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Using IP Multicast Tools

This chapter describes IP multicast tools that allow you to trace a multicast path or test a multicast environment. For a complete description of the commands in this chapter, refer to the "IP Multicast Tools Commands" chapter in the *Cisco IOS IP Command Reference, Volume 3 of 3: Multicast* publication. To locate documentation of other commands that appear in this chapter, use the command reference master index, or search online.

To identify the hardware platform or software image information associated with a feature, use the Feature Navigator on Cisco.com to search for information about the feature or refer to the software release notes for a specific release. For more information, see the "Identifying Supported Platforms" section in the "Using Cisco IOS Software" chapter.

Multicast Routing Monitor Overview

The Multicast Routing Monitor (MRM) feature is a management diagnostic tool that provides network fault detection and isolation in a large multicast routing infrastructure. It is designed to notify a network administrator of multicast routing problems in near real time.

MRM has three components that play different roles: the Manager, the Test Sender, and the Test Receiver. To test a multicast environment using test packets, perhaps before an upcoming multicast event, you need all three components.

You create a test based on various test parameters, name the test, and start the test. The test runs in the background and the command prompt returns.

If the Test Receiver detects an error (such as packet loss or duplicate packets), it sends an error report to the router configured as the Manager. The Manager immediately displays the error report. (Also, by issuing a certain **show** EXEC command, you can see the error reports, if any.) You then troubleshoot your multicast environment as normal, perhaps using the **mtrace** command from the source to the Test Receiver. If the **show** EXEC command displays no error reports, the Test Receiver is receiving test packets without loss or duplicates from the Test Sender.

The Cisco implementation of MRM supports Internet Draft of *Multicast Routing Monitor (MRM)*, Internet Engineering Task Force (IETF), March 1999.

Benefits

The benefits of the MRM feature are as follows:

- Find fault in multicast routing in near real time—If a problem exists in the multicast routing environment, you will find out about it right away.
- Can verify a multicast environment prior to an event—You need not wait for real multicast traffic to fail in order to find out that a problem exists. You can test the multicast routing environment before a planned event.
- Easy diagnostics—The error information is easy for the user to understand.
- Scalable—This diagnostic tool works well for many users.

Restrictions

You must make sure the underlying multicast forwarding network being tested has no access lists or boundaries that deny the MRM data and control traffic. Specifically, consider the following factors:

- MRM test data are User Datagram Protocol (UDP) and Real-Time Transport Protocol (RTP) packets addressed to the configured multicast group address.

- MRM control traffic between the Test Sender, Test Receiver, and Manager is addressed to the 224.0.1.111 multicast group, which all three components join.

MRM Configuration Task List

To configure and use the MRM feature, perform the required tasks described in the following sections:

- Configuring a Test Sender and Test Receiver (Required)
- Configuring a Manager (Required)
- Conducting an MRM Test (Required)

Configuring a Test Sender and Test Receiver

To configure a Test Receiver on a router or host, use the following commands beginning in global configuration mode:

	Command	Purpose
Step 1	`Router(config)# interface type number`	Specifies an interface.
Step 2	`Router(config-if)# ip mrm test-receiver`	Configures the interface to be a Test Receiver.
Step 3	`Router(config)# ip mrm accept-manager {access-list}`	Optionally, specifies that the Test Receiver can accept status report requests only from Managers specified by the access list.

To use MRM on test packets instead of actual IP multicast traffic, use the following commands beginning in global configuration mode to configure a Test Sender *on a different router or host* from where you configured the Test Receiver:

