



**7450 ETHERNET SERVICE SWITCH
7750 SERVICE ROUTER
7950 EXTENSIBLE ROUTING SYSTEM**

**MULTICAST ROUTING PROTOCOLS
GUIDE
RELEASE 14.0.R4**

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1 Getting Started

1.1 About This Guide

This guide describes multicast routing protocols, troubleshooting, and proprietary entities and presents configuration and implementation examples.

This document is organized into functional chapters and provides concepts and descriptions of the implementation flow, as well as Command Line Interface (CLI) syntax and command usage.

The topics and commands described in this document apply to the:

- 7450 ESS
- 7750 SR
- 7950 XRS

[Table 1](#) lists the available chassis types for each SR OS router.

Table 1 Supported SR OS Router Chassis Types

7450 ESS	7750 SR	7950 XRS
<ul style="list-style-type: none"> • 7450 ESS-6/6v • 7450 ESS-7/12 running in standard mode (not mixed-mode) 	<ul style="list-style-type: none"> • 7450 ESS-7/12 running in mixed-mode (not standard mode) • 7750 SR-a4/a8 • 7750 SR-c4/c12 • 7750 SR-1e/2e/3e • 7750 SR-7/12 • 7750 SR-12e 	<ul style="list-style-type: none"> • 7950 XRS-16c • 7950 XRS-20/40

For a list of unsupported features by platform and chassis, refer to the *SR OS R14.0.Rx Software Release Notes*, part number 3HE10818 000x TQZZA.

Command outputs shown in this guide are examples only; actual displays may differ depending on supported functionality and user configuration.



Note: This guide generically covers Release 14.0 content and may contain some content that will be released in later maintenance loads. Please refer to the *SR OS R14.0.Rx Software Release Notes*, part number 3HE10818 000x TQZZA, for information on features supported in each load of the Release 14.0 software.

1.2 Multicast Configuration Process

[Table 2](#) lists the tasks necessary to configure multicast protocols. This guide is presented in an overall logical configuration flow. Each section describes a software area and provides CLI syntax and command usage to configure parameters for a functional area.

Table 2 Configuration Process

Area	Task	Chapter	Support Platform
Multicast protocol configuration	Describes multicast overview and models.	Introduction to Multicast	Supported on 7450 ESS in mixed-mode, 7750 SR and 7940 XRS. Not supported on the 7450 ESS in standard mode.
	Configure Internet Group Management Protocol.	IGMP	Supported on 7450 ESS in mixed-mode, 7750 SR and 7940 XRS. Not supported on the 7450 ESS in standard mode.
	Configure Multicast Listener Discovery.	MLD	Supported on 7450 ESS in mixed-mode, 7750 SR and 7940 XRS. Not supported on the 7450 ESS in standard mode.
	Configure Protocol Independent Multicast.	PIM	Supported on 7450 ESS in mixed-mode, 7750 SR and 7940 XRS. Not supported on the 7450 ESS in standard mode.
	Configure Multicast Source Discovery Protocol.	MSDP	Supported on 7450 ESS in mixed-mode, 7750 SR and 7940 XRS. Not supported on the 7450 ESS in standard mode.
	Configure Multicast Label Distribution Protocol.	MLDP	Supported on 7450 ESS in mixed-mode, 7750 SR and 7940 XRS. Not supported on the 7450 ESS in standard mode.
	Configure Multicast Extensions to BGP.	Multicast Extensions to BGP	Supported on 7450 ESS in mixed-mode, 7750 SR and 7940 XRS. Not supported on the 7450 ESS in standard mode.
	Configure Multicast Connection Admission Control.	MCAC	Supported on 7450 ESS in mixed-mode, 7750 SR and 7940 XRS. Not supported on the 7450 ESS in standard mode.

Table 2 Configuration Process (Continued)

Area	Task	Chapter	Support Platform
Troubleshooting	Use Mtrace, Mstat, and Mrinfo, and show commands for troubleshooting.	Troubleshooting Tools	Supported on 7450 ESS in mixed-mode, 7750 SR and 7940 XRS. Not supported on the 7450 ESS in standard mode.
Reference	List of IEEE, IETF, and other proprietary entities.	Standards and Protocol Support	Supported on 7450 ESS in mixed-mode, 7750 SR and 7940 XRS. Not supported on the 7450 ESS in standard mode.

2 Introduction to Multicast

2.1 In This Chapter

This chapter provides introductory information about multicast.

Topics in this chapter include:

- [Multicast Overview](#)
- [Multicast Models](#)

2.2 Multicast Overview

IP multicast provides an effective method of many-to-many communication. Delivering unicast datagrams is fairly simple. Normally, IP packets are sent from a single source to a single recipient. The source inserts the address of the target host in the IP header destination field of an IP datagram; intermediate routers (if present) simply forward the datagram towards the target in accordance with their respective routing tables.

Sometimes, distribution needs individual IP packets be delivered to multiple destinations (like audio or video streaming broadcasts). Multicast is a method of distributing datagrams sourced from one or more hosts to a set of receivers that may be distributed over different (sub) networks. This makes delivery of multicast datagrams significantly more complex.

Multicast sources can send a single copy of data using a single address for the entire group of recipients. The routers between the source and recipients route the data using the group address route. Multicast packets are delivered to a multicast group. A multicast group specifies a set of recipients who are interested in a particular data stream and is represented by an IP address from a specified range. Data addressed to the IP address is forwarded to the members of the group. A source host sends data to a multicast group by specifying the multicast group address in the datagram's destination IP address. A source does not have to register in order to send data to a group nor do they need to be a member of the group.

Routers and Layer 3 switches use the Internet Group Management Protocol (IGMP) to manage membership for a multicast session. When a host wants to receive one or more multicast sessions it will send a join message for each multicast group it wants to join. When a host wants to leave a multicast group, it will send a leave message.

To extend multicast to the Internet, the multicast backbone (Mbone) is used. The Mbone is layered on top of portions of the Internet. These portions, or islands, are interconnected using tunnels. The tunnels allow multicast traffic to pass between the multicast-capable portions of the Internet. As more and more routers in the Internet are multicast-capable (and scalable), the unicast and multicast routing table will converge.

The original Mbone was based on Distance Vector Multicast Routing Protocol (DVMRP) and was very limited. The Mbone is, however, converging around the following protocol set:

- IGMP
- Protocol Independent Multicast (Sparse Mode) (PIM-SM)
- Border Gateway Protocol with multi-protocol extensions (MBGP)
- Multicast Source Discovery Protocol (MSDP)

2.3 Multicast Models

Nokia routers support two models to provide multicast:

- [Any-Source Multicast \(ASM\)](#)
- [Source Specific Multicast \(SSM\)](#)
- [Multicast in IP-VPN Networks](#)

2.3.1 Any-Source Multicast (ASM)

Any-Source Multicast (ASM) is the IP multicast service model defined in RFC 1112, *Host Extensions for IP Multicasting*. An IP datagram is transmitted to a host group, a set of zero or more end-hosts identified by a single IP destination address (224.0.0.0 through 239.255.255.255 for IPv4). End-hosts can join and leave the group any time and there is no restriction on their location or number. This model supports multicast groups with arbitrarily many senders. Any end-host can transmit to a host group even if it is not a member of that group.

To combat the vast complexity and scaling issues that ASM represents, the IETF is developing a service model called Source Specific Multicast (SSM).

2.3.2 Source Specific Multicast (SSM)

The Source Specific Multicast (SSM) service model defines a channel identified by an (S,G) pair, where S is a source address and G is an SSM destination address. In contrast to the ASM model, SSM only provides network-layer support for one-to-many delivery.

The SSM service model attempts to alleviate the following deployment problems that ASM has presented:

- Address allocation — SSM defines channels on a per-source basis. For example, the channel (S1,G) is distinct from the channel (S2,G), where S1 and S2 are source addresses, and G is an SSM destination address. This averts the problem of global allocation of SSM destination addresses and makes each source independently responsible for resolving address collisions for the various channels it creates.
- Access control — SSM provides an efficient solution to the access control problem. When a receiver subscribes to an (S,G) channel, it receives data sent only by the source S. In contrast, any host can transmit to an ASM host group. At the same time, when a sender picks a channel (S,G) to transmit on, it is automatically ensured that no other sender will be transmitting on the same channel (except in the case of malicious acts such as address spoofing). This makes it harder to spam an SSM channel than an ASM multicast group.
- Handling of well-known sources — SSM requires only source-based forwarding trees, eliminating the need for a shared tree infrastructure. In terms of the IGMP, PIM-SM, MSDP, MBGP protocol suite, this implies that neither the RP-based shared tree infrastructure of PIM-SM nor the MSDP protocol is required. Thus, the complexity of the multicast routing infrastructure for SSM is low, making it viable for immediate deployment. MBGP is still required for distribution of multicast reachability information.
- Anticipating that point-to-multipoint applications such as Internet TV will be significant in the future, the SSM model is better suited for such applications.

2.3.3 Multicast in IP-VPN Networks

Multicast can be deployed as part of IP-VPN networks. For details on multicast support in IP-VPNs, refer to the SR OS Services Guide.

3 IGMP

3.1 In This Chapter

This chapter provides information to configure IGMP.

Topics in this chapter include:

- [IGMP Overview](#)
- [Configuring IGMP with CLI](#)
- [IGMP Configuration Command Reference](#)

3.2 IGMP Overview

Internet Group Management Protocol (IGMP) is used by IPv4 hosts and routers to report their IP multicast group memberships to neighboring multicast routers. A multicast router keeps a list of multicast group memberships for each attached network, and a timer for each membership.

Multicast group memberships include at least one member of a multicast group on a given attached network, not a list of all of the members. With respect to each of its attached networks, a multicast router can assume one of two roles, querier or non-querier. There is normally only one querier per physical network.

A querier issues two types of queries, a general query and a group-specific query. General queries are issued to solicit membership information with regard to any multicast group. Group-specific queries are issued when a router receives a leave message from the node it perceives as the last group member remaining on that network segment.

Hosts wanting to receive a multicast session issue a multicast group membership report. These reports must be sent to all multicast enabled routers.

3.2.1 IGMP Versions and Interoperability Requirements

If routers run different versions of IGMP, they will negotiate the lowest common version of IGMP that is supported on their subnet and operate in that version.

Version 1 — Specified in RFC 1112, *Host extensions for IP Multicasting*, was the first widely deployed version and the first version to become an Internet standard.

Version 2 — Specified in RFC 2236, *Internet Group Management Protocol, Version 2*, added support for “low leave latency”, that is, a reduction in the time it takes for a multicast router to learn that there are no longer any members of a particular group present on an attached network.

Version 3 — Specified in RFC 3376, *Internet Group Management Protocol, Version 3*, adds support for source filtering; that is, the ability for a system to report interest in receiving packets only from specific source addresses, as required to support [Source Specific Multicast \(SSM\)](#), or from all but specific source addresses, sent to a particular multicast address.

IGMPv3 must keep state per group per attached network. This group state consists of a filter-mode, a list of sources, and various timers. For each attached network running IGMP, a multicast router records the desired reception state for that network.

3.2.2 IGMP Version Transition

Nokia’s routers are capable of interoperating with routers and hosts running IGMPv1, IGMPv2, and/or IGMPv3. RFC 5186, *Internet Group Management Protocol Version 3 (IGMPv3)/Multicast Listener Discovery Version 2 (MLDv2) and Multicast Routing Protocol Interaction* explores some of the interoperability issues and how they affect the various routing protocols.

IGMP version 3 specifies that if at any point a router receives an older version query message on an interface that it must immediately switch into a compatibility mode with that earlier version. Since none of the previous versions of IGMP are source aware, should this occur and the interface switch to Version 1 or 2 compatibility mode, any previously learned group memberships with specific sources (learned via the IGMPv3 specific INCLUDE or EXCLUDE mechanisms) MUST be converted to non-source specific group memberships. The routing protocol will then treat this as if there is no EXCLUDE definition present.

3.2.3 Source-Specific Multicast Groups

IGMPv3 permits a receiver to join a group and specify that it only wants to receive traffic for a group if that traffic comes from a particular source. If a receiver does this, and no other receiver on the LAN requires all the traffic for the group, then the designated router (DR) can omit performing a (*,G) join to set up the shared tree, and instead issue a source-specific (S,G) join only.

The range of multicast addresses from 232.0.0.0 to 232.255.255.255 is currently set aside for source-specific multicast in IPv4. For groups in this range, receivers should only issue source-specific IGMPv3 joins. If a PIM router receives a non-source-specific join for a group in this range, it should ignore it.

A Nokia router PIM router must silently ignore a received (*,G) PIM join message where G is a multicast group address from the multicast address group range that has been explicitly configured for SSM. This occurrence should generate an event. If configured, the IGMPv2 request can be translated into IGMPv3. The router allows for the conversion of an IGMPv2 (*,G) request into a IGMPv3 (S,G) request based on manual entries. A maximum of 32 SSM ranges is supported.

IGMPv3 also permits a receiver to join a group and specify that it only wants to receive traffic for a group if that traffic does not come from a specific source or sources. In this case, the DR will perform a (*,G) join as normal, but can combine this with a prune for each of the sources the receiver does not wish to receive.

3.2.4 Query Messages

The IGMP query source address is configurable at two hierarchical levels. It can be configured globally at each router instance IGMP level and can be configured at individual at the group-interface level. The group-interface level overrides the src-ip address configured at the router instance level.

By default, subscribers with IGMP policies send IGMP queries with an all zero SRC IP address (0.0.0.0). However, some systems only accept and process IGMP query messages with non-zero SRC IP addresses. This feature allows the BNG to inter-operate with such systems.

3.3 Configuring IGMP with CLI

This section provides information to configure IGMP and MLD using the command line interface.

Topics in this section include:

- [IGMP Configuration Overview](#)
- [Basic IGMP Configuration](#)
- [Configuring IGMP Parameters](#)
- [Disabling IGMP](#)

3.3.1 IGMP Configuration Overview

The routers use IGMP to manage membership for a given multicast session. IGMP is not enabled by default. When enabled, at least one interface must be specified in the IGMP context as IGMP is an interface function. Creating an interface enables IGMP. Traffic can only flow away from the router to an IGMP interface and to and from a PIM interface. A router directly connected to a source must have PIM enabled on the interface to that source. The traffic travels in a network from PIM interface to PIM interface and arrives finally on an IGMP enabled interface.

The IGMP CLI context allows you to specify an existing IP interface and modify the interface-specific parameters. Static IGMP group memberships can be configured to test multicast forwarding without a receiver host. When IGMP static group membership is enabled, data is forwarded to an interface without receiving membership reports from host members.

When static IGMP group entries on point-to-point links that connect routers to a rendezvous point (RP) are configured, the static IGMP group entries do not generate join messages toward the RP. When a host wants to receive multicast sessions it sends a join message for each multicast group it wants to join. Then, a leave message may be sent for each multicast group it no longer wishes to participate with.

A multicast router keeps a list of multicast group memberships for each attached network, and an interval timer for each membership. Hosts issue a Multicast Group Membership Report when they want to receive a multicast session. The reports are sent to all multicast routers.

3.3.2 Basic IGMP Configuration

Perform the following basic multicast configuration tasks:

- Enable IGMP (required)
- Configure IGMP interfaces (required)
- Specify IGMP version on the interface (optional)
- Configure static (S,G)/(*,G) (optional)
- Configure SSM translation (optional)

3.3.3 Configuring IGMP Parameters

3.3.3.1 Enabling IGMP

Use the following CLI syntax to enable IGMP.

CLI Syntax: `config>router# igmp`

The following example displays the detailed output when IGMP is enabled.

```
A:LAX>>config>router# info detail
...
#-----
echo "IGMP Configuration"
#-----
      igmp
      query-interval 125
      query-last-member-interval 1
      query-response-interval 10
      robust-count 2
      no shutdown
      exit
#-----
A:LAX>>config>system#
```

3.3.3.2 Configuring an IGMP Interface

To configure an IGMP interface:

CLI Syntax: `config>router# igmp`
`interface ip-int-name`

```
max-groups value  
import policy-name  
version version  
no shutdown
```

Use the following CLI syntax to configure IGMP interfaces:

Example:

```
config>router#  
config>router>igmp# interface "lax-vls"  
config>router>igmp>if? no shutdown  
config>router>igmp>if# exit  
config>router>igmp# interface "pl-ix"  
config>router>igmp>if? no shutdown  
config>router>igmp>if# exit  
config>router>igmp# interface "lax-sjc"  
config>router>igmp>if? no shutdown  
config>router>igmp>if# exit
```

The following example displays the IGMP configuration:

```
A:LAX>config>router>igmp# info  
-----  
interface "lax-sjc"  
exit  
interface "lax-vls"  
exit  
interface "pl-ix"  
exit  
-----  
A:LAX>config>router>igmp# exit
```

3.3.3.3 Configuring Static Parameters

To add an IGMP static multicast source:

CLI Syntax:

```
config>router# igmp  
interface ip-int-name  
no shutdown  
static  
group grp-ip-address  
source ip-address
```

Use the following CLI syntax to configure static group addresses and source addresses for the SSM translate group ranges:

Example:

```
config>router>igmp# interface lax-vls  
config>router>igmp>if# static
```

```

config>router>igmp>if>static# group 229.255.0.2
config>router>igmp>if>static>group# source
172.22.184.197
config>router>igmp>if>static>group# exit
config>router>igmp>if>static# exit
config>router>igmp>if# exit

```

The following example displays the configuration:

```

A:LAX>config>router>igmp# info
-----
interface "lax-sjc"
exit
interface "lax-vls"
static
group 229.255.0.2
source 172.22.184.197
exit
exit
exit
interface "p1-ix"
exit
-----
A:LAX>config>router>igmp#

```

To add an IGMP static starg entry:

CLI Syntax:

```

config>router# igmp
interface ip-int-name
no shutdown
static
group grp-ip-address
starg

```

Use the following CLI syntax to configure static group addresses and add a static (*,G) entry:

Example:

```

config>router>igmp# interface lax-sjc
config>router>igmp>if# static
config>router>igmp>if>static# group 230.1.1.1
config>router>igmp>if>static>group# starg
config>router>igmp>if>static>group# exit
config>router>igmp>if>static# exit
config>router>igmp>if# exit
config>router>igmp#

```

The following example displays the configuration:

```

A:LAX>config>router>igmp# info
-----
interface "lax-sjc"

```

```

        static
        group 230.1.1.1
        starg
        exit
    exit
interface "lax-vls"
    static
    group 229.255.0.2
    source 172.22.184.197
    exit
    exit
exit
interface "pl-ix"
exit
-----
A:LAX>config>router>igmp#

```

3.3.3.4 Configuring SSM Translation

To configure IGMP parameters:

CLI Syntax:

```

config>router# igmp
    ssm-translate
        grp-range start end
        source ip-address

```

The following example displays the command usage to configure IGMP parameters:

Example:

```

config>router# igmp
config>router>igmp# ssm-translate
config>router>igmp>ssm# grp-range 229.255.0.1 231.2.2.2
config>router>igmp>ssm>grp-range# source 10.1.1.1

```

The following example displays the SSM translation configuration:

```

A:LAX>config>router>igmp# info
-----
    ssm-translate
    grp-range 229.255.0.1 231.2.2.2
    source 10.1.1.1
    exit
exit
interface "lax-sjc"
    static
    group 230.1.1.1
    starg
    exit
    exit
exit
interface "lax-vls"
    static

```

```

        group 229.255.0.2
          source 172.22.184.197
        exit
      exit
    exit
  interface "pl-ix"
  exit
-----
A:LAX>config>router>igmp# exit

```

3.3.4 Disabling IGMP

Use the following CLI syntax to disable IGMP.

CLI Syntax:

```

config>router#
    igmp
        shutdown

```

The following example displays the command usage to disable multicast:

Example:

```

config>router# igmp
config>router>igmp# shutdown
config>router>igmp# exit

```

The following example displays the configuration output:

```

A:LAX>config>router# info
-----
...
#-----
echo "IGMP Configuration"
#-----
    igmp
      shutdown
      ssm-translate
        grp-range 229.255.0.1 231.2.2.2
          source 10.1.1.1
        exit
      exit
    interface "lax-sjc"
      static
        group 230.1.1.1
          starg
        exit
      exit
    exit
  interface "lax-vls"
    static
      group 229.255.0.2
        source 172.22.184.197
      exit
    exit

```

```
        exit
        interface "pl-ix"
        exit
    exit
#-----
```


3.4 IGMP Configuration Command Reference

3.4.1 Command Hierarchies

- [IGMP Configuration Commands](#)

3.4.1.1 IGMP Configuration Commands

```
config
  — router
    — [no] igmp
      — [no] group-interface ip-int-name
        — [no] disable-router-alert-check
        — import policy-name
        — no import
        — max-groups value
        — no max-groups
        — max-grp-sources value
        — no max-grp-sources
        — max-sources value
        — no max-sources
        — query-src-ip ip-address
        — no query-src-ip
        — [no] shutdown
        — [no] sub-hosts-only
        — [no] subnet-check
        — version version
        — no version
      — grp-if-query-src-ip ip-address
      — no grp-if-query-src-ip
      — [no] interface ip-int-name
        — [no] disable-router-alert-check
        — [no] group-interface ip-int-name
          — [no] shutdown
        — import policy-name
        — no import
        — max-groups value
        — no max-groups
        — max-grp-sources value
        — no max-grp-sources
        — max-sources value
        — no max-sources
        — query-interval seconds
        — no query-interval
        — query-last-member-interval seconds
        — no query-last-member-interval
```

- **query-response-interval** *seconds*
- **no query-response-interval**
- **[no] redundant-multicast**
- **[no] shutdown**
- **ssm-translate**
 - **[no] grp-range** *start end*
 - **[no] source** *ip-address*
- **static**
 - **[no] group** *grp-ip-address*
 - **[no] source** *ip-address*
 - **[no] starg**
 - **[no] group start** *grp-ip-address end grp-ip-address [step ip-address]*
- **[no] subnet-check**
- **version** *version*
- **no version**
- **query-interval** *seconds*
- **no query-interval**
- **query-last-member-interval** *seconds*
- **no query-last-member-interval**
- **query-response-interval** *seconds*
- **no query-response-interval**
- **robust-count** *robust-count*
- **no robust-count**
- **[no] shutdown**
- **ssm-translate**
 - **[no] grp-range** *start end*
 - **[no] source** *ip-address*
- **[no] tunnel-interface rsvp-p2mp** *lsp-name*
- **[no] tunnel-interface ldp-p2mp** *p2mp-id sender ip-address*
 - **[no] shutdown**
 - **static**
 - **[no] group** *grp-ip-address*
 - **[no] source** *ip-address*
 - **[no] starg**

3.4.2 Command Descriptions

3.4.2.1 Router IGMP Commands

igmp

Syntax [no] igmp

Context config>router

Description This command enables the Internet Group Management Protocol (IGMP) context. When the context is created, the IGMP protocol is enabled.

The Internet Group Management Protocol (IGMP) is used by IPv4 systems (hosts and routers) to report their IP multicast group memberships to neighboring multicast routers. An IP multicast router can be a member of one or more multicast groups, in which case it performs both the “multicast router part” of the protocol which collects the membership information needed by its multicast routing protocol, and the “group member part” of the protocol which informs itself and other neighboring multicast routers of its memberships.

The **no** form of the command disables the IGMP instance. To start or suspend execution of IGMP without affecting the configuration, use the **no shutdown** command.

Default none

group-interface

Syntax **[no] group-interface** *ip-int-name*

Context config>router>igmp
config>router>igmp>interface

Description This command enables IGMP on a group-interface in a VRF context. Activating IGMP under the group-interface is a prerequisite for subscriber replication. The group-interface is also needed so that MCAC can be applied and various IGMP parameters defined.

This command can be used in a regular, wholesaler or retailer type of VRF. The retailer VRF does not have the concept of group-interfaces under the subscriber-interface hierarchy. In the case that this command is applied to a retailer VRF instance, the optional **fwd-service** command must be configured. The **fwd-service** command is referencing the wholesaler VRF in which the traffic is ultimately replicated. Redirection in the retailer VRF is supported.

This command enables IGMP on a group-interface in the Global Routing Table (GRT). The group-interface in GRT is defined under the IES service. Activating IGMP under the group-interface is a prerequisite for subscriber replication. The group-interface is also needed so that MCAC can be applied and various IGMP parameters defined.

Default none

Parameters *ip-int-name* — Specifies the name of the group interface.

disable-router-alert-check

Syntax **[no] disable-router-alert-check**

Context config>router>igmp>group-interface
config>router>igmp>interface

Description This command enables the router alert checking for IGMP messages received on this interface.

The **no** form of the command disables the IGMP router alert check option.

import

Syntax **import** *policy-name*
no import

Context config>router>igmp>group-interface
config>router>igmp>interface

Description This command applies the referenced IGMP policy (filter) to an interface subscriber or a group-interface. An IGMP filter is also known as a black/white list and it is defined under the **config>router>policy-options**.

When redirection is applied, only the import policy from the subscriber will be in effect. The import policy under the group interface is applicable only for IGMP states received directly on the SAP (AN in IGMP proxy mode).

The **no** form of the command removes the policy association from the IGMP instance.

Default **no import** — No import policy specified.

Parameters *policy-name* — The route policy name. Allowed values are any string up to 32 characters long composed of printable, 7-bit ASCII characters. If the string contains special characters (#, \$, spaces, etc.), the entire string must be enclosed within double quotes. Route policies are configured in the **config>router>policy-options** context.

max-groups

Syntax **max-groups** *value*
no max-groups

Context config>router>igmp>group-interface
config>router>igmp>interface

Description This command specifies the maximum number of groups for which IGMP can have local receiver information based on received IGMP reports on this interface. When this configuration is changed dynamically to a value lower than the currently accepted number of groups, the groups that are already accepted are not deleted. Only new groups will not be allowed. This command is applicable for IPv4 and IPv6.

Default 0, no limit to the number of groups.

Parameters *value* — Specifies the maximum number of groups for this interface.

Values 1 to 16000

max-grp-sources

Syntax	max-grp-sources <i>value</i> no max-grp-sources
Context	config>router>igmp>interface config>router>igmp>group-interface
Description	This command configures the maximum number of group sources for which IGMP can have local receiver information based on received IGMP reports on this interface. When this configuration is changed dynamically to a value lower than currently accepted number of group sources, the group sources that are already accepted are not deleted. Only new group sources will not be allowed. The no form of the command reverts to the default.
Default	0
Parameters	<i>value</i> — Specifies the maximum number of group sources. Values 1 to 32000

max-sources

Syntax	max-sources <i>value</i> no max-sources
Context	config>router>igmp>group-interface
Description	This command configures the maximum number of group sources for this group-interface.
Parameters	<i>value</i> — Specifies the maximum number of group sources. Values 1 to 1000

query-src-ip

Syntax	query-src-ip <i>ip-address</i> no query-src-ip
Context	config>router>igmp>group-interface
Description	This command configures the query source IP address for the group interface. This IP address overrides the source IP address configured at the router level. The no form of the command removes the IP address.
Default	none
Parameters	<i>ip-address</i> — Sets the source IPv4 address for all subscriber's IGMP queries.

shutdown

Syntax	[no] shutdown
Context	config>router>igmp config>router>igmp>group-interface config>router>igmp>interface config>router>igmp>tunnel-interface
Description	<p>The shutdown command administratively disables the entity. When disabled, an entity does not change, reset, or remove any configuration settings or statistics. Many entities must be explicitly enabled using the no shutdown command and must be shut down before they may be deleted.</p> <p>Unlike other commands and parameters where the default state is not indicated in the configuration file, shutdown and no shutdown are always indicated in system generated configuration files.</p> <p>The no form of the command puts an entity into the administratively enabled state.</p>
Default	no shutdown

sub-hosts-only

Syntax	[no] sub-hosts-only
Context	config>router>igmp>group-interface
Description	<p>This command disables the processing of IGMP messages outside of the subscriber-host context. No other hosts outside of the subscriber-hosts can create IGMP states.</p> <p>Disabling this command allows the creation of the IGMP states that correspond to the AN that operate in IGMP proxy mode. In this mode, the AN will hide source IP addresses of IGMP messages and will source IGMP messages with its own IP address. In this case, an IGMP state can be created under the sap context. This IGMP state creation under the SAP is controlled via the import policy under the group-interface.</p> <p>The IGMP state processing for regular subscriber-hosts is unaffected by this command.</p> <p>The no form of the command disables the command.</p>
Default	sub-hosts-only

subnet-check

Syntax	[no] subnet-check
Context	config>router>igmp>group-interface

config>router>igmp>interface

Description This command enables subnet checking for IGMP messages received on this interface. All IGMP packets with a source address that is not in the local subnet are dropped.

Default enabled

version

Syntax **version** *version*
no version

Context config>router>igmp>group-interface
config>router>igmp>interface

Description This command specifies the IGMP version. If routers run different versions of IGMP, they will negotiate the lowest common version of IGMP that is supported by hosts on their subnet and operate in that version. For IGMP to function correctly, all routers on a LAN should be configured to run the same version of IGMP on that LAN.

For IGMPv3, a multicast router that is also a group member performs both parts of IGMPv3, receiving and responding to its own IGMP message transmissions as well as those of its neighbors.

Default 3

Parameters *version* — Specifies the IGMP version number.

Values 1, 2, 3

grp-if-query-src-ip

Syntax **grp-if-query-src-ip** *ip-address*
no grp-if-query-src-ip

Context config>router>igmp

Description This command configures the query source IP address for all group interfaces.

The **no** form of the command removes the IP address.

Default none

Parameters *ip-address* — Sets the query source IP address.

interface

Syntax [**no**] **interface** *ip-int-name*

Context	config>router>igmp
Description	<p>This command enables the context to configure an IGMP interface. The interface is a local identifier of the network interface on which reception of the specified multicast address is to be enabled or disabled.</p> <p>The no form of the command deletes the IGMP interface. The shutdown command in the config>router>igmp>interface context can be used to disable an interface without removing the configuration for the interface.</p>
Default	no interface — No interfaces are defined.
Parameters	<p><i>ip-int-name</i> — The IP interface name. Interface names must be unique within the group of defined IP interfaces for config router interface and config service ies interface commands. An interface name cannot be in the form of an IP address. Interface names can be any string up to 32 characters long composed of printable, 7-bit ASCII characters. If the string contains special characters (#, \$, spaces, etc.), the entire string must be enclosed within double quotes.</p> <p>If the IP interface name does not exist or does not have an IP address configured an error message will be returned.</p> <p>If the IP interface exists in a different area it will be moved to this area.</p>

query-interval

Syntax	query-interval <i>seconds</i> no query-interval
Context	config>router>igmp config>router>igmp>interface
Description	This command specifies the frequency that the querier router transmits general host-query messages. The host-query messages solicit group membership information and are sent to the all-systems multicast group address, 224.0.0.1.
Default	125
Parameters	<p><i>seconds</i> — Specifies the frequency, in seconds, that the router transmits general host-query messages.</p> <p>Values 2 to 1024</p>

query-last-member-interval

Syntax	query-last-member-interval <i>seconds</i>
Context	config>router>igmp config>router>igmp>interface

Description	This command configures the frequency at which the querier sends group-specific query messages including messages sent in response to leave-group messages. The lower the interval, the faster the detection of the loss of the last member of a group.
Default	1
Parameters	<i>seconds</i> — Specifies the frequency, in seconds, at which query messages are sent. Values 1 to 1023

query-response-interval

Syntax	query-response-interval <i>seconds</i>
Context	config>router>igmp config>router>igmp>interface
Description	This command specifies how long the querier router waits to receive a response to a host-query message from a host.
Default	10
Parameters	<i>seconds</i> — Specifies the length of time to wait to receive a response to the host-query message from the host. Values 1 to 1023

redundant-multicast

Syntax	[no] redundant-multicast
Context	config>router>igmp>interface
Description	This command configures the interface as a member of a redundant pair for multicast traffic. The no form of the command removes the configuration.

ssm-translate

Syntax	ssm-translate
Context	config>router>igmp config>router>igmp>interface

Description This command enables the context to configure group ranges which are translated to SSM (S,G) entries. If the static entry needs to be created, it has to be translated from a IGMPv1 IGMPv2 request to a Source Specific Multicast (SSM) join. An SSM translate source can only be added if the `starg` command is not enabled. An error message is generated if you try to configure the `source` command with `starg` command enabled.

grp-range

Syntax `[no] grp-range start end`

Context `config>router>igmp>interface>ssm-translate`
`config>router>igmp>ssm-translate`

Description This command is used to configure group ranges which are translated to SSM (S,G) entries.

Parameters `start` — An IP address that specifies the start of the group range.
`end` — An IP address that specifies the end of the group range. This value should always be greater than or equal to the value of the `start` value.

source

Syntax `[no] source ip-address`

Context `config>router>igmp>interface>ssm-translate>grp-range`
`config>router>igmp>ssm-translate>grp-range`

Description This command specifies the source IP address for the group range. Whenever a (*,G) report is received in the range specified by `grp-range start` and `end` parameters, it is translated to an (S,G) report with the value of this object as the source address.

Parameters `ip-address` — Specifies the IP address that will be sending data.

static

Syntax `static`

Context `config>router>igmp>interface`

Description This command tests multicast forwarding on an interface without a receiver host. When enabled, data is forwarded to an interface without receiving membership reports from host members.

Default none

group

- Syntax** [no] group *grp-ip-address*
[no] group start *grp-ip-address* end *grp-ip-address* [step *ip-address*]
- Context** config>router>igmp>interface>static
- Description** This command enables the context to add a static multicast group either as a (*,G) or one or more (S,G) records. Use IGMP static group memberships to test multicast forwarding without a receiver host. When IGMP static groups are enabled, data is forwarded to an interface without receiving membership reports from host members.
- When static IGMP group entries on point-to-point links that connect routers to a rendezvous point (RP) are configured, the static IGMP group entries do not generate join messages toward the RP.
- Default** none
- Parameters** *ip-address* — Specifies an IGMP multicast group address that receives data on an interface. The IP address must be unique for each static group.
- start** *grp-ip-address* — Specifies the start multicast group address.
- end** *grp-ip-address* — Specifies the end multicast group address.
- step** *ip-address* — Specifies the step increment.

