



## Using the Multicast Routing Monitor

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The Multicast Routing Monitor (MRM) 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 a test environment.

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## Finding Feature Information

Your software release may not support all the features documented in this module. For the latest feature information and caveats, see the release notes for your platform and software release. To find information about the features documented in this module, and to see a list of the releases in which each feature is supported, see the Feature Information Table at the end of this document.

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

## Restrictions for Using the Multicast Routing Monitor

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. The 224.0.1.111 group is an IANA-registered group.

- Take into account the unicast IP addresses of sources and receivers when considering what could prevent control traffic flowing.

# Information About the Multicast Routing Monitor

## Multicast Routing Monitor Operation

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 device configured as the Manager. The Manager immediately displays the error report. (The **show ip mrm status-report** command also displays 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 ip mrm status-report** 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. The IETF originally conceived MRM to use both test packets and real data. The Cisco implementation does not use real data due to technical issues and the fact that the IETF draft did not progress.

## Benefits of Multicast Routing Monitor

The benefits of the MRM are as follows:

- MRM allows network personnel to generate test flows without having to use host devices.
- MRM 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.
- MRM provides easy diagnostics. The error information is easy for the user to understand.
- MRM is scalable. This diagnostic tool works well for many users.

# How to Use the Multicast Routing Monitor

## Configuring a Test Receiver

Perform this task to configure a Test Receiver on a device or host.

## SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **interface** *type number*
4. **ip mrm test-receiver**
5. **exit**
6. **ip mrm accept-manager** *access-list*

## DETAILED STEPS

	Command or Action	Purpose
<b>Step 1</b>	<b>enable</b>  <b>Example:</b> Device> enable	Enables privileged EXEC mode.  <ul style="list-style-type: none"> <li>• Enter your password if prompted.</li> </ul>
<b>Step 2</b>	<b>configure terminal</b>  <b>Example:</b> Device# configure terminal	Enters global configuration mode.
<b>Step 3</b>	<b>interface</b> <i>type number</i>  <b>Example:</b> Device(config)# interface gigabitethernet 0/0/0	Specifies an interface, and enters interface configuration mode.
<b>Step 4</b>	<b>ip mrm test-receiver</b>  <b>Example:</b> Device(config-if)# ip mrm test-receiver	Configures the interface to operate as a Test Receiver.
<b>Step 5</b>	<b>exit</b>  <b>Example:</b> Device(config-if)# exit	Returns to the next higher configuration mode.
<b>Step 6</b>	<b>ip mrm accept-manager</b> <i>access-list</i>  <b>Example:</b> Device(config)# ip mrm accept-manager supervisor	(Optional) Specifies that the Test Receiver can accept status report requests only from Managers specified by the access list.  <ul style="list-style-type: none"> <li>• The access list is required and can be named or numbered.</li> <li>• This example uses an access list named “supervisor.” The access list is presumed to be already configured.</li> </ul>

	Command or Action	Purpose
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## Configuring a Test Sender

Perform this task to configure a Test Sender on a different device or host from where you configured the Test Receiver.

### SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **interface** *type number*
4. **ip mrm test-sender**
5. **exit**
6. **ip mrm accept-manager** [*access-list*]

### DETAILED STEPS

	Command or Action	Purpose
<b>Step 1</b>	<b>enable</b>  <b>Example:</b> Device> enable	Enables privileged EXEC mode.  <ul style="list-style-type: none"> <li>• Enter your password if prompted.</li> </ul>
<b>Step 2</b>	<b>configure terminal</b>  <b>Example:</b> Device# configure terminal	Enters global configuration mode.
<b>Step 3</b>	<b>interface</b> <i>type number</i>  <b>Example:</b> Device(config)# interface gigabitethernet 0/0/0	Specifies an interface, and enters interface configuration mode.
<b>Step 4</b>	<b>ip mrm test-sender</b>  <b>Example:</b> Device(config-if)# ip mrm test-sender	Configures the interface to operate as a Test Sender.