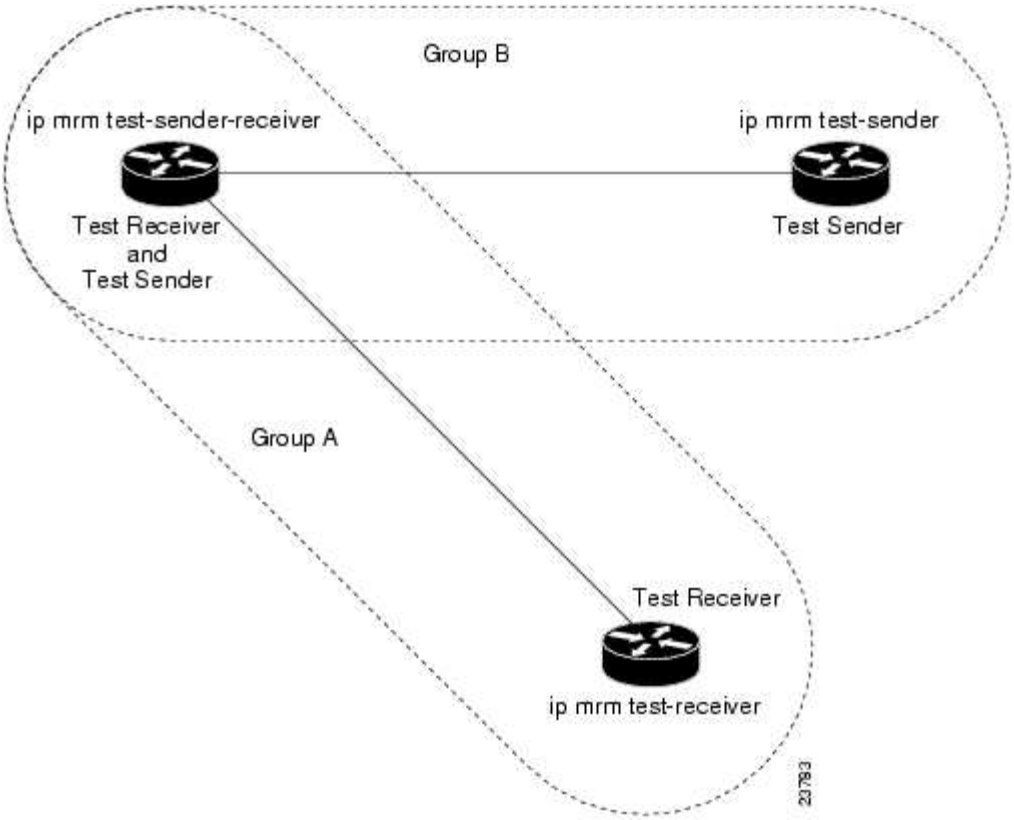
	Command	Purpose
Step 1	`Router(config)# interface type number`	Specifies an interface.
Step 2	`Router(config-if)# ip mrm test-sender`	Configures the interface to be a Test Sender.
Step 3	`Router(config)# ip mrm accept-manager {access-list}`	Optionally, specifies that the Test Sender can accept status report requests only from Managers specified by the access list.

Monitoring Multiple Groups

If you have more than one multicast group to monitor, you could configure an interface that is a Test Sender for one group and a Test Receiver for another group.

Figure 86 illustrates an environment where the router on the left is the Test Sender for Group A and the Test Receiver for Group B.

Figure 86 Test Sender and Test Receiver for Different Groups on One Router



To configure the routers in Figure 86 for monitoring more than one multcast group, configure the Test Sender in Group B and the Test Receiver in Group A separately, as already discussed, and configure the following commands beginning in global configuration mode on the router or host that belongs to both Group A and Group B (in the upper left of Figure 86):

	Command	Purpose
Step 1	`Router(config)# interface type number`	Specifies an interface.
Step 2	`Router(config-if)# ip mrm test-sender-receiver`	Configures the interface to be a Test Sender for one group and a Test Receiver for another group.
Step 3	`Router(config)# ip mrm accept-manager {access-list} [test-sender | test-receiver]`	Optionally, specifies that the Test Sender or Test Receiver can accept status report requests only from Managers specified by the access list. By default, the command applies to both the Sender and Receiver. Because this device is both, you might need to specify that the restriction applies to only the Sender or only the Receiver.

Configuring a Manager

To configure a router as a Manager in order for MRM to function, use the following commands beginning in global configuration mode. A host cannot be a Manager.

	Command	Purpose
Step 1	`Router(config)# ip mrm manager test-name`	Identifies a test by name, and places the router in manager configuration mode. The test name is used to start, stop, and monitor a test.

