



# IP Multicast Optimization: Multicast Subsecond Convergence

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## Finding Feature Information

Your software release may not support all the features documented in this module. For the latest caveats and feature information, see Bug Search Tool and 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 module.

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

## Prerequisites for Multicast Subsecond Convergence

Service providers must have a multicast-enabled core in order to use the Cisco Multicast Subsecond Convergence feature.

## Restrictions for Multicast Subsecond Convergence

Devices that use the subsecond designated router (DR) failover enhancement must be able to process hello interval information arriving in milliseconds. Devices that are congested or do not have enough CPU cycles to process the hello interval can assume that the Protocol Independent Multicast (PIM) neighbor is disconnected, although this may not be the case.

# Information About Multicast Subsecond Convergence

## Benefits of Multicast Subsecond Convergence

- The scalability components improve on the efficiency of handling increases (or decreases) in service users (receivers) and service load (sources or content).
- New algorithms and processes (such as aggregated join messages, which deliver up to 1000 individual messages in a single packet) reduce the time to reach convergence by a factor of 10.
- Multicast subsecond convergence improves service availability for large multicast networks.
- Multicast users such as financial services firms and brokerages receive better quality of service (QoS), because multicast functionality is restored in a fraction of the time previously required.

## Multicast Subsecond Convergence Scalability Enhancements

The Multicast Subsecond Convergence feature provides scalability enhancements that improve on the efficiency of handling increases (or decreases) in service users (receivers) and service load (sources or content). Scalability enhancements in this release include the following:

- Improved Internet Group Management Protocol (IGMP) and PIM state maintenance through new timer management techniques
- Improved scaling of the Multicast Source Discovery Protocol (MSDP) Source-Active (SA) cache

The scalability enhancements provide the following benefits:

- Increased potential PIM multicast route (mroute), IGMP, and MSDP SA cache state capacity
- Decreased CPU usage

## PIM Router Query Messages

Multicast subsecond convergence allows you to send PIM router query messages (PIM hellos) every few milliseconds. The PIM hello message is used to locate neighboring PIM devices. Before the introduction of this feature, the device could send the PIM hellos only every few seconds. By enabling a device to send PIM hello messages more often, this feature allows the device to discover unresponsive neighbors more quickly. As a result, the device can implement failover or recovery procedures more efficiently.

## Reverse Path Forwarding

Unicast Reverse Path Forwarding (RPF) helps to mitigate problems caused by the introduction of malformed or forged IP source addresses into a network by discarding IP packets that lack a verifiable IP source address. Malformed or forged source addresses can indicate denial-of-service (DoS) attacks based on source IP address spoofing.

RPF uses access control lists (ACLs) in determining whether to drop or forward data packets that have malformed or forged IP source addresses. An option in the ACL commands allows system administrators to

log information about dropped or forwarded packets. Logging information about forged packets can help in uncovering information about possible network attacks.

Per-interface statistics can help system administrators quickly discover the interface serving as the entry point for an attack on the network.

## Topology Changes and Multicast Routing Recovery

The Multicast Subsecond Convergence feature set enhances both enterprise and service provider network backbones by providing almost instantaneous recovery of multicast paths after unicast routing recovery.

Because PIM relies on the unicast routing table to calculate its RPF when a change in the network topology occurs, unicast protocols first need to calculate options for the best paths for traffic, and then multicast can determine the best path.

Multicast subsecond convergence allows multicast protocol calculations to finish almost immediately after the unicast calculations are completed. As a result, multicast traffic forwarding is restored substantially faster after a topology change.

## How to Configure Multicast Subsecond Convergence

### Modifying the PIM Router Query Message Interval

Perform this task to modify the PIM router query message interval.

