logical interface type (for example, an Ethernet, serial, or loopback interface) with the **ip pgm host source-interface** command configures the router to source PGM packets out of the physical or logical interface.

Note You must first enable PGM Host globally on the router using the **ip pgm host** command before sourcing PGM packets out of a physical or logical interface using the **ip pgm host source-interface** command.

Sourcing PGM packets through a vif enables the router to send and receive PGM packets through any router interface. The vif also serves as the interface to the multicast applications that reside at the PGM network layer.

Sourcing IP multicast traffic out a specific physical or logical interface configures the router to send PGM packets out that interface only and to receive packets on any router interface.

When both PGM Host and Router Assist are enabled on the router, the router can process received PGM packets as a virtual PGM Host, originate PGM packets and serve as its own first hop PGM network element, and forward received PGM packets. Refer to the "Configuring PGM Host and Router Assist" chapter of the *Cisco IOS IP Configuration Guide* for more information about PGM Router Assist.

Table 26 lists the available parameters for the *connection-parameter* argument. The parameters should be configured only by experts in PGM technology. Use the **no ip pgm host** *connection-parameter* command to return a parameter to its default value.

Table 26 ip pgm host Connection Parameters

Parameter	Definition
ihb-max *milliseconds*	(Optional) Sets the source path message (SPM) interheartbeat timer maximum. The default is 10000 milliseconds (ms).
ihb-min *milliseconds*	(Optional) Sets the SPM interheartbeat timer minimum. The default is 1000 ms.
join *milliseconds*	(Optional) Sets the amount of time the PGM Host waits, when running in router mode, for client requests. The default is 0 ms.
nak-gen-ivl *milliseconds*	(Optional) Sets the amount of time the PGM Host waits for a PGM negative acknowledgment (NAK) data packet. The default is 60000 ms.
nak-rb-ivl *milliseconds*	(Optional) Sets the amount of time the PGM Host waits before sending a PGM NAK data packet. The default is 500 ms.
nak-rdata-ivl *milliseconds*	(Optional) Sets the amount of time the PGM Host waits for a re-sent PGM NAK (NAK RDATA) data packet. The default is 2000 ms.
nak-rpt-ivl *milliseconds*	(Optional) Sets the amount of time the PGM Host waits for a PGM NAK confirmation (NAK NCF) data packet. The default is 2000 ms.
ncf-max *packets-per-second*	(Optional) Sets the maximum number of PGM NAK confirmation data packets (NAK NCFs) the PGM Host sends per second. The default is infinite.
rx-buffer-mgmt {**full** | **minimum**}	(Optional) Sets the type of receive data buffers (full or minimum) for the PGM Host. The default is minimum.
spm-ambient-ivl *milliseconds*	(Optional) Sets the amount of time the PGM Host waits for a PGM SPM ambient data packet. The default is 6000 ms.
spm-rpt-ivl *milliseconds*	(Optional) Sets the amount of time the PGM Host waits for a PGM SPM repeat data packet. The default is 3000 ms.
stream-type {**apdu** | **byte**}	(Optional) Sets the data stream type (apdu or byte) for the PGM Host. The default is apdu.
tpdu-size *number*	(Optional) Sets the size of the source transport data unit (TPDU) for the PGM Host. The available range is 41 through 16384 bytes. The default is 1400 bytes.

Table 26 ip pgm host Connection Parameters (continued)

Parameter	Definition
ttl *number*	(Optional) Sets the time-to-live (TTL) value on the PGM Host for sent multicast data packets. The default is 255 hops. The TTL value for a packet is decremented by 1 as the packet passes through a router.
tx-buffer-mgmt {**keep** | **return**}	(Optional) Sets the type of transmit data buffers (keep or return) for the PGM Host. The default is return.
tx-adv-method {**data** | **time**}	(Optional) Sets the type of advanced transmit window method (data or time) for the PGM Host. The default is time.
txw-adv-secs *milliseconds*	(Optional) Sets the size of advanced transmit window for the PGM Host. The default is 6000 ms.
txw-rte *bytes-per-second*	(Optional) Sets the data transmit rate for the PGM Host. The default is 16,384 bytes per second.
txw-secs *milliseconds*	(Optional) Sets the data transmit window size for the PGM Host. The default is 30,000 ms.
txw-timeout-max *milliseconds*	(Optional) Sets the amount of time the PGM Host waits for data packets, even if the PGM Host receives PGM NAK data packets. The default is 3,600,000 ms.

Examples

The following example enables PGM Host (both the source and receiver part of the PGM network layer) globally on the router and configures the router to source PGM packets through a vif:

```
ip pgm host
```

The following example enables PGM Host globally on the router and configures the router to source PGM packets out of physical Ethernet interface 0/1:

```
ip pgm host
ip pgm host source-interface ethernet 0/1
```

Related Commands

Command	Description
clear ip pgm host	Resets PGM Host connections to their default values and clears traffic statistics.
ip pgm router	Enables PGM Router Assist and thereby allows PGM to operate more efficiently on the router.
show ip pgm host defaults	Displays the default values for PGM Host traffic.
show ip pgm host sessions	Displays open PGM Host traffic sessions.
show ip pgm host traffic	Displays PGM Host traffic statistics.

ip pgm router

To enable Pragmatic General Multicast (PGM) Router Assist and thereby allow PGM to operate more efficiently on the router, use the **ip pgm router** command in interface configuration mode. To disable PGM Router Assist for the interface, use the **no** form of this command.

ip pgm router

no ip pgm router

Syntax Description

This command has no arguments or keywords.

Defaults

PGM Router Assist is disabled for the interface.

Command Modes

Interface configuration

Command History

Release	Modification
12.0(5)T	This command was introduced.

Usage Guidelines

This command is highly recommended for optimal deployment of PGM Reliable Transport Protocol on a host.

Examples

In the following example, PGM Router Assist is configured on Ethernet interfaces 0 and 1:

```
ip multicast-routing
interface ethernet 0
 ip pim sparse-dense-mode
 ip pgm router
interface ethernet 1
 ip pim sparse-dense-mode
 ip pgm router
```

Related Commands

Command	Description
clear ip pgm router	Clears PGM traffic statistics.
ip pgm host	Enables PGM Host.
show ip pgm router	Displays PGM Reliable Transport Protocol state and statistics.

show ip pgm host defaults

Note Support for the PGM Host feature has been removed. Use of this command is not recommended.

To display the default values for Pragmatic General Multicast (PGM) Host traffic, use the **show ip pgm host defaults** command in EXEC mode.

show ip pgm host defaults

Syntax Description

This command has no arguments or keywords.

Defaults

No default behavior or values.

Command Modes

EXEC

Command History

Release	Modification
12.1(1)T	This command was introduced.

Usage Guidelines

The default values displayed in the **show ip pgm host defaults** command output are applied to every new host connection that is opened.

Examples

The following is sample output from the **show ip pgm host defaults** command:

```
Router> show ip pgm host defaults

Source Session Default Values :

    spm-ambient-ivl (6000), txw-adv-secs (6000)
    txw-adv-timeout-max (3600000), txw-rte (16384), txw-secs (30000)
    ncf-max (infinite), spm-rpt-ivl (3000), ihb-min (1000)
    ihb-max (10000), join (0), tpdu-size (16384)
    txw-adv-method (time), tx-buffer-mgmt (return)

Receiver Session Default Values :

    nak-gen-ivl (60000), nak-rb-ivl (500), nak-rdata-ivl (2000)
    nak-rpt-ivl (2000), rx-buffer-mgmt (minimum), rx-local-retrans (none)

Common Default Values:

    stream-type (apdu), ttl (255)

Address used to source packets:(10.1.1.1)
```

Table 27 describes the fields Source Session Default Values, Receiver Session Default Values, Common Default Values, and Address used to source packets shown in the sample output. See Table 26 for a definition of each individual default value in the sample output.

Table 27 show ip pgm host defaults Field Descriptions

Field	Description
Source Session Default Values	Displays the values for source-specific PGM Host traffic defaults.
Receiver Session Default Values	Displays the values for receiver-specific PGM Host traffic defaults.
Common Default Values	Displays the values for PGM Host traffic defaults that are common between a source and a receiver.
Address used to source packets	The unicast IP address that the virtual host is using to originate PGM packets.

Related Commands

Command	Description
clear ip pgm host	Resets PGM Host connections to their default values and clears traffic statistics.
ip pgm host	Enables PGM Host.
show ip pgm host sessions	Displays open PGM Host traffic sessions.
show ip pgm host traffic	Displays PGM Host traffic statistics.

show ip pgm host sessions

Note Support for the PGM Host feature has been removed. Use of this command is not recommended.

To display open Pragmatic General Multicast (PGM) Host traffic sessions, use the **show ip pgm host sessions** command in EXEC mode.

show ip pgm host sessions [*session-number* | *group-address*]

Syntax Description

session-number	(Optional) PGM Host traffic session number.
group-address	(Optional) PGM Host multicast group address.

Defaults

No default behavior or values.

Command Modes

EXEC

Command History

Release	Modification
12.1(1)T	This command was introduced.

Usage Guidelines

If a session number or multicast group address is not specified, all open traffic sessions are displayed.