SOURCE

- Syntax** [no] source *ip-address*
- Context** config>router>igmp>interface>static>group
- Description** This command specifies a IPv4 unicast address that sends data on an interface. This enables a multicast receiver host to signal a router the group to receive multicast traffic from, and from the source(s) that the traffic is expected.
- The **source** command is mutually exclusive with the specification of individual sources for the same group.
- The **source** command in combination with the group is used to create a specific (S,G) static group entry.
- Use the **no** form of the command to remove the source from the configuration.
- Default** none
- Parameters** *ip-address* — Specifies the IPv4 unicast address.

starg

Syntax	[no] starg
Context	config>router>igmp>interface>static>group
Description	This command adds a static (*,G) entry. This command can only be enabled if no existing source addresses for this group are specified. Use the no form of the command to remove the (*,G) entry from the configuration.
Default	none

robust-count

Syntax	robust-count <i>robust-count</i> no robust-count
Context	config>router>igmp
Description	This command configures the robust count. The robust-count variable allows tuning for the expected packet loss on a subnet. If a subnet anticipates losses, the robust-count variable can be increased.
Default	2
Parameters	<i>robust-count</i> — Specify the robust count value. Values 2 to 10

tunnel-interface

Syntax	[no] tunnel-interface { rsvp-p2mp <i>lsp-name</i> ldp-p2mp <i>p2mp-id</i> sender <i>sender-address</i> [root-node]}
Context	config>router>igmp
Description	This command creates a tunnel interface associated with an RSVP P2MP LSP. IPv4 multicast packets are forwarded over the P2MP LSP at the ingress LER based on a static join configuration of the multicast group against the tunnel interface associated with the originating P2MP LSP. At the egress LER, packets of a multicast group are received from the P2MP LSP via a static assignment of the specific <S,G> to the tunnel interface associated with a terminating LSP. At ingress LER, the tunnel interface identifier consists of a string of characters representing the LSP name for the RSVP P2MP LSP. The user can create one or more tunnel interfaces in PIM and associate each to a different RSVP P2MP LSP. P2mp-ID is required to configure LDP P2MP LSP tunnel interfaces. Sender address for a tunnel interface must be specified only on the leaf node.

At egress LER, the tunnel interface identifier consists of a couple of string of characters representing the LSP name for the RSVP P2MP LSP followed by the system address of the ingress LER. The LSP name must correspond to a P2MP LSP name configured by the user at the ingress LER. The LSP name string must not contain "::" or ":" at the end of the LSP name. However, a single ":" can be used anywhere in the string except at the end of the name.

Default none

Parameters **rsvp-p2mp** *lsp-name* — Specifies the LSP. The LSP name can be up to 32 characters long and must be unique.

p2mp-id — Identifier used for signaling MLDP P2MP LSP.

Values 1 to 4294967296 (on leaf node)

Values 1 to 8192 (on root node)

sender *lsp-name* — Specifies the sender IP address: a.b.c.d.

static

Syntax **static**

Context config>router>igmp>tunnel-interface

Description This command provides the context to configure static multicast receiver hosts on a tunnel interface associated with an RSVP P2MP LSP.

When enabled, data is forwarded to an interface without receiving membership reports from host members.

Default none

group

Syntax [**no**] **group** *grp-ip-address*

Context config>router>igmp>tunnel-interface>static

Description This command enables the context to add a static multicast group either as a (*,G) or one or more (S,G) records.

The user can assign static multicast group joins to a tunnel interface associated with an RSVP P2MP LSP.

A given <*,G> or <S,G> can only be associated with a single tunnel interface.

A multicast packet which is received on an interface and which succeeds the RPF check for the source address will be replicated and forwarded to all OIFs which correspond to the branches of the P2MP LSP. The packet is sent on each OIF with the label stack indicated in the NHLFE of this OIF. The packets will also be replicated and forwarded natively on all OIFs which have received IGMP or PIM joins for this <S,G>.

The multicast packet can be received over a PIM or IGMP interface which can be an IES interface, a spoke SDP terminated IES interface, or a network interface.

Default none

Parameters *grp-ip-address* — Specifies a multicast group address that receives data on a tunnel interface. The IP address must be unique for each static group.

source

Syntax [**no**] **source** *ip-address*

Context config>router>igmp>tunnel-interface>static>group

Description This command specifies a IPv4 unicast address of a multicast source. The source command is mutually exclusive with the specification of individual sources for the same group. The source command in combination with the group is used to create a specific (S,G) group entry in a static group join on a tunnel interface associated with a P2MP RSVP LSP.

The **no** form of the command removes the source from the configuration.

Default none

Parameters *ip-address* — Specifies the IPv4 unicast address.

starg

Syntax [**no**] **starg**

Context config>router>igmp>tunnel-interface>static>group

Description This command adds a static (*,G) group entry in a static group join on a tunnel interface associated with a P2MP RSVP LSP.

This command can only be enabled if no existing source addresses for this group are specified.

The **no** form of the command removes the (*,G) entry from the configuration.

Default none

3.5 Show, Clear, and Debug Command Reference

3.5.1 Command Hierarchies

- [Show Commands](#)
- [Clear Commands](#)
- [Debug Commands](#)

3.5.1.1 Show Commands

```

show
  — router
    — igmp
      — group [grp-ip-address] [hosts | interfaces | saps]
      — group summary [hosts | interfaces | saps]
      — group-interface [fwd-service service-id] [ip-int-name] [detail] [group] [grp-
        address]
      — hosts [detail] [fwd-service service-id] [grp-interface ip-int-name]
      — hosts [host ip-address] [group grp-address] [detail]
      — hosts summary
      — interface [ip-int-name | ip-address] [group] [grp-ip-address] [detail]
      — mcast-reporting-statistics ip-address
      — ssm-translate
      — ssm-translate interface interface-name
      — static [ip-int-name | ip-addr]
      — statistics [ip-int-name | ip-address]
      — statistics group-interface [fwd-service service-id] [ip-int-name]
      — statistics host [ip-address]
      — status
      — tunnel-interface
  
```

3.5.1.2 Clear Commands

```

clear
  — router
    — igmp
      — database [group grp-ip-address [source src-ip-address]]
      — database interface {ip-int-name | ip-address} [group grp-ip-address [source
        src-ip-address]]
      — database host ip-address [group grp-ip-address [source src-ip-address]]
      — database host all [group grp-ip-address [source src-ip-address]]
  
```

- **database** group-interface *interface-name* [fwd-service *service-id*] [group *grp-ip-address* [source *src-ip-address*]]
- **database** group-interface all
- **statistics** group-interface [fwd-service *service-id*] *ip-int-name*
- **statistics** group-interface all
- **statistics** host *ip-address*
- **statistics** host all
- **statistics** [interface *ip-int-name* | *ip-address*]
- **version** group-interface [fwd-service *service-id*] *ip-int-name*
- **version** group-interface all
- **version** host *ip-address*
- **version** host all
- **version** [interface *ip-int-name* | *ip-address*]

3.5.1.3 Debug Commands

- ```
debug
 — router
 — igmp
 — [no] group-interface [fwd-service service-id] [ip-int-name]
 — [no] host [ip-address]
 — [no] host [fwd-service service-id] group-interface ip-int-name
 — [no] interface [ip-int-name | ip-address]
 — mcs [ip-int-name]
 — no mcs
 — [no] misc
 — packet [query | v1-report | v2-report | v3-report | v2-leave] [ip-int-name | ip-address] [mode {dropped-only | ingr-and-dropped | egr-ingr-and-dropped}]
 — packet [query | v1-report | v2-report | v3-report | v2-leave] [mode {dropped-only | ingr-and-dropped | egr-ingr-and-dropped}] group-interface ip-int-name
 — packet [query | v1-report | v2-report | v3-report | v2-leave] host ip-address [mode {dropped-only | ingr-and-dropped | egr-ingr-and-dropped}]
 — no packet [query | v1-report | v2-report | v3-report | v2-leave] [ip-int-name | ip-address]
 — no packet [query | v1-report | v2-report | v3-report | v2-leave] group-interface ip-int-name
 — no packet [query | v1-report | v2-report | v3-report | v2-leave] host ip-address
```

## 3.5.2 Command Descriptions

### 3.5.2.1 Show Commands

The command outputs in the following section are examples only; actual displays may differ depending on supported functionality and user configuration.

#### group

**Syntax** `group [grp-ip-address] [hosts | interfaces | saps]`  
`group summary [hosts | interfaces | saps]`

**Context** show>router>igmp

**Description** This command displays the multicast group and (S,G) addresses. If no *grp-ip-address* parameters are specified, then all IGMP group, (\*,G) and (S,G) addresses are displayed.

**Parameters** *grp-ip-address* — Displays specific multicast group addresses.  
**hosts** — Displays hosts for the multicast group address.  
**interfaces** — Displays interfaces for the multicast group address.  
**saps** — Displays SAPs for the multicast group address.

**Output** IGMP Group Output

The following table describes the output fields for IGMP group information.

**Table 3 IGMP Group Information Output Fields**

| Label       | Description                                                                                                |
|-------------|------------------------------------------------------------------------------------------------------------|
| IGMP Groups | Displays the IP multicast sources corresponding to the IP multicast groups that are statically configured. |
| Fwd List    | Displays the list of interfaces in the forward list.                                                       |
| Blk List    | Displays the list of interfaces in the bulk list.                                                          |

#### Sample Output

```
*B:Dut-C# show router igmp group
=====
IGMP Interface Groups
=====
IGMP Host Groups
```

```

=====
(*,225.0.0.1)
 Fwd List : 112.112.1.2 Up Time : 0d 00:00:21
(11.11.0.1,225.0.0.1)
 Fwd List : 112.112.1.1 Up Time : 0d 00:00:30
 Blk List : 112.112.1.2 Up Time : 0d 00:00:21
(11.11.0.2,225.0.0.1)
 Fwd List : 112.112.1.1 Up Time : 0d 00:00:30
(*,225.0.0.2)
 Fwd List : 112.112.1.2 Up Time : 0d 00:00:21
(11.11.0.1,225.0.0.2)
 Blk List : 112.112.1.2 Up Time : 0d 00:00:21

(*,G)/(S,G) Entries : 5
=====
*B:Dut-C#

*B:Dut-C# show router igmp group summary
=====
IGMP Interface Groups
=====
IGMP Host Groups Summary Nbr Fwd Hosts Nbr Blk Hosts
=====
(*,225.0.0.1) 1 0
(11.11.0.1,225.0.0.1) 1 1
(11.11.0.2,225.0.0.1) 1 0
(*,225.0.0.2) 1 0
(11.11.0.1,225.0.0.2) 0 1

(*,G)/(S,G) Entries : 5
=====
*B:Dut-C#

A:NYC# show router igmp group 224.24.24.24
=====
IGMP Groups
=====
(*,224.24.24.24) Up Time : 0d 05:23:23
 Fwd List : nyc-vlc

(*,G)/(S,G) Entries : 1
=====
A:NYC#

```

## group-interface

- Syntax** `group-interface [fwd-service service-id] [ip-int-name] [detail] [group] [grp-address]`
- Context** `show>router>igmp>group-interface`
- Description** This command displays IGMP group-interface information.
- Parameters** `fwd-service service-id` — [1..2148007980] | <svc-name:64 char max>  
`ip-int-name` — IP interface name. A string up to 32 characters.

- detail** — Displays detailed information.
- group** — Displays information from the group IP address.
- grp-address* — Group IP address in format: a.b.c.d

## hosts

- Syntax** **hosts** [**detail**] [**fwd-service** *service-id*] [**grp-interface** *ip-int-name*]  
**hosts** [**host** *ip-address*] [**group** *grp-address*] [**detail**]  
**hosts summary**
- Context** show>router>igmp
- Description** This command shows IGMP hosts information.
- Parameters** *grp-address* — Specifies the group IP address in format: a.b.c.d  
*service-id* — [1 to 2148007980]<svc-name: 64 characters maximum>  
*ip-int-name* — IP interface name. A string up to 32 characters.  
*ip-address* — IP address in format: a.b.c.d

### Output

#### Sample Output

```
*B:Dut-C# show router igmp hosts
=====
IGMP Hosts
=====
Host Oper Oper Fwd GrpItf Num Subscriber
 State Version Svc

112.112.1.1 Up 3 1 gi_1_1 1 sub_1
112.112.1.2 Up 3 1 gi_1_1 2 sub_1
112.112.1.3 Up 3 1 gi_1_2 0 sub_2

Hosts : 3
=====
*B:Dut-C#

*B:Dut-C# show router igmp hosts detail
=====
IGMP Host 112.112.1.1
=====
Oper Status : Up MacAddress : 00:00:00:00:00:01
Oper version : 3 Subscriber : sub_1
Num Groups : 1 GrpItf : gi_1_1
Max Grps Till Now: 2 IGMP-Policy : poll
PPPoE SessionId : 1 Next query time: 0d 00:02:03
FwdSvcId : 1

IGMP Group
```

```

Group Address : 225.0.0.1 Up Time : 0d 00:00:24
Expires : Not running Mode : Include
V1 Host Timer : Not running Type : Dynamic
V2 Host Timer : Not running Compat Mode : IGMP Version 3
Redir.vRtrId : N/A Redir.Intf : N/A

Source Address Expires Type Fwd/Blk

11.11.0.1 0d 00:03:56 Dynamic Fwd
11.11.0.2 0d 00:03:56 Dynamic Fwd
=====
IGMP Host 112.112.1.2
=====
Oper Status : Up MacAddress : 00:00:00:00:00:01
Oper version : 3 Subscriber : sub_1
Num Groups : 2 GrpItf : gi_1_1
Max Grps Till Now: 2 IGMP-Policy : poll
PPPoE SessionId : 2 Next query time: 0d 00:02:03
FwdSvcId : 1

IGMP Group

Group Address : 225.0.0.1 Up Time : 0d 00:00:16
Expires : 0d 00:04:05 Mode : Exclude
V1 Host Timer : Not running Type : Dynamic
V2 Host Timer : Not running Compat Mode : IGMP Version 3
Redir.vRtrId : N/A Redir.Intf : N/A

Source Address Expires Type Fwd/Blk

11.11.0.1 0d 00:00:00 Dynamic Blk

IGMP Group

Group Address : 225.0.0.2 Up Time : 0d 00:00:16
Expires : 0d 00:04:04 Mode : Exclude
V1 Host Timer : Not running Type : Dynamic
V2 Host Timer : Not running Compat Mode : IGMP Version 3
Redir.vRtrId : N/A Redir.Intf : N/A

Source Address Expires Type Fwd/Blk

11.11.0.1 0d 00:00:00 Dynamic Blk
=====
IGMP Host 112.112.1.3
=====
Oper Status : Up MacAddress : 00:00:00:00:00:02
Oper version : 3 Subscriber : sub_2
Num Groups : 0 GrpItf : gi_1_2
Max Grps Till Now: 1 IGMP-Policy : poll
PPPoE SessionId : 1 Next query time: 0d 00:00:48
FwdSvcId : 1

Hosts : 3
=====
*B:Dut-C#

```

```
*B:Dut-C# show router igmp statistics host 112.112.1.1
=====
IGMP Host Statistics 112.112.1.1
=====
Message Type Received Transmitted

Queries 0 580
Report V1 0 0
Report V2 0 0
Report V3 5 0
Leaves 0 0

General Host Statistics

Bad Length : 0
Bad Checksum : 0
Unknown Type : 0
Bad Receive If : 0
Rx Non Local : 0
Rx Wrong Version : 0
Policy Drops : 0
No Router Alert : 0
Rx Bad Encodings : 0
Local Scope Pkts : 0
Resvd Scope Pkts : 0
MCAC Policy Drops : 0

Source Group Statistics

(S,G) : 0
(*,G) : 0
=====
*B:Dut-C# show subscriber-mgmt igmp-policy
```

## interface

- Syntax** `interface [ip-int-name | ip-address] [group] [grp-ip-address] [detail]`
- Context** show>router>igmp
- Description** This command displays IGMP interface information.
- Parameters**
- ip-int-name* — Only displays the information associated with the specified IP interface name.
  - ip-address* — Only displays the information associated with the specified IP address.
  - group** *grp-ip-address* — Only displays IP multicast group address for which this entry contains information.
  - detail** — Displays detailed IP interface information along with the source group information learned on that interface.
- Output** IGMP Interface Output
- The following table provides IGMP field descriptions.

**Table 4 IGMP Fields**

| Label                                 | Description                                                                                                                                                                                                                                                                                                                                                                                                        |
|---------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Interface                             | Specifies the interfaces that participate in the IGMP protocol.                                                                                                                                                                                                                                                                                                                                                    |
| Adm<br>Admin Status                   | Displays the administrative state for the IGMP protocol on this interface.                                                                                                                                                                                                                                                                                                                                         |
| Oper<br>Oper Status                   | Displays the current operational state of IGMP protocol on the interface.                                                                                                                                                                                                                                                                                                                                          |
| Querier                               | Displays the address of the IGMP querier on the IP subnet to which the interface is attached.                                                                                                                                                                                                                                                                                                                      |
| Querier Up Time                       | Displays the time since the querier was last elected as querier.                                                                                                                                                                                                                                                                                                                                                   |
| Querier Expiry Timer                  | Displays the time remaining before the querier ages out. If the querier is the local interface address, the value will be zero.                                                                                                                                                                                                                                                                                    |
| Cfg/Opr Version<br>Admin/Oper version | Cfg<br>The configured version of IGMP running on this interface. For IGMP to function correctly, all routers on a LAN must be configured to run the same version of IGMP on that LAN.<br>Opr<br>The operational version of IGMP running on this interface. If the cfg value is 3 but all of the routers in the local subnet of this interface use IGMP version v1 or v2, the operational version will be v1 or v2. |
| Num Groups                            | The number of multicast groups which have been learned by the router on the interface.                                                                                                                                                                                                                                                                                                                             |
| Policy                                | Specifies the policy that is to be applied on the interface.                                                                                                                                                                                                                                                                                                                                                       |
| Group Address                         | Specifies the IP multicast group address for which this entry contains information.                                                                                                                                                                                                                                                                                                                                |
| Up Time                               | Specifies the time since this source group entry got created.                                                                                                                                                                                                                                                                                                                                                      |
| Last Reporter                         | Specifies the IP address of the source of the last membership report received for this IP Multicast group address on this interface. If no membership report has been received, this object has the value 0.0.0.0.                                                                                                                                                                                                 |

**Table 4 IGMP Fields (Continued)**

| Label         | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|---------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Mode          | The mode is based on the type of membership report(s) received on the interface for the group. In the 'include' mode, reception of packets sent to the specified multicast address is requested only from those IP source addresses listed in the source-list parameter of the IGMP membership report. In 'exclude' mode, reception of packets sent to the given multicast address is requested from all IP source addresses except those listed in the source-list parameter.                                                                                                                        |
| V1 Host Timer | The time remaining until the local router will assume that there are no longer any IGMP version 1 members on the IP subnet attached to this interface. Upon hearing any IGMPv1 Membership Report, this value is reset to the group membership timer. While this time remaining is non-zero, the local router ignores any IGMPv2 Leave messages for this group that it receives on this interface.                                                                                                                                                                                                     |
| V2 Host Timer | The time remaining until the local router will assume that there are no longer any IGMP version 2 members on the IP subnet attached to this interface. Upon hearing any IGMPv2 Membership Report, this value is reset to the group membership timer. While this time remaining is non-zero, the local router ignores any IGMPv3 Leave messages for this group that it receives on this interface.                                                                                                                                                                                                     |
| Type          | Indicates how this group entry was learned. If this group entry was learned by IGMP, it will be set to "dynamic". For statically configured groups, the value will be set to 'static'.                                                                                                                                                                                                                                                                                                                                                                                                                |
| Compat Mode   | Used in order for routers to be compatible with older version routers. IGMPv3 hosts MUST operate in version 1 and version 2 compatibility modes. IGMPv3 hosts MUST keep state per local interface regarding the compatibility mode of each attached network. A host's compatibility mode is determined from the Host Compatibility Mode variable which can be in one of three states: IGMPv1, IGMPv2 or IGMPv3. This variable is kept per interface and is dependent on the version of General Queries heard on that interface as well as the Older Version Querier Present timers for the interface. |

**Sample Output**

```
*A:ALA-BA# show router 100 interface
=====
Interface Table (Service: 100)
=====
Interface-Name Adm Opr (v4/v6) Mode Port/SapId
```

| IP-Address                |    |    |      | PfxState        |
|---------------------------|----|----|------|-----------------|
| IGMP_to_CE<br>11.1.1.1/24 | Up | Up | VPRN | 1/1/7<br>n/a    |
| system<br>10.20.1.2/32    | Up | Up | VPRN | loopback<br>n/a |

-----  
Interfaces : 2  
=====

\*A:ALA-BA#

\*A:ALA-BA# show router 100 interface IGMP\_to\_CE

-----  
Interface Table (Service: 100)  
=====

| Interface-Name<br>IP-Address | Adm | Opr (v4/v6) | Mode | Port/SapID<br>PfxState |
|------------------------------|-----|-------------|------|------------------------|
| IGMP_to_CE<br>11.1.1.1/24    | Up  | Up          | VPRN | 1/1/7<br>n/a           |

-----  
Interfaces : 1  
=====

\*A:ALA-BA#

\*A:ALA-BA# show router 100 igmp interface

-----  
IGMP Interfaces  
=====

| Interface  | Adm | Oper | Querier  | Cfg/Opr<br>Version | Num<br>Groups | Policy  |
|------------|-----|------|----------|--------------------|---------------|---------|
| IGMP_to_CE | Up  | Up   | 11.1.1.1 | 1/1                | 3             | igmppol |

-----  
Interfaces : 1  
=====

\*A:ALA-BA#

\*A:ALA-BA# show router 100 igmp interface IGMP\_to\_CE

-----  
IGMP Interface IGMP\_to\_CE  
=====

| Interface  | Adm | Oper | Querier  | Cfg/Opr<br>Version | Num<br>Groups | Policy  |
|------------|-----|------|----------|--------------------|---------------|---------|
| IGMP_to_CE | Up  | Up   | 11.1.1.1 | 1/1                | 3             | igmppol |

-----  
Interfaces : 1  
=====

\*A:ALA-BA#

\*A:ALA-BA# show router 100 igmp interface 11.1.1.1

-----  
IGMP Interface 11.1.1.1  
=====

| Interface | Adm | Oper | Querier | Cfg/Opr<br>Version | Num<br>Groups | Policy |
|-----------|-----|------|---------|--------------------|---------------|--------|
|           |     |      |         |                    |               |        |

```

IGMP_to_CE Up Up 11.1.1.1 1/1 3 igmppol

Interfaces : 1
=====
*A:ALA-BA#

*A:ALA-BA# show router 100 igmp interface IGMP_to_CE group 227.1.1.1
=====
IGMP Interface IGMP_to_CE
=====
Interface Adm Oper Querier Cfg/Opr Num Policy
 Version Groups

IGMP_to_CE Up Up 11.1.1.1 1/1 3 igmppol

IGMP Group

Group Address : 227.1.1.1 Up Time : 0d 00:03:52
Interface : IGMP_to_CE Expires : never
Last Reporter : 0.0.0.0 Mode : exclude
V1 Host Timer : Not running Type : static
V2 Host Timer : Not running Compat Mode : IGMP Version 3

Interfaces : 1
=====
*A:ALA-BA#

*A:ALA-BA# show router 100 igmp interface IGMP_to_CE group 227.1.1.1 detail
=====
IGMP Interface IGMP_to_CE
=====
Interface : IGMP_to_CE
Admin Status : Up
Oper Status : Up
Querier : 11.1.1.1 Querier Up Time : 0d 00:04:01
Querier Expiry Time: N/A Time for next query: 0d 00:13:42
Admin/Oper version : 1/1 Num Groups : 3
Policy : igmppol Subnet Check : Disabled
Max Groups Allowed : 16000 Max Groups Till Now: 3
MCAC Policy Name :
MCAC Max Unconst BW: no limit MCAC Const Adm St : Enable
MCAC In use Mand BW: 0 MCAC Max Mand BW : no limit
MCAC In use Opnl BW: 0 MCAC Avail Mand BW : unlimited
MCAC In use Opnl BW: 0 MCAC Avail Opnl BW : unlimited

IGMP Group

Group Address : 227.1.1.1 Up Time : 0d 00:04:02
Interface : IGMP_to_CE Expires : never
Last Reporter : 0.0.0.0 Mode : exclude
V1 Host Timer : Not running Type : static
V2 Host Timer : Not running Compat Mode : IGMP Version 3

Interfaces : 1
=====
*A:ALA-BA#

```

### mcast-reporting-statistics

- Syntax** `mcast-reporting-statistics ip-address`
- Context** `show>router>igmp`
- Description** This command displays IGMP multicast reporting statistics.
- Parameters** *ip-address* — Displays the information associated with the specified IP address.

### ssm-translate

- Syntax** `ssm-translate`  
`ssm-translate interface interface-name`
- Context** `show>router>igmp`
- Description** This command displays IGMP SSM translate configuration information.
- Parameters** *interface-name* — IP interface name. A string up to 32 characters.
- Output** IGMP Interface Output

The following table provides IGMP field descriptions.

**Table 5 IGMP Fields**

| Label                 | Description                                                                             |
|-----------------------|-----------------------------------------------------------------------------------------|
| Group Range           | Displays the address ranges of the multicast groups for which this router can be an RP. |
| Source                | Displays the unicast address that sends data on an interface.                           |
| SSM Translate Entries | Displays the total number of SSM translate entries.                                     |

#### Sample Output

```

=====
IGMP SSM Translate Entries
=====
Group Range Source Interface

<234.1.1.1 - 234.1.1.2> 100.1.1.1 -
<232.1.1.1 - 232.1.1.5> 100.1.1.2 ies-abc
=====

```

## static

- Syntax** `static [ip-int-name | ip-addr]`
- Context** show>router>igmp
- Description** This command displays static IGMP, (\*,G) and (S,G) information.
- Parameters** *ip-int-name* — Only displays the information associated with the specified IP interface name.  
*ip-addr* — Only displays the information associated with the specified IP address.
- Output** Static IGMP Output

The following table provides static IGMP field descriptions.

**Table 6 IGMP Static Fields**

| Label     | Description                                                                                                                           |
|-----------|---------------------------------------------------------------------------------------------------------------------------------------|
| Source    | Displays entries which represents a source address from which receivers are interested/not interested in receiving multicast traffic. |
| Group     | Displays the IP multicast group address for which this entry contains information.                                                    |
| Interface | Displays the interface name.                                                                                                          |

### Sample Output

```
*A:ALA-BA# show router 100 igmp static
=====
IGMP Static Group Source
=====
Source Group Interface

11.11.11.11 226.136.22.3 IGMP_to_CE
* 227.1.1.1 IGMP_to_CE
22.22.22.22 239.255.255.255 IGMP_to_CE

Static (*,G)/(S,G) Entries : 3
=====
*A:ALA-BA#
```

## statistics

- Syntax** `statistics [ip-int-name | ip-address]`  
`statistics group-interface [fwd-service service-id] [ip-int-name]`  
`statistics host [ip-address]`

- Context** show>router>igmp
- Description** This command displays IGMP statistics information.
- Parameters** *ip-int-name* — Only displays the information associated with the specified IP interface name.  
*ip-address* — Only displays the information associated with the specified IP address.
- Output** IGMP Statistics Output

The following table provides statistical IGMP field descriptions.

**Table 7 IGMP Statistics Fields**

| Label                        | Description                                                                                         |
|------------------------------|-----------------------------------------------------------------------------------------------------|
| IGMP Interface Statistics    | The section listing the IGMP statistics for a particular interface.                                 |
| Message Type                 | Queries<br>The number of IGMP general queries transmitted or received on this interface.            |
|                              | Report<br>The total number of IGMP V1, V2, or V3 reports transmitted or received on this interface. |
|                              | Leaves<br>The total number of IGMP leaves transmitted on this interface.                            |
| Received                     | Displays the total number of IGMP packets received on this interface.                               |
| Transmitted                  | Column that displays the total number of IGMP packets transmitted from this interface.              |
| General Interface Statistics | The section listing the general IGMP statistics.                                                    |
| Bad Length                   | Displays the total number of IGMP packets with bad length received on this interface.               |
| Bad Checksum                 | Displays the total number of IGMP packets with bad checksum received on this interface.             |
| Unknown Type                 | Displays the total number of IGMP packets with unknown type received on this interface.             |
| Bad Receive If               | Displays the total number of IGMP packets incorrectly received on this interface.                   |

**Table 7 IGMP Statistics Fields (Continued)**

| Label            | Description                                                                                                                                     |
|------------------|-------------------------------------------------------------------------------------------------------------------------------------------------|
| Rx Non Local     | Displays the total number of IGMP packets received from a non-local sender.                                                                     |
| Rx Wrong Version | Displays the total number of IGMP packets with wrong versions received on this interface.                                                       |
| Policy Drops     | Displays the total number of times IGMP protocol instance matched the host IP address or group/source addresses specified in the import policy. |
| No Router Alert  | Displays the total number of IGMPv3 packets received on this interface which did not have the router alert flag set.                            |

**Sample Output**

```
*A:ALA-BA# show router 100 igmp statistics
=====
IGMP Interface Statistics
=====
Message Type Received Transmitted

Queries 0 5
Report V1 0 0
Report V2 0 0
Report V3 0 0
Leaves 0 0

General Interface Statistics

Bad Length : 0
Bad Checksum : 0
Unknown Type : 0
Bad Receive If : 0
Rx Non Local : 0
Rx Wrong Version : 0
Policy Drops : 0
No Router Alert : 0
Rx Bad Encodings : 0
Rx Pkt Drops : 0

Source Group Statistics

(S,G) : 2
(*,G) : 1
=====
*A:ALA-BA#

*B:Dut-C# show router igmp statistics host
=====
IGMP Host Statistics
=====
```

```

Message Type Received Transmitted

Queries 0 1739
Report V1 0 0
Report V2 0 0
Report V3 10 0
Leaves 0 0

General Host Statistics

Bad Length : 0
Bad Checksum : 0
Unknown Type : 0
Bad Receive If : 0
Rx Non Local : 0
Rx Wrong Version : 0
Policy Drops : 0
No Router Alert : 0
Rx Bad Encodings : 0
Local Scope Pkts : 0
Resvd Scope Pkts : 0
MCAC Policy Drops : 0
=====
*B:Dut-C#

```

## status

**Syntax**    **status**

**Context**    show>router>igmp

**Description**    This command displays IGMP status information.

If IGMP is not enabled, the following message appears:

```

A:NYC# show router igmp status
MINOR: CLI IGMP is not configured.
A:NYC#

```

**Output**    IGMP Status Output

The following table provides IGMP status field descriptions.

**Table 8**    **IGMP Status Fields**

| Label          | Description                                                                         |
|----------------|-------------------------------------------------------------------------------------|
| Admin State    | Displays the administrative status of IGMP.                                         |
| Oper State     | Displays the current operating state of this IGMP protocol instance on this router. |
| Query Interval | The frequency at which IGMP query packets are transmitted.                          |

**Table 8 IGMP Status Fields (Continued)**

| Label                      | Description                                                                                                                                                                    |
|----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Last Member Query Interval | The maximum response time inserted into group-specific queries sent in response to leave group messages, and is also the amount of time between group-specific query messages. |
| Query Response Interval    | The maximum query response time advertised in IGMPv2 queries.                                                                                                                  |
| Robust Count               | Displays the number of times the router will retry a query.                                                                                                                    |

**Sample Output**

```
*A:ALA-BA# show router 100 igmp status
=====
IGMP Status
=====
Admin State : Up
Oper State : Up
Query Interval : 1024
Last Member Query Interval : 1024
Query Response Interval : 1023
Robust Count : 10
=====
*A:ALA-BA#
```

tunnel-interface

- Syntax** tunnel-interface
- Context** show>router>igmp
- Description** This command displays tunnel interface information.
- Output**

**Output Sample**

```
*A:Dut-C# show router igmp tunnel-interface
=====
IGMP Tunnel-Interfaces
=====
LSP/LDP Type SenderAddr IfIndex AdmState OperState

1 ldp 10.20.1.3 74218 Up Up
2 ldp 10.20.1.3 74219 Up Up
3 ldp 10.20.1.3 74220 Up Up
4 ldp 10.20.1.3 74221 Up Up
5 ldp 10.20.1.3 74222 Up Up

Interfaces : 5
```

---

### 3.5.2.2 Clear Commands

#### database

- Syntax**     **database** [**group** *grp-ip-address*] [**source** *src-ip-address*]  
**database interface** {*ip-int-name* | *ip-address*} [**group** *grp-ip-address*] [**source** *src-ip-address*]  
**database host** *ip-address* [**group** *grp-ip-address*] [**source** *src-ip-address*]  
**database host all** [**group** *grp-ip-address*] [**source** *src-ip-address*]  
**database group-interface** *interface-name* [**fwd-service** *service-id*] [**group** *grp-ip-address*]  
[**source** *src-ip-address*]  
**database group-interface all**
- Context**     clear>router>igmp
- Description**     This command clears IGMP or PIM database statistics on a specified interface or IP address.
- Parameters**     **group** *grp-ip-address* — Clears the multicast group address (IPv4/IPv6) or zero in the specified address group.
- source** *src-ip-address* — Clears the IGMP database from the specified source IP address.
- interface** *ip-int-name* — Clears the IGMP database on the specified interface.
- interface** *ip-address* — Clears the IGMP database on the specified IP address.
- host** *ip-address* — Clears the IGMP database on the specified host.
- host all** — Clears the IGMP database on all hosts.
- group-interface** *interface-name* — Clears the IGMP database on the specified group interface.
- group-interface all** — Clears the IGMP database on all group interfaces.

#### statistics

- Syntax**     **statistics group-interface** [**fwd-service** *service-id*] *ip-in-name*  
**statistics group-interface all**  
**statistics host** *ip-address*  
**statistics host all**  
**statistics** [**interface** *ip-int-name* | *ip-address*]
- Context**     clear>router>igmp
- Description**     This command clears IGMP statistics on a specified interface or IP address.



**Note:** Interface and group/source cannot be specified at the same time.

- Parameters**
- group-interface** *interface-name* — Clears the IGMP statistics on the specified group interface.
  - group-interface all** — Clears the IGMP statistics on all group interfaces.
  - fwd-service** *service-id* — [1to 2148007980] | <svc-name:64 char max>
  - host** *ip-address* — Clears the IGMP statistics on the specified host.
  - host all** — Clears the IGMP statistics on all hosts.
  - interface** *ip-int-name* — Clears the IGMP statistics on the specified interface.
  - interface** *ip-address* — Clears the IGMP statistics on the specified IP address.

## version

- Syntax**
- version group-interface** [**fwd-service** *service-id*] *ip-int-name*
  - version group-interface all**
  - version host** *ip-address*
  - version host all**
  - version** [**interface** *ip-int-name* | *ip-address*]
- Context** clear>router>igmp
- Description** This command clears the IGMP version on a specified interface or IP address.
- Parameters**
- group-interface** *interface-name* — Clears the IGMP version on the specified group interface.
  - group-interface all** — Clears the IGMP version on all group interfaces.
  - fwd-service** *service-id* — [1to 2148007980] | <svc-name:64 char max>
  - host** *ip-address* — Clears the IGMP version on the specified host.
  - host all** — Clears the IGMP version on all hosts.
  - interface** *ip-int-name* — Clears the IGMP version on the specified interface.
  - interface** *ip-address* — Clears the IGMP version on the specified IP address.