#### Procedure

	Command or Action	Purpose
<b>Step 1</b>	<b>enable</b> <b>Example:</b> <pre>Device&gt; enable</pre>	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> <pre>Device# configure terminal</pre>	Enters global configuration mode.
<b>Step 3</b>	<b>interface</b> <i>type slot / subslot / port</i> <b>Example:</b> <pre>Device(config)# interface gigabitethernet 1/0/0</pre>	Specifies the interface and enters interface configuration mode.
<b>Step 4</b>	<b>ip pim query-interval</b> <i>period [msec]</i> <b>Example:</b>	Configures the frequency at which multicast routers send PIM router query messages.

	Command or Action	Purpose
	Device(config-if)# ip pim query-interval 45	

## Verifying Multicast Subsecond Convergence Configurations

Perform this task to display detailed information about and to verify information regarding the Multicast Subsecond Convergence feature.

### Procedure

#### Step 1 enable

##### Example:

```
Device> enable
```

Enables privileged EXEC mode.

- Enter your password if prompted.

#### Step 2 show ip pim interface *type number*

Use this command to display information about interfaces configured for PIM.

The following is sample output from the **show ip pim interface** command:

##### Example:

```
Device# show ip pim interface GigabitEthernet 1/0/0
Address      Interface      Ver/  Nbr   Query  DR      DR
              Mode    Count Intvl Prior
172.16.1.4   GigabitEthernet1/0/0  v2/S  1     100 ms 1       172.16.1.4
```

#### Step 3 show ip pim neighbor

Use this command to display the PIM neighbors discovered by the Cisco IOS XE software.

The following is sample output from the **show ip pim neighbor** command:

##### Example:

```
Device# show ip pim neighbor
PIM Neighbor Table
Neighbor      Interface      Uptime/Expires  Ver  DR
Address
172.16.1.3    GigabitEthernet1/0/0  00:03:41/250 msec v2   1 / S
```

# Configuration Examples for Multicast Subsecond Convergence

## Modifying the PIM Router Query Message Interval Example

In the following example, the **ip pim query-interval** command has been set to 100 milliseconds. This command does not show up in **show running-config** command output unless the interval value has been configured to be the nondefault value.

```
!  
interface gigabitethernet0/0/1  
 ip address 172.16.2.1 255.255.255.0  
 ip pim query-interval 100 msec  
 ip pim sparse-mode
```

## Additional References for IP Multicast Optimization: Multicast Subsecond Convergence

### Related Documents

Related Topic	Document Title
For complete syntax and usage information for the commands used in this chapter.	See the IP Multicast Routing Commands section of the <i>Command Reference (Catalyst 9500 Series Switches)</i>
Cisco IOS commands	<a href="#">Cisco IOS Master Commands List, All Releases</a>

### MIBs

MIB	MIBs Link
No new or modified MIBs are supported by this feature, and support for existing standards has not been modified by this feature.	To locate and download MIBs for selected platforms, Cisco IOS 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
<p>The Cisco Support website provides extensive online resources, including documentation and tools for troubleshooting and resolving technical issues with Cisco products and technologies.</p> <p>To receive security and technical information about your products, you can subscribe to various services, such as the Product Alert Tool (accessed from Field Notices), the Cisco Technical Services Newsletter, and Really Simple Syndication (RSS) Feeds.</p> <p>Access to most tools on the Cisco Support website requires a Cisco.com user ID and password.</p>	<a href="http://www.cisco.com/support">http://www.cisco.com/support</a>

## Feature Information for IP Multicast Optimization: Multicast Subsecond Convergence

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 IP Multicast Optimization: Multicast Subsecond Convergence**

Feature Name	Releases	Feature Information
IP Multicast Optimization: Multicast Subsecond Convergence	Cisco IOS XE Everest 16.5.1a	<p>The Multicast Subsecond Convergence feature provides scalability enhancements that improve on the efficiency of handling increases (or decreases) in service users (receivers) and service load (sources or content).</p> <p>This feature was implemented on the following platforms:</p> <ul style="list-style-type: none"> <li>• Cisco Catalyst 9500 Series Switches</li> </ul>