Configuring PGM Host and Router Assist

Feature History

Release	Modification
Cisco IOS	For information about feature support in Cisco IOS software, use Cisco Feature Navigator.
Cisco IOS XE Release 2.1	This feature was introduced on Cisco ASR 1000 Series Routers.

Note Support for the PGM Host feature has been removed. Use of this feature is not recommended.

This module describes the PGM Host and Router Assist feature. PGM Host and Router Assist enables Cisco routers to support multicast applications that operate at the PGM transport layer and the PGM network layer, respectively.

The PGM Reliable Transport Protocol itself is implemented on the hosts of the customer. For information on PGM Reliable Transport Protocol, refer to the Internet Engineering Task Force (IETF) protocol specification draft named *PGM Reliable Transport Protocol Specification*.

For a complete description of the PGM Router Assist commands in this module, see the *Cisco IOS IP Multicast Command Reference*. To locate documentation of other commands that appear in this module, 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.

PGM Overview

Pragmatic General Multicast (PGM) is a reliable multicast transport protocol for multicast applications that require reliable, ordered, duplicate-free multicast data delivery from multiple sources to multiple receivers. PGM guarantees that a receiver in a multicast group either receives all data packets from transmissions and retransmissions, or can detect unrecoverable data packet loss. PGM is intended as a

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solution for multicast applications with basic reliability requirements. PGM has two main parts: a host element (also referred to as the transport layer of the PGM protocol) and a network element (also referred to as the network layer of the PGM protocol).

The transport layer of the PGM protocol has two main parts: a source part and a receiver part. The transport layer defines how multicast applications send and receive reliable, ordered, duplicate-free multicast data from multiple sources to multiple receivers. PGM Host is the Cisco implementation of the transport layer of the PGM protocol.

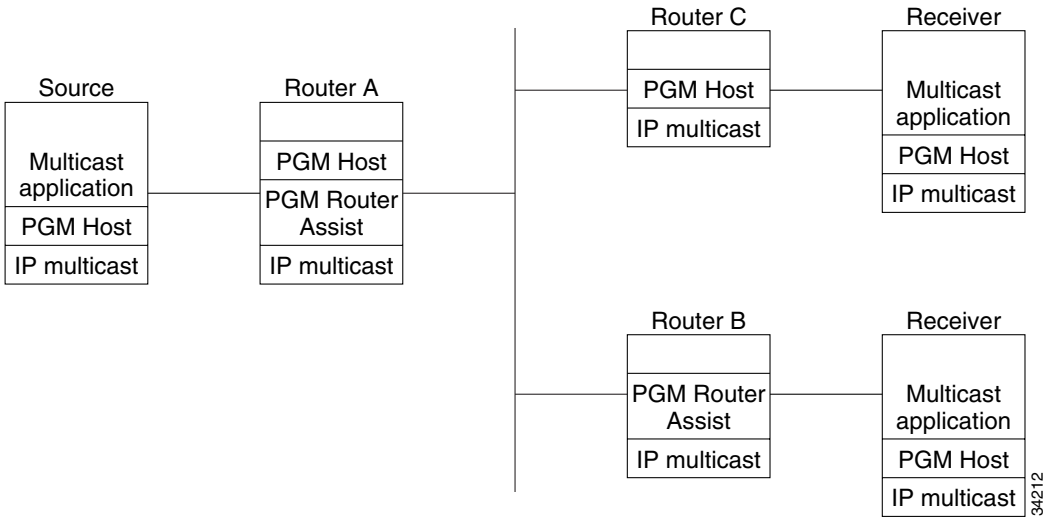
The network layer of the PGM protocol defines how intermediate network devices (such as routers and switches) handle PGM transport data as the data flows through a network. PGM Router Assist is the Cisco implementation of the network layer of the PGM protocol.

Note PGM contains an element that assists routers and switches in handling PGM transport data as it flows through a network. Unlike the Router Assist element, the Host element does not have a current practical application.