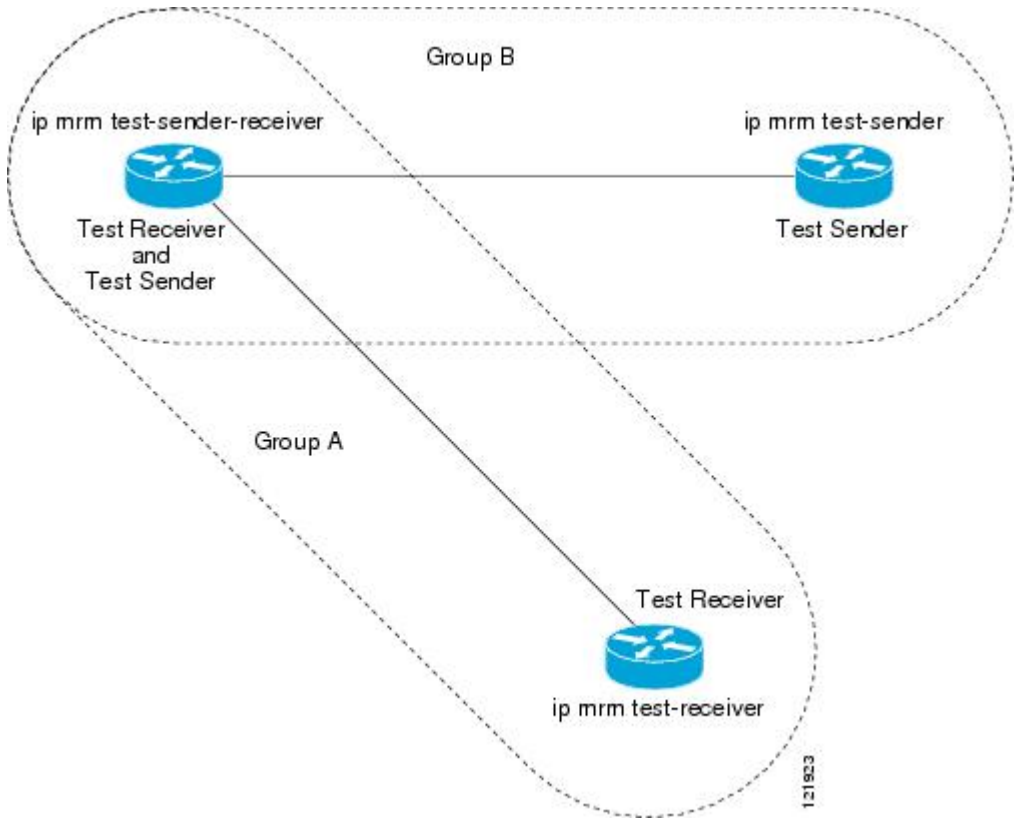
	Command or Action	Purpose
Step 5	<b>exit</b>  <b>Example:</b>  Device(config-if)# exit	Returns to the next higher configuration mode.
Step 6	<b>ip mrm accept-manager</b> <i>[access-list]</i>  <b>Example:</b>  Device(config)# ip mrm accept-manager supervisor	(Optional) Specifies that the Test Sender can accept status report requests only from Managers specified by the access list.  • This example uses an access list named “supervisor.” The access list is presumed to be already configured.

## Monitoring Multiple Groups

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

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

Figure 1: Test Sender and Test Receiver for Different Groups on One Router



SUMMARY STEPS

- 1. enable
- 2. configure terminal
- 3. interface type number
- 4. ip mrm test-sender-receiver
- 5. exit
- 6. ip mrm accept-manager access-list [test-sender | test-receiver]

DETAILED STEPS

	Command or Action	Purpose
Step 1	enable	Enables privileged EXEC mode.

	Command or Action	Purpose
	<b>Example:</b> <pre>Router&gt; enable</pre>	<ul style="list-style-type: none"> <li>Enter your password if prompted.</li> </ul>
<b>Step 2</b>	<b>configure terminal</b>  <b>Example:</b> <pre>Router# configure terminal</pre>	Enters global configuration mode.
<b>Step 3</b>	<b>interface</b> <i>type number</i>  <b>Example:</b> <pre>Router(config)# interface gigabitethernet 0/0/0</pre>	Specifies an interface, and enters interface configuration mode.
<b>Step 4</b>	<b>ip mrm test-sender-receiver</b>  <b>Example:</b> <pre>Router(config-if)# ip mrm test-sender-receiver</pre>	Configures the interface to operate as a Test Sender for one group and Test Receiver for another group.
<b>Step 5</b>	<b>exit</b>  <b>Example:</b> <pre>Router(config-if)# exit</pre>	Returns to the next higher configuration mode.
<b>Step 6</b>	<b>ip mrm accept-manager</b> <i>access-list</i> [ <b>test-sender</b>   <b>test-receiver</b> ]  <b>Example:</b> <pre>Router(config)# ip mrm accept-manager supervisor test-sender</pre>	<p>(Optional) Specifies that the Test Sender or Test Receiver can accept status report requests only from Managers specified by the access list.</p> <ul style="list-style-type: none"> <li>By default, the command applies to both the Test Sender and Test Receiver. Because this device is both, you might need to specify that the restriction applies to only the Test Sender or only the Test Receiver using the <b>test-sender</b> keyword or <b>test-receiver</b> keyword, respectively.</li> </ul>