Examples

The following example shows all open traffic sessions:

```
Router> show ip pgm host sessions

Idx  GSI           Source Port  Type     State   Dest Port  Mcast Address
1    000000000000  0            receiver listen  48059      224.3.3.3
2    9CD72EF099FA  1025         source   conn    48059      224.1.1.1
```

The following example shows traffic information for traffic session number 2:

```
Router> show ip pgm host sessions 2

Idx  GSI           Source Port  Type     State   Dest Port  Mcast Address
2    9CD72EF099FA  1025         source   conn    48059      224.1.1.1

    stream-type (apdu), ttl (255)

    spm-ambient-ivl (6000), txw-adv-secs (6000)
    txw-adv-timeout-max (3600000), txw-rte (16384), txw-secs (30000)
    ncf-max (infinite), spm-rpt-ivl (3000), ihb-min (1000)
    ihb-max (10000), join (0), tpdu-size (16384)
    txw-adv-method (time), tx-buffer-mgmt (return)

    ODATA packets sent                      0
```

```
      bytes sent                          0
RDATA packets sent                        0
      bytes sent                          0
Total bytes sent                          0
ADPUs sent                                0
APDU  transmit memory errors              0
SPM   packets sent                        6
NCF   packets sent                        0
NAK   packets received                    0
      packets received in error           0
General bad packets                       0
TX window lead                            0
TX window trail                           0
```

The following example shows traffic information for multicast group address 244.1.1.1:

```
Router> show ip pgm host sessions 244.1.1.1

Idx  GSI           Source Port  Type     State   Dest Port  Mcast Address
2    9CD72EF099FA  1025         source   conn    48059      224.1.1.1

    stream-type (apdu), ttl (255)

    spm-ambient-ivl (6000), txw-adv-secs (6000)
    txw-adv-timeout-max (3600000), txw-rte (16384), txw-secs (30000)
    ncf-max (infinite), spm-rpt-ivl (3000), ihb-min (1000)
    ihb-max (10000), join (0), tpdu-size (16384)
    txw-adv-method (time), tx-buffer-mgmt (return)

    ODATA packets sent                    0
          bytes sent                      0
    RDATA packets sent                    0
          bytes sent                      0
    Total bytes sent                      0
    ADPUs sent                            0
    APDU  transmit memory errors          0
    SPM   packets sent                    6
    NCF   packets sent                    0
    NAK   packets received                0
          packets received in error       0
    General bad packets                   0
    TX window lead                        0
    TX window trail                       0
```

Table 28 describes the significant fields shown in the displays.

Table 28 show ip pgm host sessions Field Descriptions

Field	Description
Idx	The local index for the traffic session.
GSI	The global source identifier for the traffic session.
Source Port	The source port for the traffic session.
Type	Source or receiver session.
State	The state of the session. For example, connected or listening.
Dest Port	The destination port for the traffic session.
Mcast Address	The IP multicast address for the traffic session.
ODATA	Normal data packet.

Table 28 show ip pgm host sessions Field Descriptions (continued)

Field	Description
RDATA	Re-sent data packet.
ADPUs	Application data units.
SPM	Source path message.
NCF	Negative acknowledgment (NAK) confirmation packet.
NAK	NAK packet.

Related Commands

Command	Description
clear ip pgm host	Resets PGM Host connections to their default values and clears traffic statistics.
ip pgm host	Enables PGM Host.
show ip pgm host defaults	Displays the default values for PGM Host traffic.
show ip pgm host traffic	Displays PGM Host traffic statistics.

show ip pgm host traffic

Note Support for the PGM Host feature has been removed. Use of this command is not recommended.

To display Pragmatic General Multicast (PGM) Host traffic statistics, use the **show ip pgm host traffic** command in EXEC mode.

show ip pgm host traffic

Syntax Description

This command has no arguments or keywords.

Defaults

No default behavior or values.

Command Modes

EXEC

Command History

Release	Modification
12.1(1)T	This command was introduced.

Usage Guidelines

Use this command to view traffic statistics at the PGM transport layer.

Examples

The following is sample output from the **show ip pgm host traffic** command:

```
Router> show ip pgm host traffic

General Statistics :

    Sessions in                             0
             out                            0
    Bytes    in                             0
             out                            0

Source Statistics :

    ODATA packets sent                      0
          bytes sent                        0
    RDATA packets sent                      0
          bytes sent                        0
    Total bytes sent                        0
    ADPUs sent                              0
    APDU  transmit memory errors            0
    SPM   packets sent                      0
    NCF   packets sent                      0
    NAK   packets received                  0
          packets received in error         0

Receiver Statistics :
```

```
ODATA packets received                  0
      packets received in error         0
      valid bytes received              0
RDATA packets received                  0
      packets received in error         0
      valid bytes received              0
Total valid bytes received              0
Total bytes received in error           0
ADPUs received                          0
SPM   packets received                  0
      packets received in error         0
NCF   packets received                  0
      packets received in error         0
NAK   packets received                  0
      packets received in error         0
      packets sent                      0
Undeliverable packets                   0
General bad packets                     0
Bad checksum packets                    0
```

Table 29 describes the significant fields shown in the display.

Table 29 show ip pgm host traffic Field Descriptions

Field	Description
General Statistics	Displays statistics that relate to both the traffic source and the receiver.
Source Statistics	Displays statistics that relate to the traffic source.
Receiver Statistics	Displays statistics that relate to the traffic receiver.

Related Commands

Command	Description
clear ip pgm host	Resets PGM Host connections to their default values and clears traffic statistics.
ip pgm host	Enables PGM Host.
show ip pgm host defaults	Displays the default values for PGM Host traffic.
show ip pgm host sessions	Displays open PGM Host traffic sessions.

show ip pgm router

To display Pragmatic General Multicast (PGM) Reliable Transport Protocol state and statistics, use the **show ip pgm router** command in EXEC mode.

show ip pgm router [[**interface** [*type number*]] | [**state** [*group-address*]] | [**traffic** [*type number*]]] [**verbose**]

Syntax Description

interface [*type number*]	(Optional) Displays interfaces on which PGM Router Assist is configured.
state [*group-address*]	(Optional) Displays PGM resend state information per transport session identifier (TSI). If no group address is specified, resend state for all groups is shown.
traffic [*type number*]	(Optional) Displays PGM packet counters. If no interface type and number are specified, traffic on all interfaces is displayed. These statistics do not reflect the number of PGM data packets (ODATA) that are forwarded in a session, because these are forwarded transparently by IP multicast.
verbose	(Optional) Displays extended information about outgoing interface lists, timers, Forward Error Connections (FECs), and Designated Local Retransmitters (DLRs).

Command Modes

EXEC

Command History

Release	Modification
12.0(5)T	This command was introduced.

Examples

The following is sample output of the **show ip pgm router** command with the **interface** keyword:

```
Router# show ip pgm router interface

Address         Interface
10.1.0.2        Ethernet1/0/0 (measured drop rate 0%)
10.3.0.2        Ethernet1/0/4 (measured drop rate 0%)
```

Table 30 describes the significant fields shown in the display.

Table 30 show ip pgm router Field Descriptions

Field	Description
Address	IP address of the interface running PGM Router Assist.
Interface	Interface type and number on the router that is running PGM Router Assist, plus the drop rate measured on the interface.

The following is sample output of the **show ip pgm router** command with the **traffic** keyword. An RDATA fragment is a part of an RDATA packet that has been fragmented at the IP layer while in transit. The PGM network element has seen two RDATA packets that were each fragmented into three IP fragments.

```
Router# show ip pgm router traffic

FastEthernet0/0
  NAKs received                 2
  NCFs transmitted              2
 RDATA forwarded                2
 RDATA frags forwarded          6
  SPMs received                 4
       used                     4
  SPMs forwarded               33
Serial0/0
  NAKs forwarded                2
  NAKs retransmitted            2
  NCFs received                 4
 RDATA received                 2
 RDATA frags received           6
  SPMs received                33
       used                    33
```

The following is sample output of the **show ip pgm router** command with the **state** and **verbose** keywords. The timer associated with each session is an idle timer; the TSI state is deleted when this timer expires. The measured loss rates are indicated as follows:

- link_lr: worst reported link loss rate
- path_lr: worst reported path loss rate
- receiver_lr: worst reported receiver loss rate
- cr_lead: sequence number associated with worst receiver loss rate
- cr_worst_rec: IP address that reported worst loss rate

```
Router# show ip pgm router state verbose

TSI                Group            Neighbor        TGSIZE
0A0700C85555-1000  227.7.7.7        rpf/source       N/A        00:04:25
  (link_lr 7%, path_lr 4%, receiver_lr 10%
  cr_lead 6256421, cr_worst_rec 134.45.0.126)
```

The following sample output shows state after receivers have reported loss of certain packets. Negative acknowledgments (NAKs) have been received for each of the two sessions in the previous example. After the loss, the router has state for the lost packets. The “sqn 1990” indicates that a receiver lost a packet with sequence number 1990 and is requesting that it be re-sent.

```
Router# show ip pgm router state verbose

TSI                Group            Neighbor        TGSIZE
0A0700C85555-1000  227.7.7.7        rpf/source       N/A        00:04:55
   sqn        1990            age   4 ELIM TMR
       Ethernet1/0/0
   sqn        1991            age    5 (anticipated)
0A0700C85555-2000 234.4.3.2        rpf/source       16         00:04:55
   sqn (       125,          7) age   10
       Serial5/0 prty # 7
```

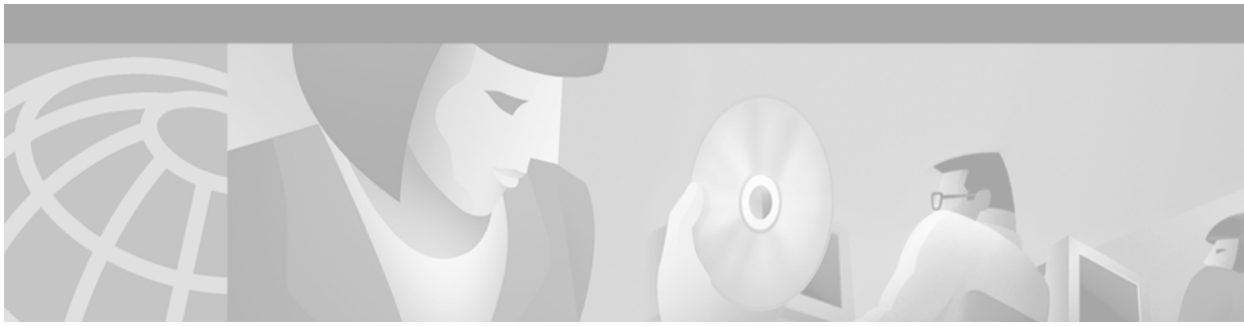
For the selective TSI, the output shows resend state for sequence number 1990. This state was created by a NAK received on Ethernet interface 1/0/0. “ELIM TMR” indicates that the state is currently eliminating duplicates of any NAK that is pending and any new NAKs for this sequence number will not be forwarded.