PGM is network-layer independent; PGM Host and Router Assist in the Cisco IOS software support PGM over IP. Both PGM Host and Router Assist use a unique transport session identifier (TSI) that identifies each individual PGM session.

Figure 1 shows a simple network topology using the PGM Host and Router Assist feature.

Figure 1 Network Topology Using PGM Host and Router Assist



When the router is functioning as a network element (PGM Router Assist is configured) and PGM Host is configured (Router A in Figure 1), 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.

When the router is functioning as a network element and PGM Host is not configured (Router B in Figure 1), the router forwards received PGM packets as specified by PGM Router Assist parameters.

When the router is not functioning as a network element and PGM Host is configured (Router C in Figure 1), the router can receive and forward PGM packets on any router interface simultaneously as specified by PGM Host feature parameters. Although this configuration is supported, it is not recommended in a PGM network because PGM Host works optimally on routers that have PGM Router Assist configured.

PGM Host Configuration Task List

Note Support for the PGM Host feature has been removed. Use of this feature is not recommended.

To configure PGM Host, perform the tasks described in the following sections. The tasks in the first section are required; the tasks in the remaining section are optional.

- Enabling PGM Host (Required)
- Verifying PGM Host Configuration (Optional)

See the end of this module for the section "PGM Host and Router Assist Configuration Examples."

Prerequisites

Before you configure PGM Host, ensure that the following tasks are performed:

- PGM Reliable Transport Protocol is configured on hosts connected to your network.
- PGM Router Assist is configured on intermediate routers and switches connected to your network.
- IP multicast routing is configured on all devices connected to your network that will be processing IP multicast traffic, including the router on which you are configuring PGM Host.
- Protocol Independent Multicast (PIM) or another IP multicast routing protocol is configured on each PGM interface in your network that will send and receive IP multicast packets.
- A PGM multicast virtual host interface (vif) is configured on the router (if you do not plan to source PGM packets through a physical interface installed on the router). The vif enables the router to send and receive IP multicast packets on several different interfaces at once, as dictated by the multicast routing tables on the router.

Enabling PGM Host

Note Support for the PGM Host feature has been removed. Use of this feature is not recommended.

When enabling PGM Host on your router, you must source PGM packets through a vif or out a physical interface installed in the router.

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 type (for example, an Ethernet, serial, or loopback interface) configures the router to send PGM packets out that interface only and to receive packets on any router interface.

Enabling PGM Host with a Virtual Host Interface

To enable PGM Host globally on the router and to configure the router to source PGM packets through a vif, use the following command in global configuration mode:

Command	Purpose
`Router(config)# ip pgm host`	Enables PGM Host (both the source and receiver parts of the PGM network layer) globally on the router and configures the router to source PGM packets through a vif. **Note** You must configure a vif by using the **interface vif** *number* global configuration command on the router before enabling PGM Host on the router; otherwise, the router will not know to use the vif to source PGM packets and PGM Host will not be enabled on the router.

See the "PGM Host with a Virtual Interface Example" section later in this module for an example of enabling PGM Host with a virtual interface.

Enabling PGM Host with a Physical Interface

To enable PGM Host globally on the router and to configure the router to source PGM packets through a physical interface, use the following commands in global configuration mode:

	Command	Purpose
Step 1	`Router(config)# ip pgm host`	Enables PGM Host (both the source and receiver part of the PGM network layer) globally on the router.
Step 2	`Router(config)# ip pgm host source-interface` *type number*	Configures the router to source PGM packets through a physical (or logical) interface.

See the "PGM Host with a Physical Interface Example" section later in this module for an example of enabling PGM Host with a physical interface.

Verifying PGM Host Configuration

Note Support for the PGM Host feature has been removed. Use of this feature is not recommended.