## Configuring a Manager

Perform this task to configure a device as a Manager in order for MRM to function.

**Note**

A host cannot be a Manager.

**SUMMARY STEPS**

1. **enable**
2. **configure terminal**
3. **ip mrm manager** *test-name*
4. **manager** *type number* **group** *ip-address*
5. **beacon** [**interval** *seconds*] [**holdtime** *seconds*][**ttl** *ttn-value*]
6. **udp-port** **test-packet** *port-number* ] **status-report** *port-number* ]
7. **senders** *access-list* [**packet-delay** *milliseconds*] [**rtp**| **udp**] [**target-only**| **all-multicasts**| **all-test-senders**]
8. **receivers** *access-list* **sender-list** *access-list* [*packet-delay*]
9. **receivers** *access-list* [**window** *seconds*] [**report-delay** *seconds*] [**loss** *percentage*] [**no-join**] [**monitor** | **poll**]

**DETAILED STEPS**

	Command or Action	Purpose
<b>Step 1</b>	<b>enable</b>  <b>Example:</b> Device> enable	Enables privileged EXEC mode.  <ul style="list-style-type: none"> <li>• Enter your password if prompted.</li> </ul>
<b>Step 2</b>	<b>configure terminal</b>  <b>Example:</b> Device# configure terminal	Enters global configuration mode.
<b>Step 3</b>	<b>ip mrm manager</b> <i>test-name</i>  <b>Example:</b> Device(config)# ip mrm manager test1	Specifies the name of an MRM test to be created or modified, and enters MRM manager configuration mode.  <ul style="list-style-type: none"> <li>• The test name is used to start, stop, and monitor a test.</li> <li>• From MRM manager configuration mode, you specify the parameters of the test.</li> </ul>
<b>Step 4</b>	<b>manager</b> <i>type number</i> <b>group</b> <i>ip-address</i>  <b>Example:</b> Device(config-mrm-manager)# manager gigabitethernet 0/0/0 group 239.1.1.1	Specifies which interface on the device is the Manager, and specifies the multicast group address the Test Receiver will listen to.



	Command or Action	Purpose
<b>Step 5</b>	<b>beacon</b> [ <i>interval seconds</i> ] [ <i>holdtime seconds</i> ][ <i>ttl ttl-value</i> ]  <b>Example:</b>  Device(config-mrm-manager) # beacon interval 60	(Optional) Changes the frequency, duration, or scope of beacon messages that the Manager sends to the Test Sender and Test Receiver. <ul style="list-style-type: none"> <li>• By default, beacon messages are sent at an interval of 60 seconds.</li> <li>• By default, the duration of a test period is 86400 seconds (1 day).</li> <li>• By default, the TTL is 32 hops.</li> </ul>
<b>Step 6</b>	<b>udp-port test-packet</b> <i>port-number</i> ] <b>status-report</b> <i>port-number</i> ]  <b>Example:</b>  Device(config-mrm-manager) # udp-port test-packet 20202	(Optional) Changes the UDP port numbers to which the Test Sender sends test packets or the Test Receiver sends status reports. <ul style="list-style-type: none"> <li>• Use the optional <b>test-packet</b> keyword and <i>port-number</i> 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.</li> <li>• By default, the Test Sender uses UDP port number 16834 to send test packets.</li> <li>• Use the optional <b>status-report</b> keyword and <i>port-number</i> 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.</li> <li>• By default, the Test Receiver uses UDP port number 65535 to send status reports.</li> </ul>
<b>Step 7</b>	<b>senders access-list</b> [ <b>packet-delay</b> <i>milliseconds</i> ] [ <b>rtp</b>   <b>udp</b> ] [ <b>target-only</b>   <b>all-multicasts</b>   <b>all-test-senders</b> ]  <b>Example:</b>  Device(config-mrm-manager) # senders 1 packet-delay 400 udp all-test-senders	Establishes Test Senders for MRM tests. <ul style="list-style-type: none"> <li>• Use the optional <b>packet-delay</b> keyword and <i>milliseconds</i> 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.</li> <li>• Use the optional <b>rtp</b> keyword or <b>udp</b> 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.</li> <li>• Use the optional <b>target-only</b> 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.</li> <li>• Use the optional <b>all-multicasts</b> 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.</li> <li>• Use the optional <b>all-test-senders</b> 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.</li> </ul>
<b>Step 8</b>	<b>receivers access-list sender-list</b> <i>access-list</i> [ <i>packet-delay</i> ]	Establishes Test Receivers for MRM.