State shown for sequence 1991 is anticipated state, indicating that it was created by a NAK confirmation (NCF) for a NAK sent by some other PGM router with the same PGM upstream neighbor as this router.

For the TSI with parity, the state shown was created by a parity NAK for seven packets of the Transmission Group 125. This state was received on Serial interface 5/0; “# 7” indicates that seven parity packets must be forwarded out this interface.

Related Commands

Command	Description
clear ip pgm router	Clears PGM traffic statistics.
ip pgm router	Enables PGM Router Assist and thereby allows PGM to operate more efficiently on the router.



Unidirectional Link Routing Commands

Use the commands in this chapter to configure and monitor unidirectional link routing (UDLR). For configuration information and examples of UDLR, refer to the "Configuring Unidirectional Link Routing" chapter of the *Cisco IOS IP Configuration Guide*.

ip igmp helper-address (UDL)

To configure Internet Group Management Protocol (IGMP) helpering as required for IGMP unidirectional link routing (UDLR), use the **ip igmp helper-address** command in interface configuration mode. To disable such report forwarding, use the **no** form of this command.

ip igmp helper-address udl *type number*

no ip igmp helper-address

Syntax Description

udl *type number*	Interface type and number of a unidirectional interface.

Defaults

No forwarding occurs.

Command Modes

Interface configuration

Command History

Release	Modification
12.0(3)T	This command was introduced.

Usage Guidelines

This command is required on a downstream router on each interface connected to a potential multicast receiver. The command allows the downstream router to helper IGMP reports received from hosts to an upstream router connected to a unidirectional link (UDL) associated with the configured *type* and *number* arguments.

Examples

The following example configures a helper address on a downstream router:

```
ip multicast-routing
!
! Interface that receiver is attached to, configure for IGMP reports to be
! helpered for the unidirectional interface.
!
interface ethernet 0
 description Forward IGMP reports from this interface to UDL querier
 ip address 14.0.0.2 255.0.0.0
 ip pim sparse-dense-mode
 ip igmp helper-address udl serial 0
```

Related Commands

Command	Description
ip igmp proxy-service	Enables the mroute proxy service.
ip igmp unidirectional-link	Configures an interface to be unidirectional and enables it for IGMP UDLR.

ip igmp mroute-proxy

To enable Internet Group Management Protocol (IGMP) report forwarding of proxied (*, G) mroute entries, use the **ip igmp mroute-proxy** command in interface configuration mode. To disable this service, use the **no** form of this command.

ip igmp mroute-proxy *type number*

no ip igmp mroute-proxy *type number*

Syntax Description

type number	Interface type and number.

Defaults

Disabled

Command Modes

Interface configuration

Command History

Release	Modification
12.1(5)T	This command was introduced.

Usage Guidelines

When used with the **ip igmp proxy-service** interface command, this command enables forwarding of IGMP reports to a proxy service interface for all (*, G) forwarding entries for this interface in the multicast forwarding table.

Examples

The following example shows how to configure the **ip igmp mroute-proxy** command on Ethernet interface 1 to request that IGMP reports be sent to loopback interface 0 for all groups in the mroute table that are forwarded to Ethernet interface 1. This example also shows how to configure the **ip igmp proxy-service** command on loopback interface 0 to enable the forwarding of IGMP reports out the interface for all groups on interfaces registered through the **ip igmp mroute-proxy** command.

```
interface loopback 0
ip address 10.7.1.1 255.255.255.0
ip pim dense-mode
ip igmp helper-address udl ethernet 0
ip igmp proxy-service
!
interface ethernet 0
ip address 10.2.1.1 255.255.255.0
ip pim dense-mode
ip igmp unidirectional link
!
interface ethernet 1
ip address 10.1.1.1 255.255.255.0
ip pim sparse-mode
ip igmp mroute-proxy loopback 0
```

Related Commands

Command	Description
ip igmp proxy-service	Enables the mroute proxy service.
ip igmp unidirectional-link	Configures an interface to be unidirectional and enables it for IGMP UDLR.

ip igmp proxy-service

To enable the mroute proxy service, use the **ip igmp proxy-service** command in interface configuration mode. To disable forwarding, use the **no** form of this command.

ip igmp proxy-service

no ip igmp proxy-service

Syntax Description

This command has no arguments or keywords.

Defaults

Disabled

Command Modes

Interface configuration

Command History

Release	Modification
12.1(5)T	This command was introduced.

Usage Guidelines

Based on the Internet Group Management Protocol (IGMP) query interval, the router periodically checks the mroute table for (*, G) forwarding entries that match interfaces configured with the **ip igmp mroute-proxy** command. Where there is a match, one IGMP report is created and received on this interface. This command was intended to be used with the **ip igmp helper-address udl** command, in which case the IGMP report would be forwarded to an upstream router.

Examples

The following example shows how to configure the **ip igmp mroute-proxy** command on Ethernet interface 1 to request that IGMP reports be sent to loopback interface 0 for all groups in the mroute table that are forwarded to Ethernet interface 1. This example also shows how to configure the **ip igmp proxy-service** command on loopback interface 0 to enable the forwarding of IGMP reports out the interface for all groups on interfaces registered through the **ip igmp mroute-proxy** command.

```
interface loopback 0
ip address 10.7.1.1 255.255.255.0
ip pim dense-mode
ip igmp helper-address udl ethernet 0
ip igmp proxy-service
!
interface ethernet 0
ip address 10.2.1.1 255.255.255.0
ip pim dense-mode
ip igmp unidirectional link
!
interface ethernet 1
ip address 10.1.1.1 255.255.255.0
ip pim sparse-mode
ip igmp mroute-proxy loopback 0
```

Related Commands

Command	Description
ip igmp helper-address (UDL)	Configures IGMP helpering as required for IGMP UDLR.
ip igmp mroute-proxy	Enables IGMP report forwarding of proxied (*, G) mroute entries.
ip igmp unidirectional-link	Configures an interface to be unidirectional and enables it for IGMP UDLR.

ip igmp unidirectional-link

To configure an interface to be unidirectional and enable it for Internet Group Management Protocol (IGMP) unidirectional link routing (UDLR), use the **ip igmp unidirectional-link** command in interface configuration mode. To disable the unidirectional link (UDL), use the **no** form of this command.

ip igmp unidirectional-link

no ip igmp unidirectional-link

Syntax Description

This command has no arguments or keywords.

Defaults

No UDLR occurs.

Command Modes

Interface configuration

Command History

Release	Modification
12.0(3)T	This command was introduced.

Usage Guidelines

One example of when you might configure this command is if you have traffic traveling via a satellite.

If you have a small number of receivers, another way to achieve UDLR is to configure a UDLR tunnel. See the descriptions of the **tunnel udlr receive-only** and **tunnel udlr send-only** commands later in this chapter.

Examples

The following example configures an upstream router with UDLR on serial interface 0:

```
ip multicast-routing
!
! Unidirectional link
!
interface serial 0
 description Unidirectional to downlink-rtr
 ip address 10.0.0.1 255.0.0.0
 ip pim sparse-dense-mode
 ip igmp unidirectional-link
 no keepalive
```

Related Commands

Command	Description
ip igmp helper-address (UDL)	Configures IGMP helpering as required for IGMP UDLR.
ip igmp mroute-proxy	Enables IGMP report forwarding of proxied (*, G) mroute entries.
ip igmp proxy-service	Enables the mroute proxy service.
ip multicast default-rpf-distance	Changes the distance given to the default RPF interface when configuring IGMP UDLR.
show ip igmp udlr	Displays UDLR information for directly connected multicast groups on interfaces that have a UDL helper address configured.
tunnel udlr receive-only	Configures a unidirectional, GRE tunnel to act as a back channel that can receive messages, when another interface is configured for UDLR to send messages.
tunnel udlr send-only	Configures a unidirectional, GRE tunnel to act as a back channel that can send messages, when another interface is configured for UDLR to receive messages.

ip multicast default-rpf-distance

When configuring Internet Group Management Protocol (IGMP) unidirectional link routing (UDLR), to change the distance given to the default Reverse Path Forwarding (RPF) interface, use the **ip multicast default-rpf-distance** command in global configuration mode. To restore the default value, use the **no** form of this command.

ip multicast default-rpf-distance *distance*

no ip multicast default-rpf-distance

Syntax Description

distance	Distance given to the default RPF interface. The default value is 15.

Defaults

The distance default value is 15.

Command Modes

Global configuration

Command History

Release	Modification
12.0(3)T	This command was introduced.

Usage Guidelines

This command is optional. If you want to receive all multicast traffic from all sources on the unidirectional link (UDL), as long as 15 is the lowest distance, you need not change the value of 15.