To verify that PGM Host is configured correctly on your router, use the following **show** commands in EXEC mode:

- Use the **show ip pgm host sessions** command to display information about current open PGM transport 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
```

  Specifying a traffic session number or a multicast IP address with the **show ip pgm host sessions** command displays information specific to that PGM transport session:

```
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
```

- Use the **show ip pgm host traffic** command to display traffic statistics at the PGM transport layer:

```
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
```

PGM Router Assist Configuration Task List

To configure PGM Router Assist, perform the required task described in the following section:

- Enabling PGM Router Assist (Required)

Prerequisites

Before you enable PGM Router Assist, ensure that the following tasks are completed:

- PGM Reliable Transport Protocol is configured on hosts connected to your network.
- IP multicast is configured on the router upon which you will enable PGM Router Assist.
- PIM is configured on each PGM interface.

Enabling PGM Router Assist

When enabling PGM Router Assist on your router, you must set up your router to forward PGM packets through a vif or out a physical interface installed in the router.

Setting up your router to forward PGM packets through a vif enables the router to forward PGM packets through any router interface. The vif also serves as the interface to the multicast applications that reside at the PGM network layer.

Setting up your router to forward PGM packets out a specific physical or logical interface type (for example, an Ethernet, serial, or loopback interface) configures the router to forward PGM packets out that interface only.

Enabling PGM Router Assist with a Virtual Host Interface

To enable PGM Router Assist on a vif, use the following command in interface configuration mode:

Command	Purpose
`Router(config-if)# ip pgm router`	Enables the router to assist PGM on this interface. **Note** You must configure a vif by using the **interface vif** *number* global configuration command on the router before enabling PGM Assist on the router; otherwise, PGM Assist will not be enabled on the router.

See the "PGM Router Assist with a Virtual Interface Example" section later in this module for an example of enabling PGM Router Assist with a virtual interface.

Enabling PGM Router Assist with a Physical Interface

To enable PGM Router Assist on the router and to configure the router to forward PGM packets through a physical interface, use the following commands in interface configuration mode:

Command	Purpose
`Router(config-if)# ip pgm router`	Enables the router to assist PGM on this interface.

See the "PGM Router Assist with a Physical Interface Example" section later in this module for an example of enabling PGM Router Assist with a physical interface.

Monitoring and Maintaining PGM Host and Router Assist

This section provides information on monitoring and maintaining the PGM Host and Router Assist feature.

Monitoring and Maintaining PGM Host

Note Support for the PGM Host feature has been removed. Use of this feature is not recommended.

To reset PGM Host connections, use the following command in privileged EXEC mode:

Command	Purpose
`Router# clear ip pgm host {defaults | traffic}`	Resets PGM Host connections to their default values and clears traffic statistics.

To enable PGM Host debugging, use the following command in privileged EXEC mode:

Command	Purpose
`Router# debug ip pgm host`	Displays debug messages for PGM Host.

To display PGM Host information, use the following commands in user EXEC mode, as needed:

Command	Purpose
`Router> show ip pgm host defaults`	Displays the default values for PGM Host traffic.
`Router> show ip pgm host sessions [session-number | group-address]`	Displays open PGM Host traffic sessions.
`Router> show ip pgm host traffic`	Displays PGM Host traffic statistics.

Monitoring and Maintaining PGM Router Assist

To clear PGM traffic statistics, use the following command in privileged EXEC mode:

Command	Purpose
`Router# clear ip pgm router [[traffic [type number]] | [rtx-state [group-address]]]`	Clears the PGM traffic statistics. Use the **rtx-state** keyword to clear PGM retransmit state.

To display PGM information, use the following command in privileged EXEC mode:

Command	Purpose
`Router# show ip pgm router [[interface [type number]] | [state [group-address]] | [traffic [type number]]] [verbose]`	Displays information about PGM traffic statistics and TSI state. The TSI is the transport-layer identifier for the source of a PGM session. Confirms that PGM Router Assist is configured, although there might not be any active traffic. Use the **state** or **traffic** keywords to learn whether an interface is actively using PGM.

PGM Host and Router Assist Configuration Examples

Note Support for the PGM Host feature has been removed. Use of this feature is not recommended.

This section provides the following configuration examples:

- PGM Host with a Virtual Interface Example
- PGM Host with a Physical Interface Example
- PGM Router Assist with a Virtual Interface Example
- PGM Router Assist with a Physical Interface Example

Note For clarity, extraneous information has been omitted from the examples in the following sections.

PGM Host with a Virtual Interface Example

Note Support for the PGM Host feature has been removed. Use of this feature is not recommended.

The following example shows PGM Host (both the source and receiver part of the PGM network layer) enabled globally on the router and PGM packets sourced through virtual host interface 1 (vif1). PGM packets can be sent and received on the vif and on the two physical interfaces (ethernet1 and ethernet2) simultaneously.

