



## PIM Dense Mode State Refresh

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This feature module describes the Protocol Independent Multicast (PIM) Dense Mode (DM) State Refresh feature, which is an extension to the dense operational mode of the PIM Version 2 multicast routing architecture. This feature module includes the following sections:

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### Feature Overview

PIM dense mode builds source-based multicast distribution trees that operate on a flood and prune principle. Multicast packets from a source are flooded to all areas of a PIM dense mode network. PIM routers that receive multicast packets and have no directly connected multicast group members or PIM neighbors send a prune message back up the source-based distribution tree toward the source of the packets. As a result, subsequent multicast packets are not flooded to pruned branches of the distribution tree. However, the pruned state in PIM dense mode times out approximately every 3 minutes and the entire PIM dense mode network is reflooded with multicast packets and prune messages. This reflooding of unwanted traffic throughout the PIM dense mode network consumes network bandwidth.

The PIM Dense Mode State Refresh feature keeps the pruned state in PIM dense mode from timing out by periodically forwarding a control message down the source-based distribution tree. The control message refreshes the prune state on the outgoing interfaces of each router in the distribution tree.

### Benefits

The PIM Dense Mode State Refresh feature keeps the pruned state in PIM dense mode from timing out, which saves network bandwidth by greatly reducing the reflooding of unwanted multicast traffic to pruned branches of the PIM dense mode network. This feature also enables PIM routers in a PIM dense mode multicast network to recognize topology changes (sources joining or leaving a multicast group) before the default 3-minute state refresh timeout period.

## Restrictions

All routers in a PIM dense mode network must run a Cisco IOS software release, such as Cisco IOS Release 12.1(5)T, that supports the PIM Dense Mode State Refresh feature to process and forward state refresh control messages.

The origination interval for the state refresh control message must be the same for all PIM routers on the same LAN. Specifically, the same origination interval must be configured on each router interface that is directly connected to the LAN.

## Related Features and Technologies

The PIM Dense Mode State Refresh feature is an extension of the PIM Version 2 multicast routing architecture, which is documented in the Release 12.1 *Cisco IOS IP and IP Routing Configuration Guide* and the *Cisco IOS IP and IP Routing Command Reference*.

## Supported Platforms

The PIM Dense Mode State Refresh feature is supported on the following platforms:

- Cisco 800 series
- Cisco 1400 series
- Cisco 1600 series
- Cisco 1700 series
- Cisco 2500 series
- Cisco 2600 series
- Cisco 3600 series
- Cisco 4000 series (Cisco 4000, 4000-M, 4500, 4500-M, 4700, 4700-M)
- Cisco 7000 series
- Cisco 7200 series
- Cisco 7500 series
- Cisco AS5800 access server
- Cisco AS5400 series
- Cisco AS5300 series
- Cisco AS5200 series
- Cisco MC3810 series
- Cisco MGX8850 WAN edge switch
- Cisco uBR7200 series

# Supported Standards, MIBs, and RFCs

## Standards

No new or modified standards are supported by this feature.

## MIBs

No new or modified MIBs are supported by this feature.

To obtain lists of MIBs supported by platform and Cisco IOS releases, and to download MIB modules, go to the Cisco MIB web site on Cisco Connection Online (CCO) at <http://www.cisco.com/public/sw-center/netmgmt/cmtk/mibs.shtml>.

## RFCs

No new or modified RFCs are supported by this feature.

## Prerequisites

You must have PIM dense mode enabled on an interface before configuring the PIM Dense Mode State Refresh feature.

## Configuration Tasks

There are no configuration tasks for enabling the PIM Dense Mode State Refresh feature. By default, all PIM routers that are running a Cisco IOS software release that supports the PIM Dense Mode State Refresh feature automatically process and forward state refresh control messages. To disable the processing and forwarding of state refresh control messages on a PIM router, use the **ip pim state-refresh disable** global configuration command.

The origination of state refresh control messages is disabled by default. To configure the origination of the control messages on a PIM router, use the following commands beginning in global configuration mode:

Command	Purpose
Router(config)# <b>interface</b> <i>type number</i>	Specifies an interface and places the router in interface configuration mode.
Router(config-if)# <b>ip pim state-refresh origination-interval</b> [ <i>interval</i> ]	Configures the origination of the PIM Dense Mode State Refresh control message. Optionally, you can configure the number of seconds between control messages by using the <i>interval</i> argument. The default interval is 60 seconds. The interval range is 4 seconds to 100 seconds.