Step 2	`Router(config-mrm-manager)#` **`manager`** *`type number`* **`group`** *`ip-address`*	Specifies which interface on the router is the Manager, and specifies the multicast group address the Test Receiver will listen to.
Step 3	**`beacon`** [**`interval`** *`seconds`*] [**`holdtime`** *`seconds`*] [**`ttl`** *`ttl-value`*] **Example:** `Router(config-mrm-manager)# beacon interval 60`	Optionally, changes the frequency, duration, or scope of beacon messages that the Manager sends to the Test Sender and Test Receiver. • By default, beacon messages are sent at an interval of 60 seconds. • By default, the duration of a test period is 86400 seconds (1 day). • By default, the TTL is 32 hops.
Step 4	**`udp-port`** [**`test-packet`** *`port-number`*] [**`status-report`** *`port-number`*] **Example:** `Router(config-mrm-manager)# udp-port test-packet 20202`	Optionally, changes the UDP port numbers to which the Test Sender sends test packets or the Test Receiver sends status reports. • Use the optional **test-packet** keyword and *port-number* argument to change the UDP port to which the Test Sender sends test packets. The port number must be even if the packets are Real-Time Transport Protocol (RTP)-encapsulated. The range is from 16384 to 65535. • By default, the Test Sender uses UDP port number 16834 to send test packets. • Use the optional **status-report** keyword and *port-number* argument to change the UDP port to which the Test Receiver sends status reports. The port number must be odd if the packets are RTP Control Protocol (RTCP)-encapsulated. The range is from 16834 to 65535. • By default, the Test Receiver uses UDP port number 65535 to send status reports.
Step 5	**`senders`** `access-list` [**`packet-delay`** *`milliseconds`*] [**`rtp`** | **`udp`**] [**`target-only`** | **`all-multicasts`** | **`all-test-senders`**] **Example:** `Router(config-mrm-manager)# senders 1 packet-delay 30 udp all-test-senders`	Establishes Test Senders for MRM tests. • Use the optional **packet-delay** keyword and *milliseconds* argument to specify the delay between test packets (in milliseconds). The range is from 50 to 10000. The default is 200 milliseconds, which results in 5 packets per second. • Use the optional **rtp** keyword or **udp** keyword to specify the encapsulation of test packets, either Real-Time Transport Protocol (RTP) encapsulated or User Datagram Protocol (UDP) encapsulated. By default, test packets are RTP-encapsulated. • Use the optional **target-only** keyword to specify 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 out on all interfaces that are enabled with IP multicast. • Use the optional **all-multicasts** keyword to specify that the test packets are sent out on all interfaces that are enabled with IP multicast. This is the default method for sending test packets. • Use the optional **all-test-senders** keyword to specify that test packets are sent out on all interfaces that have test-sender mode enabled. By default, test packets are sent out on all interfaces that are enabled with IP multicast.
Step 6	**receivers** *access-list* **sender-list** *access-list* [*packet-delay*] **Example:** `Router(config-mrm-manager)# receivers 1 sender-list 3`	Establishes Test Receivers for MRM. **Note** Although the Cisco IOS CLI parser accepts the command entered without the **sender-list** *access-list* keyword-argument pair, this keyword-argument pair is not optional. For an MRM test to work, you must specify the sources that the Test Receiver should monitor using the **sender-list** keyword and *access-list* argument. • Use the **sender-list** keyword and *access-list* to specify 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 the MRM test. Otherwise, the **receivers** command requires that a delay be specified for the *packet-delay* argument. • Use the optional *packet-delay* argument to specify the delay between test packets (in milliseconds). The range is from 50 to 10000. If the **sender-list** access list matches any access list specified in a **senders** command, the associated **packet-delay** *milliseconds* keyword and argument of that **senders** command are used in this command. Otherwise, the **receivers** command requires that a delay be specified for the *packet-delay* argument.
Step 7	**receivers** *access-list* [**window** *seconds*] [**report-delay** *seconds*] [**loss** *percentage*] [**no-join**] [**monitor** | **poll**] **Example:** `Router(config-mrm-manager)# receivers 1 window 7 report-delay 30`	Optionally, modifies the parameters of Test Receivers. • Use the optional **window** keyword and *seconds* argument to specify the duration (in seconds) of a test period. This is a sliding window of time in which the packet count is collected, so that the loss percentage can be