```
ip multicast-routing
ip routing
ip pgm host
```

```
interface vif1
ip address 10.0.0.1 255.255.255.0
ip pim dense-mode
no ip directed-broadcast
no ip mroute-cache

interface ethernet1
ip address 10.1.0.1 255.255.255.0
ip pim dense-mode
no ip directed-broadcast
no ip mroute-cache
media-type 10BaseT

interface ethernet2
ip address 10.2.0.1 255.255.255.0
ip pim dense-mode
no ip directed-broadcast
no ip mroute-cache
media-type 10BaseT
```

PGM Host with a Physical Interface Example

Note Support for the PGM Host feature has been removed. Use of this feature is not recommended.

The following example shows PGM Host (both the source and receiver part of the PGM network layer) enabled globally on the router and PGM packets sourced out of physical Ethernet interface 1. PGM packets can be received on physical Ethernet interfaces 1 and 2 simultaneously.

```
ip multicast-routing
ip routing
ip pgm host
ip pgm host source-interface ethernet1
ip pgm host source-interface ethernet2

interface ethernet1
ip address 10.1.0.1 255.255.255.0
ip pim dense-mode
no ip directed-broadcast
no ip mroute-cache
media-type 10BaseT

interface ethernet2
ip address 10.2.0.1 255.255.255.0
ip pim dense-mode
no ip directed-broadcast
no ip mroute-cache
media-type 10BaseT
```

PGM Router Assist with a Virtual Interface Example

The following example shows PGM Router Assist (the PGM network layer) enabled on the router and the router set up to forward PGM packets on virtual host interface 1 (vif1). PGM packets can be received on interfaces vif1, ethernet1, and ethernet2 simultaneously.

```
ip multicast-routing
ip routing
```

```
interface vif1
ip address 10.0.0.1 255.255.255.0
ip pim dense-mode
ip pgm router
no ip directed-broadcast
no ip mroute-cache

interface ethernet1
ip address 10.1.0.1 255.255.255.0
ip pim dense-mode
ip pgm router
no ip directed-broadcast
no ip mroute-cache
media-type 10BaseT

interface ethernet2
ip address 10.2.0.1 255.255.255.0
ip pim dense-mode
ip pgm router
no ip directed-broadcast
no ip mroute-cache
```
media-type 10BaseT

PGM Router Assist with a Physical Interface Example

The following example shows PGM Router Assist (the PGM network layer) enabled on the router and the router set up to forward PGM packets out of physical Ethernet interfaces 1 and 2. PGM packets can be received on physical Ethernet interfaces 1 and 2 simultaneously.

```
ip multicast-routing
ip routing

interface ethernet1
ip address 10.1.0.1 255.255.255.0
ip pim dense-mode
ip pgm router
no ip directed-broadcast
no ip mroute-cache
media-type 10BaseT

interface ethernet2
ip address 10.2.0.1 255.255.255.0
ip pim dense-mode
ip pgm router
no ip directed-broadcast
no ip mroute-cache
media-type 10BaseT
```