---

### 3.5.2.3 Debug Commands

#### group-interface

- Syntax** `[no] group-interface [fwd-service service-id] [ip-int-name]`
- Context** debug>router>igmp
- Description** This command enables debugging for IGMP group-interface.  
The **no** form of the command disables debugging.
- Parameters** **fwd-service service-id** — [1 to 2148007978]<svc-name: 64 characters maximum>  
**ip-int-name** — Debugs the information associated with the specified IP interface name.
- Values** IP interface address

#### host

- Syntax** `[no] host [ip-address]`  
`[no] host [fwd-service service-id] group-interface ip-int-name`
- Context** debug>router>igmp
- Description** This command enables debugging for the IGMP host.  
The **no** form of the command disables debugging.
- Parameters** **ip-address** — Debugs the information associated with the specified IP address.  
**fwd-service service-id** — [1 to 2148007978]<svc-name: 64 characters maximum>  
**group-interface ip-int-name** — Debugs the information associated with the specified IP interface name.
- Values** IP interface address

#### interface

- Syntax** `[no] interface [ip-int-name | ip-address]`
- Context** debug>router>igmp
- Description** This command enables debugging for IGMP interfaces.  
The **no** form of the command disables the IGMP interface debugging for the specifies interface name or IP address.

---

**Parameters** *ip-int-name* — Debugs the information associated with the specified IP interface name.  
**Values** IP interface address  
*ip-address* — Debugs the information associated with the specified IP address.

## mcs

**Syntax** **mcs** [*ip-int-name*]  
**no mcs**

**Context** debug>router>igmp

**Description** This command enables debugging for IGMP multicast servers (MCS).  
The **no** form of the command disables the IGMP interface debugging for the specifies interface name.

**Parameters** *ip-int-name* — Debugs the information associated with the specified IP interface name.  
**Values** IP interface address

## misc

**Syntax** [**no**] **misc**

**Context** debug>router>igmp

**Description** This command enables debugging for IGMP miscellaneous.  
The **no** form of the command disables the debugging.

**Output**

### Sample Output

```
A:ALA-CA# debug router 100 igmp misc
*A:ALA-CA# show debug
debug
 router "100"
 igmp
 misc
 exit
 exit
exit
*A:ALA-CA#
```

## packet

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <pre>packet [query   v1-report   v2-report   v3-report   v2-leave] [ip-int-name   ip-address] [mode {dropped-only   ingr-and-dropped   egr-ingr-and-dropped}] packet [query   v1-report   v2-report   v3-report   v2-leave] [mode {dropped-only   ingr- and-dropped   egr-ingr-and-dropped}] group-interface ip-int-name packet [query   v1-report   v2-report   v3-report   v2-leave] host ip-address [mode {dropped-only   ingr-and-dropped   egr-ingr-and-dropped}] no packet [query   v1-report   v2-report   v3-report   v2-leave] [ip-int-name   ip-address] no packet [query   v1-report   v2-report   v3-report   v2-leave] group-interface ip-int-name no packet [query   v1-report   v2-report   v3-report   v2-leave] host ip-address</pre>                                                      |
| <b>Context</b>     | debug>router>igmp                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Description</b> | This command enables/disables debugging for IGMP packets.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Parameters</b>  | <p><b>query</b> — Specifies to log the IGMP group- and source-specific queries transmitted and received on this interface.</p> <p><b>v1-report</b> — Specifies to debug IGMP V1 reports transmitted and received on this interface.</p> <p><b>v2-report</b> — Specifies to debug IGMP V2 reports transmitted and received on this interface.</p> <p><b>v3-report</b> — Specifies to debug IGMP V3 reports transmitted and received on this interface.</p> <p><b>v2-leave</b> — Specifies to debug the IGMP Leaves transmitted and received on this interface.</p> <p><i>ip-int-name</i> — Debugs the information associated with the specified IP interface name.</p> <p><b>Values</b> IP interface address</p> <p><i>ip-address</i> — Debugs the information associated with the specified IP address.</p> |

---

## 4 MLD

### 4.1 In This Chapter

This chapter provides information to configure MLD.

Topics in this chapter include:

- [MLD Overview](#)
- [Configuring MLD with CLI](#)
- [MLD Configuration Command Reference](#)

### 4.2 MLD Overview

Multicast Listener Discovery (MLD) is the IPv6 version of IGMP and belongs to the Source Specific Multicast (SSM) service model (see [IPv6 PIM models](#) for more information). The purpose of MLD is to allow each IPv6 router to discover the presence of multicast listeners on its directly attached links, and to discover specifically which multicast groups are of interest to those neighboring nodes.

MLD is a sub-protocol of ICMPv6. MLD message types are a subset of the set of ICMPv6 messages, and MLD messages are identified in IPv6 packets by a preceding Next Header value of 58. All MLD messages are sent with a link-local IPv6 source address, a Hop Limit of 1, and an IPv6 Router Alert option in the Hop-by-Hop Options header.

#### 4.2.1 MLDv1

Similar to IGMPv2, MLDv1 reports only include the multicast group addresses that listeners are interested in, and don't include the source addresses. In order to work with PIM SSM model, a similar SSM translation function is required when MLDv1 is used.

SSM translation allows an IGMPv2 device to join an SSM multicast network through the router that provides such a translation capability. Currently SSM translation can be done at a box level, but this does not allow a per-interface translation to be specified. SSM translation per interface offers the ability to have a same (\*,G) mapped to two different (S,G) on two different interfaces to provide flexibility.

## 4.2.2 MLDv2

MLDv2 is backward compatible with MLDv1 and adds the ability for a node to report interest in listening to packets with a particular multicast group only from specific source addresses or from all sources except for specific source addresses.

---

## 4.3 Configuring MLD with CLI

This section provides information to configure IGMP and MLD using the command line interface.

Topics in this section include:

- [IGMP Configuration Overview](#)
- [Basic IGMP Configuration](#)
- [Configuring IGMP Parameters](#)
- [Disabling MLD](#)

### 4.3.1 IGMP Configuration Overview

The routers use IGMP to manage membership for a given multicast session. IGMP is not enabled by default. When enabled, at least one interface must be specified in the IGMP context as IGMP is an interface function. Creating an interface enables IGMP. Traffic can only flow away from the router to an IGMP interface and to and from a PIM interface. A router directly connected to a source must have PIM enabled on the interface to that source. The traffic travels in a network from PIM interface to PIM interface and arrives finally on an IGMP enabled interface.

The IGMP CLI context allows you to specify an existing IP interface and modify the interface-specific parameters. Static IGMP group memberships can be configured to test multicast forwarding without a receiver host. When IGMP static group membership is enabled, data is forwarded to an interface without receiving membership reports from host members.

When static IGMP group entries on point-to-point links that connect routers to a rendezvous point (RP) are configured, the static IGMP group entries do not generate join messages toward the RP. When a host wants to receive multicast sessions it sends a join message for each multicast group it wants to join. Then, a leave message may be sent for each multicast group it no longer wishes to participate with.

A multicast router keeps a list of multicast group memberships for each attached network, and an interval timer for each membership. Hosts issue a Multicast Group Membership Report when they want to receive a multicast session. The reports are sent to all multicast routers.

## 4.3.2 Basic IGMP Configuration

Perform the following basic multicast configuration tasks:

- Enable IGMP (required)
- Configure IGMP interfaces (required)
- Specify IGMP version on the interface (optional)
- Configure static (S,G)/(\*,G) (optional)
- Configure SSM translation (optional)

## 4.3.3 Configuring IGMP Parameters

### 4.3.3.1 Enabling IGMP

Use the following CLI syntax to enable IGMP.

**CLI Syntax:** `config>router# igmp`

The following example displays the detailed output when IGMP is enabled.

```
A:LAX>>config>router# info detail
...
#-----
echo "IGMP Configuration"
#-----
 igmp
 query-interval 125
 query-last-member-interval 1
 query-response-interval 10
 robust-count 2
 no shutdown
 exit
#-----
A:LAX>>config>system#
```

### 4.3.3.2 Configuring an IGMP Interface

To configure an IGMP interface:

**CLI Syntax:** `config>router# igmp`  
`interface ip-int-name`

```
max-groups value
import policy-name
version version
no shutdown
```

Use the following CLI syntax to configure IGMP interfaces:

**Example:**

```
config>router#
config>router>igmp# interface "lax-vls"
config>router>igmp>if? no shutdown
config>router>igmp>if# exit
config>router>igmp# interface "pl-ix"
config>router>igmp>if? no shutdown
config>router>igmp>if# exit
config>router>igmp# interface "lax-sjc"
config>router>igmp>if? no shutdown
config>router>igmp>if# exit
```

The following example displays the IGMP configuration:

```
A:LAX>config>router>igmp# info

 interface "lax-sjc"
 exit
 interface "lax-vls"
 exit
 interface "pl-ix"
 exit

A:LAX>config>router>igmp# exit
```

### 4.3.3.3 Configuring Static Parameters

To add an IGMP static multicast source:

**CLI Syntax:**

```
config>router# igmp
 interface ip-int-name
 no shutdown
 static
 group grp-ip-address
 source ip-address
```

Use the following CLI syntax to configure static group addresses and source addresses for the SSM translate group ranges:

**Example:**

```
config>router>igmp# interface lax-vls
config>router>igmp>if# static
```

```

config>router>igmp>if>static# group 229.255.0.2
config>router>igmp>if>static>group# source
172.22.184.197
config>router>igmp>if>static>group# exit
config>router>igmp>if>static# exit
config>router>igmp>if# exit

```

The following example displays the configuration:

```

A:LAX>config>router>igmp# info

interface "lax-sjc"
exit
interface "lax-vls"
static
group 229.255.0.2
source 172.22.184.197
exit
exit
exit
interface "p1-ix"
exit

A:LAX>config>router>igmp#

```

To add an IGMP static starg entry:

**CLI Syntax:**

```

config>router# igmp
interface ip-int-name
no shutdown
static
group grp-ip-address
starg

```

Use the following CLI syntax to configure static group addresses and add a static (\*,G) entry:

**Example:**

```

config>router>igmp# interface lax-sjc
config>router>igmp>if# static
config>router>igmp>if>static# group 230.1.1.1
config>router>igmp>if>static>group# starg
config>router>igmp>if>static>group# exit
config>router>igmp>if>static# exit
config>router>igmp>if# exit
config>router>igmp#

```

The following example displays the configuration:

```

A:LAX>config>router>igmp# info

interface "lax-sjc"

```

```

 static
 group 230.1.1.1
 starg
 exit
 exit
interface "lax-vls"
 static
 group 229.255.0.2
 source 172.22.184.197
 exit
 exit
exit
interface "pl-ix"
exit

A:LAX>config>router>igmp#

```

#### 4.3.3.4 Configuring SSM Translation

To configure IGMP parameters:

**CLI Syntax:**

```

config>router# igmp
 ssm-translate
 grp-range start end
 source ip-address

```

The following example displays the command usage to configure IGMP parameters:

**Example:**

```

config>router# igmp
config>router>igmp# ssm-translate
config>router>igmp>ssm# grp-range 229.255.0.1 231.2.2.2
config>router>igmp>ssm>grp-range# source 10.1.1.1

```

The following example displays the SSM translation configuration:

```

A:LAX>config>router>igmp# info

 ssm-translate
 grp-range 229.255.0.1 231.2.2.2
 source 10.1.1.1
 exit
exit
interface "lax-sjc"
 static
 group 230.1.1.1
 starg
 exit
 exit
exit
interface "lax-vls"
 static

```

```
 group 229.255.0.2
 source 172.22.184.197
 exit
 exit
 interface "pl-ix"
 exit

A:LAX>config>router>igmp# exit
```

### 4.3.4 Disabling MLD

Use the following CLI syntax to disable MLD.

**CLI Syntax:**

```
config>router#
 mld
 shutdown
```

The following example displays the command usage to disable MLD.

**Example:**

```
config>router# mld
config>router>mld# shutdown
```

## 4.4 MLD Configuration Command Reference

### 4.4.1 Command Hierarchies

- [MLD Configuration Commands](#)

#### 4.4.1.1 MLD Configuration Commands

For more information about MLD commands, refer to the *SR OS Triple Play Guide*.

```

config
 — [no] router
 — [no] mld
 — [no] group-interface ip-int-name
 — [no] disable-router-alert-check
 — import policy-name
 — no import
 — max-groups value
 — no max-groups
 — max-grp-sources [1 to 32000]
 — no max-grp-sources
 — max-sources [1 to 1000]
 — no max-sources
 — query-interval seconds
 — no query-interval
 — query-last-listener-interval seconds
 — no query-last-listener-interval
 — query-response-interval seconds
 — no query-response-interval
 — query-src-ip ipv6-address
 — no query-src-ip
 — [no] shutdown
 — [no] sub-hosts-only
 — [no] subnet-check
 — version version
 — no version
 — grp-if-query-src-ip ipv6-address
 — no grp-if-query-src-ip
 — [no] interface ip-int-name
 — [no] disable-router-alert-check
 — import policy-name
 — no import
 — max-groups value
 — no max-groups
 — max-grp-sources [1 to 32000]
 — no max-grp-sources

```

- **max-sources** [1 to 1000]
- **no max-sources**
- **query-interval** *seconds*
- **no query-interval**
- **query-last-listener-interval** *seconds*
- **no query-last-listener-interval**
- **query-response-interval** *seconds*
- **no query-response-interval**
- **[no] shutdown**
- **ssm-translate**
  - **[no] grp-range** *start end*
  - **[no] source** *src-ipv6-address*
- **static**
  - **[no] group** *grp-ipv6-address*
    - **[no] source** *src-ipv6-address*
    - **[no] starg**
  - **[no] group start** *grp-ipv6-address end grp-ipv6-address [step*  
*ipv6-address]*
    - **[no] source** *src-ipv6-address*
    - **[no] starg**
- **version** *version*
- **no version**
- **query-interval** *seconds*
- **no query-interval**
- **query-last-listener-interval** *seconds*
- **no query-last-listener-interval**
- **query-response-interval** *seconds*
- **no query-response-interval**
- **robust-count** *robust-count*
- **no robust-count**
- **[no] shutdown**
- **ssm-translate**
  - **[no] grp-range** *start end*
  - **[no] source** *src-ipv6-address*

## 4.4.2 Command Descriptions

### 4.4.2.1 MLD Commands

mld

**Syntax** [no] mld

**Context** config>router

---

**Description** This command enables the context to configure Multicast Listener Discovery (MLD) parameters.

The **no** form of the command disables MLD.

**Default** no mld

## group-interface

**Syntax** [**no**] **group-interface** *ip-int-name*

**Context** config>router>mld

**Description** This command creates and enables the context to configure MLD group interface parameters.

**Parameters** *ip-int-name* — The IP interface name. Interface names must be unique within the group of defined IP interfaces for **config router interface** and **config service ies interface** commands. An interface name cannot be in the form of an IP address. Interface names can be any string up to 32 characters long composed of printable, 7-bit ASCII characters. If the string contains special characters (#, \$, spaces, etc.), the entire string must be enclosed within double quotes.

## grp-if-query-src-ip

**Syntax** **grp-if-query-src-ip** *ipv6-address*  
**no grp-if-query-src-ip**

**Context** config>router>mld

**Description** This command configures the query source IPv6 address for all group interfaces.

The **no** form of the command removes the IP address.

**Default** none

**Parameters** *ipv6-address* — Sets the source IPv6 address for all group interfaces. The address can be up to 64 characters.

## query-src-ip

**Syntax** **query-src-ip** *ipv6-address*  
**no query-src-ip**

**Context** config>router>mld>group-interface

---

|                    |                                                                                                                                                                                                                                   |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Description</b> | This command configures the query source IPv6 address for the group interface. This IP address overrides the source IP address configured at the router level.<br><br>The <b>no</b> form of the command removes the IPv6 address. |
| <b>Default</b>     | none                                                                                                                                                                                                                              |
| <b>Parameters</b>  | <i>ipv6-address</i> — Sets the source IPv6 address for all subscriber's IGMP queries.                                                                                                                                             |

## sub-hosts-only

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] sub-hosts-only</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Context</b>     | config>router>mld>group-interface                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Description</b> | This command disables the processing of MLD messages outside of the subscriber-host context. No other hosts outside of the subscriber-hosts can create MLD states.<br><br>Disabling this command allows the creation of the MLD states that correspond to the AN that operate in MLD proxy mode. In this mode, the AN will hide source IP addresses of MLD messages and will source MLD messages with its own IP address. In this case, an MLD state can be created under the <b>sap</b> context. This MLD state creation under the SAP is controlled via the import policy under the group-interface.<br><br>The MLD state processing for regular subscriber-hosts is unaffected by this command.<br><br>The <b>no</b> form of the command disables the command. |
| <b>Default</b>     | sub-hosts-only                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |

## subnet-check

|                    |                                                                                                                                                                      |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] subnet-check</b>                                                                                                                                             |
| <b>Context</b>     | config>router>mld>group-interface                                                                                                                                    |
| <b>Description</b> | This command enables subnet checking for MLD messages received on this interface. All MLD packets with a source address that is not in the local subnet are dropped. |
| <b>Default</b>     | enabled                                                                                                                                                              |

## version

|                |                                                    |
|----------------|----------------------------------------------------|
| <b>Syntax</b>  | <b>version</b> <i>version</i><br><b>no version</b> |
| <b>Context</b> | config>router>mld>group-interface                  |

config>router>mld>interface

**Description** This command specifies the MLD version. If routers run different versions of MLD, they will negotiate the lowest common version of MLD that is supported by hosts on their subnet and operate in that version. For MLD to function correctly, all routers on a LAN should be configured to run the same version of MLD on that LAN.

**Default** 3

**Parameters** *version* — Specifies the MLD version number.

**Values** 1, 2, 3

### 4.4.2.2 Generic Commands

#### shutdown

**Syntax** [no] shutdown

**Context** config>router>mld  
config>router>mld>grp-if>mcac>mc-constraints  
config>router>mld>group-interface  
config>router>mld>interface

**Description** The **shutdown** command administratively disables the entity. When disabled, an entity does not change, reset, or remove any configuration settings or statistics. Many entities must be explicitly enabled using the **no shutdown** command and must be shut down before they may be deleted.

Unlike other commands and parameters where the default state is not indicated in the configuration file, **shutdown** and **no shutdown** are always indicated in system generated configuration files.

The **no** form of the command puts an entity into the administratively enabled state.

**Default** no shutdown

#### interface

**Syntax** [no] interface *ip-int-name*

**Context** config>router>mld

**Description** This command enables the context to configure an Multicast Listener Discovery (MLD) interface. The interface is a local identifier of the network interface on which reception of the specified multicast address is to be enabled or disabled.

The **no** form of the command deletes the MLD interface. The **shutdown** command in the **config>router>mld>interface** context can be used to disable an interface without removing the configuration for the interface.

**Default** **no interface** — No interfaces are defined.

**Parameters** *ip-int-name* — The IP interface name. Interface names must be unique within the group of defined IP interfaces for **config>router>interface** and **config>service>ies>interface** commands. An interface name cannot be in the form of an IP address. Interface names can be any string up to 32 characters long composed of printable, 7-bit ASCII characters. If the string contains special characters (#, \$, spaces, etc.), the entire string must be enclosed within double quotes.

If the IP interface name does not exist or does not have an IP address configured an error message will be returned.

If the IP interface exists in a different area it will be moved to this area.

## disable-router-alert-check

**Syntax** [**no**] **disable-router-alert-check**

**Context** config>router>mld>interface  
config>router>mld>group-interface

**Description** This command enables router alert checking for MLD messages received on this interface.

The no form of the command disables the router alert checking.

**Default** none

## import

**Syntax** **import** *policy-name*  
**no import**

**Context** config>router>mld>interface  
config>router>mld>group-interface

**Description** This command specifies the import route policy to be used for determining which membership reports are accepted by the router. Route policies are configured in the **config>router>policy-options** context.

When an import policy is not specified, all the MLD reports are accepted.

The **no** form of the command removes the policy association from the MLD instance.

**Default** **no import** — No import policy specified.

---

**Parameters** *policy-name* — The route policy name. Allowed values are any string up to 32 characters long composed of printable, 7-bit ASCII characters. If the string contains special characters (#, \$, spaces, etc.), the entire string must be enclosed within double quotes. Route policies are configured in the **config>router>policy-options** context.

## max-groups

**Syntax** **max-groups** *value*  
**no max-groups**

**Context** config>router>mld>group-interface  
config>router>mld>interface

**Description** This command specifies the maximum number of groups for which MLD can have local receiver information based on received MLD reports on this interface. When this configuration is changed dynamically to a value lower than the currently accepted number of groups, the groups that are already accepted are not deleted. Only new groups will not be allowed.

**Default** 0, no limit to the number of groups.

**Parameters** *value* — Specifies the maximum number of groups for this interface.  
**Values** 1 to 16000

## max-grp-sources

**Syntax** **max-grp-sources**  
**no max-grp-sources**

**Context** config>router>mld>group-interface  
config>router>mld>interface

**Description** This command configures the maximum number of group sources for which MLD can have local receiver information based on received IGMP reports on this interface. When this configuration is changed dynamically to a value lower than currently accepted number of group sources, the group sources that are already accepted are not deleted. Only new group sources will not be allowed.

The **no** form of the command reverts to the default.

**Default** 0

**Parameters** **1 to 32000** — Specifies the maximum number of group source.  
**Values** 1 to 32000

---

## max-sources

|                    |                                                                                       |
|--------------------|---------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>max-sources</b><br><b>no max-sources</b>                                           |
| <b>Context</b>     | config>router>mld>group-interface<br>config>router>mld>interface                      |
| <b>Description</b> | This command configures the maximum number of group sources for this group-interface. |

## query-interval

|                    |                                                                                                                                                                                                                                      |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>query-interval</b> <i>seconds</i><br><b>no query-interval</b>                                                                                                                                                                     |
| <b>Context</b>     | config>router>mld<br>config>router>mld>interface<br>config>router>mld>group-interface                                                                                                                                                |
| <b>Description</b> | This command specifies the frequency that the querier router transmits general host-query messages. The host-query messages solicit group membership information and are sent to the all-systems multicast group address, 224.0.0.1. |
| <b>Default</b>     | 125                                                                                                                                                                                                                                  |
| <b>Parameters</b>  | <i>seconds</i> — The time frequency, in seconds, that the router transmits general host-query messages.<br><b>Values</b> 2 to 1024                                                                                                   |

## query-last-listener-interval

|                    |                                                                                                                                                                                                                                                         |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>query-last-listener-interval</b> <i>seconds</i><br><b>no query-last-listener-interval</b>                                                                                                                                                            |
| <b>Context</b>     | config>router>mld<br>config>router>mld>interface<br>config>router>mld>group-interface                                                                                                                                                                   |
| <b>Description</b> | This command configures the frequency at which the querier sends group-specific query messages including messages sent in response to leave-group messages. The lower the interval, the faster the detection of the loss of the last member of a group. |
| <b>Default</b>     | 1                                                                                                                                                                                                                                                       |
| <b>Parameters</b>  | <i>seconds</i> — Specifies the frequency, in seconds, at which query messages are sent.<br><b>Values</b> 1 to 1024                                                                                                                                      |

---

## query-response-interval

|                    |                                                                                                                                                     |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>query-response-interval</b> <i>seconds</i><br><b>no query-response-interval</b>                                                                  |
| <b>Context</b>     | config>router>mld<br>config>router>mld>interface<br>config>router>mld>group-interface                                                               |
| <b>Description</b> | This command specifies how long the querier router waits to receive a response to a host-query message from a host.                                 |
| <b>Default</b>     | 10                                                                                                                                                  |
| <b>Parameters</b>  | <i>seconds</i> — Specifies the the length of time to wait to receive a response to the host-query message from the host.<br><b>Values</b> 1 to 1023 |

## static

|                    |                                                                                                                                                                                          |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>static</b>                                                                                                                                                                            |
| <b>Context</b>     | config>router>mld>interface                                                                                                                                                              |
| <b>Description</b> | This command tests multicast forwarding on an interface without a receiver host. When enabled, data is forwarded to an interface without receiving membership reports from host members. |
| <b>Default</b>     | none                                                                                                                                                                                     |

## group

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] group</b> <i>grp-ipv6-address</i><br><b>[no] group start</b> <i>grp-ipv6-address</i> <b>end</b> <i>grp-ipv6-address</i> [ <b>step</b> <i>ipv6-address</i> ]                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Context</b>     | config>router>mld>interface>static                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Description</b> | This command enables the context to add a static multicast group either as a (*,G) or one or more (S,G) records. Use MLD static group memberships to test multicast forwarding without a receiver host. When MLD static groups are enabled, data is forwarded to an interface without receiving membership reports from host members.<br><br>When static MLD group entries on point-to-point links that connect routers to a rendezvous point (RP) are configured, the static MLD group entries do not generate join messages toward the RP.<br><br>The <b>no</b> form of the command removes the IPv6 address from the configuration. |

---

|                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|-------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Default</b>    | none                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Parameters</b> | <p><i>grp-ipv6-address</i> — Specifies an MLD multicast group address that receives data on an interface. The IP address must be unique for each static group.</p> <p><b>Values</b>    ipv6-address:</p> <ul style="list-style-type: none"> <li>• x:x:x:x:x:x:x (eight 16-bit pieces)</li> <li>• x:x:x:x:x:d.d.d.d</li> <li>• x: [0 to FFFF]H</li> <li>• d: [0 to 255]D</li> </ul> <p><b>start</b> <i>grp-ipv6-address</i> — Specifies the start multicast group address.</p> <p><b>Values</b>    ipv6-address:</p> <ul style="list-style-type: none"> <li>• x:x:x:x:x:x:x (eight 16-bit pieces)</li> <li>• x:x:x:x:x:d.d.d.d</li> <li>• x: [0 to FFFF]H</li> <li>• d: [0 to 255]D</li> </ul> <p><b>end</b> <i>grp-ipv6-address</i> — Specifies the end multicast group address.</p> <p><b>Values</b>    ipv6-address:</p> <ul style="list-style-type: none"> <li>• x:x:x:x:x:x:x (eight 16-bit pieces)</li> <li>• x:x:x:x:x:d.d.d.d</li> <li>• x: [0 to FFFF]H</li> <li>• d: [0 to 255]D</li> </ul> <p><b>step</b> <i>ipv6-address</i> — Specifies the step increment.</p> |

## source

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | [no] <b>source</b> <i>src-ipv6-address</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Context</b>     | config>router>mld>interface>static>group                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Description</b> | <p>This command specifies an IPv6 unicast address that sends data on an interface. This enables a multicast receiver host to signal a router the group to receive multicast traffic from, and from the source(s) that the traffic is expected.</p> <p>The <b>source</b> command is mutually exclusive with the specification of individual sources for the same group.</p> <p>The <b>source</b> command, in combination with the group, is used to create a specific (S,G) static group entry.</p> <p>The <b>no</b> form of the command removes the source from the configuration.</p> |
| <b>Default</b>     | none                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |

---

**Parameters** *src-ipv6-address* — Specifies the IPv6 unicast address.

## starg

**Syntax** [no] starg

**Context** config>router>mld>interface>static>group

**Description** This command adds a static (\*,G) entry. This command can only be enabled if no existing source addresses for this group are specified.

Use the **no** form of the command to remove the starg entry from the configuration.

**Default** none

## robust-count

**Syntax** **robust-count** *robust-count*  
**no robust-count**

**Context** config>router>mld

**Description** This command configures the robust count. The robust-count variable allows tuning for the expected packet loss on a subnet. If a subnet anticipates losses, the robust-count variable can be increased.

**Default** 2

**Parameters** *robust-count* — Specify the robust count value.

**Values** 2 to 10

## ssm-translate

**Syntax** **ssm-translate**

**Context** config>router>mld  
config>router>mld>interface

**Description** This command enables the context to configure group ranges which are translated to SSM (S,G) entries. If the static entry needs to be created, it has to be translated from a IGMPv1 IGMPv2 request to a Source Specific Multicast (SSM) join. An SSM translate source can only be added if the starg command is not enabled. An error message is generated if you try to configure the **source** command with **starg** command enabled.

## grp-range

- Syntax** `[no] grp-range start end`
- Context** `config>router>mld>ssm-translate`  
`config>router>mld>interface>ssm-translate`
- Description** This command is used to configure group ranges which are translated to SSM (S,G) entries.
- Parameters** *start* — An IP address that specifies the start of the group range.  
*end* — An IP address that specifies the end of the group range. This value should always be greater than or equal to the value of the *start* value.

## source

- Syntax** `[no] source ip-address`
- Context** `config>router>mld>ssm-translate>grp-range`  
`config>router>mld>interface>ssm-translate>grp-range`
- Description** This command specifies the source IP address for the group range. Whenever a (\*,G) report is received in the range specified by **grp-range** *start* and *end* parameters, it is translated to an (S,G) report with the value of this object as the source address.
- Parameters** *ip-address* — Specifies the IP address that will be sending data.

---

## 4.5 Show, Clear, and Debug Command Reference

### 4.5.1 Command Hierarchies

- [Clear Commands](#)

#### 4.5.1.1 Clear Commands

```
clear
 — router
 — mld
 — database [interface ip-int-name | ipv6-address] [group ipv6-address [source
 ipv6-address]]
 — statistics [ip-int-name | ipv6-address]
 — version [ip-int-name | ipv6-address]
```

### 4.5.2 Command Descriptions

#### 4.5.2.1 Clear Commands

mld

|                    |                                                                                                     |
|--------------------|-----------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>mld</b>                                                                                          |
| <b>Context</b>     | clear>router                                                                                        |
| <b>Description</b> | This command enables the context to to clear and reset Multicast Listener Discovery (MLD) entities. |

database

|                    |                                                                                                   |
|--------------------|---------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>database [interface ip-int-name   ipv6-address] [group ipv6-address [source ipv6-address]]</b> |
| <b>Context</b>     | clear>router>mld                                                                                  |
| <b>Description</b> | This command clears Multicast Listener Discovery (MLD) database parameters.                       |

- 
- Parameters**
- interface** *ip-int-name* — Clears database information for the specified Multicast Listener Discovery (MLD) interface name.
  - interface** *ipv6-address* — Clears database information for the specified Multicast Listener Discovery (MLD) interface IPv6 address.
  - group** *ipv6-address* — Clears database information for the specified Multicast Listener Discovery (MLD) group IPv6 address.
  - source** *ipv6-address* — Clears database information for the specified Multicast Listener Discovery (MLD) source IPv6 address.

## statistics

- Syntax** **statistics** [*ip-int-name* | *ipv6-address*]
- Context** clear>router>mld
- Description** This command clears Multicast Listener Discovery (MLD) statistics parameters.
- Parameters**
- ip-int-name* — Clears statistics for the specified Multicast Listener Discovery (MLD) interface name.
  - ipv6-address* — Clears statistics for the specified Multicast Listener Discovery (MLD) IPv6 address.

## version

- Syntax** **version** [*ip-int-name* | *ipv6-address*]
- Context** clear>router>mld
- Description** This command clears Multicast Listener Discovery (MLD) version parameters.
- Parameters**
- ip-int-name* — Clears version information for the specified Multicast Listener Discovery (MLD) interface name.
  - ipv6-address* — Clears version information for the specified Multicast Listener Discovery (MLD) IPv6 address.

---

## 5 PIM

### 5.1 In This Chapter

This chapter provides information to configure Protocol Independent Multicast (PIM) protocols for IPv4 and IPv6.

Topics in this chapter include:

- [PIM Overview](#)
- [IPv6 PIM models](#)
- [Configuring PIM with CLI](#)
- [PIM Configuration Command Reference](#)

### 5.2 PIM Overview

PIM-SM leverages the unicast routing protocols that are used to create the unicast routing table, OSPF, IS-IS, BGP, and static routes. Because PIM uses this unicast routing information to perform the multicast forwarding function it is effectively IP protocol independent. Unlike DVMRP, PIM does not send multicast routing tables updates to its neighbors.

PIM-SM uses the unicast routing table to perform the Reverse Path Forwarding (RPF) check function instead of building up a completely independent multicast routing table.

PIM-SM only forwards data to network segments with active receivers that have explicitly requested the multicast group. PIM-SM in the ASM model initially uses a shared tree to distribute information about active sources. Depending on the configuration options, the traffic can remain on the shared tree or switch over to an optimized source distribution tree. As multicast traffic starts to flow down the shared tree, routers along the path determine if there is a better path to the source. If a more direct path exists, then the router closest to the receiver sends a join message toward the source and then reroutes the traffic along this path.

As stated above, PIM-SM relies on an underlying topology-gathering protocol to populate a routing table with routes. This routing table is called the Multicast Routing Information Base (MRIB). The routes in this table can be taken directly from the unicast routing table, or it can be different and provided by a separate routing protocol such as MBGP. Regardless of how it is created, the primary role of the MRIB in the PIM-SM protocol is to provide the next hop router along a multicast-capable path to each destination subnet. The MRIB is used to determine the next hop neighbor to whom any PIM join/prune message is sent. Data flows along the reverse path of the join messages. Thus, in contrast to the unicast RIB that specifies the next hop that a data packet would take to get to some subnet, the MRIB gives reverse-path information, and indicates the path that a multicast data packet would take from its origin subnet to the router that has the MRIB.



**Note:** For proper functioning of the PIM protocol, multicast data packets need to be received by the CPM CPU. Therefore CPM Filters and Management Access Filters must be configured to allow forwarding of multicast data packets.

## 5.2.1 PIM-SM Functions

PIM-SM functions in three phases:

- [Phase One](#)
- [Phase Two](#)
- [Phase Three](#)

### 5.2.1.1 Phase One

In this phase, a multicast receiver expresses its interest in receiving traffic destined for a multicast group. Typically it does this using IGMP or MLD, but other mechanisms might also serve this purpose. One of the receiver's local routers is elected as the DR for that subnet. When the expression of interest is received, the DR sends a PIM join message towards the RP for that multicast group. This join message is known as a (\*,G) join because it joins group G for all sources to that group. The (\*,G) join travels hop-by-hop towards the RP for the group, and in each router it passes through the multicast tree state for group G is instantiated. Eventually the (\*,G) join either reaches the RP or reaches a router that already has (\*,G) join state for that group. When many receivers join the group, their join messages converge on the RP and form a distribution tree for group G that is rooted at the RP. This is known as the RP tree and is also known as the shared tree because it is

shared by all sources sending to that group. Join messages are resent periodically as long as the receiver remains in the group. When all receivers on a leaf-network leave the group, the DR will send a PIM (\*,G) prune message towards the RP for that multicast group. However if the prune message is not sent for any reason, the state will eventually time out.