	Command or Action	Purpose
	<p><b>Example:</b></p> <pre>Device(config-mrm-manager)# receivers 1 sender-list 3</pre>	<p><b>Note</b> Although the Cisco IOS CLI parser accepts the command entered without the <b>sender-list</b> <i>access-list</i> 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 <b>sender-list</b> keyword and <i>access-list</i> argument.</p> <ul style="list-style-type: none"> <li>• Use the <b>sender-list</b> keyword and <i>access-list</i> to specify the sources that the Test Receiver should monitor. If the named or numbered access list matches any access list specified in the <b>senders</b> command, the associated <b>packet-delay</b> <i>milliseconds</i> keyword and argument of that <b>senders</b> command are used in the MRM test. Otherwise, the <b>receivers</b> command requires that a delay be specified for the <i>packet-delay</i> argument.</li> <li>• Use the optional <i>packet-delay</i> argument to specify the delay between test packets (in milliseconds). The range is from 50 to 10000. If the <b>sender-list</b> access list matches any access list specified in a <b>senders</b> command, the associated <b>packet-delay</b> <i>milliseconds</i> keyword and argument of that <b>senders</b> command are used in this command. Otherwise, the <b>receivers</b> command requires that a delay be specified for the <i>packet-delay</i> argument.</li> </ul>
<b>Step 9</b>	<p><b>receivers</b> <i>access-list</i> [<b>window</b> <i>seconds</i>] [<b>report-delay</b> <i>seconds</i>] [<b>loss</b> <i>percentage</i>] [<b>no-join</b>] [<b>monitor</b>   <b>poll</b>]</p> <p><b>Example:</b></p> <pre>Device(config-mrm-manager)# receivers 1 window 7 report-delay 30</pre>	<p>(Optional) Modifies the parameters of Test Receivers.</p> <ul style="list-style-type: none"> <li>• Use the optional <b>window</b> keyword and <i>seconds</i> 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.</li> <li>• Use the optional <b>report-delay</b> keyword and <i>seconds</i> 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.</li> <li>• Use the optional <b>loss</b> keyword and <i>percentage</i> 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.</li> <li>• Use the optional <b>no-join</b> keyword to specify that the Test Receiver does not join the monitored group. The default is that the Test Receiver joins the monitored group.</li> <li>• Use either the optional <b>monitor</b> or <b>poll</b> keyword to specify whether the Test Receiver monitors the test group or polls for receiver statistics. The <b>monitor</b> keyword means the Test Receiver reports only if the test criteria are met. The <b>poll</b> keyword means the Test Receiver sends status reports regularly, whether test criteria are met or not. The default is the behavior set with the <b>monitor</b> keyword.</li> </ul>

## Conducting an MRM Test and Viewing Results

From the device playing the Manager role, you can start and stop the MRM test. To start and subsequently stop your MRM test, perform this task.

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.

### SUMMARY STEPS

1. **enable**
2. **clear ip mrm status-report** *[ip-address]*
3. **show ip mrm interface** *[type number]*
4. **show ip mrm manager** *[test-name]*
5. **mrm test-name start**
6. **mrm test-name stop**
7. **show ip mrm status-report** *[ip-address]*