The default RPF interface is selected when an IGMP query message is received on a UDL and indicates to the router that all sources will use RPF to reach the UDL interface.

Any explicit sources learned by routing protocols will take preference as long as their distance is less than the *distance* argument configured with the **ip multicast default-rpf-distance** command.

You might consider changing the default value for one of the following reasons:

- To make IGMP prefer the UDL.
- To configure a value less than existing routing protocols.
- If you want to receive multicast packets from sources on interfaces other than the UDL interface. Configure a value greater than the distances of the existing routing protocols to make IGMP prefer the nonunidirectional link.

Examples

The following example configures a distance of 20:

```
ip multicast default-rpf-distance 20
```

Related Commands

Command	Description
ip igmp unidirectional-link	Configures an interface to be unidirectional and enables it for IGMP UDLR.

show ip igmp udlr

To display unidirectional link routing (UDLR) information for directly connected multicast groups on interfaces that have a unidirectional link (UDL) helper address configured, use the **show ip igmp udlr** command in EXEC mode.

show ip igmp udlr [*group-name* | *group-address* | *type number*]

Syntax Description

group-name | *group-address*	(Optional) Name or address of the multicast group for which to show UDLR information.
type number	(Optional) Interface type and number for which to show UDLR information.

Command Modes

EXEC

Command History

Release	Modification
12.0(3)T	This command was introduced.

Usage Guidelines

This command displays which groups are being forwarded and received over the UDL.

On the upstream router, this command shows which interface is a UDL interface and which IP multicast groups are being forwarded out that interface. The UDL Reporter is the IP address of the downstream interface on the receiving router. If there is more than one downstream router, this field shows which downstream router forwarded the IGMP host report to the upstream router over the ground-based network. This report is forwarded over the UDL so that all downstream routers know which groups have already have been requested by other downstream routers, so that additional IGMP host reports are suppressed.

On the downstream router, this command (in the Interface field) shows which local interface received an IGMP host report (from a directly connected host for a specific group). The UDL Reporter is the IP address of the router that had forwarded the IGMP host report to the upstream router over the ground-based network. The UDL Interfaces column shows the interface on which IP multicast packets are being received.

Examples

The following is sample output of the **show ip igmp udlr** command on an upstream router:

```
upstream-rtr# show ip igmp udlr

IGMP UDLR Status, UDL Interfaces: Serial0
Group Address    Interface            UDL Reporter     Reporter Expires
224.2.127.254    Serial0              10.0.0.2         00:02:12
224.0.1.40       Serial0              10.0.0.2         00:02:11
225.7.7.7        Serial0              10.0.0.2         00:02:15
```

The following is sample output of the **show ip igmp udlr** command on a downstream router:

```
downstream-rtr# show ip igmp udlr
```

```
IGMP UDLR Status, UDL Interfaces: Serial0
Group Address    Interface            UDL Reporter     Reporter Expires
224.2.127.254    Serial0              10.0.0.2         00:02:49
224.0.1.40       Serial0              10.0.0.2         00:02:48
225.7.7.7        Serial0              10.0.0.2         00:02:52
```

Table 31 describes the significant fields shown in the first display.

Table 31 show ip igmp udlr Field Descriptions

Field	Description
Group Address	All groups helpered by the UDL Reporter on the interface.
Interface	Interface type and number to which the group is connected.
UDL Reporter	IP address of the router on the UDL network that is IGMP helpering for the group.
Reporter Expires	How soon the UDL Reporter will become inactive, in hours:minutes:seconds. This can occur under the following conditions: • The UDL Reporter has become nonoperational. • The link or network to the reporter has become nonoperational. • The group member attached to the UDL Reporter has left the group.

tunnel udlr address-resolution

To enable the forwarding of the Address Resolution Protocol (ARP) and Next Hop Resolution Protocol (NHRP) over a unidirectional link (UDL), use the **tunnel udlr address-resolution** command in interface configuration mode. To disable forwarding, use the **no** form of this command.

tunnel udlr address-resolution

no tunnel udlr address-resolution

Syntax Description

This command has no arguments or keywords.

Defaults

Disabled

Command Modes

Interface configuration

Command History

Release	Modification
12.1(5)T	This command was introduced.

Usage Guidelines

This command is configured on the send-only tunnel interface of a downstream router.

Examples

The following example shows how to configure the **tunnel udlr address-resolution** command on an interface to enable ARP and NHRP over a send-only tunnel. An ARP address resolution request received from the upstream router on the UDL (Ethernet interface 0) will be replied to over the send-only tunnel of the receiver. Likewise, an ARP request may be sent by the downstream router over the send-only tunnel, and the response will be received over the UDL.

```
interface tunnel 0
tunnel udlr send-only ethernet 0
tunnel udlr address-resolution
```

Related Commands

Command	Description
tunnel udlr send-only	Configures a unidirectional, GRE tunnel to act as a back channel that can send messages, when another interface is configured for UDLR to receive messages.

tunnel udlr receive-only

To configure a unidirectional, generic routing encapsulation (GRE) tunnel to act as a back channel that can receive messages, when another interface is configured for unidirectional link routing (UDLR) to send messages, use the **tunnel udlr receive-only** command in interface configuration mode. To remove the tunnel, use the **no** form of this command.

tunnel udlr receive-only *type number*

no tunnel udlr receive-only *type number*

Syntax Description

type number	Interface type and number. The *type* and *number* arguments must match the unidirectional send-only interface type and number specified by the **interface** command. Thus, when packets are received over the tunnel, the upper layer protocols will treat the packets as if they are received over the unidirectional send-only interface.

Defaults

No UDLR tunnel is configured.

Command Modes

Interface configuration

Command History

Release	Modification
12.0(3)T	This command was introduced.

Usage Guidelines

Use this command to configure a router that has a unidirectional interface with send-only capabilities. One example of when you might configure this command is if you have traffic traveling via a satellite.

The *type* and *number* arguments must match the send-only interface type and number specified by the **interface** command.

You must configure the **tunnel udlr send-only** command at the opposite end of the tunnel.

If you have a large number of receivers, you should configure UDLR by an alternative means: Internet Group Management Protocol (IGMP) UDLR. See the description of the **ip igmp unidirectional-link** command earlier in this chapter.

Examples

In the following example, Router A (the upstream router) is configured with Open Shortest Path First (OSPF) and Protocol Independent Multicast (PIM). Serial interface 0 has send-only capability. Therefore, the UDLR tunnel is configured as receive-only, and points to serial interface 0.

Router A Configuration

```
ip multicast-routing
!
! Serial0 has send-only capability
!
interface serial 0
 encapsulation hdlc
 ip address 10.1.0.1 255.255.0.0
 ip pim sparse-dense-mode
!
! Configure tunnel as receive-only UDLR tunnel.
!
interface tunnel 0
 tunnel source ethernet 0
 tunnel destination <downstream-router>
 tunnel udlr receive-only serial 0
!
! Configure OSPF.
!
router ospf <pid>
 network 10.0.0.0 0.255.255.255 area 0
```

Router B (the downstream router) is configured with OSPF and PIM. Serial interface 1 has receive-only capability. Therefore, the UDLR tunnel is configured as send-only, and points to serial interface 1.

Router B Configuration

```
ip multicast-routing
!
! Serial1 has receive-only capability
!
interface serial 1
 encapsulation hdlc
 ip address 10.1.0.2 255.255.0.0
 ip pim sparse-dense-mode

!
! Configure tunnel as send-only UDLR tunnel.
!
interface tunnel 0
 tunnel source ethernet 0
 tunnel destination <upstream-router>
 tunnel udlr send-only serial 1
!
! Configure OSPF.
!
router ospf <pid>
 network 10.0.0.0 0.255.255.255 area 0
```

Related Commands

Command	Description
interface	Defines the IP addresses of the server, configures an interface type, and enters interface configuration mode.
interface tunnel	Configures a tunnel interface.
ip igmp unidirectional-link	Configures an interface to be unidirectional and enables it for IGMP UDLR.
tunnel udlr send-only	Configures a unidirectional, GRE tunnel to act as a back channel that can send messages, when another interface is configured for UDLR to receive messages.

tunnel udlr send-only

To configure a unidirectional, generic routing encapsulation (GRE) tunnel to act as a back channel that can send messages, when another interface is configured for unidirectional link routing (UDLR) to receive messages, use the **tunnel udlr send-only** command in interface configuration mode. To remove the tunnel, use the **no** form of this command.

tunnel udlr send-only *type number*

no tunnel udlr send-only *type number*

Syntax Description

type number	Interface type and number. The *type* and *number* arguments must match the unidirectional receive-only interface type and number specified by the **interface** command. Thus, when packets are sent by upper layer protocols over the interface, they will be redirected and sent over this GRE tunnel.

Defaults

No UDLR tunnel is configured.

Command Modes

Interface configuration

Command History

Release	Modification
12.0(3)T	This command was introduced.

Usage Guidelines

Use this command to configure a router that has a unidirectional interface with receive-only capabilities. The UDLR tunnel will act as a back channel. One example of when you might configure this command is if you have traffic traveling via a satellite.

The *type* and *number* arguments must match the receive-only interface type and number specified by the **interface** command.

You must configure the **tunnel udlr receive-only** command at the opposite end of the tunnel.

Examples

In the following example, Router A (the upstream router) is configured with Open Shortest Path First (OSPF) and Protocol Independent Multicast (PIM). Serial interface 0 has send-only capability. Therefore, the UDLR tunnel is configured as receive-only, and points to serial interface 0.