A multicast data sender starts sending data destined for a multicast group. The sender's local router (the DR) takes those data packets, unicast-encapsulates them, and sends them directly to the RP. The RP receives these encapsulated data packets, removes the encapsulation, and forwards them onto the shared tree. The packets then follow the (\*,G) multicast tree state in the routers on the RP tree, being replicated wherever the RP tree branches, and eventually reaching all the receivers for that multicast group. The process of encapsulating data packets to the RP is called registering, and the encapsulation packets are known as PIM register packets.

At the end of phase one, multicast traffic is flowing encapsulated to the RP, and then natively over the RP tree to the multicast receivers.

### 5.2.1.2 Phase Two

In this phase, register-encapsulation of data packets is performed. However, register-encapsulation of data packets is unsuitable for the following reasons:

- Encapsulation and de-encapsulation can be resource intensive operations for a router to perform depending on whether or not the router has appropriate hardware for the tasks.
- Traveling to the RP and then back down the shared tree can cause the packets to travel a relatively long distance to reach receivers that are close to the sender. For some applications, increased latency is unwanted.

Although register-encapsulation can continue indefinitely, for these reasons, the RP will normally switch to native forwarding. To do this, when the RP receives a register-encapsulated data packet from source S on group G, it will normally initiate an (S,G) source-specific join towards S. This join message travels hop-by-hop towards S, instantiating (S,G) multicast tree state in the routers along the path. (S,G) multicast tree state is used only to forward packets for group G if those packets come from source S. Eventually the join message reaches S's subnet or a router that already has (S,G) multicast tree state, and then packets from S start to flow following the (S,G) tree state towards the RP. These data packets can also reach routers with (\*,G) state along the path towards the RP - if so, they can short-cut onto the RP tree at this point.

While the RP is in the process of joining the source-specific tree for S, the data packets will continue being encapsulated to the RP. When packets from S also start to arrive natively at the RP, the RP will be receiving two copies of each of these packets. At this point, the RP starts to discard the encapsulated copy of these packets and it sends a register-stop message back to S's DR to prevent the DR unnecessarily encapsulating the packets. At the end of phase 2, traffic will be flowing natively from S along a source-specific tree to the RP and from there along the shared tree to the receivers. Where the two trees intersect, traffic can transfer from the shared RP tree to the shorter source tree.



**Note:** A sender can start sending before or after a receiver joins the group, and thus, phase two may occur before the shared tree to the receiver is built.

### 5.2.1.3 Phase Three

In this phase, the RP joins back towards the source using the shortest path tree. Although having the RP join back towards the source removes the encapsulation overhead, it does not completely optimize the forwarding paths. For many receivers the route via the RP can involve a significant detour when compared with the shortest path from the source to the receiver.

To obtain lower latencies, a router on the receiver's LAN, typically the DR, may optionally initiate a transfer from the shared tree to a source-specific shortest-path tree (SPT). To do this, it issues an (S,G) Join towards S. This instantiates state in the routers along the path to S. Eventually this join either reaches S's subnet or reaches a router that already has (S,G) state. When this happens, data packets from S start to flow following the (S,G) state until they reach the receiver.

At this point the receiver (or a router upstream of the receiver) will be receiving two copies of the data - one from the SPT and one from the RPT. When the first traffic starts to arrive from the SPT, the DR or upstream router starts to drop the packets for G from S that arrive via the RP tree. In addition, it sends an (S,G) prune message towards the RP. The prune message travels hop-by-hop instantiating state along the path towards the RP indicating that traffic from S for G should NOT be forwarded in this direction. The prune message is propagated until it reaches the RP or a router that still needs the traffic from S for other receivers.

By now, the receiver will be receiving traffic from S along the shortest-path tree between the receiver and S. In addition, the RP is receiving the traffic from S, but this traffic is no longer reaching the receiver along the RP tree. As far as the receiver is concerned, this is the final distribution tree.

---

## 5.2.2 Encapsulating Data Packets in the Register Tunnel

Conceptually, the register tunnel is an interface with a smaller MTU than the underlying IP interface towards the RP. IP fragmentation on packets forwarded on the register tunnel is performed based upon this smaller MTU. The encapsulating DR can perform path-MTU discovery to the RP to determine the effective MTU of the tunnel. This smaller MTU takes both the outer IP header and the PIM register header overhead into consideration.

## 5.2.3 PIM Bootstrap Router Mechanism

For proper operation, every PIM-SM router within a PIM domain must be able to map a particular global-scope multicast group address to the same RP. If this is not possible, then black holes can appear (this is where some receivers in the domain cannot receive some groups). A domain in this context is a contiguous set of routers that all implement PIM and are configured to operate within a common boundary.

The bootstrap router (BSR) mechanism provides a way in which viable group-to-RP mappings can be created and distributed to all the PIM-SM routers in a domain. Each candidate BSR originates bootstrap messages (BSMs). Every BSM contains a BSR priority field. Routers within the domain flood the BSMs throughout the domain. A candidate BSR that hears about a higher-priority candidate BSR suppresses its sending of further BSMs for a period of time. The single remaining candidate BSR becomes the elected BSR and its BSMs inform the other routers in the domain that it is the elected BSR.

It is adaptive, meaning that if an RP becomes unreachable, it will be detected and the mapping tables will be modified so the unreachable RP is no longer used and the new tables will be rapidly distributed throughout the domain.

## 5.2.4 PIM-SM Routing Policies

Multicast traffic can be restricted from certain source addresses by creating routing policies. Join messages can be filtered using import filters. PIM join policies can be used to reduce denial of service attacks and subsequent PIM state explosion in the router and to remove unwanted multicast streams at the edge of the network before it is carried across the core. Route policies are created in the **config>router>policy-options** context. Join and register route policy match criteria for PIM-SM can specify the following:

- Router interface or interfaces specified by name or IP address.

- Neighbor address (the source address in the IP header of the join and prune message).
- Multicast group address embedded in the join and prune message.
- Multicast source address embedded in the join and prune message.

Join policies can be used to filter PIM join messages so no \*,G or S,G state will be created on the router.

**Table 9 Join Filter Policy Match Conditions**

| Match Condition | Matches the:                                      |
|-----------------|---------------------------------------------------|
| Interface       | RTR interface by name                             |
| Neighbor        | The neighbors source address in the IP header     |
| Group Address   | Multicast Group address in the join/prune message |
| Source Address  | Source address in the join/prune message          |

PIM register message are sent by the first hop designated router that has a direct connection to the source. This serves a dual purpose:

- Notifies the RP that a source has active data for the group
- Delivers the multicast stream in register encapsulation to the RP and its potential receivers.
- If no one has joined the group at the RP, the RP will ignore the registers.

In an environment where the sources to particular multicast groups are always known, it is possible to apply register filters at the RP to prevent any unwanted sources from transmitting multicast stream. You can apply these filters at the edge so that register data does not travel unnecessarily over the network towards the RP.

**Table 10 Register Filter Policy Match Conditions**

| Match Condition | Matches the:                                      |
|-----------------|---------------------------------------------------|
| Interface       | RTR interface by name                             |
| Group Address   | Multicast Group address in the join/prune message |
| Source Address  | Source address in the join/prune message          |

---

## 5.2.5 Reverse Path Forwarding Checks

Multicast implements a reverse path forwarding check (RPF). RPF checks the path that multicast packets take between their sources and the destinations to prevent loops. Multicast requires that an incoming interface is the outgoing interface used by unicast routing to reach the source of the multicast packet. RPF forwards a multicast packet only if it is received on an interface that is used by the router to route to the source.

If the forwarding paths are modified due to routing topology changes then any dynamic filters that may have been applied must be re-evaluated. If filters are removed then the associated alarms are also cleared.

## 5.2.6 Anycast RP for PIM-SM

The implementation of Anycast RP for PIM-SM environments enable fast convergence when a PIM rendezvous point (RP) router fails by allowing receivers and sources to rendezvous at the closest RP. It allows an arbitrary number of RPs per group in a single shared-tree protocol Independent Multicast-Sparse Mode (PIM-SM) domain. This is, in particular, important for triple play configurations that opt to distribute multicast traffic using PIM-SM, not SSM. In this case, RP convergence must be fast enough to avoid the loss of multicast streams which could cause loss of TV delivery to the end customer.

Anycast RP for PIM-SM environments is supported in the base routing/PIM-SM instance of the service router. This feature is supported in Layer 3-VPRN instances that are configured with PIM.

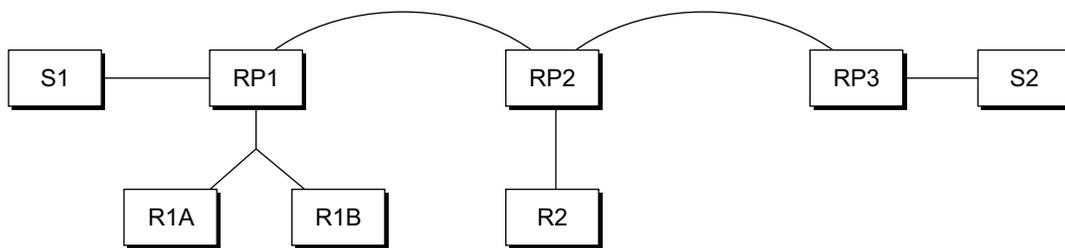
### 5.2.6.1 Implementation

The Anycast RP for PIM-SM implementation is defined in RFC 4610, *Anycast-RP Using Protocol Independent Multicast (PIM)*, and is similar to that described in RFC 3446, *Anycast Rendezvous Point (RP) mechanism using Protocol Independent Multicast (PIM) and Multicast Source Discovery Protocol (MSDP)*, and extends the register mechanism in PIM so Anycast RP functionality can be retained without using Multicast Source Discovery Protocol (MSDP) (see [Multicast in Virtual Private Networks](#)).

The mechanism works as follows:

- An IP address is chosen to use as the RP address. This address is statically configured, or distributed using a dynamic protocol, to all PIM routers throughout the domain.
- A set of routers in the domain are chosen to act as RPs for this RP address. These routers are called the Anycast-RP set.
- Each router in the Anycast-RP set is configured with a loopback interface using the RP address.
- Each router in the Anycast-RP set also needs a separate IP address to be used for communication between the RPs.
- The RP address, or a prefix that covers the RP address, is injected into the unicast routing system inside of the domain.
- Each router in the Anycast-RP set is configured with the addresses of all other routers in the Anycast-RP set. This must be consistently configured in all RPs in the set.

**Figure 1** Anycast RP for PIM-SM Implementation Example



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Assume the scenario in [Figure 1](#) is completely connected where R1A, R1B, and R2 are receivers for a group, and S1 and S2 send to that group. Assume RP1, RP2, and RP3 are all assigned the same IP address which is used as the Anycast-RP address (for example, the IP address is RPA).



**Note:** The address used for the RP address in the domain (the Anycast-RP address) must be different than the addresses used by the Anycast-RP routers to communicate with each other.

The following procedure is used when S1 starts sourcing traffic:

1. S1 sends a multicast packet.

2. The DR directly attached to S1 forms a PIM register message to send to the Anycast-RP address (RPA). The unicast routing system delivers the PIM register message to the nearest RP, in this case RP1A.
3. RP1 receives the PIM register message, de-encapsulates it, and sends the packet down the shared-tree to get the packet to receivers R1A and R1B.
4. RP1 is configured with RP2 and RP3's IP address. Because the register message did not come from one of the RPs in the anycast-RP set, RP1 assumes the packet came from a DR. If the register message is not addressed to the Anycast-RP address, an error has occurred and it should be rate-limited logged.
5. RP1 sends a copy of the register message from S1's DR to both RP2 and RP3. RP1 uses its own IP address as the source address for the PIM register message.
6. RP1 may join back to the source-tree by triggering a (S1,G) Join message toward S1; however, RP1 must create (S1,G) state.
7. RP2 receives the register message from RP1, de-encapsulates it, and also sends the packet down the shared-tree to get the packet to receiver R2.
8. RP2 sends a register-stop message back to the RP1. RP2 may wait to send the register-stop message if it decides to join the source-tree. RP2 should wait until it has received data from the source on the source-tree before sending the register-stop message. If RP2 decides to wait, the register-stop message will be sent when the next register is received. If RP2 decides not to wait, the register-stop message is sent now.
9. RP2 may join back to the source-tree by triggering a (S1,G) Join message toward S1; however, RP2 must create (S1,G) state.
10. RP3 receives the register message from RP1, de-encapsulates it, but since there are no receivers joined for the group, it can discard the packet.
11. RP3 sends a register-stop message back to the RP1.
12. RP3 creates (S1,G) state so when a receiver joins after S1 starts sending, RP3 can join quickly to the source-tree for S1.
13. RP1 processes the register-stop message from each of RP2 and RP3. RP1 may cache on a per-RP/per-(S,G) basis the receipt of register-stop message messages from the RPs in the anycast-RP set. This option is performed to increase the reliability of register message delivery to each RP. When this option is used, subsequent register messages received by RP1 are sent only to the RPs in the Anycast-RP set which have not previously sent register-stop message messages for the (S,G) entry.
14. RP1 sends a register-stop message back to the DR the next time a register message is received from the DR and (when the option in the last bullet is in use) if all RPs in the Anycast-RP set have returned register-stop messages for a particular (S,G) route.

The procedure for S2 sending follows the same steps as above, but it is RP3 which sends a copy of the register originated by S2's DR to RP1 and RP2. Therefore, this example shows how sources anywhere in the domain, associated with different RPs, can reach all receivers, also associated with different RPs, in the same domain.

## 5.2.7 Distributing PIM Joins over Multiple ECMP Paths

Commonly used multicast load-balancing method is per bandwidth/round robin, but the interface in an ECMP set can also be used for a particular channel to be predictable without knowing anything about the other channels using the ECMP set.

The **mc-ecmp-hashing-enabled** command enables PIM joins to be distributed over the multiple ECMP paths based on a hash of S and G. When a link in the ECMP set is removed, the multicast streams that were using that link are re-distributed over the remaining ECMP links using the same hash algorithm. When a link is added to the ECMP set, new joins may be allocated to the new link based on the hash algorithm. Existing multicast streams using the other ECMP links stay on those links until they are pruned, unless the **rebalance** option is specified.

The default is **no mc-ecmp-hashing-enabled**, which means that the use of multiple ECMP paths (if enabled at the **config>service>vprn** context) is controlled by the existing implementation and CLI commands, that is, **mc-ecmp-balance**.

The **mc-ecmp-hashing-enabled** command and the **mc-ecmp-balance** command cannot be used together in the same context.

To achieve distribution of streams across the ECMP links, following are the hashings steps:

1. For a given S, G get all possible nHops.
2. Sort these nHops based on nhops address.
3. xor S and G addresses.
4. Hash the xor address over number of pim next hops.
5. Use the hash value obtained in step 4, and get that element, in the sorted list, we obtained in step 2 as the preferred nHop.
6. If this element is not available/is not a PIM Next hop (PIM neighbor), the next available next hop is chosen.

The following example displays PIM status indicating ECMP Hashing is disabled:

```
*B:BB# show router 100 pim status
```

```
=====
PIM Status ipv4
```

```
=====
Admin State : Up
Oper State : Up

IPv4 Admin State : Up
IPv4 Oper State : Up

BSR State : Accept Any

Elected BSR
 Address : None
 Expiry Time : N/A
 Priority : N/A
 Hash Mask Length : 30
 Up Time : N/A
 RPF Intf towards E-BSR : N/A

Candidate BSR
 Admin State : Down
 Oper State : Down
 Address : None
 Priority : 0
 Hash Mask Length : 30

Candidate RP
 Admin State : Down
 Oper State : Down
 Address : 0.0.0.0
 Priority : 192
 Holdtime : 150

SSM-Default-Range : Enabled
SSM-Group-Range : None

MC-ECMP-Hashing : Disabled

Policy : None

RPF Table : rtable-u

Non-DR-Attract-Traffic : Disabled
=====
```

```

*B:BB>config>service>vprn>pim# no mc-ecmp-balance mc-ecmp-balance mc-ecmp-balance-
hold
*B:BB>config>service>vprn>pim# no mc-ecmp-balance
*B:BB>config>service>vprn>pim# mc-ecmp-mc-ecmp-balance mc-ecmp-balance-hold mc-ecmp-
hashing-enabled
*B:BB>config>service>vprn>pim# mc-ecmp-hashing-enabled
*B:BB>config>service>vprn>pim# info

 apply-to all
 rp
 static
 address 3.3.3.3
 group-prefix 224.0.0.0/4
 exit
```

```

 exit
 bsr-candidate
 shutdown
 exit
 rp-candidate
 shutdown
 exit
 exit
 no mc-ecmp-balance
 mc-ecmp-hashing-enabled

*B:BB>config>service>vprn>pim#
apply-to - Create/remove interfaces in PIM
[no] import - Configure import policies
[no] interface + Configure PIM interface
[no] mc-ecmp-balance - Enable/
Disable multicast balancing of traffic over ECMP links
[no] mc-ecmp-balanc* - Configure hold time for multicast balancing over ECMP links
[no] mc-ecmp-hashin* - Enable/
Disable hash based multicast balancing of traffic over ECMP links
[no] non-dr-attract* - Enable/disable attracting traffic when not DR
 rp + Configure the router as static or Candidate-RP
[no] shutdown - Administratively enable or disable the operation of PIM
[no] spt-switchover* -
Configure shortest path tree (spt tree) switchover threshold for a group prefix
[no] ssm-default-ra* - Enable the disabling of SSM Default Range
[no] ssm-groups + Configure the SSM group ranges

```

The following example shows distribution of PIM joins over multiple ECMP paths.

```

*A:BA# show router 100 pim group
=====
PIM Groups ipv4
=====
Group Address Type Spt Bit Inc Intf No.Oifs
 Source Address RP

225.1.1.1 (S,G) spt to_C0 1
 170.0.100.33 10.20.1.6
225.1.1.2 (S,G) spt to_C3 1
 170.0.100.33 10.20.1.6
225.1.1.3 (S,G) spt to_C2 1
 170.0.100.33 10.20.1.6
225.1.1.4 (S,G) spt to_C1 1
 170.0.100.33 10.20.1.6
225.1.1.5 (S,G) spt to_C0 1
 170.0.100.33 10.20.1.6
225.1.1.6 (S,G) spt to_C3 1
 170.0.100.33 10.20.1.6

225.2.1.1 (S,G) spt to_C0 1
 170.0.100.33 10.20.1.6
225.2.1.2 (S,G) spt to_C3 1
 170.0.100.33 10.20.1.6
225.2.1.3 (S,G) spt to_C2 1

```

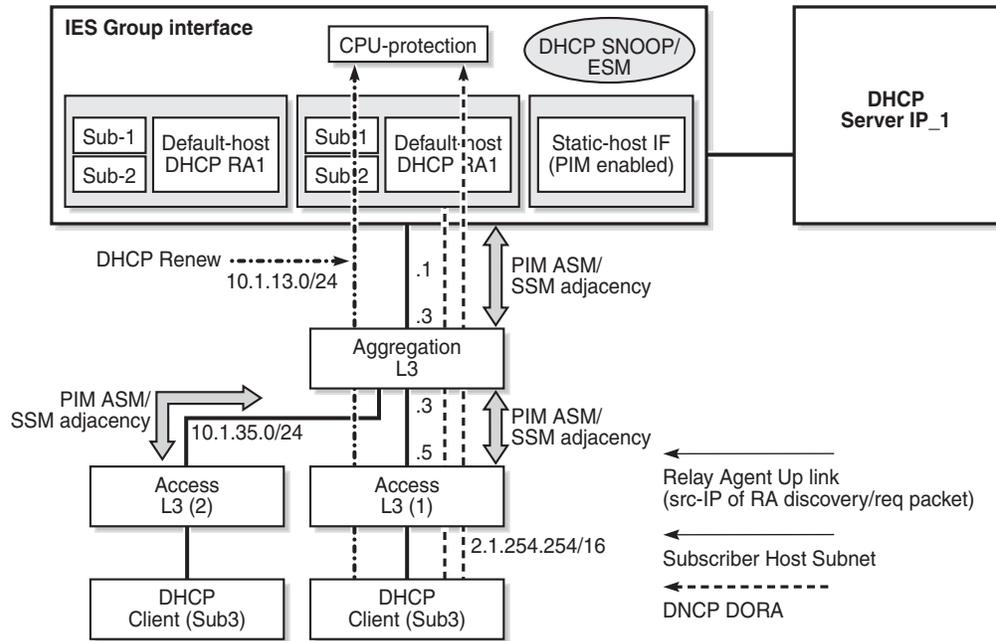
---

|              |           |       |  |   |
|--------------|-----------|-------|--|---|
| 170.0.100.33 | 10.20.1.6 |       |  |   |
| 225.2.1.4    | (S,G) spt | to_C1 |  | 1 |
| 170.0.100.33 | 10.20.1.6 |       |  |   |
| 225.2.1.5    | (S,G) spt | to_C0 |  | 1 |
| 170.0.100.33 | 10.20.1.6 |       |  |   |
| 225.2.1.6    | (S,G) spt | to_C3 |  | 1 |
| 170.0.100.33 | 10.20.1.6 |       |  |   |
| 225.3.1.1    | (S,G) spt | to_C0 |  | 1 |
| 170.0.100.33 | 10.20.1.6 |       |  |   |
| 225.3.1.2    | (S,G) spt | to_C3 |  | 1 |
| 170.0.100.33 | 10.20.1.6 |       |  |   |
| 225.3.1.3    | (S,G) spt | to_C2 |  | 1 |
| 170.0.100.33 | 10.20.1.6 |       |  |   |
| 225.3.1.4    | (S,G) spt | to_C1 |  | 1 |
| 170.0.100.33 | 10.20.1.6 |       |  |   |
| 225.3.1.5    | (S,G) spt | to_C0 |  | 1 |
| 170.0.100.33 | 10.20.1.6 |       |  |   |
| 225.3.1.6    | (S,G) spt | to_C3 |  | 1 |
| 170.0.100.33 | 10.20.1.6 |       |  |   |
| 225.4.1.1    | (S,G) spt | to_C0 |  | 1 |
| 170.0.100.33 | 10.20.1.6 |       |  |   |
| 225.4.1.2    | (S,G) spt | to_C3 |  | 1 |
| 170.0.100.33 | 10.20.1.6 |       |  |   |
| 225.4.1.3    | (S,G) spt | to_C2 |  | 1 |
| 170.0.100.33 | 10.20.1.6 |       |  |   |
| 225.4.1.4    | (S,G) spt | to_C1 |  | 1 |
| 170.0.100.33 | 10.20.1.6 |       |  |   |
| 225.4.1.5    | (S,G) spt | to_C0 |  | 1 |
| 170.0.100.33 | 10.20.1.6 |       |  |   |
| 225.4.1.6    | (S,G) spt | to_C3 |  | 1 |
| 170.0.100.33 | 10.20.1.6 |       |  |   |
| -----        |           |       |  |   |
| Groups : 24  |           |       |  |   |
| =====        |           |       |  |   |

## 5.2.8 PIM Interface on IES Subscriber Group Interfaces

PIM on a subscriber group interface allows for SAP-level replication over an ESM Group interface by establishing PIM adjacency to a downstream router. [Figure 2](#) depicts the model:

**Figure 2 PIM Interface on IES Subscriber Group Interface**



On an IES subscriber-interface, an Ethernet SAP is configured (LAG or physical port). On the SAP, a static-host is configured for connectivity to downstream Layer 3 aggregation devices (including PIM adjacency) while multiple default-hosts can be configured for subscriber traffic. Single SAP with a single static-host per group interface is supported to establish PIM adjacency on a given subscriber group interface. Both IPv4 PIM ASM and SSM are supported.

Feature caveats:

- Only IPv4 PIM is supported with a single static host used to form a PIM interface under a group interface. Using multiple hosts or non-static hosts is not supported. Configuring IPv6-related parameters in **configure>router>pim>interface group-ift** is not blocked, but takes no effect.
- **config>router>pim>apply-to** configuration does not apply to PIM interfaces on IES subscriber group interfaces.
- PIM on group interfaces is not supported in VPRN context.
- Extranet is not supported.
- Locally attached receivers are not supported (no IGMP/MLD and PIM mix in OIF list).
- Default anti-spoofing must be configured (IP+MAC).

- A subscriber profile with pim-policy enabled cannot combine with the following policies (**config>subscr-mgmt>sub-prof**):
  - **[no] host-tracking** — Apply a host tracking policy
  - **[no] igmp-policy** — Apply an IGMP policy
  - **[no] mld-policy** — Apply an MLD policy
  - **[no] nat-policy** — Apply a NAT policy
  - **[no] sub-mcac-policy** — Apply a subscriber MCAC policy (MCAC policy can be used when configured in PIM interface context)
- The feature is supported on IOM3-XP or newer line cards. When enabling the feature on older hardware, joins may be accepted and an outgoing interface may be created for the group, but traffic will not be sent out on egress because no OIF is created in forwarding.

## 5.2.9 Multicast Only Fast Reroute (MoFRR)

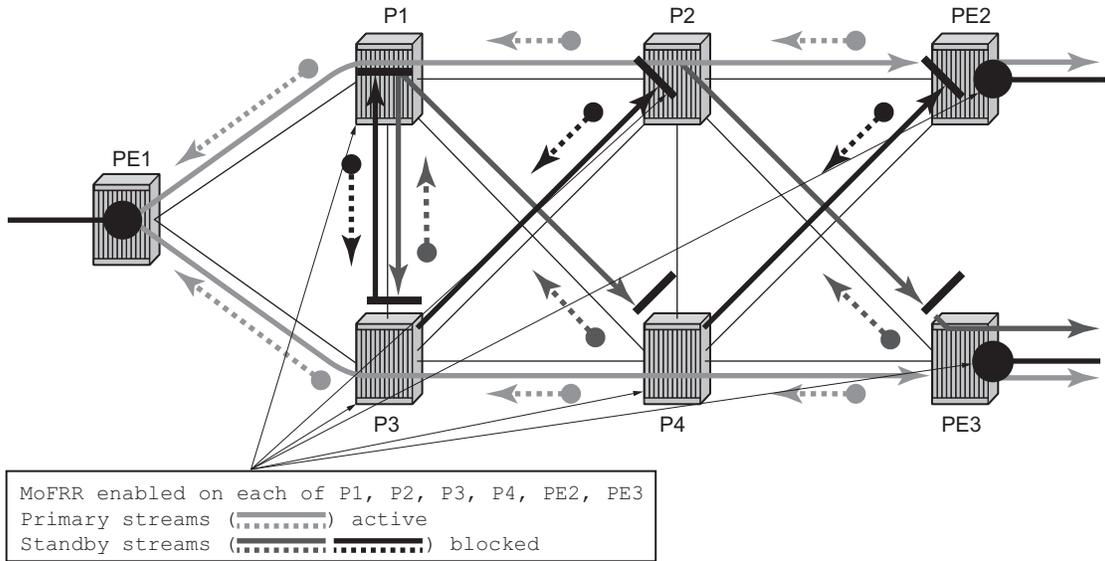
With large scale multicast deployments, a link or nodal failure impacts multiple subscribers or a complete region/segment of receivers. This failure interrupts the receiver client experience. Besides the impact on user experience, though multicast client applications may buffer streams for short period of time, the loss of stream data may trigger unicast request for the missing stream data to the source in certain middleware implementations. Those requests can overload the network resources, if a traffic loss persists for a prolonged period.

To minimize service interruption to end-users and protect the network from sudden surge of unicast requests, SR OS implements a fast failover scheme for native IP networks. SR OS MoFRR implementation is based on <http://tools.ietf.org/html/draft-karan-mofrr-02> and relies on:

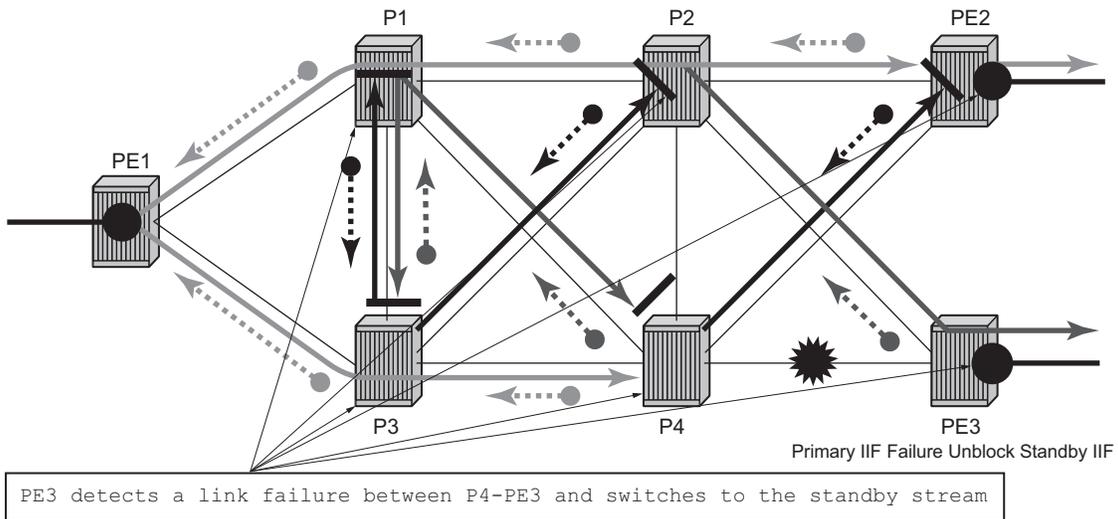
- Sending a JOIN to a primary and a single standby upstream nodes over disjointed paths.
- Fast failover to a standby stream upon detection of a failure.

The functionality relies on failure detection on the primary path to switch to forwarding the traffic from the standby path. The traffic failure can happen with or without physical links or nodes going down. Various mechanisms for link/node failure detections are supported; however, to achieve best performance and resilience, it is recommended to enable MoFRR on every node in the network and use hop-by-hop BFD for fast link failure or data plane failure detection on each upstream link. Without BFD, the PIM adjacency loss or route change could be used to detect traffic failure. [Figure 3](#) and [Figure 4](#) depict MoFRR behavior.

**Figure 3 MoFRR Steady State No Failure**



**Figure 4 MoFRR Switch to Standby Stream on a Link Failure**



The MoFRR functionality on SR OSs supports the following:

- IPv4 link/node failure protection in global routing instance.
- Rosen PIM SSM with MDT SAFI
- Active and a single standby stream JOINS L3 over disjoint ECMP paths
- Active and a single standby stream JOINS over ISIS/OSPF Loop Free Alternative paths.

- When enabled, MoFRR is enabled on all regular PIM interfaces supporting MoFRR for all multicast streams. Tunnel interfaces are ignored.

## 5.2.10 Automatic Discovery of Group-to-RP Mappings (Auto-RP)

Auto-RP is a proprietary group discovery and mapping mechanism for IPv4 PIM that is described in `cisco-ipmulticast/pim-autorp-spec`, *Auto-RP: Automatic discovery of Group-to-RP mappings for IP multicast*. The functionality is similar to the IETF standard bootstrap router (BSR) mechanism that is described in RFC 5059, *Bootstrap Router (BSR) Mechanism for Protocol Independent Multicast (PIM)*, to dynamically learn about the availability of Rendezvous Points (RPs) in a network. When a router is configured as an RP-mapping agent with the `pim>rp>auto-rp-discovery` command, it listens to the CISCO-RP-ANNOUNCE (224.0.1.39) group and caches the announced mappings. The RP-mapping agent then periodically sends out RP-mapping packets to the CISCO-RP-DISCOVERY (224.0.1.40) group. PIM dense-mode (PIM-DM) as described in RFC 3973, *Protocol Independent Multicast - Dense Mode (PIM-DM): Protocol Specification (Revised)*, is used for the auto-RP groups to support multihoming and redundancy. The RP-mapping agent supports announcing, mapping, and discovery functions; candidate RP functionality is not supported.

Auto-RP is supported for IPv4 in multicast VPNs and in the global routing instance. Either BSR or auto-RP for IPv4 can be configured; the two mechanisms cannot be enabled together. BSR for IPv6 and auto-RP for IPv4 can be enabled together. In a multicast VPN, auto-RP cannot be enabled together with sender-only or receiver-only multicast distribution trees (MDTs), or wildcard S-PMSI configurations that could block flooding.

## 5.3 IPv6 PIM models

IPv6 multicast enables multicast applications over native IPv6 networks. There are two service models: Any Source Multicast (ASM) and Source Specific Multicast (SSM) which includes PIM SSM and MLD (see [MLD Overview](#)). SSM does not require source discovery and only supports single source for a specific multicast stream. As a result, SSM is easier to operate in a large scale deployment that uses the one-to-many service model.

---

### 5.3.1 PIM SSM

The IPv6 address family for SSM model is supported. This includes the ability to choose which RTM table to use (unicast RTM, multicast RTM, or both). OSPF3, IS-IS and static-route have extensions to support submission of routes into the IPv6 multicast RTM.

### 5.3.2 PIM ASM

IPv6 PIM ASM is supported. All PIM ASM related functions such as bootstrap router, RP, etc., support both IPv4 and IPv6 address-families. IPv6 specific parameters are configured under **configure>router>pim>rp>ipv6**.

### 5.3.3 Embedded RP

The detailed protocol specification is defined in RFC 3956, *Embedding the Rendezvous Point (RP) Address in an IPv6 Multicast Address*. This RFC describes a multicast address allocation policy in which the address of the RP is encoded in the IPv6 multicast group address, and specifies a PIM-SM group-to-RP mapping to use the encoding, leveraging, and extending unicast-prefix-based addressing. This mechanism not only provides a simple solution for IPv6 inter-domain ASM but can be used as a simple solution for IPv6 intra-domain ASM with scoped multicast addresses as well. It can also be used as an automatic RP discovery mechanism in those deployment scenarios that would have previously used the Bootstrap Router protocol (BSR).

---

## 5.4 Configuring PIM with CLI

This section provides information to configure PIM using the command line interface.

Topics in this section include:

- [PIM Configuration Overview](#)
- [Basic PIM Configuration](#)
- [Configuring PIM Parameters](#)
- [Disabling PIM](#)

### 5.4.1 PIM Configuration Overview

PIM is not enabled by default. When PIM is enabled, data is forwarded to network segments with active receivers that have explicitly requested the multicast group. When enabled, at least one interface must be specified in the PIM context as PIM is an interface function. Creating an interface enables PIM.