### DETAILED STEPS

	Command or Action	Purpose
<b>Step 1</b>	<b>enable</b>  <b>Example:</b> Device> enable	Enables privileged EXEC mode.  <ul style="list-style-type: none"> <li>• Enter your password if prompted.</li> </ul>
<b>Step 2</b>	<b>clear ip mrm status-report</b> <i>[ip-address]</i>  <b>Example:</b> Device# clear ip mrm status-report 172.16.0.0	(Optional) Clears the MRM status report cache.
<b>Step 3</b>	<b>show ip mrm interface</b> <i>[type number]</i>  <b>Example:</b> Device# show ip mrm interface Ethernet 1	(Optional) Displays MRM information related to interfaces.  <ul style="list-style-type: none"> <li>• Use this command before starting an MRM test to verify the interfaces are participating in MRM, in which roles, and whether the interfaces are up or down.</li> </ul>
<b>Step 4</b>	<b>show ip mrm manager</b> <i>[test-name]</i>  <b>Example:</b> Device# show ip mrm manager test1	(Optional) Displays information about MRM tests.  <ul style="list-style-type: none"> <li>• Use this command before starting an MRM test to verify MRM status information and the parameters configured for an MRM test.</li> </ul>

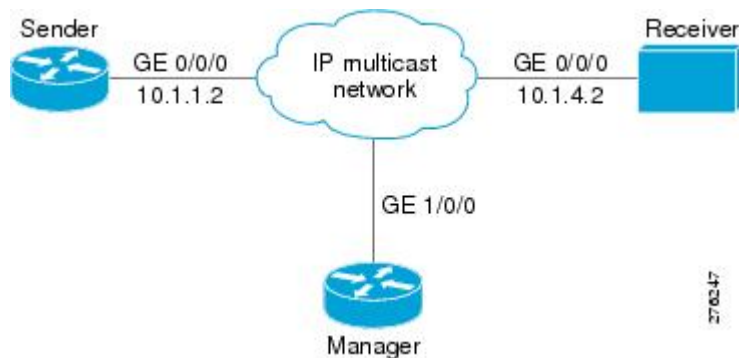
	Command or Action	Purpose
<b>Step 5</b>	<b>mrm test-name start</b>  <b>Example:</b> Device# mrm test1 start	Starts the MRM test.
<b>Step 6</b>	<b>mrm test-name stop</b>  <b>Example:</b> Device# mrm test1 stop	Stops the MRM test.
<b>Step 7</b>	<b>show ip mrm status-report [ip-address]</b>  <b>Example:</b> Device# show ip mrm status-report	(Optional) Displays the status reports in the MRM status report cache.

## Configuration Examples for MRM

### Configuring MRM Example

The figure 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 2: MRM Example Topology**



#### Test Sender Configuration

```

interface GigabitEthernet 0/0/0
ip mrm test-sender

```

**Test Receiver Configuration**

```
interface GigabitEthernet 0/0/0
 ip mrm test-receiver
```

**Manager Configuration**

```
ip mrm manager test1
manager GigabitEthernet 1/0/0 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
```

# Additional References

**Related Documents**

Related Topic	Document Title
Cisco IOS commands	<a href="#">Cisco IOS Master Commands List, All Releases</a>
IP multicast commands	<a href="#">Cisco IOS IP Multicast Command Reference</a>

**Standards and RFCs**

Standard/RFC	Title
draft-ietf-mboned-mrm-use-00.txt	<a href="#">Justification and Use of the Multicast Routing Monitor (MRM) Protocol</a>

**MIBs**

MIB	MIBs Link
—	To locate and download MIBs for selected platforms, Cisco IOS XE software releases, and feature sets, use Cisco MIB Locator found at the following URL:  <a href="http://www.cisco.com/go/mibs">http://www.cisco.com/go/mibs</a>

**Technical Assistance**

Description	Link
The Cisco Support and Documentation website provides online resources to download documentation, software, and tools. Use these resources to install and configure the software and to troubleshoot and resolve technical issues with Cisco products and technologies. Access to most tools on the Cisco Support and Documentation website requires a Cisco.com user ID and password.	<a href="http://www.cisco.com/cisco/web/support/index.html">http://www.cisco.com/cisco/web/support/index.html</a>

## Feature Information for Using the Multicast Routing Monitor

The following table provides release information about the feature or features described in this module. This table lists only the software release that introduced support for a given feature in a given software release train. Unless noted otherwise, subsequent releases of that software release train also support that feature.

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

**Table 1: Feature Information for Using the Multicast Routing Monitor**

Feature Name	Releases	Feature Information
Multicast Routing Monitor (MRM)	12.0(5)S 12.2(15)T	The Multicast Routing Monitor is a network fault detection and isolation mechanism for administering a multicast routing infrastructure.