Router A Configuration

```
ip multicast-routing
!
! Serial0 has send-only capability
!
interface serial 0
 encapsulation hdlc
 ip address 10.1.0.1 255.255.0.0
 ip pim sparse-dense-mode
```

```
!
! Configure tunnel as receive-only UDLR tunnel.
!
interface tunnel 0
 tunnel source ethernet 0
 tunnel destination <downstream-router>
 tunnel udlr receive-only serial 0
```

Router B (the downstream router) is configured with OSPF and PIM. Serial interface 1 has receive-only capability. Therefore, the UDLR tunnel is configured as send-only, and points to serial interface 1.

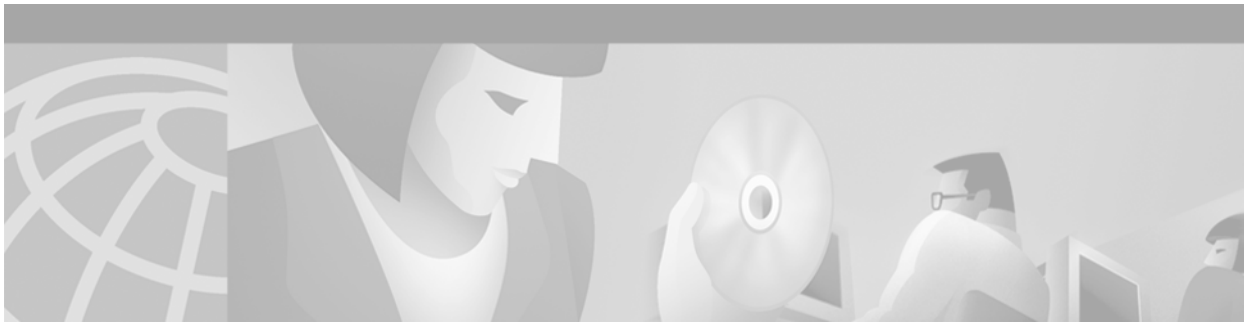
Router B Configuration

```
ip multicast-routing
!
! Serial1 has receive-only capability
!
interface serial 1
 encapsulation hdlc
 ip address 10.1.0.2 255.255.0.0
 ip pim sparse-dense-mode

!
! Configure tunnel as send-only UDLR tunnel.
!
interface tunnel 0
 tunnel source ethernet 0
 tunnel destination <upstream-router>
 tunnel udlr send-only serial 1
```

Related Commands

Command	Description
interface	Defines the IP addresses of the server, configures an interface type, and enters interface configuration mode.
interface tunnel	Configures a tunnel interface.
ip igmp unidirectional-link	Configures an interface to be unidirectional and enables it for IGMP UDLR.
tunnel udlr address-resolution	Enables the forwarding of ARP and NHRP over a UDL.
tunnel udlr receive-only	Configures a unidirectional, GRE tunnel to act as a back channel that can receive messages, when another interface is configured for UDLR to send messages.



IP Multicast Tools Commands

Use the commands in this chapter to configure and use IP multicast tools such as Multicast Routing Monitor (MRM), mrinfo, mstat, and mtrace. For configuration information and examples of IP multicast tools, refer to the "Using IP Multicast Tools" chapter of the *Cisco IOS IP Configuration Guide*.

beacon

To change the frequency, duration, or scope of beacon messages that the Manager sends to Test Senders and Test Receivers during a multicast routing monitor test, use the **beacon** command in manager configuration mode. To restore the default value, use the **no** form of this command.

beacon [**interval** *seconds*] [**holdtime** *seconds*] [**ttl** *ttl-value*]

no beacon [**interval** *seconds*] [**holdtime** *seconds*] [**ttl** *ttl-value*]

Syntax Description

interval *seconds*	(Optional) Frequency of beacon messages (in seconds). The default value is 60 seconds, meaning one beacon message every 60 seconds.
holdtime *seconds*	(Optional) Length of the test period in seconds. The Test Sender and Test Receiver are respectively sending and receiving test data constantly during the hold time. The default value is 1 day (86,400 seconds).
ttl *ttl-value*	(Optional) Time-to-live (TTL) value of the beacon messages. The default value is 32 hops.

Defaults

interval *seconds*: 60.

holdtime *seconds*: 86400 (1 day).

ttl *hops*: 32.

Command Modes

Manager configuration

Command History

Release	Modification
12.0(5)S	This command was introduced.

Usage Guidelines

The beacon message functions like a keepalive message. The Manager multicasts beacon messages to the Test Sender and Test Receiver. Beacon messages include the sender requests and receiver requests to start the test, thus providing redundancy in case the Test Sender or Test Receiver goes down.

You can increase the default **interval** keyword to reduce beacon traffic.

You can decrease the **holdtime** keyword to shorten the test time.

You can change the default number of TTL hops if your network is large and the beacon needs more than 32 hops to get from the Manager to the Test Sender or Test Receiver.

Examples

The following example customizes the Manager to send beacon messages every 30 minutes (1800 seconds), for a test period of 12 hours (43,200 seconds), with a TTL of 40 hops:

```
beacon interval 1800 holdtime 43200 ttl 40
```

Related Commands

Command	Description
manager	Specifies that an interface is the Manager for MRM, and specifies the multicast group address the Test Receiver will listen to.

clear ip mrm status-report

To clear the status report cache buffer, use the **clear ip mrm status-report** command in EXEC mode.

clear ip mrm status-report [*ip-address*]

Syntax Description

ip-address	(Optional) Address of the Test Receiver. Clears only those status reports received from the Test Receiver that has this IP address. If no address is specified, all status reports are cleared from the cache buffer.

Command Modes

EXEC

Command History

Release	Modification
12.0(5)S	This command was introduced.

Usage Guidelines

You typically need not clear this circular cache buffer.

Examples

The following example clears status reports from the Test Receiver at 175.2.3.4:

```
Router# clear ip mrm status-report 175.2.3.4
```

Related Commands

Command	Description
show ip mrm status-report	Displays MRM status reports of errors in the circular cache buffer.

ip mrm

To configure an interface to operate as a Test Sender or Test Receiver, or both, for Multicast Routing Monitor (MRM), use the **ip mrm** command in interface configuration mode. To remove the interface as a Test Sender or Test Receiver, use the **no** form of this command.

ip mrm {**test-sender** | **test-receiver** | **test-sender-receiver**}

no ip mrm {**test-sender** | **test-receiver** | **test-sender-receiver**}

Syntax Description

test-sender	Configures the interface to be a Test Sender.
test-receiver	Configures the interface to be a Test Receiver.
test-sender-receiver	Configures the interface to be both a Test Sender and Test Receiver (for different groups).

Defaults

The interface is neither a Test Sender nor a Test Receiver.

Command Modes

Interface configuration

Command History

Release	Modification
12.0(5)S	This command was introduced.

Usage Guidelines

The Test Sender and Test Receiver can be either a router or a host.

If a router (or host) belongs to more than one test group, it can be a Test Sender for one group and a Test Receiver for the other group. It cannot be the Test Sender and Test Receiver for the same group.

Examples

The following example configures Ethernet interface 0 to be a Test Sender:

```
interface ethernet 0
 ip mrm test-sender
```

Related Commands

Command	Description
receivers	Establishes Test Receivers for MRM.
senders	Configures Test Sender parameters used in MRM.

ip mrm accept-manager

To configure a Test Sender or Test Receiver to accept requests only from Managers that pass an access list, use the **ip mrm accept-manager** command in global configuration mode. To remove the restriction, use the **no** form of this command.

ip mrm accept-manager {*access-list*} [**test-sender** | **test-receiver**]

no ip mrm accept-manager {*access-list*}

Syntax Description

access-list	Number or name of IP access list applied to the Managers.
test-sender	(Optional) The access list applies only to the Test Sender.
test-receiver	(Optional) The access list applies only to the Test Receiver.

Defaults

If neither the **test-sender** nor **test-receiver** keyword is configured, the access list applies to both.

Command Modes

Global configuration

Command History

Release	Modification
12.0(5)S	This command was introduced.

Usage Guidelines

Use this command to control which Managers a Test Sender or Test Receiver must respond to.

Examples

The following example configures the Test Sender to respond only to Managers that pass the access list named supervisor:

```
ip access-list standard supervisor
remark Permit only the Manager from Central Office
 permit 172.18.2.4
ip mrm accept-manager supervisor test-sender
```

Related Commands

Command	Description
ip mrm	Configures an interface to operate as a Test Sender or Test Receiver, or both, for MRM.

ip mrm manager

To identify a Multicast Routing Monitor (MRM) test and enter the mode in which you specify the test parameters, use the **ip mrm manager** command in global configuration mode. To remove the test, use the **no** form of this command.

ip mrm manager *test-name*

no ip mrm manager *test-name*

Syntax Description

test-name	Name of the group of MRM test parameters that follow.

Defaults

There is no MRM test.

Command Modes

Global configuration

Command History

Release	Modification
12.0(5)S	This command was introduced.

Usage Guidelines

The *test-name* argument identifies a test so that you can start, stop, or monitor the test.

After you enter this command, the router is in manager configuration mode and you must set the test parameters.

Examples

The following example identifies an MRM test named test1 and causes the system to enter manager configuration mode:

```
ip mrm manager test1
 manager ethernet 0 group 239.1.1.1
 senders 1
```

Related Commands

Command	Description
mrm	Starts or stops an MRM test.
show ip mrm manager	Displays test information for MRM.

manager

To specify that an interface is the Manager for Multicast Routing Monitor (MRM), and to specify the multicast group address the Test Receiver will listen to, use the **manager** command in manager configuration mode. To remove the Manager or group address, use the **no** form of this command.

manager *type number* **group** *ip-address*

no manager *type number* **group** *ip-address*

Syntax Description

type number	Interface type and number of the Manager. The IP address associated with this interface is the source address of the Manager.
group *ip-address*	IP multicast group address that the Test Receiver will listen to.