### 5.4.2 Basic PIM Configuration

Perform the following basic PIM configuration tasks:

- Enable PIM (required)
- Add interfaces so the protocol establishes adjacencies with the neighboring routers (required)
- Configure a way to calculate group-to-RP mapping (required) by either:
  - Static group-to-RP mapping
  - Enable Candidate RP/Bootstrap mechanism on some routers.
- Enable unicast routing protocols to learn routes towards the RP/source for reverse path forwarding (required)
- Add SSM ranges (optional)
- Enable Candidate BSR (optional)
- Enable Candidate RP (optional)
- Change hello interval (optional)
- Configure route policies (bootstrap-export, bootstrap-import, import join and register)

## 5.4.3 Configuring PIM Parameters

- [Enabling PIM](#)
- [Configuring PIM Interface Parameters](#)
- [Importing PIM Join/Register Policies](#)

### 5.4.3.1 Enabling PIM

When configuring PIM, make sure to enable PIM on all interfaces for the routing instance, otherwise multicast routing errors can occur.

Use the following CLI syntax to enable PIM.

**CLI Syntax:** `config>router# pim`

The following example displays the detailed output when PIM is enabled.

```
A:LAX>>config>router# info detail
...
#-----
echo "PIM Configuration"
#-----
 pim
 no import join-policy
 no import register-policy
 apply-to none
 rp
 no bootstrap-import
 no bootstrap-export
 static
 exit
 bsr-candidate
 shutdown
 priority 0
 hash-mask-len 30
 no address
 exit
 rp-candidate
 shutdown
 no address
 holdtime 150
 priority 192
 exit
 exit
 no shutdown
 exit
#-----
...
A:LAX>>config>system#
```

### 5.4.3.2 Configuring PIM Interface Parameters

The following example displays the command usage to configure PIM interface parameters:

**Example:**

```
A:LAX>config>router# pim
A:LAX>config>router>pim# interface "system"
A:LAX>config>router>pim>if# exit
A:LAX>config>router>pim# interface "lax-vls"
A:LAX>config>router>pim>if# exit
A:LAX>config>router>pim# interface "lax-sjc"
A:LAX>config>router>pim>if# exit
A:LAX>config>router>pim# interface "pl-ix"
A:LAX>config>router>pim>if# exit
A:LAX>config>router>pim# rp
A:LAX>config>router>pim>rp# static
A:LAX>config>router>pim>rp>static# address 2.22.187.237
A:LAX>config>router>.>address# group-prefix
 224.24.24.24/32
A:LAX>config>router>pim>rp>static>address# exit
A:LAX>config>router>pim>rp>static# exit
A:LAX>config>router>pim>rp# exit
A:LAX>config>router>pim#
```

The following example displays the PIM configuration:

```
A:LAX>config>router>pim# info

 interface "system"
 exit
 interface "lax-vls"
 exit
 interface "lax-sjc"
 exit
 interface "pl-ix"
 exit
 rp
 static
 address 2.22.187.237
 group-prefix 224.24.24.24/32
 exit
 address 10.10.10.10
 exit
 exit
 bsr-candidate
 shutdown
 exit
 rp-candidate
 shutdown
 exit
 exit

A:LAX>config>router>pim#
```

```

Example: A:SJC>config>router# pim
 A:SJC>config>router>pim# interface "system"
 A:SJC>config>router>pim>if# exit
 A:SJC>config>router>pim# interface "sjc-lax"
 A:SJC>config>router>pim>if# exit
 A:SJC>config>router>pim# interface "sjc-nyc"
 A:SJC>config>router>pim>if# exit
 A:SJC>config>router>pim# interface "sjc-sfo"
 A:SJC>config>router>pim>if# exit
 A:SJC>config>router>pim# rp
 A:SJC>config>router>pim>rp# static
 A:SJC>config>router>pim>rp>static# address 2.22.187.237
 A:SJC>config>router>pim>rp>static>address# group-prefix
 224.24.24.24/32
 A:SJC>config>router>pim>rp>static>address# exit
 A:SJC>config>router>pim>rp>static# exit
 A:SJC>config>router>pim>rp# exit
 A:SJC>config>router>pim#

```

```

A:SJC>config>router>pim# info

 interface "system"
 exit
 interface "sjc-lax"
 exit
 interface "sjc-nyc"
 exit
 interface "sjc-sfo"
 exit
 rp
 static
 address 2.22.187.237
 group-prefix 224.24.24.24/32
 exit
 exit
 bsr-candidate
 shutdown
 exit
 rp-candidate
 shutdown
 exit
 exit

A:SJC>config>router>pim#

```

```

Example: A:MV>config>router# pim
 A:MV>config>router>pim# interface "system"
 A:MV>config>router>pim>if# exit
 A:MV>config>router>pim# interface "mv-sfo"
 A:MV>config>router>pim>if# exit
 A:MV>config>router>pim# interface "mv-v1c"
 A:MV>config>router>pim>if# exit
 A:MV>config>router>pim# interface "p3-ix"

```

```
A:MV>config>router>pim>if# exit
A:MV>config>router>pim# rp
A:MV>config>router>pim>rp# static
A:MV>config>router>pim>rp>static# address 2.22.187.237
A:MV>config>router>pim>rp>static>address# group-prefix
 224.24.24.24/32
A:MV>config>router>pim>rp>static>address# exit
A:MV>config>router>pim>rp>static#
A:MV>config>router>pim>rp# exit
A:MV>config>router>pim#
```

```
A:MV>config>router>pim# info

interface "system"
exit
interface "mv-sfo"
exit
interface "mv-vlc"
exit
interface "p3-ix"
exit
rp
 static
 address 2.22.187.237
 group-prefix 224.24.24.24/32
 exit
exit
bsr-candidate
 address 2.22.187.236
 no shutdown
exit
rp-candidate
 address 2.22.187.236
 no shutdown
exit
exit

A:MV>config>router>pim#
```

**Example:**

```
A:SFO>config>router# pim
A:SFO>config>router>pim# interface "system"
A:SFO>config>router>pim>if# exit
A:SFO>config>router>pim# interface "sfo-sfc"
A:SFO>config>router>pim>if# exit
A:SFO>config>router>pim# interface "sfo-was"
A:SFO>config>router>pim>if# exit
A:SFO>config>router>pim# interface "sfo-mv"
A:SFO>config>router>pim>if# exit
A:SFO>config>router>pim# rp
A:SFO>config>router>pim>rp# static
A:SFO>config>router>pim>rp>static# address 2.22.187.237
A:SFO>config>router>pim>rp>static>address# group-prefix
 224.24.24.24/32
```

```
A:SFO>config>router>pim>rp>static>address# exit
A:SFO>config>router>pim>rp>static# exit
A:SFO>config>router>pim>rp # exit
A:SFO>config>router>pim#
```

```
A:SFO>config>router>pim# info
```

```

interface "system"
exit
interface "sfo-sjc"
exit
interface "sfo-was"
exit
interface "sfo-mv"
exit
rp
 static
 address 2.22.187.237
 group-prefix 224.24.24.24/32
 exit
exit
 bsr-candidate
 address 2.22.187.239
 no shutdown
 exit
 rp-candidate
 address 2.22.187.239
 no shutdown
 exit
exit
```

```

A:SFO>config>router>pim#
```

**Example:**

```
A:WAS>config>router# pim
A:WAS>config>router>pim# interface "system"
A:WAS>config>router>pim>if# exit
A:WAS>config>router>pim# interface "was-sfo"
A:WAS>config>router>pim>if# exit
A:WAS>config>router>pim# interface "was-vlc"
A:WAS>config>router>pim>if# exit
A:WAS>config>router>pim# interface "p4-ix"
A:WAS>config>router>pim>if# exit
A:WAS>config>router>pim# rp
A:WAS>config>router>pim>rp# static
A:WAS>config>router>pim>rp>static# address 2.22.187.237
A:WAS>config>router>pim>rp>static>address# group-prefix
 224.24.24.24/32
A:WAS>config>router>pim>rp>static>address# exit
A:WAS>config>router>pim>rp>static# exit
A:WAS>config>router>pim>rp# bsr-candidate
A:WAS>config>router>pim>rp>bsr-cand# address
 2.22.187.240
A:WAS>config>router>pim>rp>bsr-cand# no shutdown
```

```

A:WAS>config>router>pim>rp>bsr-cand# exit
A:WAS>config>router>pim>rp# exit
A:WAS>config>router>pim#

A:WAS>config>router>pim# info

interface "system"
exit
interface "was-sfo"
exit
interface "was-vlc"
exit
interface "p4-ix"
exit
rp
static
address 2.22.187.237
group-prefix 224.24.24.24/32
exit
exit
bsr-candidate
address 2.22.187.240
no shutdown
exit
rp-candidate
address 2.22.187.240
no shutdown
exit
exit

A:WAS>config>router>pim#

```

### 5.4.3.3 Importing PIM Join/Register Policies

The import command provides a mechanism to control the (\*,G) and (S,G) state that gets created on a router. Import policies are defined in the **config>router>policy-options** context.



**Note:** In the import policy, if an action is not specified in the entry then the default-action takes precedence. If no entry matches then the default-action also takes precedence. If no default-action is specified, then the default default-action is executed.

Use the following commands to configure PIM parameters:

**CLI Syntax:**

```

config>router# pim
import {join-policy|register-policy} [policy-name
[.. policy-name]

```

The following example displays the command usage to apply the policy statement which does not allow join messages for group 229.50.50.208/32 and source 192.168.0.0/16 but allows join messages for 192.168.0.0/16, 229.50.50.208 (refer to the Configuring Route Policy Components section of the Unicast Routing Protocols guide).

**Example:**

```
config>router# pim
config>router>pim# import join-policy "foo"
config>router>pim# no shutdown
```

The following example displays the PIM configuration:

```
A:LAX>config>router>pim# info

import join-policy "foo"
interface "system"
exit
interface "lax-vls"
exit
interface "lax-sjc"
exit
interface "pl-ix"
exit
rp
 static
 address 2.22.187.237
 group-prefix 224.24.24.24/3
 exit
 address 10.10.10.10
 exit
 exit
 bsr-candidate
 shutdown
 exit
 rp-candidate
 shutdown
 exit
exit

A:LAX>config>router>pim#
```

## 5.4.4 Disabling PIM

Use the following CLI syntax to disable PIM.

**CLI Syntax:**

```
config>router#
 pim
 shutdown
```

The following example displays the command usage to disable multicast:

```
Example: config>router# pim
 config>router>pim# shutdown
 config>router>pim# exit
```

The following example displays the configuration output:

```
A:LAX>config>router# info

...
#-----
echo "PIM Configuration"
#-----
 pim
 shutdown
 import join-policy "foo"
 interface "system"
 exit
 interface "lax-sjc"
 exit
 interface "lax-vls"
 exit
 interface "pl-ix"
 exit
 rp
 static
 address 2.22.187.237
 group-prefix 224.24.24.24/32
 exit
 address 10.10.10.10
 exit
 exit
 bsr-candidate
 shutdown
 exit
 rp-candidate
 shutdown
 exit
 exit
 exit
#-----
....

A:LAX>config>router#
```



## 5.5 PIM Configuration Command Reference

### 5.5.1 Command Hierarchies

- [Configuration Commands](#)

#### 5.5.1.1 Configuration Commands

```

config
 — router
 — [no] pim
 — apply-to {ies | non-ies | all | none}
 — [no] enable-mdt-spt
 — import {join-policy | register-policy} policy-name [.. policy-name]
 — no import {join-policy | register-policy}
 — [no] interface ip-int-name
 — assert-period assert-period
 — no assert-period
 — [no] bfd-enable [ipv4 | ipv6]
 — [no] bsm-check-rtr-alert
 — hello-interval hello-interval
 — no hello-interval
 — hello-multiplier deci-units
 — no hello-multiplier
 — [no] improved-assert
 — [no] instant-prune-echo
 — [no] ipv4-multicast-disable
 — [no] ipv6-multicast-disable
 — max-groups value
 — no max-groups
 — multicast-senders {auto | always | never}
 — no multicast-senders
 — [no] p2mp-ldp-tree-join [ipv4] [ipv6]
 — priority dr-priority
 — no priority
 — [no] shutdown
 — sticky-dr [priority dr-priority]
 — no sticky-dr
 — three-way-hello [compatibility-mode]
 — no three-way-hello
 — [no] tracking-support
 — [no] ipv4-multicast-disable
 — ipv6-multicast-disable
 — [no] lag-usage-optimization
 — [no] mc-ecmp-balance
 — mc-ecmp-balance-hold minutes

```

- **no mc-ecmp-balance-hold**
- **[no] mc-ecmp-hashing-enabled [rebalance]**
- **[no] multicast-fast-failover**
- **[no] non-dr-attract-traffic**
- **rp**
  - **[no] anycast** *rp-ip-address*
    - **[no] rp-set-peer** *ip-address*
  - **[no] auto-rp-discovery**
  - **bootstrap-export** *policy-name* [*.. policy-name*]
  - **no bootstrap-export**
  - **bootstrap-import** *policy-name* [*.. policy-name*]
  - **no bootstrap-import**
  - **bsr-candidate**
    - **address** *ipv4-address*
    - **no address**
    - **hash-mask-len** *hash-mask-length*
    - **no hash-mask-len**
    - **priority** *bootstrap-priority*
    - **no priority**
    - **[no] shutdown**
- **ipv6**
  - **[no] anycast** *rp-ip-address*
    - **[no] rp-set-peer** *ip-address*
  - **bsr-candidate**
    - **address** *ipv6-address*
    - **no address**
    - **hash-mask-len** *hash-mask-length*
    - **no hash-mask-len**
    - **priority** *bootstrap-priority*
    - **no priority**
    - **[no] shutdown**
  - **[no] embedded-rp**
    - **[no] group-range** *ipv6-address/prefix-length*
    - **[no] shutdown**
  - **rp-candidate**
    - **address** *ip-address*
    - **no address**
    - **[no] group-range** {*grp-ip-address/mask* | *grp-ip-address netmask*}
    - **holdtime** *holdtime*
    - **no holdtime**
    - **priority** *priority*
    - **no priority**
    - **[no] shutdown**
  - **static**
    - **[no] address** *ipv6-address*
      - **[no] group-prefix** *grp-ipv6-address/prefix-length*
      - **[no] override**
- **rp-candidate**
  - **address** *ip-address*
  - **no address**
  - **[no] group-range** {*grp-ip-address/mask* | *grp-ip-address netmask*}
  - **holdtime** *holdtime*

- **no holdtime**
- **priority** *priority*
- **no priority**
- **[no] shutdown**
- **static**
  - **[no] address** *ip-address*
    - **[no] group-prefix** {*grp-ip-address/mask* | *grp-ip-address netmask*}
    - **[no] override**
- **rpf-table** {*rtable-m* | *r table-u* | **both**}
- **no rpf-table**
- **rpf6-table** {*rtable6-m* | *rtable6-u* | **both**}
- **no rpf6-table**
- **rpfv core**
- **rpfv mvpn**
- **rpfv core mvpn**
- **no rpfv** [*core*] [*mvpn*]
- **[no] shutdown**
- **spt-switchover-threshold** {*grp-ipv4-prefix/ipv4-prefix-length* | *grp-ipv4-prefix netmask* | *grp-ipv6-prefix/ipv6-prefix-length*} *spt-threshold*
- **no spt-switchover-threshold** {*grp-ipv4-prefix/ipv4-prefix-length* | *grp-ipv4-prefix netmask* | *grp-ipv6-prefix/ipv6-prefix-length*}
- **[no] ssm-groups**
  - **[no] group-range** {*ip-prefix/mask* | *ip-prefix netmask*}
- **[no] tunnel-interface** *rsvp-p2mp lsp-name* [**sender** *ip-address*]

## 5.5.2 Command Descriptions

### 5.5.2.1 Router PIM Commands

pim

|                    |                                                                                                                                                                                                                                                                                                            |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] pim</b>                                                                                                                                                                                                                                                                                            |
| <b>Context</b>     | config>router                                                                                                                                                                                                                                                                                              |
| <b>Description</b> | <p>This command configures a Protocol Independent Multicast (PIM) instance.</p> <p>PIM is used for multicast routing within the network. Devices in the network can receive the multicast feed requested and non-participating routers can be pruned. The router OS supports PIM sparse mode (PIM-SM).</p> |
| <b>Default</b>     | not enabled                                                                                                                                                                                                                                                                                                |

---

## interface

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] interface</b> <i>ip-int-name</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Context</b>     | config>router>pim                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Description</b> | <p>This command creates a PIM interface.</p> <p>Interface names are case-sensitive and must be unique within the group of defined IP interfaces defined for <b>config router interface</b>, <b>config service ies interface</b>, and <b>config service ies subscriber-interface group-interface</b>. Interface names must not be in the dotted decimal notation of an IP address. For example, the name “1.1.1.1” is not allowed, but “int-1.1.1.1” is allowed. Show commands for router interfaces use either the interface names or the IP addresses. Ambiguity can exist if an IP address is used as an IP address and an interface name. Duplicate interface names can exist in different router instances, although this is not recommended because it may be confusing.</p> <p>The <b>no</b> form of the command removes the IP interface and all the associated configurations.</p> |
| <b>Default</b>     | No interfaces or names are defined within PIM.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Parameters</b>  | <p><i>ip-int-name</i> — The name of the IP interface. Interface names must be unique within the group of defined IP interfaces for <b>config router interface</b>, <b>config service ies interface</b>, and <b>config service ies subscriber-interface group-interface</b> commands. An interface name cannot be in the form of an IP address. If the string contains special characters (#, \$, spaces, etc.), the entire string must be enclosed within double quotes.</p> <p><b>Values</b> 1 to 32 alphanumeric characters.</p> <p>If the <i>ip-int-name</i> already exists, the context is changed to maintain that IP interface. If <i>ip-int-name</i> does not exist, the interface is created and the context is changed to that interface for further command processing.</p>                                                                                                      |

## apply-to

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>apply-to</b> {ies   non-ies   all   none}                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Context</b>     | config>router>pim                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Description</b> | <p>This command creates a PIM interface with default parameters.</p> <p>If a manually created or modified interface is deleted, the interface will be recreated when (re)processing the <b>apply-to</b> command and if PIM is not required on a specific interface a shutdown should be executed.</p> <p>The <b>apply-to</b> command is first saved in the PIM configuration structure. Then, all subsequent commands either create new structures or modify the defaults as created by the apply-to command.</p> |
| <b>Default</b>     | none (keyword)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |

- Parameters**
- ies** — Creates all IES interfaces in PIM.
  - non-ies** — Non-IES interfaces are created in PIM.
  - all** — All IES and non-IES interfaces are created in PIM.
  - none** — Removes all interfaces that are not manually created or modified. It also removes explicit no interface commands if present.

## assert-period

- Syntax** **assert-period** *assert-period*  
**no assert-period**
- Context** config>router>pim>interface
- Description** This command configures the period for periodic refreshes of PIM Assert messages on an interface.
- The **no** form of the command removes the assert-period from the configuration.
- Default** no assert-period
- Parameters** *assert-period* — Specifies the period for periodic refreshes of PIM Assert messages on an interface.
- Values** 1 to 300 seconds

## bfd-enable

- Syntax** [**no**] **bfd-enable** [**ipv4** | **ipv6**]
- Context** config>router>pim>interface
- Description** This command enables the use of IPv4 or IPv6 bi-directional forwarding (BFD) to control the state of the associated protocol interface. By enabling BFD on a given protocol interface, the state of the protocol interface is tied to the state of the BFD session between the local node and the remote node. The parameters used for the BFD are set via the BFD command under the IP interface.
- The **no** form of this command removes BFD from the associated IGP protocol adjacency.
- Default** no bfd-enable
- Parameters** **ipv4** — Enables the use of IPv4 bi-directional forwarding (BFD)  
**ipv6** — Enables the use of IPv6 bi-directional forwarding (BFD)

---

## enable-mdt-spt

|                    |                                                                                                                                                                                                                                                                               |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] enable-mdt-spt</b>                                                                                                                                                                                                                                                    |
| <b>Context</b>     | config>router>pim                                                                                                                                                                                                                                                             |
| <b>Description</b> | This command is used to enable SPT switchover for default MDT. On enable, PIM instance resets all MDTs and reinitiate setup.<br><br>The <b>no</b> form of the command disables SPT switchover for default MDT. On disable, PIM instance resets all MDTs and reinitiate setup. |
| <b>Default</b>     | <b>no enable-mdt-spt</b>                                                                                                                                                                                                                                                      |

## import

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>import {join-policy   register-policy} [policy-name [.. policy-name]]</b><br><b>no import {join-policy   register-policy}</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Context</b>     | config>router>pim                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Description</b> | This command specifies the import route policy to be used. Route policies are configured in the <b>config&gt;router&gt;policy-options</b> context.<br><br>When an import policy is not specified, BGP routes are accepted by default. Up to five import policy names can be specified.<br><br>The <b>no</b> form of the command removes the policy association from the instance.                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Default</b>     | <b>no import</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Parameters</b>  | <b>join-policy</b> — Use this command to filter PIM join messages which prevents unwanted multicast streams from traversing the network.<br><br><b>register-policy</b> — This keyword filters register messages. PIM register filters prevent register messages from being processed by the RP. This filter can only be defined on an RP. When a match is found, the RP immediately sends back a register-stop message.<br><br><i>policy-name</i> — The route policy name. Allowed values are any string up to 32 characters long composed of printable, 7-bit ASCII characters. If the string contains special characters (#, \$, spaces, etc.), the entire string must be enclosed within double quotes. Route policies are configured in the <b>config&gt;router&gt;policy-options</b> context. |

## ipv4-multicast-disable

|                |                                    |
|----------------|------------------------------------|
| <b>Syntax</b>  | <b>[no] ipv4-multicast-disable</b> |
| <b>Context</b> | config>router>pim                  |

config>router>pim>interface

**Description** This command administratively disables/enables PIM operation for IPv4.

IPv4 multicast must be enabled to enable MLDP in-band signaling for IPv4 PIM joins; see [p2mp-ldp-tree-join](#).

**Default** no ipv4-multicast-disable

## lag-usage-optimization

**Syntax** [no] lag-usage-optimization

**Context** config>router>pim

**Description** This command specifies whether the router should optimize usage of the LAG such that traffic for a given multicast stream destined to an IP interface using the LAG is sent only to the forwarding complex that owns the LAG link on which it will actually be forwarded.

Changing the value causes the PIM protocol to be restarted.

If this optimization is disabled, the traffic will be sent to all forwarding complexes that own at least one link in the LAG.



**Note:** Changes made for multicast hashing cause Layer 4 multicast traffic to not be hashed. This is independent of if **lag-usage-optimization** is enabled or disabled.

Using this command and the **mc-ecmp-hashing-enabled** command on mixed port speed LAGs is not recommended, because some groups may be forwarded incorrectly.

**Default** no lag-usage-optimization

## mc-ecmp-balance

**Syntax** [no] mc-ecmp-balance

**Context** config>router>pim

**Description** This command enables multicast balancing of traffic over ECMP links based on the number of (S, G) distributed over each link. When enabled, each new multicast stream that needs to be forwarded over an ECMP link is compared to the count of (S, G) already using each link, so that the link with the fewest (S, G) is chosen.

This command cannot be used together with the **mc-ecmp-hashing-enabled** command.

The **no** form of the command disables multicast ECMP balancing.

---

## mc-ecmp-balance-hold

|                    |                                                                                                                        |
|--------------------|------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>mc-ecmp-balance-hold</b> <i>minutes</i><br><b>no mc-ecmp-balance-hold</b>                                           |
| <b>Context</b>     | config>router>pim                                                                                                      |
| <b>Description</b> | This command configures the hold time for multicast balancing over ECMP links.                                         |
| <b>Parameters</b>  | <i>minutes</i> — Specifies the hold time, in minutes, that applies after an interface has been added to the ECMP link. |

## mc-ecmp-hashing-enabled

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] mc-ecmp-hashing-enabled [rebalance]</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Context</b>     | config>router>pim                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Description</b> | <p>This command enables hash-based multicast balancing of traffic over ECMP links and causes PIM joins to be distributed over the multiple ECMP paths based on a hash of S and G (and possibly next-hop IP address). When a link in the ECMP set is removed, the multicast flows that were using that link are redistributed over the remaining ECMP links using the same hash algorithm. When a link is added to the ECMP set new joins may be allocated to the new link based on the hash algorithm, but existing multicast flows using the other ECMP links stay on those links until they are pruned.</p> <p>Hash-based multicast balancing is supported for both IPv4 and IPv6.</p> <p>This command cannot be used together with the <b>mc-ecmp-balance</b> command. Using this command and the <b>lag-usage-optimization</b> command on mixed port speed LAGs is not recommended, because some groups may be forwarded incorrectly.</p> <p>The <b>no</b> form of the command disables the hash-based multicast balancing of traffic over ECMP links.</p> |
| <b>Default</b>     | no mc-ecmp-hashing-enabled                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Parameters</b>  | <b>rebalance</b> — Specifies to rebalance flows to newly added links immediately, instead of waiting until they are pruned.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |

## multicast-fast-failover

|                    |                                                                                                                                                           |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] multicast-fast-failover</b>                                                                                                                       |
| <b>Context</b>     | config>router>pim                                                                                                                                         |
| <b>Description</b> | This command configures the option to enable multicast only fast failover functionality for IPv4 PIM SSM interfaces in the global routing table instance. |

---

The **no** version of this command disables MoFRR for PIM interfaces.

**Default** no multicast-fast-failover

## ipv6-multicast-disable

**Syntax** **ipv6-multicast-disable**

**Context** config>router>pim  
config>router>pim>interface

**Description** This command administratively disables/enables PIM operation for IPv6.

IPv6 multicast must be enabled to enable MLDP in-band signaling for IPv6 PIM joins; see [p2mp-ldp-tree-join](#).

**Default** ipv6-multicast-disable

## bsm-check-rtr-alert

**Syntax** [**no**] **bsm-check-rtr-alert**

**Context** config>router>pim>interface

**Description** This command enables the checking of the router alert option in the bootstrap messages received on this interface.

**Default** no bsm-check-rtr-alert

## hello-interval

**Syntax** **hello-interval** *hello-interval*  
**no hello-interval**

**Context** config>router>pim>interface

**Description** This command configures the frequency at which PIM Hello messages are transmitted on this interface.

The **no** form of this command reverts to the default value of the hello-interval.

**Default** 30

**Parameters** *hello-interval* — Specifies the hello interval in seconds. A 0 (zero) value disables the sending of hello messages (the PIM neighbor will never timeout the adjacency).

**Values** 0 to 255 seconds

## hello-multiplier

|                    |                                                                                                                                                                                                                                                                                |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>hello-multiplier</b> <i>deci-units</i><br><b>no hello-multiplier</b>                                                                                                                                                                                                        |
| <b>Context</b>     | config>router>pim>interface                                                                                                                                                                                                                                                    |
| <b>Description</b> | This command configures the multiplier to determine the holdtime for a PIM neighbor on this interface.<br><br>The <b>hello-multiplier</b> in conjunction with the <b>hello-interval</b> determines the holdtime for a PIM neighbor.                                            |
| <b>Parameters</b>  | <i>deci-units</i> — Specify the value, specified in multiples of 0.1, for the formula used to calculate the hello-holdtime based on the hello-multiplier:<br>(hello-interval * hello-multiplier) / 10<br>This allows the PIMv2 default timeout of 3.5 seconds to be supported. |
| <b>Values</b>      | 20 to 100                                                                                                                                                                                                                                                                      |
| <b>Default</b>     | 35                                                                                                                                                                                                                                                                             |

## improved-assert

|                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                                                                       | <b>[no] improved-assert</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Context</b>                                                                      | config>router>pim>interface                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Description</b>                                                                  | The PIM assert process establishes a forwarder for a LAN and requires interaction between the control and forwarding planes. The assert process is started when data is received on an outgoing interface meaning that duplicate traffic is forwarded to the LAN until the forwarder is negotiated among the routers.<br><br>When the <b>improved-assert</b> command is enabled, the PIM assert process is done entirely in the control plane. The advantages are that it eliminates duplicate traffic forwarding to the LAN. It also improves performance since it removes the required interaction between the control and data planes. |
|  | <b>Note:</b> improved-assert is still fully interoperable with the RFC 4601, <i>Protocol Independent Multicast - Sparse Mode (PIM-SM): Protocol Specification (Revised)</i> and RFC 2362, <i>Protocol Independent Multicast-Sparse Mode (PIM-SM)</i> , implementations. However, there may be conformance tests that may fail if the tests expect control-data plane interaction in determining the assert winner. Disabling the <b>improved-assert</b> command when performing conformance tests is recommended.                                                                                                                         |
| <b>Default</b>                                                                      | enabled                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |

---

## instant-prune-echo

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] instant-prune-echo</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Context</b>     | config>router>pim>interface                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Description</b> | <p>This command enables PIM to send an instant prune echo when the router starts the prune pending timer for a group on the interface. All downstream routers will see the prune message immediately, and can send a join override if they are interested in receiving the group. Configuring instant-prune-echo is recommended on broadcast interfaces with more than one PIM neighbor to optimize multicast convergence.</p> <p>The <b>no</b> form of the command disables instant Prune Echo on the PIM interface.</p> |
| <b>Default</b>     | no instant-prune-echo                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |

## max-groups

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                      |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>max-groups [1..16000]</b><br><b>no max-groups</b>                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Context</b>     | config>router>pim>interface                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Description</b> | <p>This command specifies the maximum number of groups for which PIM can have local receiver information based on received PIM reports on this interface. When this configuration is changed dynamically to a value lower than the currently accepted number of groups, the groups that are already accepted are not deleted. Only new groups will not be allowed. This command is applicable for IPv4 and IPv6.</p> |
| <b>Default</b>     | 0, no limit to the number of groups.                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Parameters</b>  | <i>value</i> — Specifies the maximum number of groups for this interface.                                                                                                                                                                                                                                                                                                                                            |
| <b>Values</b>      | 1 to 16000                                                                                                                                                                                                                                                                                                                                                                                                           |

## multicast-senders

|                    |                                                                                                                                                                                                                                                                                                                                                                           |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>multicast-senders {auto   always   never}</b><br><b>no multicast-senders</b>                                                                                                                                                                                                                                                                                           |
| <b>Context</b>     | config>router>pim>interface                                                                                                                                                                                                                                                                                                                                               |
| <b>Description</b> | <p>This command configures how traffic from directly-attached multicast sources should be treated on broadcast interfaces. It can also be used to treat all traffic received on an interface as traffic coming from a directly-attached multicast source. This is particularly useful if a multicast source is connected to a point-to-point or unnumbered interface.</p> |
| <b>Default</b>     | auto                                                                                                                                                                                                                                                                                                                                                                      |

- Parameters**
- auto** — Specifies that, on broadcast interfaces, the forwarding plane performs subnet-match check on multicast packets received on the interface to determine if the packet is from a directly-attached source. On unnumbered/point-to-point interfaces, all traffic is implicitly treated as coming from a remote source.
  - always** — Treats all traffic received on the interface as coming from a directly-attached multicast source.
  - never** — Specifies that, on broadcast interfaces, traffic from directly-attached multicast sources will not be forwarded; however, traffic from a remote source will still be forwarded if there is a multicast state for it. On unnumbered/point-to-point interfaces, it means that all traffic received on that interface must not be forwarded.

## p2mp-ldp-tree-join

- Syntax** `[no] p2mp-ldp-tree-join [ipv4] [ipv6]`
- Context** `config>router>pim>interface`
- Description** This command configures the option to join the P2MP LDP tree towards the multicast source. If **p2mp-ldp-tree-join** is enabled, a PIM multicast join received on an interface is processed to join the P2MP LDP LSP, using the in-band signaled P2MP tree for the same multicast flow. LDP P2MP tree is set up towards the multicast source. The route to the multicast node source is looked up from the RTM. The next-hop address for the route to source is set as the root of LDP P2MP tree.
- The **no** form of the command disables joining the P2MP LDP tree for IPv4 or IPv6 or for both (if both or none is specified).
- Default** `no p2mp-ldp-tree-join`
- Parameters**
- ipv4* — Enables dynamic MLDP in-band signaling for IPv4 PIM joins. IPv4 multicast must be enabled; see [ipv4-multicast-disable](#). For backward compatibility **p2mp-ldp-tree-join** is equivalent to **p2mp-ldp-tree-join ipv4**.
  - ipv6* — Enables dynamic MLDP in-band signaling for IPv6 PIM joins. IPv6 multicast must be enabled; see [ipv6-multicast-disable](#).