## Verifying PIM Dense Mode State Refresh Configuration

Use the **show ip pim interface** *[type number]* **detail** and the **show ip pim neighbor** *[interface]* commands to verify that the PIM Dense Mode State Refresh feature is configured correctly. The following output of the **show ip pim interface** *[type number]* **detail** command indicates that processing, forwarding, and origination of state refresh control messages is enabled.

```
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
```

The S in the Mode field of the following **show ip pim neighbor** *[interface]* command output indicates that the neighbor has the PIM Dense Mode State Refresh feature configured.

```
Router# show ip pim neighbor
```

```
PIM Neighbor Table
Neighbor      Interface      Uptime/Expires   Ver   DR
Address
→ 172.16.5.1   Ethernet1/1    00:09:03/00:01:41 v2     1 / B S
```

## Monitoring and Maintaining PIM DM State Refresh

Following are the PIM Dense Mode State Refresh control messages that are sent and received by a PIM router after the **debug ip pim** privileged EXEC command is configured for multicast group 239.0.0.1:

```
Router# debug ip pim 239.0.0.1
```

```
*Mar  1 00:25:10.416:PIM:Originating refresh message for
(172.16.8.3,239.0.0.1)
*Mar  1 00:25:10.416:PIM:Send SR on Ethernet1/1 for (172.16.8.3,239.0.0.1)
TTL=9
```

The following output from the **show ip mroute** command displays the resulting prune timer changes for interface Ethernet 1/0 and multicast group 239.0.0.1. (The following output assumes that the **debug ip pim** privileged EXEC command has already been configured on the router.) In the first output from the **show ip mroute** command, the prune timer reads 00:02:06. The debug messages indicate that a PIM Dense Mode State Refresh control message is received and sent on Ethernet interface 1/0, and that other PIM Dense Mode State Refresh routers were discovered. In the second output from the **show ip mroute** command, the prune timer has been reset to 00:02:55.

```
Router# show ip mroute 239.0.0.1

(172.16.8.3, 239.0.0.1), 00:09:50/00:02:06, flags:PT
  Incoming interface:Ethernet1/1, RPF nbr 172.16.5.2
  Outgoing interface list:
→   Ethernet1/0, Prune/Dense, 00:09:43/00:02:06

Router#
*Mar 1 00:32:06.657:PIM:SR on iif from 172.16.5.2 orig 172.16.8.1 for
(172.16.8.3,239.0.0.1)
*Mar 1 00:32:06.661:      flags:prune-indicator
*Mar 1 00:32:06.661:PIM:Cached metric is [0/0]
*Mar 1 00:32:06.661:PIM:Keep RPF nbr 172.16.5.2
*Mar 1 00:32:06.661:PIM:Send SR on Ethernet1/0 for (172.16.8.3,239.0.0.1)
TTL=8
*Mar 1 00:32:06.661:      flags:prune-indicator

Router# show ip mroute 239.0.0.1

(172.16.8.3, 239.0.0.1), 00:10:01/00:02:55, flags:PT
  Incoming interface:Ethernet1/1, RPF nbr 172.16.5.2
  Outgoing interface list:
→   Ethernet1/0, Prune/Dense, 00:09:55/00:02:55
```

## Configuration Examples

The following example is for a PIM router that is originating, processing, and forwarding PIM Dense Mode State Refresh control messages on Fast Ethernet interface 0/1 every 60 seconds:

```
ip multicast-routing

interface FastEthernet0/1
 ip address 172.16.8.1 255.255.255.0
 ip pim state-refresh origination-interval 60
 ip pim dense-mode
```

The following example is for a PIM router that is just processing and forwarding PIM Dense Mode State Refresh control messages on Fast Ethernet interface 1/1:

```
ip multicast-routing

interface FastEthernet1/1
 ip address 172.16.7.3 255.255.255.0
 ip pim dense-mode
```

# Command Reference

This section documents new or modified commands. All other commands used with this feature are documented in the Cisco IOS Release 12.1 command reference publications.