Defaults

There is no MRM Manager.

Command Modes

Manager configuration

Command History

Release	Modification
12.0(5)S	This command was introduced.

Usage Guidelines

This command identifies the interface that acts as the Manager, and therefore is required in order to run MRM.

Examples

The following example configures Ethernet interface 0 as the Manager. It also configures the Test Receiver to listen to multicast group 239.1.1.1.

```
ip mrm manager test1
 manager ethernet 0 group 239.1.1.1
```

Related Commands

Command	Description
beacon	Changes the frequency, duration, or scope of beacon messages that the Manager sends to Test Senders and Test Receivers during an MRM test.
ip mrm accept-manager	Configures a Test Sender or Test Receiver to accept requests only from Managers that pass an access list.
show ip mrm manager	Displays test information for MRM.

mrinfo

To query which neighboring multicast routers are "peering" with the local router, use the **mrinfo** command in EXEC mode.

mrinfo [*host-name* | *host-address*] [*source-address* | *interface*]

Syntax Description

host-name	*host-address*	(Optional) Queries the Domain Name System (DNS) name or IP address of the multicast router. If omitted, the router queries itself.
source-address	(Optional) Source address used on mrinfo requests. If omitted, the source is based on the outbound interface for the destination.
interface	(Optional) Source interfaceused on mrinfo requests. If omitted, the source is based on the outbound interface for the destination.

Command Modes

EXEC

Command History

Release	Modification
11.0	This command was introduced.

Usage Guidelines

The mrinfo command is the original tool of the multicast backbone (MBONE) to determine which neighboring multicast routers are peering with a multicast router. Cisco routers have supported responding to mrinfo requests since Cisco IOS Release 10.2.

Now you can query a multicast router using this command. The output format is identical to the mrouted version of Distance Vector Multicast Routing Protocol (DVMRP). (The mrouted software is the UNIX software that implements DVMRP.)

Examples

The following is sample output of the **mrinfo** command:

```
Router # mrinfo

192.31.7.37 (barrnet-gw.cisco.com) [version cisco 11.1] [flags: PMSA]:
  192.31.7.37 -> 192.31.7.34 (sj-wall-2.cisco.com) [1/0/pim]
  192.31.7.37 -> 192.31.7.47 (dirtylab-gw-2.cisco.com) [1/0/pim]
  192.31.7.37 -> 192.31.7.44 (dirtylab-gw-1.cisco.com) [1/0/pim]
  131.119.26.10 -> 131.119.26.9 (su-pr2.bbnplanet.net) [1/32/pim]
```

The flags indicate the following:

- P: prune-capable
- M: mtrace-capable
- S: SNMP-capable
- A: Auto-RP-capable

mrm

To start or stop a Multicast Routing Monitor (MRM) test, use the **mrm** command in EXEC mode.

mrm *test-name* {**start** | **stop**}

Syntax Description

test-name	Name of the MRM test, as defined by the **ip mrm manager** command.
start	Starts the MRM test specified by the *test-name* argument.
stop	Stops the MRM test specified by the *test-name* argument.

Command Modes

EXEC

Command History

Release	Modification
12.0(5)S	This command was introduced.

Usage Guidelines

You must use this command to run an MRM test. When the test runs, the Test Sender sends User Datagram Protocol (UDP) or UDP/Real-Time Transport Protocol (RTP) packets (depending on the **senders** command) to the Test Receiver.

Examples

The following example starts the MRM test named test1:

```
Router# mrm test1 start
```

Related Commands

Command	Description
ip mrm manager	Identifies an MRM test and enters the mode in which you specify the test parameters.
show ip mrm status-report	Displays MRM status reports of errors in the circular cache buffer.

mstat

To display IP multicast packet rate and loss information, use the **mstat** command in user EXEC mode.

mstat {*source-name* | *source-address*} [*destination-name* | *destination-address*] [*group-name* | *group-address*]

Syntax Description

source-name | *source-address*	Domain Name System (DNS) name or the IP address of the multicast-capable source.
destination-name | *destination-address*	(Optional) DNS name or address of the destination. If omitted, the command uses the system at which the command is typed.
group-name | *group-address*	(Optional) DNS name or multicast address of the group to be displayed. Default address is 224.2.0.1 (the group used for multicast backbone [MBONE] Audio).

Command Modes

User EXEC

Command History

Release	Modification
11.0	This command was introduced.

Usage Guidelines

If no arguments are entered, the router will interactively prompt you for them.

This command is a form of UNIX mtrace that reports packet rate and loss information.

Examples

The following is sample output from the **mstat** command:

```
Router> mstat lwei-home-ss2 171.69.58.88 224.0.255.255

Type escape sequence to abort.
Mtrace from 171.69.143.27 to 171.69.58.88 via group 224.0.255.255
>From source (lwei-home-ss2.cisco.com) to destination (lwei-ss20.cisco.com)
Waiting to accumulate statistics......
Results after 10 seconds:

  Source        Response Dest    Packet Statistics For    Only For Traffic
171.69.143.27    171.69.62.144    All Multicast Traffic     From 171.69.143.27
     |       __/  rtt 48   ms   Lost/Sent = Pct  Rate     To 224.0.255.255
     v      /     hop 48   ms   ---------------------     --------------------
171.69.143.25   lwei-cisco-isdn.cisco.com
     |     ^      ttl   1
     v     |      hop 31   ms    0/12 = 0%      1 pps    0/1 = --%  0 pps
171.69.121.84
171.69.121.45   eng-frmt12-pri.cisco.com
     |     ^      ttl   2
     v     |      hop -17  ms    -735/12 = --%      1 pps    0/1 = --%  0 pps
171.69.121.4
171.69.5.27     eng-cc-4.cisco.com
     |     ^      ttl   3
     v     |      hop -21  ms    -678/23 = --%      2 pps    0/1 = --%  0 pps
171.69.5.21
```

```
171.69.62.130   eng-ios-2.cisco.com
     |     ^      ttl   4
     v     |      hop 5    ms    605/639 = 95%      63 pps    1/1 = --%  0 pps
171.69.62.144
171.69.58.65    eng-ios-f-5.cisco.com
     |      \__   ttl   5
     v         \  hop 0    ms        4         0 pps           0    0 pps
171.69.58.88    171.69.62.144
  Receiver      Query Source
```

Table 32 describes the significant fields shown in the display.

Table 32 mstat Field Descriptions

Field	Description
Source	Traffic source of packet.
Response Dest	Place where the router sends the results of the **mstat** command.
ttl	Number of hops required from the traffic source to the current hop.
hop	Number of milliseconds of delay.
Only For Traffic From ... 0/2	0 packets dropped out of 2 packets received. If, for example, –2/2 was indicated, then there are 2 extra packets, which could indicate a loop condition.

Related Commands

Command	Description
mtrace	Traces the path from a source to a destination branch for a multicast distribution tree.

mtrace

To trace the path from a source to a destination branch for a multicast distribution tree, use the **mtrace** user command in EXEC mode.

mtrace {*source-name* | *source-address*} [*destination-name* | *destination-address*] [*group-name* | *group-address*]

Syntax Description

source-name | *source-address*	Domain Name System (DNS) name or the IP address of the multicast-capable source. This is a unicast address of the beginning of the path to be traced.
destination-name | *destination-address*	(Optional) DNS name or address of the unicast destination. If omitted, the mtrace starts from the system at which the command is typed.
group-name | *group-address*	(Optional) DNS name or multicast address of the group to be traced. Default address is 224.2.0.1 (the group used for multicast backbone [MBONE] Audio). When address 0.0.0.0 is used, the software invokes a weak **mtrace**. A weak **mtrace** is one that follows the RPF path to the source, regardless of whether any router along the path has multicast routing table state.

Command Modes

User EXEC

Command History

Release	Modification
11.0	This command was introduced.

Usage Guidelines

The trace request generated by the **mtrace** command is multicast to the multicast group to find the last hop router to the specified destination. The trace then follows the multicast path from destination to source by passing the mtrace request packet via unicast to each hop. Responses are unicast to the querying router by the first hop router to the source. This command allows you to isolate multicast routing failures.

If no arguments are entered, the router will interactively prompt you for them.

This command is identical in function to the UNIX version of mtrace.

Examples

The following is sample output from the **mtrace** command:

```
Router> mtrace 171.69.215.41 171.69.215.67 239.254.254.254

Type escape sequence to abort.
Mtrace from 171.69.215.41 to 171.69.215.67 via group 239.254.254.254
From source (?) to destination (?)
Querying full reverse path...
 0  171.69.215.67
-1  171.69.215.67 PIM  thresh^ 0  0 ms
-2  171.69.215.74 PIM  thresh^ 0  2 ms
-3  171.69.215.57 PIM  thresh^ 0  894 ms
-4  171.69.215.41 PIM  thresh^ 0  893 ms
-5  171.69.215.12 PIM  thresh^ 0  894 ms
-6  171.69.215.98 PIM  thresh^ 0  893 ms
```

Table 33 describes the significant fields shown in the display.

Table 33 mtrace Field Descriptions

Field	Description
Mtrace from 171.69.215.41 to 171.69.215.67 via group 239.254.254.254	Name and address of source, destination, and group for which routes are being traced.
-3 171.69.215.57	Hops away from destination (–3) and address of intermediate router.
PIM thresh^ 0	Multicast protocol in use on this hop, and time-to-live (TTL) threshold.
893 ms	Time taken for trace to be forwarded between hops.