## priority

- Syntax** `priority dr-priority`  
`no priority`
- Context** `config>router>pim>interface`
- Description** This command sets the priority value to elect the designated router (DR). The DR election priority is a 32-bit unsigned number and the numerically larger priority is always preferred.
- The **no** form of the command restores the default values.

|                   |                                                                                                                          |
|-------------------|--------------------------------------------------------------------------------------------------------------------------|
| <b>Default</b>    | 1                                                                                                                        |
| <b>Parameters</b> | <i>priority</i> — Specifies the priority to become the designated router. The higher the value, the higher the priority. |
| <b>Values</b>     | 1 to 4294967295                                                                                                          |

## priority

|                    |                                                                                                                                                                                                                                                                                                |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>priority</b> <i>bootstrap-priority</i><br><b>no priority</b>                                                                                                                                                                                                                                |
| <b>Context</b>     | config>router>pim>rp>bsr-candidate<br>config>router>pim>rp>ipv6>bsr-candidate                                                                                                                                                                                                                  |
| <b>Description</b> | This command configures the bootstrap priority of the router. The RP is sometimes called the bootstrap router. The priority determines if the router is eligible to be a bootstrap router. In the case of a tie, the router with the highest IP address is elected to be the bootstrap router. |
| <b>Default</b>     | 0                                                                                                                                                                                                                                                                                              |
| <b>Parameters</b>  | <i>bootstrap-priority</i> — Specifies the priority to become the bootstrap router. The higher the value, the higher the priority. A 0 value the router is not eligible to be the bootstrap router. A value of 1 means router is the least likely to become the designated router.              |
| <b>Values</b>      | 0 to 255                                                                                                                                                                                                                                                                                       |

## priority

|                    |                                                                                                                                           |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>priority</b> <i>priority</i><br><b>no priority</b>                                                                                     |
| <b>Context</b>     | config>router>pim>rp>rp-candidate<br>config>router>pim>rp>ipv6>rp-candidate                                                               |
| <b>Description</b> | This command configures the Candidate-RP priority for becoming a rendezvous point (RP). This value is used to elect RP for a group range. |
| <b>Default</b>     | 192                                                                                                                                       |
| <b>Parameters</b>  | <i>priority</i> — Specifies the priority to become a rendezvous point (RP). A value of 0 is considered as the highest priority.           |
| <b>Values</b>      | 0 to 255                                                                                                                                  |

## sticky-dr

|               |                                                         |
|---------------|---------------------------------------------------------|
| <b>Syntax</b> | <b>sticky-dr</b> [ <b>priority</b> <i>dr-priority</i> ] |
|---------------|---------------------------------------------------------|

**no sticky-dr**

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Context</b>     | config>router>pim>interface                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Description</b> | <p>This command enables sticky-dr operation on this interface. When enabled, the priority in PIM hellos sent on this interface when elected as the designated router (DR) will be modified to the value configured in <i>dr-priority</i>. This is done to avoid the delays in forwarding caused by DR recovery, when switching back to the old DR on a LAN when it comes back up.</p> <p>By enabling <b>sticky-dr</b> on this interface, it will continue to act as the DR for the LAN even after the old DR comes back up.</p> <p>The <b>no</b> form of the command disables sticky-dr operation on this interface.</p> |
| <b>Default</b>     | disabled                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Parameters</b>  | <p><b>priority</b> <i>dr-priority</i> — Sets the DR priority to be sent in PIM Hello messages following the election of that interface as the DR, when sticky-dr operation is enabled.</p> <p><b>Values</b> 1 to 4294967295</p>                                                                                                                                                                                                                                                                                                                                                                                          |

## three-way-hello

|                    |                                                                                                                                                                                                                                            |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>three-way-hello [compatibility-mode]</b><br><b>no three-way-hello</b>                                                                                                                                                                   |
| <b>Context</b>     | config>router>pim>interface                                                                                                                                                                                                                |
| <b>Description</b> | This command configures the compatibility mode to enable three-way hello. By default, the value is disabled on all interface which specifies that the standard two-way hello is supported. When enabled, the three way hello is supported. |
| <b>Default</b>     | no three-way-hello                                                                                                                                                                                                                         |

## tracking-support

|                    |                                                                                                                                                                                                                                                 |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] tracking-support</b>                                                                                                                                                                                                                    |
| <b>Context</b>     | config>router>pim>interface                                                                                                                                                                                                                     |
| <b>Description</b> | This command sets the the T bit in the LAN Prune Delay option of the Hello Message. This indicates the router's capability to enable join message suppression. This capability allows for upstream routers to explicitly track join membership. |
| <b>Default</b>     | no tracking-support                                                                                                                                                                                                                             |

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## rp

|                    |                                                                                                                                                                                                                                                                                                                                                                                   |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>rp</b>                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Context</b>     | config>router>pim                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Description</b> | <p>This command enables the context to configure rendezvous point (RP) parameters. The address of the root of the group's shared multicast distribution tree is known as its RP. Packets received from a source upstream and join messages from downstream routers rendezvous at this router.</p> <p>If this command is not enabled, then the router can never become the RP.</p> |

## ipv6

|                    |                                                                |
|--------------------|----------------------------------------------------------------|
| <b>Syntax</b>      | <b>ipv6</b>                                                    |
| <b>Context</b>     | config>router>pim>rp                                           |
| <b>Description</b> | This command enables the context to configure IPv6 parameters. |

## anycast

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] anycast</b> <i>rp-ip-address</i>                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Context</b>     | config>router>pim>rp<br>config>router>pim>rp>ipv6                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Description</b> | <p>This command configures a PIM anycast protocol instance for the RP being configured. Anycast enables fast convergence when a PIM RP router fails by allowing receivers and sources to rendezvous at the closest RP.</p> <p>The <b>no</b> form of the command removes the anycast instance from the configuration.</p>                                                                                                                                            |
| <b>Default</b>     | none                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Parameters</b>  | <p><i>rp-ip-address</i> — Configure the loopback IP address shared by all routes that form the RP set for this anycast instance. Only a single address can be configured. If another anycast command is entered with an address then the old address will be replaced with the new address. If no ip-address is entered then the command is simply used to enter the anycast CLI level.</p> <p><b>Values</b> Any valid loopback address configured on the node.</p> |

## auto-rp-discovery

|               |                               |
|---------------|-------------------------------|
| <b>Syntax</b> | <b>[no] auto-rp-discovery</b> |
|---------------|-------------------------------|

**Context** config>router>pim>rp

**Description** This command enables auto-RP protocol in discovery mode. In discovery mode, RP-mapping and RP-candidate messages are received and forwarded to downstream nodes. RP-mapping messages are received locally to learn about availability of RP nodes present in the network.

Either **bsr-candidate** for IPv4 or **auto-rp-discovery** can be configured; the two mechanisms cannot be enabled together. **bsr-candidate** for IPv6 and **auto-rp-discovery** for IPv4 can be enabled together.

The **no** form of the command disables auto-RP.

**Default** no auto-rp-discovery

## rp-set-peer

**Syntax** [**no**] **rp-set-peer** *ip-address*

**Context** config>router>pim>rp>anycast  
config>router>pim>rp>ipv6>anycast

**Description** This command configures a peer in the anycast RP-set. The address identifies the address used by the other node as the RP candidate address for the same multicast group address range as configured on this node.

This is a manual procedure. Caution should be taken to produce a consistent configuration of an RP-set for a given multicast group address range. The priority should be identical on each node and be a higher value than any other configured RP candidate that is not a member of this RP-set.

Although there is no set maximum number of addresses that can be configured in an RP-set, up to 15 IP addresses is recommended.

The **no** form of the command removes an entry from the list.

**Default** None

**Parameters** *ip-address* — Specifies a peer in the anycast RP-set.

**Values** Any valid ip-address within the scope outlined above.

## bsr-candidate

**Syntax** **bsr-candidate**

**Context** config>router>pim>rp  
config>router>pim>rp>ipv6

- Description** This command enables the context to configure Candidate Bootstrap (BSR) parameters.
- Either **bsr-candidate** for IPv4 or **auto-rp-discovery** can be configured; the two mechanisms cannot be enabled together. **bsr-candidate** for IPv6 and **auto-rp-discovery** for IPv4 can be enabled together.
- The **no** form of the command disables BSR.
- Default** no bsr-candidate

## rp-candidate

- Syntax** **rp-candidate**
- Context** config>router>pim>rp  
config>router>pim>rp>ipv6
- Description** This command enables the context to configure the Candidate RP parameters.
- Routers use a set of available rendezvous points distributed in Bootstrap messages to get the proper group-to-RP mapping. A set of routers within a domain are also configured as candidate RPs (C-RPs); typically these will be the same routers that are configured as candidate BSRs.
- Every multicast group has a shared tree through which receivers learn about new multicast sources and new receivers learn about all multicast sources. The rendezvous point (RP) is the root of this shared tree.
- Default** shutdown

## static

- Syntax** **static**
- Context** config>router>pim>rp  
config>router>pim>rp>ipv6
- Description** This command enables the context to configure static Rendezvous Point (RP) addresses for a multicast group range.
- Entries can be created or destroyed. If no IP addresses are configured in the **config>router>pim>rp>static>address** context, then the multicast group to RP mapping is derived from the RP-set messages received from the Bootstrap Router.

## address

- Syntax** **address** *ip-address*

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|                    |                                                                                                                                                                                                                                                                |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Context</b>     | config>router>pim>rp>bsr-candidate<br>config>router>pim>rp>ipv6>bsr-candidate                                                                                                                                                                                  |
| <b>Description</b> | This command is used to configure the candidate BSR IP address. This address is for Bootstrap router election.                                                                                                                                                 |
| <b>Default</b>     | none                                                                                                                                                                                                                                                           |
| <b>Parameters</b>  | <i>ip-address</i> — The <i>ip-address</i> portion of the <b>address</b> command specifies the IP host address that will be used by the IP interface within the subnet. This address must be unique within the subnet and specified in dotted decimal notation. |
| <b>Values</b>      | 1.0.0.0 – 223.255.255.255                                                                                                                                                                                                                                      |

## address

|                    |                                                                                                                                |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | [no] <b>address</b> <i>ip-address</i>                                                                                          |
| <b>Context</b>     | config>router>pim>rp>rp-candidate<br>config>router>pim>rp>ipv6>bsr-candidate                                                   |
| <b>Description</b> | This command configures the local RP address. This address is sent in the RP candidate advertisements to the bootstrap router. |
| <b>Default</b>     | none                                                                                                                           |
| <b>Parameters</b>  | <i>ip-address</i> — The <i>ip-address</i> .                                                                                    |
| <b>Values</b>      | 1.0.0.0 – 223.255.255.255                                                                                                      |

## address

|                    |                                                                                                                                                                                                                                                                                              |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>address</b> <i>ip-address</i><br><b>no address</b>                                                                                                                                                                                                                                        |
| <b>Context</b>     | config>router>pim>rp>static<br>config>router>pim>rp>ipv6>static                                                                                                                                                                                                                              |
| <b>Description</b> | This command indicates the Rendezvous Point (RP) address that should be used by the router for the range of multicast groups configured by the range command.                                                                                                                                |
| <b>Default</b>     | none                                                                                                                                                                                                                                                                                         |
| <b>Parameters</b>  | <i>ip-address</i> — The static IP address of the RP. The <i>ip-addr</i> portion of the <b>address</b> command specifies the IP host address that will be used by the IP interface within the subnet. This address must be unique within the subnet and specified in dotted decimal notation. |
| <b>Values</b>      | 1.0.0.0 – 223.255.255.255                                                                                                                                                                                                                                                                    |

---

## embedded-rp

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] embedded-rp</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Context</b>     | config>router>pim>rp>ipv6                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Description</b> | <p>This command enables the context to configure embedded RP parameters.</p> <p>Embedded RP is required to support IPv6 inter-domain multicast because there is no MSDP equivalent in IPv6.</p> <p>The detailed protocol specification is defined in RFC 3956, <i>Embedding the Rendezvous Point (RP) Address in an IPv6 Multicast Address</i>. This RFC describes a multicast address allocation policy in which the address of the RP is encoded in the IPv6 multicast group address, and specifies a PIM-SM group-to-RP mapping to use the encoding, leveraging, and extending unicast-prefix-based addressing. This mechanism not only provides a simple solution for IPv6 inter-domain ASM but can be used as a simple solution for IPv6 intra-domain ASM with scoped multicast addresses as well. It can also be used as an automatic RP discovery mechanism in those deployment scenarios that would have previously used the Bootstrap Router protocol (BSR).</p> <p>The <b>no</b> form of the command disables embedded RP.</p> |

## group-range

|                    |                                                                                                                                                                                                                                                                                                                             |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] group-range</b> <i>ipv6-address/prefix-length</i>                                                                                                                                                                                                                                                                   |
| <b>Context</b>     | config>router>pim>ipv6>rp>embedded-rp                                                                                                                                                                                                                                                                                       |
| <b>Description</b> | This command defines which multicast groups can embed RP address information besides FF70::/12. Embedded RP information is only used when the multicast group is in FF70::/12 or the configured group range.                                                                                                                |
| <b>Parameters</b>  | <i>ipv6-address/prefix-length</i> — Specifies the group range for embedded RP.<br><b>Values</b> <i>ipv6-address</i> : <ul style="list-style-type: none"><li>• x:x:x:x:x:x:x (eight 16-bit pieces)</li><li>• x:x:x:x:x:d.d.d.d</li><li>• x: [0 to FFFF]H</li><li>• d: [0 to 255]D</li></ul> <i>prefix-length</i> : 16 to 128 |

## group-range

|                |                                                                                        |
|----------------|----------------------------------------------------------------------------------------|
| <b>Syntax</b>  | <b>[no] group-range</b> { <i>grp-ip-address/mask</i>   <i>grp-ip-address netmask</i> } |
| <b>Context</b> | config>router>pim>rp>rp-candidate                                                      |

```
config>router>pim>rp>static>rp>ipv6>rp-candidate
```

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Description</b> | This command configures the address ranges of the multicast groups for which this router can be an RP.                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Default</b>     | none                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Parameters</b>  | <p><i>grp-ip-address</i> — The multicast group IP address expressed in dotted decimal notation.</p> <p><b>Values</b> 224.0.0.0 to 239.255.255.255</p> <p><i>mask</i> — The mask associated with the IP prefix expressed as a mask length or in dotted decimal notation; for example /16 for a sixteen-bit mask. The mask can also be entered in dotted decimal notation (255.255.0.0).</p> <p><b>Values</b> 4 to 32</p> <p><i>netmask</i> — The subnet mask in dotted decimal notation.</p> <p><b>Values</b> 0.0.0.0 to 255.255.255.255 (network bits all 1 and host bits all 0)</p> |

## group-range

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | [no] <b>group-range</b> { <i>ip-prefix/mask</i>   <i>ip-prefix netmask</i> }                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Context</b>     | config>router>pim>ssm-groups                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Description</b> | This command configures the address ranges of the multicast groups for this router. When there are parameters present, the command configures the SSM group ranges for IPv6 addresses and netmasks                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Default</b>     | none                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Parameters</b>  | <p><i>ip-prefix/mask</i> — The IP prefix in dotted decimal notation for the range used by the ABR to advertise that summarizes the area into another area <i>ipv6-prefix</i>.</p> <p><b>Values</b> ipv4-prefix:</p> <ul style="list-style-type: none"> <li>• a.b.c.d</li> </ul> <p>ipv4-prefix-le: 0 to 32</p> <p>ipv6-address:</p> <ul style="list-style-type: none"> <li>• x:x:x:x:x:x:x (eight 16-bit pieces)</li> <li>• x:x:x:x:x:d.d.d.d</li> <li>• x: [0 to FFFF]H</li> <li>• d: [0 to 255]D</li> </ul> <p>ipv6-prefix-le: 0 to 128</p> <p><b>Values</b> 0 to 32 (mask length), 0.0.0.0 to 255.255.255.255 (dotted decimal)</p> |

*netmask* — The subnet mask in dotted decimal notation.

**Values** 0.0.0.0 to 255.255.255.255 (network bits all 1 and host bits all 0)

## holdtime

**Syntax** **holdtime** *holdtime*  
**no holdtime**

**Context** config>router>pim>rp>rp-candidate  
config>router>pim>rp>ipv6>rp-candidate

**Description** This command configures the length of time, in seconds, that neighbors should consider the sending router to be operationally up. A local RP cannot be configured on a logical router.

**Parameters** *holdtime* — Specifies the hold time, in seconds.

**Values** 5 to 255

## group-prefix

**Syntax** [**no**] **group-prefix** *grp-ipv6-address/prefix-length*

**Context** config>router>pim>rp>static>address  
config>router>pim>rp>ipv6>static>address

**Description** This command specifies the range of multicast group addresses which should be used by the router as the Rendezvous Point (RP). The config>router>pim>rp>static>address a.b.c.d implicitly defaults to deny all for all multicast groups (224.0.0.0/4). A group-prefix must be specified for that static address. This command does not apply to the whole group range.

The **no** form of the command removes the group-prefix from the configuration.

**Default** none

**Parameters** *grp-ipv6-address* — The multicast group IPv6 address expressed in dotted decimal notation.

**Values** grp-ipv6-address x:x:x:x:x:x:x (eight 16-bit pieces)  
x:x:x:x:x:d.d.d.d  
x [0..FFFF]H  
d [0..255]D

*prefix-length* — The prefix length of the IPv6 address

**Values** 8 to 128

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## override

|                    |                                                                                                                                                                                                              |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] override</b>                                                                                                                                                                                         |
| <b>Context</b>     | config>router>pim>rp>static>address<br>config>router>pim>rp>ipv6>static>address                                                                                                                              |
| <b>Description</b> | This command changes the precedence of static RP over dynamically learned Rendezvous Point (RP).<br><br>When enabled, the static group-to-RP mappings take precedence over the dynamically learned mappings. |
| <b>Default</b>     | no override                                                                                                                                                                                                  |

## non-dr-attract-traffic

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] non-dr-attract-traffic</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Context</b>     | config>router>pim                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Description</b> | This command specifies whether the router should ignore the designated router state and attract traffic even when it is not the designater router.<br><br>An operator can configure an interface (router or IES or VPRN interfaces) to IGMP and PIM. The interface state will be synchronized to the backup node if it is associated with the redundant peer port. The interface can be configured to use PIM which will cause multicast streams to be sent to the elected DR only. The DR will also be the router sending traffic to the DSLAM. Since it may be required to attract traffic to both routers a flag non-dr-attract-traffic can be used in the PIM context to have the router ignore the DR state and attract traffic when not DR. While using this flag, the router may not send the stream down to the DSLAM while not DR.<br><br>When enabled, the designated router state is ignored. When disabled, <b>no non-dr-attract-traffic</b> , the designated router value is honored. |
| <b>Default</b>     | no non-dr-attract-traffic                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |

## rpf-table

|                    |                                                                                                                                               |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>rpf-table {rtable-m   rtable-u   both}</b><br><b>no rpf-table</b>                                                                          |
| <b>Context</b>     | config>router>pim                                                                                                                             |
| <b>Description</b> | This command configures the sequence of route tables used to find a Reverse Path Forwarding (RPF) interface for a particular multicast route. |

By default, only the unicast route table is looked up to calculate RPF interface towards the source/rendezvous point. However, the operator can specify the following:

- use the unicast route table only
- use the multicast route table only or
- use both the route tables

|                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|-------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Default</b>    | rtable-u                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Parameters</b> | <p><b>rtable6-m</b> — Specifies that only the multicast route table will be used by the multicast protocol (PIM) for IPv4 RPF checks. This route table will contain routes submitted by static routes, ISIS and OSPF.</p> <p><b>rtable6-u</b> — Specifies only that the unicast route table will be used by the multicast protocol (PIM) for IPv4 RPF checks. This route table will contain routes submitted by all the unicast routing protocols.</p> <p><b>both</b> — Will always lookup first in the multicast route table and if there is a route, it will use it. If PIM does not find a route in the first lookup, it will try to find it in the unicast route table. Rtable-m is checked before rtable6-u.</p> |

## rpf6-table

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>rpf6-table {rtable6-m   rtable6-u   both}</b><br><b>no rpf6-table</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Context</b>     | config>router>pim                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Description</b> | <p>This command configures the sequence of route tables used to find a Reverse Path Forwarding (RPF) interface for a particular multicast route.</p> <p>By default, only the unicast route table is looked up to calculate RPF interface towards the source/rendezvous point. However, the operator can specify the following:</p> <ul style="list-style-type: none"> <li>• use unicast route table only</li> <li>• use multicast route table only or</li> <li>• use both the route tables</li> </ul>                                                                                                                                                                                 |
| <b>Default</b>     | rtable6-u                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Parameters</b>  | <p><b>rtable6-m</b> — Specifies that only the multicast route table will be used by the multicast protocol (PIM) for IPv6 RPF checks. This route table will contain routes submitted by static routes, ISIS and OSPF.</p> <p><b>rtable6-u</b> — Specifies that only the unicast route table will be used by the multicast protocol (PIM) for IPv6 RPF checks. This route table will contain routes submitted by all the unicast routing protocols.</p> <p><b>both</b> — Specifies that the multicast route table will be used first by the multicast protocol (PIM) for IPv6 RPF checks, and then the unicast route table will be used if the multicast route table lookup fails.</p> |

## rpfv

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>rpfv core</b><br><b>rpfv mvpn</b><br><b>rpfv core mvpn</b><br><b>no rpfv [core] [mvpn]</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Context</b>     | config>router>pim                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Description</b> | This command enables RPF Vector processing for Inter-AS Rosen MVPN Option-B and Option-C. The <b>rpfv</b> must be enabled on every node for Inter-AS Option B/C MVPN support.<br><br>If <b>rpfv</b> is configured, MLDP inter-AS resolution cannot be used. These two features are mutually exclusive.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Default</b>     | no rpfv                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Parameters</b>  | <b>mvpn</b> — Enables mvpn RPF vector processing for Inter-AS Option B/C MVPN based on RFC 5496 and RFC 6513. If a core RPF vector is received, it will be dropped before a message is processed.<br><br><b>core</b> — Enables core RPF vector (no RD) processing for Inter-AS Option B/C MVPN, which allows SR OS interoperability as P-router with third-party vendors that do not encode RD in the RPF vector for Inter-AS MVPN.<br><br><b>core mvpn</b> — Enables core RPF vector (no RD) processing for Inter-AS Option B/C MVPN, which allows SR OS interoperability as P-router with third-party vendors that do not encode RD in the RPF vector for Inter-AS MVPN.<br><br>The <b>no</b> version of this command disables RPF Vector processing. If RPF vector is received in a PIM join message, the vector will be removed before local processing of PIM message starts. |

## shutdown

|                    |                                                                                                                                                                                                                                                                                                        |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] shutdown</b>                                                                                                                                                                                                                                                                                   |
| <b>Context</b>     | config>router>pim<br>config>router>pim>interface<br>config>router>pim>rp>rp-candidate<br>config>router>pim>rp>bsr-candidate<br>config>router>pim>rp>ipv6>rp-candidate<br>config>router>pim>rp>ipv6>bsr-candidate<br>config>router>pim>interface>mcac>mc-constraints                                    |
| <b>Description</b> | The <b>shutdown</b> command administratively disables the entity. When disabled, an entity does not change, reset, or remove any configuration settings or statistics. Many entities must be explicitly enabled using the <b>no shutdown</b> command and must be shut down before they may be deleted. |

Unlike other commands and parameters where the default state is not indicated in the configuration file, **shutdown** and **no shutdown** are always indicated in system generated configuration files.

The **no** form of the command puts an entity into the administratively enabled state.

**Default** no shutdown

## spt-switchover-threshold

**Syntax** **spt-switchover-threshold** {*grp-ipv4-prefix* *ipv4-prefix-length* | *grp-ipv4-prefix netmask* | *grp-ipv6-prefix* *ipv6-prefix-length*} *spt-threshold*  
**no spt-switchover-threshold** {*grp-ipv4-prefix* *ipv4-prefix-length* | *grp-ipv4-prefix netmask* | *grp-ipv6-prefix* *ipv6-prefix-length*}

**Context** config>router>pim

**Description** This command configures shortest path (SPT) tree switchover thresholds for group prefixes.

PIM-SM routers with directly connected routers receive multicast traffic initially on a shared tree rooted at the Rendezvous Point (RP). Once the traffic arrives on the shared tree and the source of the traffic is known, a switchover to the SPT tree rooted at the source is attempted.

For a group that falls in the range of a prefix configured in the table, the corresponding threshold value determines when the router should switch over from the shared tree to the source specific tree. The switchover is attempted only if the traffic rate on the shared tree for the group exceeds the configured threshold.

In the absence of any matching prefix in the table, the default behavior is to switchover when the first packet is seen. In the presence of multiple prefixes matching a given group, the most specific entry is used.

**Parameters** *grp-ipv4-prefix* — the group IPv4 multicast address in dotted decimal notation

**Values** a.b.c.d

*ipv4-prefix-length* — the length of the IPv4 prefix

**Values** 4 to 32

*netmask* — the netmask associated with the IPv4 prefix, expressed in dotted decimal notation. Network bits must be 1, and host bits must be 0.

**Values** a.b.c.d

*grp-ipv6-prefix* — the group IPv6 multicast address in hexadecimal notation

**Values** xxxx:xxxx:xxxx:xxxx:xxxx:xxxx:xxxx:xxxx (eight 16-bit pieces)  
 x:x:x:x:x:d.d.d.d  
 xx — 0 to FF (hex)

*ipv6-prefix-length* — the length of the IPv6 prefix

**Values** 8 to 128

*spt-threshold* — Specifies the configured threshold in kilobits per second (kbps) for a group prefix. A switchover is attempted only if the traffic rate on the shared tree for the group exceeds this configured threshold. When the **infinity** keyword is specified, no switchover will occur at any time, regardless of the traffic level is detected.

**Values** 1 to 4294967294 | infinity

## ssm-groups

**Syntax** [no] **ssm-groups**

**Context** config>router>pim

**Description** This command enables the context to enable an ssm-group configuration instance.

## tunnel-interface

**Syntax** [no] **tunnel-interface rsvp-p2mp** *lsp-name* **sender** *ip-address*

**Context** config>router>pim

**Description** This command creates a tunnel interface associated with an RSVP P2MP LSP. IPv4 multicast packets are forwarded over the P2MP LSP at the ingress LER based on a static join configuration of the multicast group against the tunnel interface associated with the originating P2MP LSP. At the egress LER, packets of a multicast group are received from the P2MP LSP via a static assignment of the specific <S,G> to the tunnel interface associated with a terminating LSP.

At ingress LER, the tunnel interface identifier consists of a string of characters representing the LSP name for the RSVP P2MP LSP. The user can create one or more tunnel interfaces in PIM and associate each to a different RSVP P2MP LSP.

At egress LER, the tunnel interface identifier consists of a couple of string of characters representing the LSP name for the RSVP P2MP LSP followed by the system address of the ingress LER. The LSP name must correspond to a P2MP LSP name configured by the user at the ingress LER. The LSP name string must not contain “:” (two :s) nor contain a “.” (single “.”) at the end of the LSP name. However, a “.” (single “.”) can appear anywhere in the string except at the end of the name.

**Default** none

**Parameters** *lsp-name* — Specifies the LSP. The LSP name can be up to 32 characters long and must be unique.

*ip-address* — :Specifies the sender IP address: a.b.c.d.

---

## bootstrap-export

- Syntax** `bootstrap-export policy-name [..policy-name]`
- Context** `config>router>pim>rp`
- Description** Use this command to apply export policies to control the flow of bootstrap messages from the RP, and apply them to the PIM configuration. Up to 5 policy names can be specified.
- Default** `no bootstrap-export`
- Parameters** *policy-name* — Specify the export policy name up to 32 characters in length.

## bootstrap-import

- Syntax** `bootstrap-import policy-name [..policy-name]`
- Context** `config>router>pim>rp`
- Description** Use this command to apply import policies to control the flow of bootstrap messages to the RP, and apply them to the PIM configuration. Up to 5 policy names can be specified.
- Default** `no bootstrap-import`
- Parameters** *policy-name* — Specify the import policy name up to 32 characters in length.

## hash-mask-len

- Syntax** `hash-mask-len hash-mask-length`  
`no hash-mask-len`
- Context** `config>router>pim>rp>bsr-candidate`  
`config>router>pim>rp>ipv6>bsr-candidate`
- Description** This command is used to configure the length of a mask that is to be combined with the group address before the hash function is called. All groups with the same hash map to the same RP. For example, if this value is 24, only the first 24 bits of the group addresses matter. This mechanism is used to map one group or multiple groups to an RP.
- Parameters** *hash-mask-length* — The hash mask length.
- Values** 0 to 32



## 5.6 Show, Clear, and Debug Command Reference

### 5.6.1 Command Hierarchies

- [Show Commands](#)
- [Clear Commands](#)
- [Debug Commands](#)

#### 5.6.1.1 Show Commands

```

show
 -- router
 -- pim
 -- anycast [detail]
 -- crp [ip-address]
 -- s-pmsi [data-mt-interface-name] [detail]
 -- group [grp-ip-address] [source ip-address] [type {starstarrp | starg | sg}]
 [detail] [family]
 -- interface [ip-int-name | mt-int-name | ip-address] [group [grp-ip-address]
 source ip-address] [type {starstarrp | starg | sg}] [detail] [family]
 -- neighbor [ip-address | ip-int-name [address ip-address]] [detail] [family]
 -- rp [ip-address]
 -- rp-hash grp-ip-address
 -- statistics [ip-int-name | mt-int-name | ip-address] [family]
 -- status [detail] [family]
 -- tunnel-interface [ip-int-name | mt-int-name | int-ip-address] [group[grp-ip-
 address] source ip-address] [type {starstarrp | starg | sg}] [detail] [family]

```

#### 5.6.1.2 Clear Commands

```

clear
 -- router
 -- pim
 -- database [interface ip-int-name | ip-address | mt-int-name] [group grp-ip-
 address [source ip-address]][family]
 -- neighbor [interface ip-int-name | ip-address] [family]
 -- s-pmsi [mdSrcAddr] [mdGrpAddr] [vprnSrcAddr vprnGrpAddr]
 -- statistics [{[interface ip-int-name | ip-address | mt-int-name]} {[group grp-ip-
 address [source ip-address]]}][family]

```

### 5.6.1.3 Debug Commands

```

debug
 — router
 — pim
 — [no] adjacency
 — all [group grp-ip-address] [source ip-address] [detail]
 — no all
 — assert [group grp-ip-address] [source ip-address] [detail]
 — no assert
 — auto-rp [detail]
 — no auto-rp
 — bgp [source ip-address] [group group-ip-address] [peer peer-ip-address]
 — no bgp
 — bsr [detail]
 — no bsr
 — data [group grp-ip-address] [source ip-address] [detail]
 — no data
 — db [group grp-ip-address] [source ip-address] [detail]
 — no db
 — dynmldp [detail]
 — no dynmldp
 — extranet [detail]
 — no extranet
 — grafts [source ip-address] [group grp-ip-address] [detail]
 — no grafts
 — interface [ip-int-name | mt-int-name] ip-address [detail]
 — no interface
 — jp [group grp-ip-address] [source ip-address] [detail]
 — no jp
 — [no] mofrr
 — mrib [group grp-ip-address] [source ip-address] [detail]
 — no mrib
 — msg [detail]
 — no msg
 — mvpn-rtcache [group grp-ip-address] [peer ip-address]
 — no mvpn-rtcache
 — packet [hello | register | register-stop | jp | bsr | assert | crp | mdt-tlv | auto-
 rp-announcement | auto-rp-mapping | graft | graft-ack] [ip-int-name | mt-
 int-name | int-ip-address | mpls-if-name]
 — no packet
 — red [detail]
 — no red
 — register [group grp-ip-address] [source ip-address] [detail]
 — no register
 — rpfv [detail]
 — no rpfv
 — rtm [detail]
 — no rtm
 — s-pmsi [{vpnSrcAddr [vpnGrpAddr]} [mdSrcAddr]] [detail]
 — no s-pmsi
 — tunnel-interface [ldp-p2mp p2mp-id] [sender ip-address] [detail]
 — no tunnel-interface [ldp-p2mp p2mp-id] [sender ip-address]

```

- **tunnel-interface** [rsvp-p2mp *lsp-name*] [sender *ip-address*] [detail]
- **no tunnel-interface** [rsvp-p2mp *lsp-name*] [sender *ip-address*]

## 5.6.2 Command Descriptions

### 5.6.2.1 Show Commands

The command outputs in the following section are examples only; actual displays may differ depending on supported functionality and user configuration.

#### anycast

- Syntax** `anycast [detail]`
- Context** `show>router>pim`
- Description** This command displays PIM anycast rp-set information.
- Parameters** **detail** — Displays detailed information.
- Output** PIM anycast Output

The following table provides PIM anycast field descriptions

**Table 11 PIM Anycast Fields**

| Label           | Description                                     |
|-----------------|-------------------------------------------------|
| Anycast Address | Displays the candidate anycast address.         |
| Anycast RP Peer | Displays the candidate anycast RP peer address. |

#### Sample Output

```
A:dut-d# show router pim anycast
=====
PIM Anycast RP Entries
=====
Anycast RP Anycast RP Peer

100.100.100.1 102.1.1.1
 103.1.1.1
 104.1.1.1

PIM Anycast RP Entries : 3
=====
```

crp

- Syntax**     **crp** [*ip-address*]
- Context**     show>router>pim
- Description**   Display PIM candidate RP (CRP) information received at the elected Bootstrap router (BSR).
- Parameters**   *ip-address* — The candidate RP IP address.
- Output**       PIM CRP Output

The following table provides PIM CRP field descriptions.

**Table 12     PIM CRP Fields**

| Label         | Description                                                                                                                                                                              |
|---------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| RP Address    | Displays the Candidate RP address.                                                                                                                                                       |
| Group Address | Displays the range of multicast group addresses for which the CRP is the Candidate RP.                                                                                                   |
| Priority      | Displays the Candidate RP's priority for becoming a rendezvous point (RP). This value is used to elect RP for a group range. A value of 0 is considered as the highest priority.         |
| Holdtime      | Displays the hold time of the candidate RP. It is used by the Bootstrap router to time out the RP entries if it does not listen to another CRP advertisement within the holdtime period. |
| Expiry        | The minimum time remaining before the CRP will be declared down. If the local router is not the BSR, this value is 0.                                                                    |
| Candidate RPs | Displays the number of CRP entries.                                                                                                                                                      |

**Sample Output**

```
A:WAS# show router pim crp
=====
PIM Candidate RPs
=====
RP Address Group Address Priority Holdtime Expiry Time

2.22.187.236 224.0.0.0/4 192 150 0d 00:02:19
2.22.187.239 224.0.0.0/4 192 150 0d 00:02:19
2.22.187.240 224.0.0.0/4 192 150 0d 00:02:09

Candidate RPs : 3
=====
A:WAS#

A:WAS# show router pim crp 2.22.187.236
```

```

=====
PIM Candidate RPs
=====
RP Address Group Address Priority Holdtime Expiry Time

2.22.187.236 224.0.0.0/4 192 150 0d 00:01:43

Candidate RPs : 1
=====
A:WAS#

```

## s-pmsi

- Syntax** `s-pmsi [mdSrcAddr [mdGrpAddr]] [detail]`
- Context** `show>router>pim`
- Description** Displays the list of selective provider multicast service interfaces that are currently active.
- Parameters**
  - mdSrcAddr* — Specifies the source address of the multicast sender.
  - mdGrpAddr* — Specifies the group address of the multicast sender.
  - detail** — Displays detailed output.
- Output** PIM data MDT Output

The following table provides PIM data MDT descriptions.

**Table 13 PIM Data MDT**

| Label          | Description                                                                                                                                                                                                    |
|----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| MD Grp Address | Displays the IP multicast group address for which this entry contains information.                                                                                                                             |
| MD Src Address | Displays the source address of the multicast sender. It will be 0 if the type is configured as <b>starg</b> . It will be the address of the Rendezvous Point (RP) if the type is configured as <b>starRP</b> . |
| MT Index       | Displays the index number.                                                                                                                                                                                     |
| Num VP SGs     | Displays the VPN number.                                                                                                                                                                                       |

### Sample Output PIM Selective Provider Tunnel

```

*B:node-6# show router 100 pim s-pmsi
=====
PIM Selective provider tunnels
=====
MD Src Address MD Grp Address MT Index Num VPN SGs

200.200.200.7 230.0.89.72 24603 1

```

```

200.200.200.7 230.0.89.73 24604 1
200.200.200.7 230.0.89.74 24605 1
200.200.200.7 230.0.89.75 24606 1
200.200.200.7 230.0.89.76 24607 1
200.200.200.7 230.0.89.77 24608 1
200.200.200.7 230.0.89.78 24609 1
200.200.200.7 230.0.89.79 24610 1
200.200.200.7 230.0.89.80 24611 1
200.200.200.7 230.0.89.81 24612 1
200.200.200.7 230.0.89.82 24613 1
200.200.200.7 230.0.89.83 24614 1
200.200.200.7 230.0.89.84 24615 1
200.200.200.7 230.0.89.85 24616 1
200.200.200.7 230.0.89.86 24617 1
200.200.200.7 230.0.89.87 24618 1
...