- **ip pim state-refresh disable**
- **ip pim state-refresh origination-interval**
- **show ip pim interface**

# ip pim state-refresh disable

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

**ip pim state-refresh disable**

**no ip pim state-refresh disable**

## Syntax Description

This command has no arguments or keywords.

## 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.

## 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
<b>ip pim state-refresh origination-interval</b>	Configures the origination of and the interval for the PIM Dense Mode State Refresh feature control messages.
<b>show ip pim interface</b>	Displays information about interfaces configured for PIM.
<b>show ip pim neighbor</b>	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 the Protocol Independent Multicast (PIM) Dense Mode State Refresh feature control messages on a PIM router, use the **ip pim state-refresh origination-interval** interface configuration command. 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**

<b>Syntax Description</b>	<i>interval</i>	(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.
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<b>Defaults</b>	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.	
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<b>Command Modes</b>	Interface configuration
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<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	12.1(5)T	This command was introduced.

<b>Usage Guidelines</b>	<p>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.</p> <p>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 the PIM Dense Mode State Refresh feature.</p>
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<b>Examples</b>	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:
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```
interface ethernet 0
 ip pim state-refresh origination-interval 80
```

<b>Related Commands</b>	<b>Command</b>	<b>Description</b>
	<b>ip pim state-refresh disable</b>	Disables the processing and forwarding of PIM Dense Mode State Refresh feature control messages on a PIM router.
	<b>show ip pim interface</b>	Displays information about interfaces configured for PIM.
	<b>show ip pim neighbor</b>	Lists the PIM neighbors discovered by the Cisco IOS software.

# show ip pim interface

To display information about interfaces configured for Protocol Independent Multicast (PIM), use the **show ip pim interface EXEC** command.

**show ip pim interface** [*type number*] [*count*] [*detail*]

Syntax Description	
<i>type</i>	(Optional) Interface type.
<i>number</i>	(Optional) Interface number.
<b>count</b>	(Optional) Number of packets received and sent out the interface.
<b>detail</b>	(Optional) PIM details of each interface.

**Defaults** No default behavior or values.

**Command Modes** EXEC

Command History	Release	Modification
	10.0	This command was introduced.
	12.1(5)T	The <b>detail</b> keyword was added.

**Usage Guidelines** This command works only on interfaces that are configured for PIM.

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

```
Router# show ip pim interface
```

Address	Interface	Mode	Neighbor Count	Query Interval	DR
198.92.37.6	Ethernet0	Dense	2	30	198.92.37.33
198.92.36.129	Ethernet1	Dense	2	30	198.92.36.131
10.1.37.2	Tunnel0	Dense	1	30	0.0.0.0

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

```
Router# show ip pim interface count
```

Address	Interface	FS	Mpackets In/Out
171.69.121.35	Ethernet0	*	548305239/13744856
171.69.121.35	Serial0.33	*	8256/67052912
198.92.12.73	Serial0.1719	*	219444/862191

Table 1 describes the significant fields shown in the displays.

**Table 1** *show ip pim interface Field Descriptions*

Field	Description
Address	IP address of the next hop router.
Interface	Interface type and number that is configured to run PIM.
Mode	Multicast mode in which the Cisco IOS software is operating. This can be dense mode or sparse mode. DVMRP indicates a Distance Vector Multicast Routing Protocol (DVMRP) tunnel is configured.
Neighbor 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 router-query messages, as set by the <b>ip pim query-interval</b> interface configuration command. The default is 30 seconds.
DR	IP address of the designated router on the LAN. Note that serial lines do not have designated routers, so the IP address is 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 box has been up.

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 2 describes the significant fields shown in the display.

**Table 2** *show ip pim interface detail Field Descriptions*

<b>Field</b>	<b>Description</b>
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 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 designated router.
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 mode.
PIM ATM multipoint signalling:	Indicates whether the interface is enabled for ATM multipoint signalling.
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**

<b>Command</b>	<b>Description</b>
<b>ip pim</b>	Enables PIM on an interface.
<b>ip pim state-refresh disable</b>	Disables the processing and forwarding of PIM Dense Mode State Refresh feature control messages on a PIM router.
<b>ip pim state-refresh origination-interval</b>	Configures the origination of and the interval for the PIM Dense Mode State Refresh feature control message.
<b>show ip pim neighbor</b>	Lists the PIM neighbors discovered by the Cisco IOS software.

■ show ip pim interface