Related Commands

Command	Description
mstat	Displays IP multicast packet rate and loss information.

receivers

To establish Test Receivers for Multicast Routing Monitor (MRM), use the **receivers** command in manager configuration mode. To restore the default values, use the **no** form of this command.

receivers {*access-list*} [**sender-list** {*access-list*} [*packet-delay*]] [**window** *seconds*] [**report-delay** *seconds*] [**loss** *percentage*] [**no-join**] [**monitor** | **poll**]

no receivers {*access-list*} [**sender-list** {*access-list*} [*packet-delay*]] [**window** *seconds*] [**report-delay** *seconds*] [**loss** *percentage*] [**no-join**] [**monitor** | **poll**]

Syntax Description

access-list	IP named or numbered access list that establishes the Test Receivers. Only these Test Receivers are subject to the other keywords and arguments specified in this command.
sender-list *access-list*	(Optional) Specifies the sources that the Test Receiver should monitor. If the named or numbered access list matches any access list specified in the **senders** command, the associated **packet-delay** *milliseconds* keyword and argument of that **senders** command are used in this command. Otherwise, the *packet-delay* argument is required in this **receivers** command.
packet-delay	(Optional) Specifies the delay between test packets (in milliseconds). If the **sender-list** access list matches any access list specified in the **senders** command, the associated **packet-delay** *milliseconds* keyword and argument of that **senders** command are used in this command. Otherwise, the *packet-delay* argument is required in this **receivers** command.
window *seconds*	(Optional) Duration (in seconds) of a test period. This is a sliding window of time in which packet count is collected, so that the loss percentage can be calculated. Default is 5 seconds.
report-delay *seconds*	(Optional) Delay (in seconds) between staggered status reports from multiple Test Receivers to the Manager. The delay prevents multiple receivers from sending status reports to the Manager at the same time for the same failure. Receiver 1 sends status, *seconds* later Receiver 2 sends status, *seconds* later Receiver 3 sends status, and so on. This value is relevant only if there are multiple Test Receivers. The default is 1 second.
loss *percentage*	(Optional) Threshold percentage of packet loss required before a status report is triggered. The default is 0 percent, which means that a status report is sent for any packet loss. (This value is not applied to packet duplication; a fault report is sent for any duplicated packets.) Loss percentage calculation is explained in the "Usage Guidelines" section of this command.
no-join	(Optional) Specifies that the Test Receiver does not join the monitored group. The default is that the Test Receiver joins the monitored group.
monitor | **poll**	(Optional) Specifies whether the Test Receiver monitors the test group or polls for receiver statistics. The **monitor** keyword means the Test Receiver reports only if the test criteria are met. The **poll** keyword means the Test Receiver sends status reports regularly, whether test criteria are met or not. The default is the **monitor** keyword.

Defaults

window *seconds*: 5 seconds

report-delay *seconds*: 1 second

loss *percentage*: 0 percent

monitor

Command Modes

Manager configuration

Command History

Release	Modification
12.0(5)S	This command was introduced.

Usage Guidelines

This command is required for MRM to work; the **receivers** keyword and the first access list must be specified. The rest of the command is optional.

Loss percentage is calculated based on the **packet-delay** value of the **senders** command, which defaults to 200 milliseconds, or 5 packets per second. If the **window** keyword defaults to 5 seconds, then the Test Receiver expects 5 packets per second for 5 seconds = 25 packets. If the Test Receiver receives only 15 packets, then 25–15 = 10 lost packets. Lost packets divided by packets expected equals loss percentage. 10/25 equals a loss percentage of 40 percent.

Examples

In the following example, the test2 group has the proxy-sender address 10.1.1.10, and the corresponding **receivers** command has an explicit packet delay configured to match the default packet delay of the sender:

```
ip mrm manager test1
 manager e4/0/1 group 239.1.1.1
 senders 1
 receivers 2 sender-list 1
ip mrm manager test2
 manager e4/0/1 group 239.1.1.1
 senders 1 10.1.1.10
 receivers 2 sender-list 3  200
 udp-port test-packet 16386 status-report 65533
!
access-list 1 permit 10.1.1.2
access-list 2 permit 10.1.4.2
access-list 3 permit 10.1.1.10
```

Related Commands

Command	Description
senders	Configures Test Sender parameters used in MRM.

senders

To configure Test Sender parameters used in Multicast Routing Monitor (MRM), use the **senders** command in manager configuration mode. To restore the default values, use the **no** form of this command.

senders {*access-list*} [**packet-delay** *milliseconds*] [**rtp** | **udp**] [**target-only** | **all-multicasts** | **all-test-senders**] [*proxy_src*]

no senders {*access-list*} [**packet-delay** *milliseconds*] [**rtp** | **udp**] [**target-only** | **all-multicasts** | **all-test-senders**] [*proxy_src*]

Syntax Description

access-list	IP named or numbered access list that defines which Test Senders are involved in the test and which Test Senders these parameters apply to.
packet-delay *milliseconds*	(Optional) Specifies the delay between test packets (in milliseconds). The default is 200 milliseconds, which results in 5 packets per second.
rtp | **udp**	(Optional) Encapsulation of test packets, either Real-Time Transport Protocol (RTP-encapsulated or User Datagram Protocol (UDP)-encapsulated. The default is RTP-encapsulated.
target-only	(Optional) Specifies that test packets are sent out on the targeted interface only (that is, the interface with the IP address that is specified in the Test Sender request target field). By default, test packets are sent as described in the **all-multicasts** keyword.
all-multicasts	(Optional) Specifies that the test packets are sent out on all interfaces that are enabled with IP multicast. This is the default way that test packets are sent.
all-test-senders	(Optional) Specifies that test packets are sent out on all interfaces that have test-sender mode enabled. By default, test packets are sent as described in the **all-multicasts** keyword.
proxy_src	(Optional) Source IP address for which the Test Sender will proxy test packets. Use this if you want to test, for a specific source, whether the multicast distribution tree is working.

Defaults

packet-delay *milliseconds*: 200 milliseconds (that is, 5 packets per second)

rtp

all-multicasts

Command Modes

Manager configuration

Command History

Release	Modification
12.0(5)S	This command was introduced.

Usage Guidelines

Use this command to specify which Test Senders are involved in the test and are affected by these parameters.

Examples

In the following example, the test2 group has the proxy-sender address 10.1.1.10, and the corresponding **receivers** command has an explicit packet delay configured to match the default packet delay of the sender:

```
ip mrm manager test1
 manager e4/0/1 group 239.1.1.1
 senders 1
 receivers 2 sender-list 1
ip mrm manager test2
 manager e4/0/1 group 239.1.1.1
 senders 1 10.1.1.10
 receivers 2 sender-list 3  200
 udp-port test-packet 16386 status-report 65533
!
access-list 1 permit 10.1.1.2
access-list 2 permit 10.1.4.2
access-list 3 permit 10.1.1.10
```

Related Commands

Command	Description
receivers	Establishes Test Receivers for MRM.

show ip mrm interface

To display Test Sender or Test Receiver information about Multicast Routing Monitor (MRM), use the **show ip mrm interface** command in EXEC mode.

show ip mrm interface [*type number*]

Syntax Description

type number	(Optional) Displays Test Sender or Test Receiver information for the specified interface type and number. If no interface is specified, information about all Test Senders and Test Receivers is displayed.

Command Modes

EXEC

Command History

Release	Modification
12.0(5)S	This command was introduced.

Usage Guidelines

Use this command to see which interfaces are participating in MRM in which roles, and whether the interfaces are up or down.

Examples

The following example is sample output for the **show ip mrm interface** command:

```
Router# show ip mrm interface

Interface           Address          Mode                 Status
Ethernet0           1.1.1.1          Test-Sender          Up
Ethernet1           2.2.2.2          Test-Receiver        Up
```

Table 34 describes the significant fields showh in the display.

Table 34 show ip mrm interface Field Descriptions

Field	Description
Interface	List of interfaces on this router that serve as a Test Sender or Test Receiver.
Address	IP address of the interface.
Mode	Role that the interface plays in MRM, either Test Sender or Test Receiver.
Status	Status of the interface.

Related Commands

Command	Description
ip mrm	Configures an interface to operate as a Test Sender or Test Receiver, or both, for MRM.

show ip mrm manager

To display test information for Multicast Routing Monitor (MRM), use the **show ip mrm manager** command in EXEC mode.

show ip mrm manager [*test-name*]

Syntax Description

test-name	(Optional) Name of the MRM test (as specified in the **ip mrm manager** command) for which to display information. If no name is specified, information about all Managers is displayed.

Command Modes

EXEC

Command History

Release	Modification
12.0(5)S	This command was introduced.

Usage Guidelines

Use this command to see information about the Manager.

Examples

The following example is sample output for the **show ip mrm manager** command executed at two different times:

```
Router# show ip mrm manager test

Manager:test/1.1.1.1 is running, expire:1d00h
  Beacon interval/holdtime/ttl:60/86400/32
  Group:239.1.2.3, UDP port test-packet/status-report:16384/65535
  Test senders:
    2.2.2.2          /Ack
  Test receivers:
    3.3.3.3          /Ack

Router# show ip mrm manager test

Manager:test/1.1.1.1 is not running
  Beacon interval/holdtime/ttl:60/86400/32
  Group:239.1.2.3, UDP port test-packet/status-report:16384/65535
  Test senders:
    2.2.2.2
  Test receivers:
    3.3.3.3
```

Table 35 describes the significant fields shown in the display.