```

```

=====
*B:node-6#

```

**Sample Output PIM Selective Provider Tunnel Detail**

```

*B:node-6# show router 100 pim s-pmsi detail
=====
PIM Selective provider tunnels
=====
Md Source Address : 200.200.200.7 Md Group Address : 230.0.89.72
Number of VPN SGs : 1 Uptime : 0d 00:00:18
MT IfIndex : 24603 Egress Fwding Rate : 163.2 kbps

VPN Group Address : 228.1.0.0 VPN Source Address : 11.2.102.1
State : RX Joined
Expiry Timer : 0d 00:02:41
=====
PIM Selective provider tunnels
=====
Md Source Address : 200.200.200.7 Md Group Address : 230.0.89.73
Number of VPN SGs : 1 Uptime : 0d 00:00:18
MT IfIndex : 24604 Egress Fwding Rate : 163.2 kbps

VPN Group Address : 228.1.0.1 VPN Source Address : 11.2.102.1
State : RX Joined
Expiry Timer : 0d 00:02:41
=====
PIM Selective provider tunnels
=====
Md Source Address : 200.200.200.7 Md Group Address : 230.0.89.74
Number of VPN SGs : 1 Uptime : 0d 00:00:20
MT IfIndex : 24605 Egress Fwding Rate : 165.7 kbps

VPN Group Address : 228.1.0.2 VPN Source Address : 11.2.102.1
State : RX Joined
Expiry Timer : 0d 00:02:39
=====
PIM Selective provider tunnels
=====
Md Source Address : 200.200.200.7 Md Group Address : 230.0.89.75
Number of VPN SGs : 1 Uptime : 0d 00:00:20

```

```

MT IfIndex : 24606 Egress Fwding Rate : 165.7 kbps
VPN Group Address : 228.1.1.3 VPN Source Address : 11.2.102.1
State : RX Joined
Expiry Timer : 0d 00:02:39

```

=====  
\*B:node-6#

### Sample Output RX Tracking for RSVP S-PMSI Tunnel

\*A:Dut-C# show router 1 pim s-pmsi

```

=====
PIM RSVP Spmsi tunnels
=====
P2mp ID Tunnel ID Ext Tunnel Adrs SPMSI Index Num VPN State
 SGs

0 0 10.20.1.4 1030144 1 RX Tracking
0 0 10.20.1.4 1030144 1 RX Tracking
=====

```

PIM RSVP Spmsi Interfaces : 2

\*A:Dut-C# show router 21 pim s-pmsi

```

=====
PIM LDP Spmsi tunnels
=====
Lsp ID Root Addr SPMSI Index Num VPN State
 SGs

0 10.20.1.4 1030144 1 RX Tracking
0 10.20.1.4 1030144 1 RX Tracking
=====

```

PIM LDP Spmsi Interfaces : 2

\*A:Dut-C#

### Sample Output RX Tracking for RSVP S-PMSI Tunnel Detail

\*A:Dut-C# show router 1 pim s-pmsi detail

```

=====
PIM RSVP Spmsi tunnels
=====
P2MP ID : 0 Tunnel ID : 0
Ext Tunnel Adrs : 10.20.1.4 Spmsi IfIndex : 1030144
Number of VPN SGs : 1 Uptime : 0d 00:02:48

VPN Group Address : 225.100.0.0
VPN Source Address : 10.1.101.2
State : RX Tracking Mdt Threshold : 0

```

```

=====
PIM RSVP Spmsi tunnels
=====
P2MP ID : 0 Tunnel ID : 0

```

```

Ext Tunnel Addr : 10.20.1.4 Spmsi IfIndex : 1030144
Number of VPN SGs : 1 Uptime : 0d 00:02:47

```

```

VPN Group Address : ff0e:225:100::
VPN Source Address : 2001:10:1:101::2
State : RX Tracking Mdt Threshold : 0

```

```

=====
PIM RSVP Spmsi Interfaces : 2
=====

```

```

*A:Dut-C# show router 21 pim s-pmsi detail

```

```

=====
PIM LDP Spmsi tunnels
=====

```

```

LSP ID : 0
Root Addr : 10.20.1.4 Spmsi IfIndex : 1030144
Number of VPN SGs : 1 Uptime : 0d 00:03:35

```

```

VPN Group Address : 225.100.0.0
VPN Source Address : 10.1.101.2
State : RX Tracking Mdt Threshold : 0

```

```

=====
PIM LDP Spmsi tunnels
=====

```

```

LSP ID : 0
Root Addr : 10.20.1.4 Spmsi IfIndex : 1030144
Number of VPN SGs : 1 Uptime : 0d 00:03:34

```

```

VPN Group Address : ff0e:225:100::
VPN Source Address : 2001:10:1:101::2
State : RX Tracking Mdt Threshold : 0

```

```

=====
PIM LDP Spmsi Interfaces : 2
=====

```

```

*A:Dut-C#

```

### Sample Output TX Tracking for RSVP S-PMSI Tunnel Detail

```

*A:Dut-C# show router 1 pim s-pmsi detail

```

```

=====
PIM RSVP Spmsi tunnels
=====

```

```

P2MP ID : 1 Tunnel ID : 61442
Ext Tunnel Addr : 10.20.1.4 Spmsi IfIndex : 74230
Number of VPN SGs : 1 Uptime : 0d 00:05:11

```

```

VPN Group Address : 225.100.0.0
VPN Source Address : 10.1.101.2
State : TX Join Pending Mdt Threshold : 1
Join Timer : N/A Holddown Timer : 0d 00:00:47
Receiver Count : 4

```

```

=====
PIM RSVP Spmsi tunnels
=====

```

```

P2MP ID : 1 Tunnel ID : 61443

```

```

Ext Tunnel Addr : 10.20.1.4 Spmsi IfIndex : 74231
Number of VPN SGs : 1 Uptime : 0d 00:05:10

VPN Group Address : ff0e:225:100::
VPN Source Address : 2001:10:1:101::2
State : TX Join Pending Mdt Threshold : 1
Join Timer : N/A Holddown Timer : 0d 00:00:50
Receiver Count : 4

```

=====  
PIM RSVP Spmsi Interfaces : 2  
=====

\*A:Dut-D# show router 21 pim s-pmsi detail

=====  
PIM LDP Spmsi tunnels  
=====

```

LSP ID : 8194
Root Addr : 10.20.1.4 Spmsi IfIndex : 74228
Number of VPN SGs : 1 Uptime : 0d 00:05:56

VPN Group Address : 225.100.0.0
VPN Source Address : 10.1.101.2
State : TX Join Pending Mdt Threshold : 1
Join Timer : N/A Holddown Timer : 0d 00:00:02
Receiver Count : 4

```

=====  
PIM LDP Spmsi tunnels  
=====

```

LSP ID : 8195
Root Addr : 10.20.1.4 Spmsi IfIndex : 74229
Number of VPN SGs : 1 Uptime : 0d 00:05:55

VPN Group Address : ff0e:225:100::
VPN Source Address : 2001:10:1:101::2
State : TX Join Pending Mdt Threshold : 1
Join Timer : N/A Holddown Timer : 0d 00:00:05
Receiver Count : 4

```

=====  
PIM LDP Spmsi Interfaces : 2  
=====

\*A:Dut-D#

## group

- Syntax** `group grp-ip-address [source ip-address [type {starstarrp | starg | sg}]] [detail] [family]`
- Context** show>router>pim
- Description** This command displays PIM source group database information.
- Parameters**
- `grp-ip-address` — Specifies the IP multicast group address for which this entry contains information.
  - `source ip-address` — Specifies the source address for which this entry contains information.

**type starstarrp** — Specifies that only (\*, \*, rp) entries be displayed.

**type starg** — Specifies that only (\*,G) entries be displayed.

**type sg** — specifies that only (S,G) entries be displayed.

**detail** — Displays detailed group information.

**family** — Displays either IPv4 or IPv6 information.

**Output** PIM Group Output

The following table provides PIM Group field descriptions.

**Table 14 PIM Group Fields**

| Label               | Description                                                                                                                                                                                                                               |
|---------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Group Address       | Displays the IP multicast group address for which this entry contains information.                                                                                                                                                        |
| Source Address      | Displays the source address of the multicast sender.<br>It will be 0 if the type is configured as starg.<br>It will be the address of the Rendezvous Point (RP) if the type is configured as starRP.                                      |
| RP Address          | Displays the RP address.                                                                                                                                                                                                                  |
| Type                | Specifies the type of entry, (*, *, rp)/(*,G) or (S,G).                                                                                                                                                                                   |
| Spt Bit             | Specifies whether to forward on (*, *, rp)/(*,G) or on (S,G) state. It is updated when the (S,G) data comes on the RPF interface towards the source.                                                                                      |
| Incoming Intf       | Displays the interface on which the traffic comes in. It can be the RPF interface to the RP (if starg) or the source (if sg).                                                                                                             |
| Num Oifs            | Displays the number of interfaces in the inherited outgoing interface list. An inherited list inherits the state from other types.                                                                                                        |
| Flags               | Displays the different lists that this interface belongs to.                                                                                                                                                                              |
| Keepalive Timer Exp | The keepalive timer is applicable only for (S,G) entries.<br>The (S,G) keepalive timer is updated by data being forwarded using this (S,G) Forwarding state. It is used to keep (S,G) state alive in the absence of explicit (S,G) joins. |
| MRIB Next Hop       | Displays the next hop address towards the RP.                                                                                                                                                                                             |
| MRIB Src Flags      | Displays the MRIB information about the source. If the entry is of type starg or starstarrp, it will contain information about the RP for the group.                                                                                      |
| Up Time             | Displays the time since this source group entry was created.                                                                                                                                                                              |

**Table 14 PIM Group Fields (Continued)**

| Label                    | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|--------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Resolved By              | Displays the route table used for RPF check.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Up JP State              | Displays the upstream join prune state for this entry on the interface. PIM join prune messages are sent by the downstream routers towards the RPF neighbor.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Up JP Expiry             | Displays the minimum amount of time remaining before this entry will be aged out.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Up JP Rpt                | Displays the join prune Rpt state for this entry on the interface. PIM join/prune messages are sent by the downstream routers towards the RPF neighbor. (S,G, rpt) state is a result of receiving (S,G, rpt) JP message from the downstream router on the RP tree.                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Up JP Rpt Override       | Displays the value used to delay triggered Join (S,G, rpt) messages to prevent implosions of triggered messages.<br>If this has a non-zero value, it means that the router was in 'notPruned' state and it saw a prune (S,G, rpt) message being sent to RPF (S,G, rpt). If the router sees a join (S,G, rpt) override message being sent by some other router on the LAN while the timer is still non-zero, it simply cancels the override timer. If it does not see a join (S,G, rpt) message, then on expiry of the override timer, it sends it's own join (S,G, rpt) message to RPF (S,G, rpt). A similar scenario exists when RPF (S,G, rpt) changes to become equal to RPF (*,G). |
| Register State           | Specifies the register state. The register state is kept at the source DR. When the host starts sending multicast packets and if there are no entries programmed for that group, the source DR sends a register packet to the RP (g). Register state transition happen based on the register stop timer and the response received from the RP.                                                                                                                                                                                                                                                                                                                                         |
| Register Stop Exp        | Displays the time remaining before the register state might transition to a different state.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Register from Anycast RP | Displays if the register packet for that group has been received from one of the RP from the anycast-RP set.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| RPF Neighbor             | Displays the address of the RPF neighbor.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Outgoing Intf List       | Displays a list of interfaces on which data is forwarded.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Curr Fwding Rate         | Displays the current forwarding rate of the multicast data for this group and source. This forwarding rate is calculated before ingress QoS policing or shaping is applied.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |

**Table 14 PIM Group Fields (Continued)**

| Label             | Description                                                                                                                                                                                                                  |
|-------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Forwarded Packets | Displays the number of multicast packets that were forwarded to the interfaces in the outgoing interface list. This packet count is before ingress QoS policing or shaping is applied.                                       |
| Discarded Packets | Displays the number of multicast packets that matched this source group entry but were discarded.<br>For (S,G) entries, if the traffic is getting forwarded on the SPT, the packets arriving from the RPT will be discarded. |
| Forwarded Octets  | Displays the number of octets forwarded.                                                                                                                                                                                     |
| RPF Mismatches    | Displays the number of multicast packets that matched this source group entry but they did not arrive on the interface.                                                                                                      |
| Spt threshold     | Displays the value of the SPT threshold configured for that group. 0 Kbps means that the switch to the SP tree will happen immediately.                                                                                      |

**Sample Output**

```
A:Dut-A# show router pim group
=====
PIM Group ipv4
=====
Group Address Type Spt Bit Inc Intf no.Oifs
Source Address RP State Inc Intf(S)

224.1.1.1 (S,G) ip-10.10.2.1 1
 3.1.1.2 10.20.1.4 ip-10.10.1*
*A:Dut-C# show router 100 pim group ipv6
=====
Legend: A = Active S = Standby
=====
PIM Groups ipv6
=====
Group Address Type Spt Bit Inc Intf No.Oifs
Source Address RP State Inc Intf(S)

ff04::224:100:0:0 (*,G) vprn_itf_C_11* 2
 * 3ffe::110:100:1*
ff04::224:100:0:0 (S,G) spt mpls-if-74457* 3
 3ffe::100:114:1:2 3ffe::110:100:1*
ff04::224:100:0:1 (*,G) vprn_itf_C_11* 2
 * 3ffe::110:100:1*
ff04::224:100:0:1 (S,G) spt mpls-if-74457* 3
 3ffe::100:114:1:2 3ffe::110:100:1*
ff04::224:100:0:2 (*,G) vprn_itf_C_11* 2
 * 3ffe::110:100:1*
ff04::224:100:0:2 (S,G) spt mpls-if-74457* 3
 3ffe::100:114:1:2 3ffe::110:100:1*
```

```

ff04::224:100:0:3 (*,G) vprn_itf_C_11* 2
* 3ffe::110:100:1*
ff04::224:100:0:3 (S,G) spt mpls-if-74457* 3
 3ffe::100:114:1:2 3ffe::110:100:1*
ff04::224:100:0:4 (*,G) vprn_itf_C_11* 2
* 3ffe::110:100:1*
ff04::224:100:0:4 (S,G) spt mpls-if-74457* 3
 3ffe::100:114:1:2 3ffe::110:100:1*

```

-----  
 Groups : 10

=====  
 \* indicates that the corresponding row element may have been truncated.

A:NYC>show>router>pim# group 239.255.255.250

=====  
 PIM Groups

```

=====

Group Address Source Address RP Address Type Spt Incoming Num

 Bit Intf Oifs

239.255.255.250 * 2.22.187.240 <*,G> nyc-sjc 1

```

Groups : 1

=====  
 A:NYC>show>router>pim#

A:NYC>show>router>pim# group 239.255.255.250 detail

=====  
 PIM Source Group

```

=====

Group Address : 239.255.255.250 Source Address : 16.1.1.2

RP Address : 100.100.100.1 Type : (S,G)

Flags : spt, rpt-prn-des Keepalive Timer Exp: 0d 00:03:07

MRIB Next Hop : 16.1.1.2 MRIB Src Flags : direct

Up Time : 0d 00:00:50 Resolved By : rtable-u

Up JP State : Joined Up JP Expiry : 0d 00:00:00

Up JP Rpt : Pruned Up JP Rpt Override : 0d 00:00:00

Register State : Pruned Register Stop Exp : 0d 00:00:47

Reg From Anycast RP: No

RPF Neighbor : 16.1.1.2

Incoming Intf : SOURCE-3

Outgoing Intf List : To-Dut-A

Curr Fwding Rate : 482.9 kbps

Forwarded Packets : 1262 Discarded Packets : 0

Forwarded Octets : 1269572 RPF Mismatches : 0

Spt threshold : 0 kbps

=====

```

=====  
 A:NYC>show>router>pim#

B:Dut-C# show router pim group 225.0.0.1 type sg detail

=====  
 PIM Source Group ipv4

=====

```

Group Address : 225.0.0.1
Source Address : 11.11.0.1
RP Address : 10.20.1.3
Flags : rpt-prn-des Type : (S,G)
MRIB Next Hop : 11.11.0.1
MRIB Src Flags : direct Keepalive Timer : Not Running
Up Time : 0d 00:04:17 Resolved By : rtable-u

Up JP State : Joined Up JP Expiry : 0d 00:00:00
Up JP Rpt : Pruned Up JP Rpt Override : 0d 00:00:00

Register State : No Info
Reg From Anycast RP: No

Rpf Neighbor : 11.11.0.1
Incoming Intf : svc_itf
Outgoing Host List : 112.112.1.1

Curr Fwding Rate : 0.0 kbps
Forwarded Packets : 0 Discarded Packets : 0
Forwarded Octets : 0 RPF Mismatches : 0
Spt threshold : 0 kbps ECMP opt threshold : 7
Admin bandwidth : 1 kbps Preference : 0

```

```

=====
PIM Source Group ipv4
=====

```

```

Group Address : 225.0.0.1
Source Address : 11.11.0.2
RP Address : 10.20.1.3
Flags : Type : (S,G)
MRIB Next Hop : 11.11.0.2
MRIB Src Flags : direct Keepalive Timer : Not Running
Up Time : 0d 00:04:18 Resolved By : rtable-u

Up JP State : Joined Up JP Expiry : 0d 00:00:00
Up JP Rpt : Not Pruned Up JP Rpt Override : 0d 00:00:00

Register State : No Info
Reg From Anycast RP: No

Rpf Neighbor : 11.11.0.2
Incoming Intf : svc_itf
Outgoing Host List : 112.112.1.1, 112.112.1.2

Curr Fwding Rate : 0.0 kbps
Forwarded Packets : 0 Discarded Packets : 0
Forwarded Octets : 0 RPF Mismatches : 0
Spt threshold : 0 kbps ECMP opt threshold : 7
Admin bandwidth : 1 kbps Preference : 0

```

```

Groups : 2

```

```

*B:Dut-C#

```

```

A:Dut-A# show router pim group detail

```

```

=====
PIM Source Group ipv4
=====

```

```

Group Address : 224.1.1.1
Source Address : 3.1.1.21
RP Address : 10.20.1.4
Advt Ruoter : 10.20.1.3
Flags :
Type : (S,G)
MRIB Next Hop : 10.10.2.3
MRIB Src Flags : remote
Standby Src Flags : remote
keepalive Timer : Not Running
Up Time : 0d 00:01:22
Resolved By : rtable-u

Up JP State : Joined
Up JP Expiry : 0d 00:00:00
Up JP Rpt : Pruned
Up JP Rpt Override : 0d 00:00:00
Up Stdbby JP State : Joined
Up Stdbby JP Expiry : 0d 00:00:12

Register State : No Info
Reg From Anycast RP: No

Rpf Neighbor : 10.10.2.3
Incoming Intf : ip-10.10.2.1
Outgoing Host List : ix
Stdbby Rpf Neighbor : 10.10.1.2
Stdbby Intf : ip-10.10.1.1

Curr Fwding Rate : 0.0 kbps
Forwarded Packets : 0
Discarded Packets : 0
Forwarded Octets : 0
RPF Mismatches : 0
Spt threshold : 0 kbps
ECMP opt threshold : 7
Admin bandwidth : 1 kbps

```

```

=====
PIM Source Group ipv4

```

## interface

- Syntax** `interface [ip-int-name | mt-int-name | ip-address] [group grp-ip-address | source ip-address [type {starstarrp | starg | sg}]] [detail] [family]`
- Context** show>router>pim
- Description** This command displays PIM interface information and the (S,G)/(\*,G)/(\*, \*, rp) state of the interface.
- Parameters**
- ip-int-name* — Only displays the interface information associated with the specified IP interface name.
  - mt-int-name* — Specifies the Multicast Tunnel (MT) interface for a VPRN.
- Values** <vprn-id>-mt-<grp-ip-address>
- ip-address* — Only displays the interface information associated with the specified IP address.
  - group** *grp-ip-address* — Specifies the IP multicast group address for which this entry contains information.
  - source** *ip-address* — Specifies the source address for which this entry contains information.

If the type is starg, the value of this object will be zero.

If the type is starstarrp, the value of this object will be address of the RP.

**type** — Specifies the type of this entry.

**Values** starstarrp, starg, sg

**detail** — Displays detailed interface information.

**family** — Displays IPv4 or IPv6 information for the interface.

**Output** PIM Interface Output

The following table provides PIM interface field descriptions.

**Table 15 PIM Interface Fields**

| Label       | Description                                                                                                             |
|-------------|-------------------------------------------------------------------------------------------------------------------------|
| Admin State | Displays the administrative state for PIM protocol on this interface.                                                   |
| Oper State  | Displays the current operational state of PIM protocol on this interface.                                               |
| DR          | Displays the designated router on this PIM interface.                                                                   |
| DR Priority | Displays the priority value sent in PIM Hello messages and that is used by routers to elect the designated router (DR). |
| Hello Intvl | Indicates the frequency at which PIM Hello messages are transmitted on this interface.                                  |

**Sample Output**

```
ALA-1# show router pim interface
=====
PIM Interfaces
=====
Interface Admin Oper DR DR Hello
 State State Priority Intvl

system Up Up N/A 1 30
ip-10.1.1.7.1 Up Up 10.1.7.7 5 30
ip-10.1.2.1 Up Up 10.1.2.2 5 30
ip-100.111.1.1 Up Up 100.111.1.1 5 30

Interfaces : 4
=====
ALA-1#

ALA-1# show router pim interface ip-10.1.2.1 detail
=====
PIM Interface ip-10.1.2.1
=====
```

```

Interface Admin Oper DR DR Hello
 State State Priority Intvl

ip-10.1.2.1 Up Up 10.1.2.2 5 30

```

PIM Group Source

```

Group Address : 228.101.0.5 Src Address : 100.111.1.2
Interface : ip-10.1.2.1 Type : <S,G>
RP Address : 200.200.200.4

```

```

Join Prune State : Join Expires : 0d 00:03:00
Prune Pend Expires : N/A

```

Assert State : No Info

Interfaces : 1

ALA-1#

ALA-1# show router pim interface group

PIM Interface ip-10.1.7.1

```

Interface Admin Oper DR DR Hello
 State State Priority Intvl

ip-10.1.7.1 Up Up 10.1.7.7 5 30

```

```

Group Address Source Address RP Address Type JP Assert

228.101.0.0 100.111.1.2 200.200.200.4 <S,G> Join No Info
228.101.0.1 100.111.1.2 200.200.200.4 <S,G> Join No Info
228.101.0.2 100.111.1.2 200.200.200.4 <S,G> Join No Info
228.101.0.3 100.111.1.2 200.200.200.4 <S,G> Join No Info
228.101.0.4 100.111.1.2 200.200.200.4 <S,G> Join No Info
228.101.0.6 100.111.1.2 200.200.200.4 <S,G> Join No Info
228.101.0.7 100.111.1.2 200.200.200.4 <S,G> Join No Info
228.101.0.8 100.111.1.2 200.200.200.4 <S,G> Join No Info
228.101.0.9 100.111.1.2 200.200.200.4 <S,G> Join No Info

```

PIM Interface ip-10.1.2.1

```

Interface Admin Oper DR DR Hello
 State State Priority Intvl

ip-10.1.2.1 Up Up 10.1.2.2 5 30

```

```

Group Address Source Address RP Address Type JP Assert

228.101.0.5 100.111.1.2 200.200.200.4 <S,G> Join No Info

```

PIM Interface ip-100.111.1.1

```

Interface Admin Oper DR DR Hello
 State State Priority Intvl

ip-100.111.1.1 Up Up 100.111.1.1 5 30

```

```

Group Address Source Address RP Address Type JP Assert

228.102.0.0 * 200.200.200.4 <*,G> Join No Info
228.102.0.1 * 200.200.200.4 <*,G> Join No Info
228.102.0.2 * 200.200.200.4 <*,G> Join No Info
228.102.0.3 * 200.200.200.4 <*,G> Join No Info
228.102.0.4 * 200.200.200.4 <*,G> Join No Info
228.102.0.5 * 200.200.200.4 <*,G> Join No Info
228.102.0.6 * 200.200.200.4 <*,G> Join No Info
228.102.0.7 * 200.200.200.4 <*,G> Join No Info
228.102.0.8 * 200.200.200.4 <*,G> Join No Info
228.102.0.9 * 200.200.200.4 <*,G> Join No Info

```

Interfaces : 3

ALA-1#

ALA-1# show router pim interface group 228.102.0.0 detail

PIM Interface ip-100.111.1.1

```

Interface Admin Oper DR DR Hello
 State State Priority Intvl

ip-100.111.1.1 Up Up 100.111.1.1 5 30

```

PIM Group Source

```

Group Address : 228.102.0.0 Src Address : *
Interface : ip-100.111.1.1 Type : <*,G>
RP Address : 200.200.200.4

Join Prune State : Join Expires : 0d 00:02:05
Prune Pend Expires : N/A

Assert State : No Info

```

Interfaces : 1

ALA-1#

ALA-1# show router pim interface type starg

PIM Interface ip-100.111.1.1

```

Interface Admin Oper DR DR Hello
 State State Priority Intvl

ip-100.111.1.1 Up Up 100.111.1.1 5 30

```

```

Group Address Source Address RP Address Type JP Assert

228.102.0.0 * 200.200.200.4 <*,G> Join No Info
228.102.0.1 * 200.200.200.4 <*,G> Join No Info
228.102.0.2 * 200.200.200.4 <*,G> Join No Info
228.102.0.3 * 200.200.200.4 <*,G> Join No Info

```

```

228.102.0.4 * 200.200.200.4 <*,G> Join No Info
228.102.0.5 * 200.200.200.4 <*,G> Join No Info
228.102.0.6 * 200.200.200.4 <*,G> Join No Info
228.102.0.7 * 200.200.200.4 <*,G> Join No Info
228.102.0.8 * 200.200.200.4 <*,G> Join No Info
228.102.0.9 * 200.200.200.4 <*,G> Join No Info

```

Interfaces : 1

ALA-1#

A:SetupCLI# show router pim interface detail

=====

PIM Interface int1

=====

```

Interface : int1
Admin Status : Up Oper Status : Up
DR : 10.1.1.1 Oper DR Priority : 1
BSM RA Check : Disabled Cfg DR Priority : 1
Hello Interval : 30 Time for next hello: 0d 00:00:23
Multicast Senders : auto Hello Multiplier : 35
J/P Tracking Admin : Disabled J/P Tracking Oper : Disabled
Auto-created : No Improved Assert : Enabled
Sticky-DR : Disabled Sticky-DR Priority : N/A
Max Groups Allowed : 0 Max Groups Till Now: 0
Num Groups : 0 Bfd Enabled : No
=====

```

PIM Interface sender

=====

```

Interface : sender
Admin Status : Up Oper Status : Up
DR : 11.1.1.1 Oper DR Priority : 1
=====

```

A:SetupCLI#

## neighbor

**Syntax** **neighbor** [*ip-address* | *ip-int-name* [**address** *ip-address*]] [**detail**] [*family*]

**Context** show>router>pim

**Description** This command displays PIM neighbor information.

This can be important if an interface has more than one adjacency. For example, a LAN-interface configuration with three routers connected and all are running PIM on their LAN interfaces. These routers then have two adjacencies on their LAN interface, each with different neighbors. If the **address** *address* parameter is not defined in this example, then the **show** command output would display two adjacencies.

**Parameters** **neighbor** *ip-int-name* — Only displays the interface information associated with the specified IP interface name.

*neighbor ip-address* — Only displays the interface information associated with the specified IP address.

**address** *ip-address* — The ip-address of the neighbor, on the other side of the interface.

**detail** — Displays detailed neighbor information.

**family** — Displays either IPv4 or IPv6 information for the specified neighbor.

**Output** PIM Neighbor Output

The following table provides PIM neighbor field descriptions.

**Table 16 PIM Neighbor Fields**

| Label               | Description                                                                                                                                                                                                                                                                                                                                                              |
|---------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Interface           | Displays the neighbor's interface name. (W) indicates wildcard tunnels.                                                                                                                                                                                                                                                                                                  |
| Nbr DR Priority     | Displays the value of the neighbor's DR priority which is received in the hello message.                                                                                                                                                                                                                                                                                 |
| Nbr Address         | Displays the neighbor's address.                                                                                                                                                                                                                                                                                                                                         |
| Up Time             | Displays the time since this PIM neighbor (last) became a neighbor of the local router.                                                                                                                                                                                                                                                                                  |
| Expiry Time         | Displays the minimum time remaining before this PIM neighbor will be aged out.<br>0—Means that this neighbor will never be aged out. This happens when the PIM neighbor sends a Hello message with holdtime set to `0xffff`.                                                                                                                                             |
| Hold Time           | Displays the value of the hold time present in the hello message.                                                                                                                                                                                                                                                                                                        |
| DR Priority         | Displays the value of the neighbor's DR priority which is received in the hello message.                                                                                                                                                                                                                                                                                 |
| Tracking Support    | Displays whether the T bit in the LAN prune delay option was present in the hello message. This indicates the neighbor's capability to disable join message suppression.                                                                                                                                                                                                 |
| LAN Delay           | Displays the value of the LAN delay field present in the hello message received from the neighbor.                                                                                                                                                                                                                                                                       |
| Gen Id              | Displays a randomly generated 32-bit value that is regenerated each time PIM forwarding is started or restarted on the interface, including when the router itself restarts. When a hello message with a new GenID is received from a neighbor, any old hello information about that neighbor is discarded and superseded by the information from the new hello message. |
| Override Intvl (ms) | Displays the value of the override interval present in the Hello message.                                                                                                                                                                                                                                                                                                |

**Sample Output**

```
ALA-1# show router pim neighbor
=====
PIM Neighbors
=====
Interface Nbr DR Nbr Address Up Time Expiry Time Hold
 Priority

ip-10.1.7.1 5 10.1.7.7 0d 00:10:39 0d 00:01:36 105
ip-10.1.2.1 5 10.1.2.2 0d 00:10:39 0d 00:01:35 105
ip-100.111.1.1 3 100.111.1.2 0d 00:09:31 0d 00:01:15 105

Neighbors : 3
=====
ALA-1#
```

```
*A:Dut-C# show router 100 pim neighbor ipv6
=====
PIM Neighbor ipv6
=====
Interface Nbr DR Prty Up Time Expiry Time Hold Time
 Nbr Address

vprn_itf_C_1100 1 0d 00:02:54 0d 00:01:43 105
 fe80::4403:1ff:fe01:2
mpls-if-74456(W) 1 0d 00:02:10 never 65535
 ::a14:104
mpls-if-74457(W) 1 0d 00:02:10 never 65535
 ::a14:105
mpls-virt-if-1030145 1 0d 00:02:44 never 65535
 ::a14:102

Neighbors : 4
=====
```

```
ALA-1# show router pim neighbor detail
=====
PIM Neighbor
=====
Interface : ip-10.1.7.1
Neighbor Addr : 10.1.7.7 DR Priority : 5
Tracking Support : No LAN Delay(ms) : 500
Gen Id : 26470 Override Intvl(ms) : 2500
Up Time : 0d 00:10:41 Expiry Time : 0d 00:01:34
Hold Time(sec) : 105
=====
PIM Neighbor
=====
Interface : ip-10.1.2.1
Neighbor Addr : 10.1.2.2 DR Priority : 5
Tracking Support : No LAN Delay(ms) : 500
Gen Id : 37928 Override Intvl(ms) : 2500
Up Time : 0d 00:10:42 Expiry Time : 0d 00:01:33
Hold Time(sec) : 105
```

```

=====
PIM Neighbor
=====
Interface : ip-100.111.1.1
Neighbor Addr : 100.111.1.2 DR Priority : 3
Tracking Support : No LAN Delay(ms) : 500
Gen Id : 742098371 Override Intvl(ms) : 2500
Up Time : 0d 00:09:33 Expiry Time : 0d 00:01:43
Hold Time(sec) : 105

Neighbors : 3
=====
ALA-1#

```

rp

- Syntax**    `rp ip-address`
- Context**    `show>router>pim`
- Description**    This command displays the rendezvous point (RP) set information built by the router.
- Parameters**    *ip-address* — Specifies the IP address of the RP.
- Output**        PIM RP Output

The following table provides PIM RP field descriptions.

**Table 17    PIM RP Fields**

| Label         | Description                                                                                                 |
|---------------|-------------------------------------------------------------------------------------------------------------|
| Group Address | Displays the multicast group address of the entry.                                                          |
| RP Address    | Displays the address of the Rendezvous Point (RP).                                                          |
| Type          | Specifies whether the entry was learned through the Bootstrap mechanism or if it was statically configured. |
| Priority      | Displays the priority for the specified group address. The higher the value, the higher the priority.       |
| Holdtime      | Displays the value of the hold time present in the BSM message.                                             |

**Sample Output**

```

A:ALA-1# show router pim rp
=====
PIM RP Set
=====
Group Address RP Address Type Priority Holdtime

224.0.0.0/4 200.200.200.4 Dynamic 192 150

```

```

10.1.7.1 Static 1 N/A

Group Prefixes : 1
=====
A:ALA-1#

A:ALA-1# show router pim rp 10.1.7.1
=====
PIM RP Set
=====
Group Address RP Address Type Priority Holdtime

224.0.0.0/4 10.1.7.1 Static 1 N/A

Group Prefixes : 1
=====
A:ALA-1#

```

## rp-hash

**Syntax** `rp-hash grp-ip-address`

**Context** `show>router>pim`

**Description** This command hashes the RP for the specified group from the RP set.

**Parameters** `grp-ip-address` — Displays specific multicast group addresses.

**Output** PIM RP-Hash Output

The following table provides RP-Hash output field descriptions.

**Table 18 RP-Hash Fields**

| Label         | Description                                                                                                 |
|---------------|-------------------------------------------------------------------------------------------------------------|
| Group Address | Displays the multicast group address of the entry.                                                          |
| RP Address    | Displays the address of the Rendezvous Point (RP).                                                          |
| Type          | Specifies whether the entry was learned through the Bootstrap mechanism or if it was statically configured. |

### Sample Output

```

A:ALA-1# show router pim rp-hash 228.101.0.0
=====
PIM Group-To-RP mapping
=====
Group Address RP Address Type

228.101.0.0 200.200.200.4 Bootstrap

```

```

=====
A:ALA-1#

A:ALA-1# show router pim rp-hash 228.101.0.6
=====
PIM Group-To-RP mapping
=====
Group Address RP Address Type

228.101.0.6 200.200.200.4 Bootstrap
=====
A:ALA-1#

```

### statistics

- Syntax**     **statistics** [*ip-int-name* | *mt-int-name* | *ip-address*] [*family*]
- Context**    show>router>pim
- Description** This command displays statistics for a particular PIM instance.
- Parameters**
  - ip-int-name* — Only displays the interface information associated with the specified IP interface name.
  - ip-address* — Only displays the interface information associated with the specified IP address.
  - family* — Displays either IPv4 or IPv6 information.
- Output**     PIM Statistics Output

The following table provides PIM statistics output field descriptions.