	calculated. The range is from 1 to 10. The default is 5 seconds. • Use the optional **report-delay** keyword and *seconds* argument to specify the delay (in seconds) between status reports. The delay prevents multiple Test Receivers from sending status reports to the Manager at the same time for the same failure. This value is relevant only if there are multiple Test Receivers. The range is from 1 to 60. The default is 1 second. • Use the optional **loss** keyword and *percentage* argument to specify the threshold percentage of packet loss required before a status report is triggered. The range is from 0 to 100. The default is 0 percent, which means that a status report is sent for any packet loss. • Use the optional **no-join** keyword to specify that the Test Receiver does not join the monitored group. The default is that the Test Receiver joins the monitored group. • Use either the optional **monitor** or **poll** keyword to specify 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 behavior set with the **monitor** keyword.

Conducting an MRM Test

To start and subsequently stop your MRM test, use the following command in EXEC mode:

Command	Purpose
`Router# mrm test-name {start | stop}`	Starts or stops the MRM test.

When the test begins, the Manager sends a unicast control packet to the Test Sender and Test Receiver, and then the Manager starts sending beacons. The Test Sender and Test Receiver send acknowledgments to the Manager and begin sending or receiving test packets. If an error occurs, the Test Receiver sends an error report to the Manager, which immediately displays the report.

You cannot change the Manager parameters while the test is in progress.

Monitoring IP Multicast Routing

To monitor IP multicast routers, packets, and paths, use the following commands in EXEC mode :

Command	Purpose
`Router# mrinfo [host-name | host-address] [source-address | interface]`	Queries a multicast router about which neighboring multicast routers are peering with it.

`Router# mstat source [destination] [group]`	Displays IP multicast packet rate and loss information.
`Router# mtrace {source-name | source-address} [destination-name | destination-address][group-name | group-address]`	Traces the path from a source to a destination branch for a multicast distribution tree for a given group.

Monitoring and Maintaining MRM

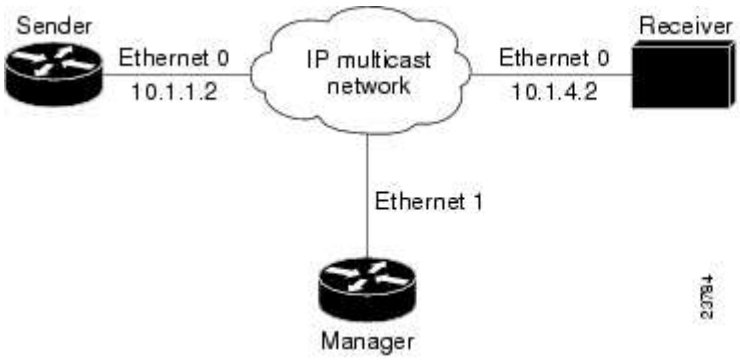
To monitor and maintain MRM, use the following commands in EXEC mode:

Command	Purpose
`Router# clear ip mrm status-report [ip-address]`	Clears the status report cache buffer.
`Router# show ip mrm interface [type number]`	Displays Test Sender and Test Receiver information.
`Router# show ip mrm manager [test-name]`	Displays MRM test information.
`Router# show ip mrm status-report [ip-address]`	Displays the status reports (errors) in the circular cache buffer.

MRM Configuration Example

Figure 87 illustrates a Test Sender, a Test Receiver, and a Manager in an MRM environment. The partial configurations for the three devices follow the figure.

Figure 87 Multicast Routing Monitor Example



Test Sender Configuration

```
interface Ethernet 0
 ip mrm test-sender
```

Test Receiver Configuration

```
interface Ethernet 0
 ip mrm test-receiver
```

Manager Configuration

```
ip mrm manager test1
 manager Ethernet 1 group 239.1.1.1
 senders 1
 receivers 2 sender-list 1
!
access-list 1 permit 10.1.1.2
access-list 2 permit 10.1.4.2
```