Table 35 show ip mrm manager Field Descriptions

Field	Description
Manager	Status of the test named test run by the Manager at 1.1.1.1.
Beacon interval/holdtime/ttl	Beacon parameters configured by the **beacon** command.
Group	IP multicast group that the Test Receiver will listen to, as configured by the **manager** command.
UDP port test-packet/status-report	User Datagram Protocol (UDP) port number to which test packets sent are by a Test Sender/status reports sent by a Test Receiver, as configured by the **udp-port** command.
Test senders	IP address of Test Senders.
Test receivers	IP address of Test Receivers.

Related Commands

Command	Description
ip mrm manager	Identifies an MRM test and enters the mode in which you specify the test parameters.
manager	Specifies that an interface is the Manager for MRM, and specifies the multicast group address the Test Receiver will listen to.

show ip mrm status-report

To display Multicast Routing Monitor (MRM) status reports of errors in the circular cache buffer, use the **show ip mrm status-report** command in EXEC mode.

show ip mrm status-report [*ip-address*]

Syntax Description

ip-address	(Optional) Displays information received from this IP address only. If no address is specified, all status reports in the cache buffer are displayed.

Command Modes

EXEC

Command History

Release	Modification
12.0(5)S	This command was introduced.

Usage Guidelines

Use this command during your MRM test period to learn if any errors are reported. The Manager immediately displays error reports and sends error reports, if any, to the circular cache buffer. The buffer holds up to 1024 lines, with one line for each error report.

No errors reported indicates that the Test Receiver is receiving test packets without loss or duplicates from the Test Sender.

Examples

The following example is sample output for the **show ip mrm status-report** command:

```
Router# show ip mrm status-report

IP MRM status report cache:
Timestamp        Manager         Test Receiver   Pkt Loss/Dup (%)      Ehsr
*Apr 20 07:36:08 1.1.1.1         3.3.3.3         5            (20%)    0
*Apr 20 07:36:09 1.1.1.1         3.3.3.3         10           (40%)    0
*Apr 20 07:36:10 1.1.1.1         3.3.3.3         15           (60%)    0
```

Table 36 describes the significant fields shown in the display.

Table 36 show ip mrm status-report Field Descriptions

Field	Description
Timestamp	Time when the status report arrived in the cache. Month and date, hours:minutes:seconds.
Manager	IP address of the Manager.
Test Receiver	IP address of the Test Receiver.
Pkt Loss/Dup	Number of packets lost or duplicated.

Table 36 show ip mrm status-report Field Descriptions (continued)

Field	Description
(%)	Percentage of packets lost or duplicated. Loss percentage is calculated based on the **packet-delay** value of the **senders** command, which defaults to 200 milliseconds, or 5 packets per second. If the **window** keyword defaults to 5 seconds, then the Test Receiver expects 5 packets per second for 5 seconds = 25 packets. If the Test Receiver receives only 15 packets, then 25–15 = 10 lost packets. Lost packets divided by packets expected equals loss percentage. 10/25 equals a loss percentage of 40 percent. A negative percentage indicates duplicate packets were received. If the packet loss reaches 100 percent, the Test Receiver will not send periodic reports until the packet loss decreases to less than 100 percent.
Ehsr	Extended highest sequence number received from Real-Time Transport Protocol (RTP).

Related Commands

Command	Description
clear ip mrm status-report	Clears the status report cache buffer.

udp-port

To change User Datagram Protocol (UDP) port numbers to which a Test Sender sends test packets or a Test Receiver sends status reports, use the **udp-port** command in manager configuration mode. To remove the port numbers, use the **no** form of this command.

udp-port [**test-packet** *port-number*] [**status-report** *port-number*]

no udp-port [**test-packet** *port-number*] [**status-report** *port-number*]

Syntax Description

test-packet *port-number*	(Optional) UDP port number to which test packets are sent by a Test Sender. The port number must be even if the packets are Real-Time Transport Protocol (RTP)-encapsulated. The default port number is 16384.
status-report *port-number*	(Optional) UDP port number to which status reports are sent by a Test Receiver. The port number must be odd if the packets are RTP Control Protocol (RTCP)-encapsulated. The default port number is 65535.

Defaults

test-packet *port-number*: 16384, the minimum value of an audio port

status-report *port-number*: 65535, the maximum value of a video port

Command Modes

Manager configuration

Command History

Release	Modification
12.0(5)S	This command was introduced.

Usage Guidelines

Change the default values if you want to listen to a different port.

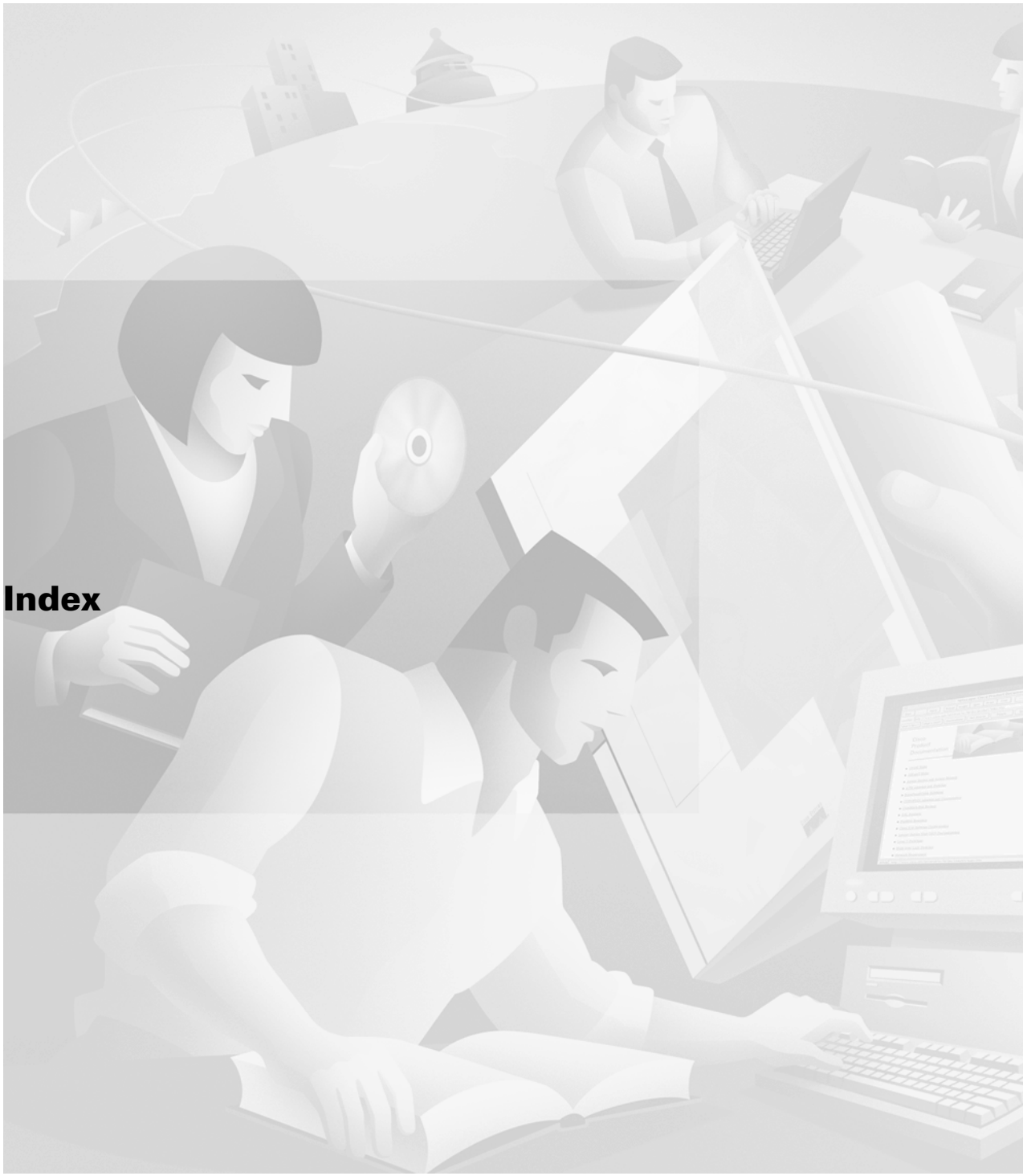
Examples

The following example changes the UDP port number to which test packets are targeted to 20000:

```
udp-port test-packet 20000
```

Related Commands

Command	Description
ip mrm	Configures an interface to operate as a Test Sender or Test Receiver, or both, for MRM.



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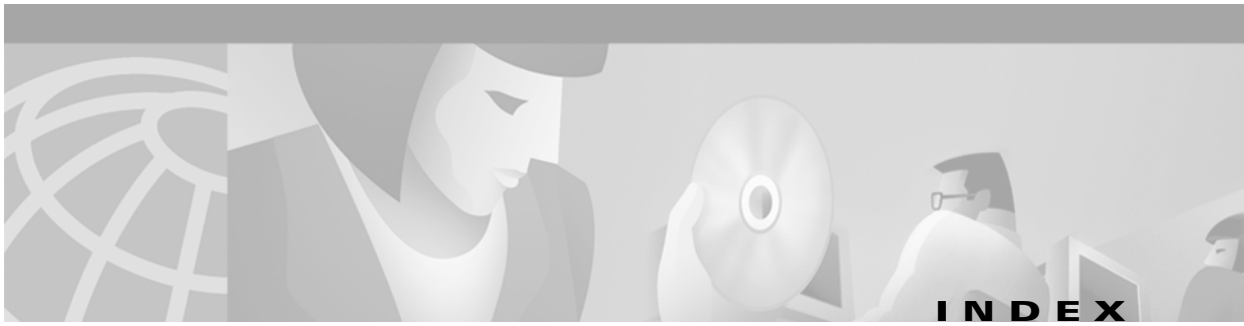

Symbols

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