**Table 19     PIM Statistics Output Fields**

| Label          | Description                                                        |
|----------------|--------------------------------------------------------------------|
| PIM Statistics | The section listing the PIM statistics for a particular interface. |

**Table 19 PIM Statistics Output Fields (Continued)**

| Label        | Description                                                                                                |
|--------------|------------------------------------------------------------------------------------------------------------|
| Message Type | Displays the type of message.                                                                              |
|              | Hello<br>Displays the number of PIM hello messages received or transmitted.                                |
|              | Join Prune<br>Displays the number of PIM join prune messages received or transmitted.                      |
|              | Asserts<br>Displays the number of PIM assert messages received or transmitted.                             |
|              | Register<br>Displays the number of register messages received or transmitted.                              |
|              | Null Register<br>Displays the number of PIM null register messages received or transmitted.                |
|              | Register Stop<br>Displays the number of PIM register stop messages received or transmitted.                |
|              | BSM<br>Displays the number of PIM Bootstrap messages (BSM) received or transmitted.                        |
|              | Candidate RP Adv<br>Displays the number of candidate RP advertisements.                                    |
|              | Auto-RP Announce<br>Displays the number of auto-RP announce (224.0.1.39) messages received or transmitted. |
|              | Auto-RP Mapping<br>Displays the number of auto-RP mapping (224.0.1.40) messages received or transmitted.   |

**Table 19 PIM Statistics Output Fields (Continued)**

| Label                        | Description                                                                                                                                                                       |
|------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Message Type                 | PIM DM Grafts<br>Displays the number of PIM graft messages received or transmitted.                                                                                               |
|                              | PIM DM Graft Acks<br>Displays the number of PIM graft acknowledgment messages received or transmitted.                                                                            |
|                              | Total Packets<br>Displays the total number of packets transmitted and received.                                                                                                   |
| Received                     | Displays the number of messages received.                                                                                                                                         |
| Transmitted                  | Displays the number of multicast data packets transmitted.                                                                                                                        |
| Rx Errors                    | Displays the total number of receive errors.                                                                                                                                      |
| General Interface Statistics | The section listing the general PIM interface statistics.                                                                                                                         |
| Register TTL Drop            | Displays the number of multicast data packets which could not be encapsulated in Register messages because the time to live (TTL) was zero.                                       |
| Tx Register MTU Drop         | Displays the number of Bootstrap messages received on this interface but were dropped.                                                                                            |
| Rx Invalid Register          | Displays the number of invalid PIM register messages received.                                                                                                                    |
| Rx Neighbor Unknown          | Displays the number of PIM messages (other than hello messages) which were received and were rejected because the adjacency with the neighbor router was not already established. |
| Rx Bad Checksum Discard      | Displays the number of PIM messages received, and which were discarded because of bad checksum.                                                                                   |
| Rx Bad Encoding              | Displays the number of PIM messages with bad encodings received.                                                                                                                  |
| Rx Bad Version Discard       | Displays the number of PIM messages with bad versions received.                                                                                                                   |
| Rx CRP No Router Alert       | Displays the number of candidate-rp advertisements (C-RP-Adv) received, and which had no router alert option set.                                                                 |
| Rx Invalid Join Prune        | Displays the number of invalid PIM join prune messages received.                                                                                                                  |
| Rx Unknown PDU Type          | Displays the number of packets received with an unsupported PIM type.                                                                                                             |

**Table 19 PIM Statistics Output Fields (Continued)**

| Label                         | Description                                                                                                                                         |
|-------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|
| Join Policy Drops             | Displays the number of times the join policy match resulted in dropping PIM join-prune message or one of the source group contained in the message. |
| Register Policy Drops         | Displays the number of times the register policy match resulted in dropping PIM register message.                                                   |
| Bootstrap Import Policy Drops | Displays the number of Bootstrap messages received that were dropped because of Bootstrap import policy.                                            |
| Bootstrap Export Policy Drops | Displays the number of Bootstrap messages that were not transmitted because of Bootstrap export policy.                                             |
| Source Group Statistics       | The section listing the source group statistics.                                                                                                    |
| (S,G)                         | Displays the number of entries in which the type is (S,G).                                                                                          |
| (* ,G)                        | Displays the number of entries in which the type is (* ,G).                                                                                         |
| (* ,*,RP)                     | Displays the number of entries in which the type is (* , * , rp).                                                                                   |

**Sample output**

```
A:ALA-1# show router pim statistics
=====
PIM Statistics ipv4
=====
Message Type Received Transmitted Rx Errors

Hello 18009 12834 0
Join Prune 9135 1129 10
Core RPFV JP 0 0 0
MVPN RPFV JP 0 0 0
Asserts 0 0 0
Register 0 0 0
Null Register 0 0 0
Register Stop 0 0 0
BSM 0 0 0
Candidate RP Adv 0 0 0
Auto-RP Announce 2049 0 0
Auto-RP Mapping 2066 0 0
PIM DM Grafts 0 0 0
PIM DM Graft Acks 0 0 0
Total Packets 31231 13963

Intra-AS AD 0 0 0
Inter-AS AD 0 0 0
Mdt-Safi 1323 10 0
S-PMSI AD 0 0 0
Leaf AD 0 0 0
Source-Active AD 0 0 0
```

```

Shared Tree Join 0 0 0
Source Tree Join 0 0 0
Total BGP Packets 1323 10

```

-----  
General Statistics  
-----

```

Rx Invalid Register : 0
Rx Neighbor Unknown : 10
Rx Bad Checksum Discard : 0
Rx Bad Encoding : 0
Rx Bad Version Discard : 0
Rx CRP No Router Alert : 0
Rx BSM Router Alert Drops : 0
Rx BSM Wrong If Drops : 0
Rx Invalid Join Prune : 0
Rx Invalid Auto-RP PDU : 0
RPF Mismatch Auto-RP Mapping PDU : 65
RPF Mismatch Auto-RP Announce PDU : 80
Rx Unknown PDU Type : 0
Join Policy Drops : 0
Register Policy Drops : 0
Bootstrap Import Policy Drops : 0
Bootstrap Export Policy Drops : 0
Mcac Policy Drops : 0
Fwd Candidate RP Adv : 0
Fwd Candidate RP Adv Drops : 0
S-pmsi Join TLV PDUs txd. : 0
S-pmsi Join TLV PDUs rcd. : 0
S-pmsi Join TLV PDUs txd. Drops : 0
S-pmsi Join TLV PDUs rcd. Drops : 0
S-pmsi Maximum-P2mp-Spmsi Hits : 0
P2mp Pmsi Create Failures : 0
P2mp Pmsi Request Failures : 0
PDU Drops on Non-PIM/Down Intf : 0
Active Tx S-pmsis : 0
Active Tx MS-pmsis : 0
Active Rx S-pmsis : 0
Active Rx Pseudo S-pmsis : 0
Total Tx S-pmsis : 0
Total Rx S-pmsis : 0

```

-----  
Source Group Statistics  
-----

```

(S,G) : 2
(*,G) : 2
(*,*,RP) : 0

```

=====

status

**Syntax**    **status [detail] [family]**

**Context**    show>router>pim

**Description** This command displays PIM status. The Oper Status reflects the combined operational status of IPv4/IPv6 PIM protocol status. If both are down, then Oper Status will be reflected as down. If IPv4 or IPv6 reflects up, the Oper Status will reflect up.

If PIM is not enabled, the following message appears:

```
A:NYC# show router pim status
MINOR: CLI PIM is not configured.
A:NYC#
```

**Parameters** **detail** — Displays detailed status information.  
*family* — Displays either IPv4 or IPv6 information.

**Output** PIM Status Output

The following table provides PIM status output field descriptions.

**Table 20 PIM Status Output Fields**

| Label            | Description                                                                                                      |
|------------------|------------------------------------------------------------------------------------------------------------------|
| Admin State      | Displays the administrative status of PIM.                                                                       |
| Oper State       | Displays the current operating state of this PIM protocol instance.                                              |
| BSR State        | Displays the state of the router with respect to the Bootstrap mechanism.                                        |
| Address          | Displays the address of the elected Bootstrap router.                                                            |
| Expiry Time      | Displays the time remaining before the router sends the next Bootstrap message.                                  |
| Priority         | Displays the priority of the elected Bootstrap router. The higher the value, the higher the priority.            |
| Hash Mask Length | Displays the hash mask length of the Bootstrap router.                                                           |
| Up Time          | Displays the time since the current E-BSR became the Bootstrap router.                                           |
| RPF Intf towards | Displays the RPF interface towards the elected BSR. The value is zero if there is no elected BSR in the network. |
| Address          | Displays the address of the candidate BSR OS.                                                                    |
| Expiry Time      | Displays the time remaining before the router sends the next Bootstrap message.                                  |
| Auto-RP          | Displays if auto-RP functionality is enabled or disabled.                                                        |
| Priority         | Displays the priority of the Bootstrap router. The higher the value, the higher the priority.                    |

**Table 20 PIM Status Output Fields (Continued)**

| Label            | Description                                                                                                                                                                             |
|------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Hash Mask Length | Displays the hash mask length of the candidate Bootstrap router.                                                                                                                        |
| Up Time          | Displays the time since becoming the Bootstrap router.                                                                                                                                  |
| Admin State      | Displays the administrative status of CRP.                                                                                                                                              |
| Oper State       | Displays the current operating state of the C-RP mechanism.                                                                                                                             |
| Address          | Displays the local RP address.                                                                                                                                                          |
| Priority         | Displays the CRP's priority for becoming a rendezvous point (RP). A 0 value is the highest priority.                                                                                    |
| Holdtime         | Displays the hold time of the candidate RP. It is used by the Bootstrap router to timeout the RP entries if it does not listen to another CRP advertisement within the holdtime period. |
| Policy           | Displays the PIM policies for a particular PIM instance.                                                                                                                                |
| Default Group    | Displays the default core group address.                                                                                                                                                |
| RPF Table        | Displays the route table used for RPF check.                                                                                                                                            |
| MC-ECMP-Hashing  | Displays if hash-based multicast balancing of traffic over ECMP links is enabled or disabled.                                                                                           |

**Sample Output**

```
A:dut-d# show router pim status
=====
PIM Status ipv4
=====
Admin State : Up
Oper State : Up
IPv4 Admin State : Up
IPv4 Oper State : Up
BSR State : Accept Any
Elected BSR
 Address : None
 Expiry Time : N/A
 Priority : N/A
 Hash Mask Length : 30
 Up Time : N/A
 RPF Intf towards E-BSR : N/A
Candidate BSR
 Admin State : Down
 Oper State : Down
 Address : None
 Priority : 0
 Hash Mask Length : 30
Candidate RP
 Admin State : Down
 Oper State : Down
```

```

Address : 0.0.0.0
Priority : 192
Holdtime : 150
Auto-RP : Disabled
Multicast-Fast-Failover : Disabled
SSM-Default-Range : Enabled
SSM-Assert-Comp-Mode : Disabled
SSM-Group-Range :
None
MC-ECMP-Hashing : Disabled
MC-ECMP-Hashing-Rebalance : Disabled
Enable-MDT-SPT : Disabled
Policy : None
RPF Table : rtable-u
Non-DR-Attract-Traffic : Disabled
Rpf-Vector : None
ESM : Disabled
=====
A:dut-d#

```

## tunnel-interface

- Syntax** **tunnel-interface** [*ip-int-name* | *mt-int-name* | *int-ip-address*] [**group** [*grp-ip-address*] **source** *ip-address*] [**type** {**starstarrp** | **starg** | **sg**}] [**detail**] [*family*]
- Context** show>router>pim
- Description** This command displays PIM tunnel interface information.
- Parameters** *ip-int-name* — Specifies the IP interface name. A string up to 32 characters.  
*mt-int-name* — Specifies the Multicast Tunnel (MT) interface for a VPRN.
- Values** *vprn-id-mt-grp-ip-address*  
*int-ip-address* — Specifies the interface IPv4 or IPv6 address.  
**group** *grp-ip-address* — Specifies the IP multicast group address, or 0.  
**source** *ip-address* — Specifies the source or RP IPv4 or IPv6 address.  
**type** — Specifies the type of entry.
- Values** **starstarrp** | **starg** | **sg**  
**detail** — Displays detailed interface information.  
*family* — Specifies the IPv4 or IPv6 address family.

### Output

#### Sample Output

```

*A:Dut-C# show router pim tunnel-interface
=====
PIM Interfaces ipv4
=====

```

| Interface     | Originator Address | Adm | Opr | Transport | Type |
|---------------|--------------------|-----|-----|-----------|------|
| mpls-if-73728 | N/A                | Up  | Up  | Tx-IPMSI  |      |
| mpls-if-73729 | N/A                | Up  | Up  | Tx-IPMSI  |      |
| mpls-if-73730 | N/A                | Up  | Up  | Tx-IPMSI  |      |
| mpls-if-73731 | N/A                | Up  | Up  | Tx-IPMSI  |      |
| mpls-if-73732 | N/A                | Up  | Up  | Tx-IPMSI  |      |

-----  
Interfaces : 5  
=====

### mvpn-list

- Syntax** `mvpn-list [type type] [auto-discovery auto-discovery] [signalling signalling] [group group]`
- Context** show>router
- Description** This command displays the list of multicast VPNs.
- Parameters**
  - type* — Specifies the MVPN type.
    - Values** pim | rsvp | ldp
  - auto-discovery* — Specifies the auto-discovery mode.
    - Values** none | default | mdt-s
  - signalling* — Specifies the signalling type.
    - Values** bgp | pim
  - group* — Specifies the group address.

### Output

#### Sample Output

```
*A:Dut-D# show router mvpn-list

Legend: Sig = Signal Pim-a = pim-asm Pim-s = pim-ssm A-D = Auto-Discovery
SR = Sender-Receiver SO = Sender-Only RO = Receiver-Only

=====
MVPN List
=====
VprnID A-D iPmsi/sPmsi GroupAddr/Lsp-Template IPv4 (S,G) / (*,G)
 Sig Mdt-Type

100 None Pim-a/None 224.100.201.101 0/0
 Pim N/A

Total Mvpns : 1
=====
```

```

Total PIM RSVP MLDP

I-PMSI tunnels 1 0 0
TX S-PMSI tunnels 0 0 0
RX S-PMSI tunnels 0 0 0
RX PSEUDO S-PMSI tunnels 0 0 0

Total IPv4 (S,G)/(*,G) : 0/0
Total IPv6 (S,G)/(*,G) : 0/0
=====
*A:Dut-D#

```

## 5.6.2.2 Clear Commands

### database

- Syntax** `database [interface ip-int-name | mt-int-name | int-ip-address] [group grp-ip-address [source ip-address]] [family]`
- Context** `clear>router>pim`
- Description** This command clears IGMP or PIM database statistics on a specified interface or IP address.
- Parameters**
- interface *ip-int-name*** — Clears the IGMP or PIM database on the specified interface.
  - interface *mt-int-name*** — Clears the default core group address of the Multicast Distribution Tree (MDT) for the VPRN instance. The Multicast Tunnel (MT) interface for a VPRN is created when this object is set to a valid group address.  
**Syntax:** *vprn-id-mt-grp-ip-address*
  - interface *int-ip-address*** — Clears the IGMP or PIM database on the specified IP address.
  - group *group-ip-address*** — Clears the multicast group address (ipv4/ipv6) or zero in the specified address group.
  - source *ip-address*** — Clears the IGMP or PIM database from the specified source IP address.
  - family*** — Clears either IPv4 or IPv6 information.
  - mpls-if-name*** — Clears the MPLS interface name.  
**Syntax:** *mpls-if-index*

### s-pmsi

- Syntax** `s-pmsi [mdSrcAddr] [mdGrpAddr] [vprnSrcAddr vprnGrpAddr]`
- Context** `clear>router>pim`

---

|                    |                                                                                                                                                                                                                                                                                                                                                                                       |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Description</b> | This command clears PIM selective provider multicast service interface cache.                                                                                                                                                                                                                                                                                                         |
| <b>Parameters</b>  | <p><i>mdSrcAddr</i> — Clears the specified source address used for Multicast Distribution Tree (MDT).</p> <p><i>mdGrpAddr</i> — Clears the specified group address used for Multicast Distribution Tree (MDT).</p> <p><i>vprnSrcAddr</i> — Clears the specified source address of the multicast sender.</p> <p><i>vprnGrpAddr</i> — Clears the specified multicast group address.</p> |

## statistics

|                    |                                                                                                                                                                                                      |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>statistics</b> [[[ <b>interface</b> <i>ip-int-name</i>   <i>ip-address</i>   <i>mt-int-name</i> ]]] {[ <b>group</b> <i>grp-ip-address</i> [ <b>source</b> <i>ip-address</i> ]]] [ <i>family</i> ] |
| <b>Context</b>     | clear>router>pim                                                                                                                                                                                     |
| <b>Description</b> | This command clears PIM statistics on a specified interface or IP address.                                                                                                                           |



**Note:** An interface and group or source cannot be specified at the same time.

|                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|-------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Parameters</b> | <p><b>interface</b> <i>ip-int-name</i> — Clears PIM statistics on the specified interface.</p> <p><b>interface</b> <i>ip-address</i> — Clears PIM statistics on the specified IP address.</p> <p><b>interface</b> <i>mt-int-name</i> — Clears the default core group address of the Multicast Distribution Tree (MDT) for the VPRN instance. The Multicast Tunnel (MT) interface for a VPRN is created when this object is set to a valid group address.</p> <p><b>syntax:</b> <i>vprn-id-mt-grp-ip-address</i></p> <p><b>group</b> <i>grp-ip-address</i> — When only the group address is specified and no source is specified, (*,G) statistics are cleared. When the group address is specified along with the source address, then the (S,G) statistics are reset to zero.</p> <p><b>source</b> <i>ip-address</i> — When the source address is specified along with the group address, then the (S,G) statistics are reset to zero.</p> <p><i>family</i> — Clears either IPv4 or IPv6 information.</p> |
|-------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

## neighbor

|                    |                                                                               |
|--------------------|-------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>neighbor</b> [ <i>ip-int-name</i>   <i>ip-address</i> ] [ <i>family</i> ]  |
| <b>Context</b>     | clear>router>pim                                                              |
| <b>Description</b> | This command clears PIM neighbor data on a specified interface or IP address. |

- Parameters** *ip-int-name* — Clears PIM neighbor on the specified interface.  
*ip-address* — Clears PIM neighbor on the specified IP address.  
*family* — Clears either IPv4 or IPv6 information.

### 5.6.2.3 Debug Commands

#### adjacency

- Syntax** [no] adjacency  
**Context** debug>router>pim  
**Description** This command enables/disables debugging for PIM adjacencies.

#### all

- Syntax** all [group *grp-ip-address*] [source *ip-address*] [detail]  
no all  
**Context** debug>router>pim  
**Description** This command enables/disables debugging for all the PIM modules.  
**Parameters** group *grp-ip-address* — Debugs information associated with all PIM modules.  
    **Values** IPv4 or IPv6 address  
source *ip-address* — Debugs information associated with all PIM modules.  
    **Values** IPv4 or IPv6 address  
detail — Debugs detailed information on all PIM modules.

#### assert

- Syntax** assert [group *grp-ip-address*] [source *ip-address*] [detail]  
no assert  
**Context** debug>router>pim  
**Description** This command enables/disables debugging for PIM assert mechanism.  
**Parameters** group *grp-ip-address* — Debugs information associated with the PIM assert mechanism.  
    **Values** multicast group address (ipv4/ipv6)

**source** *ip-address* — Debugs information associated with the PIM assert mechanism.

**Values** source address (ipv4/ipv6)

**detail** — Debugs detailed information on the PIM assert mechanism.

## auto-rp

**Syntax** **auto-rp [detail]**  
**no auto-rp**

**Context** debug>router>pim

**Description** This command enables/disables debugging for PIM auto-RP.

**Parameters** **detail** — Debugs detailed information on the PIM auto-RP mechanism.

## bgp

**Syntax** **bgp [source *ip-address*] [group *group-ip-address*] [peer *peer-ip-address*]**  
**no bgp**

**Context** debug>router>pim

**Description** This command enables/disables debugging for PIM/BGP specific interoperation.

**Parameters** **source** *ip-address* — Debugs BGP information associated with the specified source.

**Values** source address (ipv4/ipv6)

**group** *group-ip-address* — Debugs BGP information associated with the specified group.

**Values** group address (ipv4/ipv6)

**peer** *peer-ip-address* — Debugs BGP information associated with the specified peer.

**Values** peer address (ipv4/ipv6)

## bsr

**Syntax** **bsr [detail]**  
**no bsr**

**Context** debug>router>pim

**Description** This command enables/disables debugging for the PIM bootstrap mechanism.

The **no** form of the command disables debugging.

---

**Parameters** **detail** — Debugs detailed information on the PIM bootstrap mechanism.

## data

**Syntax** **data** [**group** *grp-ip-address*] [**source** *ip-address*] [**detail**]  
**no data**

**Context** debug>router>pim

**Description** This command enables/disables debugging for PIM data exception.

**Parameters** **group** *grp-ip-address* — Debugs information associated with the specified data exception.  
**Values** multicast group address (ipv4/ipv6)

**source** *ip-address* — Debugs information associated with the specified data exception.  
**Values** source address (ipv4/ipv6)

**detail** — Debugs detailed IP data exception information.

## db

**Syntax** **db** [**group** *grp-ip-address*] [**source** *ip-address*] [**detail**]  
**no db**

**Context** debug>router>pim

**Description** This command enables/disables debugging for PIM database.

**Parameters** **group** *grp-ip-address* — Debugs information associated with the specified database.  
**Values** multicast group address (ipv4/ipv6) or zero

**source** *ip-address* — Debugs information associated with the specified database.  
**Values** source address (ipv4/ipv6)

**detail** — Debugs detailed IP database information.

## dynmldp

**Syntax** **dynmldp** [**detail**]  
**no dynmldp**

**Context** debug>router>pim

**Description** This command enables/disables debugging for dynamic MLDP.

**Parameters** **detail** — Debugs detailed dynamic MLDP information.

---

## extranet

|                    |                                                           |
|--------------------|-----------------------------------------------------------|
| <b>Syntax</b>      | <b>extranet [detail]</b><br><b>no extranet</b>            |
| <b>Context</b>     | debug>router>pim                                          |
| <b>Description</b> | This command enables/disables debugging for extranet PIM. |
| <b>Parameters</b>  | <b>detail</b> — Debugs detailed extranet PIM information. |

## grafts

|                    |                                                                                                                                                                                                                                                                                                                                                               |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>grafts [source <i>ip-address</i>] [group <i>grp-ip-address</i>] [detail]</b><br><b>no grafts</b>                                                                                                                                                                                                                                                           |
| <b>Context</b>     | debug>router>pim                                                                                                                                                                                                                                                                                                                                              |
| <b>Description</b> | This command enables/disables debugging for PIM grafts.                                                                                                                                                                                                                                                                                                       |
| <b>Parameters</b>  | <b>source <i>ip-address</i></b> — Debugs graft information associated with the specified source.<br><b>Values</b> source address (ipv4/ipv6)<br><b>group <i>grp-ip-address</i></b> — Debugs graft information associated with the specified group.<br><b>Values</b> multicast group address (ipv4/ipv6)<br><b>detail</b> — Debugs detailed graft information. |

## interface

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>interface [<i>ip-int-name</i>   <i>mt-int-name</i>   <i>ip-address</i>] [detail]</b><br><b>no interface</b>                                                                                                                                                                                                                                                                                                                    |
| <b>Context</b>     | debug>router>pim                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Description</b> | This command enables/disables debugging for PIM interface information.                                                                                                                                                                                                                                                                                                                                                            |
| <b>Parameters</b>  | <b><i>ip-int-name</i></b> — Debugs the information associated with the specified IP interface name.<br><b>Values</b> IPv4 or IPv6 interface address<br><b><i>mt-int-address</i></b> — Debugs the information associated with the specified VPRN ID and group address.<br><b><i>ip-address</i></b> — Debugs the information associated with the specified IP address.<br><b>detail</b> — Debugs detailed IP interface information. |

---

## jp

|                    |                                                                                                                                                                                                                                                                                                                                                                                                       |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>jp</b> [ <b>group</b> <i>grp-ip-address</i> ] [ <b>source</b> <i>ip-address</i> ] [ <b>detail</b> ]<br><b>no jp</b>                                                                                                                                                                                                                                                                                |
| <b>Context</b>     | debug>router>pim                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Description</b> | This command enables/disables debugging for PIM join and prune mechanisms.                                                                                                                                                                                                                                                                                                                            |
| <b>Parameters</b>  | <b>group</b> <i>grp-ip-address</i> — Debugs information associated with the specified Join-Prune mechanism.<br><b>Values</b> multicast group address (ipv4/ipv6) or zero<br><b>source</b> <i>ip-address</i> — Debugs information associated with the specified Join-Prune mechanism.<br><b>Values</b> source address (ipv4/ipv6)<br><b>detail</b> — Debugs detailed Join-Prune mechanism information. |

## mofrr

|                    |                                                                          |
|--------------------|--------------------------------------------------------------------------|
| <b>Syntax</b>      | [ <b>no</b> ] <b>mofrr</b>                                               |
| <b>Context</b>     | debug>router>pim                                                         |
| <b>Description</b> | This command enables/disables debugging for PIM multicast fast failover. |

## mrib

|                    |                                                                                                                                                                                                                                                                                                                                                       |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>mrib</b> [ <b>group</b> <i>grp-ip-address</i> ] [ <b>source</b> <i>ip-address</i> ] [ <b>detail</b> ]<br><b>no mrib</b>                                                                                                                                                                                                                            |
| <b>Context</b>     | debug>router>pim                                                                                                                                                                                                                                                                                                                                      |
| <b>Description</b> | This command enables/disables debugging for PIM MRIB.                                                                                                                                                                                                                                                                                                 |
| <b>Parameters</b>  | <b>group</b> <i>grp-ip-address</i> — Debugs information associated with the specified PIM MRIB.<br><b>Values</b> multicast group address (ipv4/ipv6)<br><b>source</b> <i>ip-address</i> — Debugs information associated with the specified PIM MRIB.<br><b>Values</b> source address (ipv4/ipv6)<br><b>detail</b> — Debugs detailed MRIB information. |

## msg

|                    |                                                            |
|--------------------|------------------------------------------------------------|
| <b>Syntax</b>      | <b>msg [detail]</b><br><b>no msg</b>                       |
| <b>Context</b>     | debug>router>pim                                           |
| <b>Description</b> | This command enables/disables debugging for PIM messaging. |
| <b>Parameters</b>  | <b>detail</b> — Debugs detailed messaging information.     |

## mvpn-rtcache

|                    |                                                                                                                                                                                                                                                                                                    |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>mvpn-rtcache [group <i>grp-ip-address</i>] [peer <i>ip-address</i>]</b><br><b>no mvpn-rtcache</b>                                                                                                                                                                                               |
| <b>Context</b>     | debug>router>pim                                                                                                                                                                                                                                                                                   |
| <b>Description</b> | This command enables/disables debugging for the PIM MVPN route cache.                                                                                                                                                                                                                              |
| <b>Parameters</b>  | <b>group <i>grp-ip-address</i></b> — Debugs information associated with the specified group.<br><b>Values</b> multicast group address (ipv4/ipv6) or zero<br><b>peer <i>peer-ip-address</i></b> — Debugs information associated with the specified peer.<br><b>Values</b> peer address (ipv4/ipv6) |

## packet

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>packet [hello   register   register-stop   jp   bsr   assert   crp   mdt-tlv   auto-rp-announcement   auto-rp-mapping   graft   graft-ack] [<i>ip-int-name</i>   <i>mt-int-name</i>   <i>int-ip-address</i>   <i>mpls-if-name</i>]</b><br><b>no packet</b>                                                                                                                                                                                                                                                                           |
| <b>Context</b>     | debug>router>pim                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Description</b> | This command enables/disables debugging for PIM packets.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Parameters</b>  | <b>hello   register   register-stop   jp   bsr   assert   crp   mdt-tlv   auto-rp-announcement   auto-rp-mapping   graft   graft-ack</b> — PIM packet types.<br><i>ip-int-name</i> — Debugs the information associated with the specified IP interface name, up to 32 characters.<br><i>mt-int-name</i> — Debugs the information associated with the specified VPRN ID and group address.<br><b>Values</b> <i>vprn-id-mt-grp-ip-address</i><br><i>int-ip-address</i> — Debugs the information associated with the specified IP address. |

---

*mpls-if-name* — Debugs the information associated with the specified MPLS interface.

**Values** *mpls-if-index*

## red

|                    |                                                                                         |
|--------------------|-----------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>red [detail]</b><br><b>no red</b>                                                    |
| <b>Context</b>     | debug>router>pim                                                                        |
| <b>Description</b> | This command enables/disables debugging for PIM redundancy messages to the standby CPM. |
| <b>Parameters</b>  | <b>detail</b> — Displays detailed redundancy information.                               |

## register

|                    |                                                                                                                                                                                                                                                                                                                                                                                 |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>register [group <i>grp-ip-address</i>] [source <i>ip-address</i>] [detail]</b><br><b>no register</b>                                                                                                                                                                                                                                                                         |
| <b>Context</b>     | debug>router>pim                                                                                                                                                                                                                                                                                                                                                                |
| <b>Description</b> | This command enables/disables debugging for PIM register mechanism.                                                                                                                                                                                                                                                                                                             |
| <b>Parameters</b>  | <b>group <i>grp-ip-address</i></b> — Debugs information associated with the specified PIM register.<br><b>Values</b> <i>multicast group address (ipv4/ipv6)</i><br><b>source <i>ip-address</i></b> — Debugs information associated with the specified PIM register.<br><b>Values</b> <i>source address (ipv4/ipv6)</i><br><b>detail</b> — Debugs detailed register information. |

## rpfv

|                    |                                                             |
|--------------------|-------------------------------------------------------------|
| <b>Syntax</b>      | <b>rpfv [detail]</b><br><b>no rpfv</b>                      |
| <b>Context</b>     | debug>router>pim                                            |
| <b>Description</b> | This command enables/disables debugging for PIM RPF vector. |
| <b>Parameters</b>  | <b>detail</b> — Debugs detailed RPF vector information.     |

---

**rtm**

|                    |                                                      |
|--------------------|------------------------------------------------------|
| <b>Syntax</b>      | <b>rtm [detail]</b><br><b>no rtm</b>                 |
| <b>Context</b>     | debug>router>pim                                     |
| <b>Description</b> | This command enables/disables debugging for PIM RTM. |
| <b>Parameters</b>  | <b>detail</b> — Displays detailed RTM information.   |

**s-pmsi**

|                    |                                                                                                                                                                                                                                                               |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>s-pmsi</b> [{ <i>vpnSrcAddr</i> [ <i>vpnGrpAddr</i> ]} [ <i>mdSrcAddr</i> ]] [ <b>detail</b> ]<br><b>no s-pmsi</b>                                                                                                                                         |
| <b>Context</b>     | debug>router>pim                                                                                                                                                                                                                                              |
| <b>Description</b> | This command enables debugging for PIM selective provider multicast service interface.<br><br>The <b>no</b> form of the command disables the debugging.                                                                                                       |
| <b>Parameters</b>  | <i>vpnSrcAddr</i> — Specifies the VPN source address.<br><i>vpnGrpAddr</i> — Specifies the VPN group address<br><i>mdSrcAddr</i> — Specifies the source address of the multicast domain.<br><b>detail</b> — Displays detailed information for selective PMSI. |

**tunnel-interface**

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>tunnel-interface</b> [ <b>rsvp-p2mp</b> <i>lsp-name</i> ] [ <b>sender</b> <i>ip-address</i> ] [ <b>detail</b> ]<br><b>tunnel-interface</b> [ <b>ldp-p2mp</b> <i>p2mp-id</i> ] [ <b>sender</b> <i>ip-address</i> ] [ <b>detail</b> ]<br><b>no tunnel-interface</b> [ <b>rsvp-p2mp</b> <i>lsp-name</i> ] [ <b>sender</b> <i>ip-address</i> ]<br><b>no tunnel-interface</b> [ <b>ldp-p2mp</b> <i>p2mp-id</i> ] [ <b>sender</b> <i>ip-address</i> ] |
| <b>Context</b>     | debug>router>pim                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Description</b> | This command enables/disables debugging for PIM tunnel interfaces.                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Parameters</b>  | <b>rsvp-p2mp</b> <i>lsp-name</i> — Specifies the LSP for RSVP P2MP.<br><b>sender</b> <i>ip-address</i> — Specifies the IP address of the sender.<br><b>ldp-p2mp</b> <i>p2mp-id</i> — Specifies the P2MP ID for LDP P2MP.<br><b>detail</b> — Displays detailed information for PIM tunnel interfaces.                                                                                                                                               |

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## 6 MSDP

### 6.1 In This Chapter

This chapter provides information to configure Multicast Source Discovery Protocol (MSDP).

Topics in this chapter include:

- [Multicast Source Discovery Protocol](#)
- [Configuring MSDP with CLI](#)
- [MSDP Configuration Command Reference](#)

### 6.2 Multicast Source Discovery Protocol

MSDP-speaking routers in a PIM-SM domain have MSDP peering relationship with MSDP peers in another domain. The peering relationship is made up of a TCP connection in which control information is exchanged. Each domain has one or more connections to this virtual topology.

When a PIM-SM RP learns about a new multicast source within its own domain from a standard PIM register mechanism, it encapsulates the first data packet in an MSDP source-active message and sends it to all MSDP peers.

The source-active message is flooded (after an RPF check) by each peer to its MSDP peers until the source-active message reaches every MSDP router in the interconnected networks. If the receiving MSDP peer is an RP, and the RP has a (\*.G) entry (receiver) for the group, the RP creates state for the source and joins to the shortest path tree for the source. The encapsulated data is de-encapsulated and forwarded down the shared tree of that RP. When the packet is received by the last hop router of the receiver, the last hop router also may join the shortest path tree to the source.

The MSDP speaker periodically sends source-active messages that include all sources.

## 6.2.1 Anycast RP for MSDP

MSDP is a mechanism that allows rendezvous points to share information about active sources. When RPs in remote domains hear about the active sources, they can pass on that information to the local receivers and multicast data can be forwarded between the domains. MSDP allows each domain to maintain an independent RP that does not rely on other domains but enables RPs to forward traffic between domains. PIM-SM is used to forward the traffic between the multicast domains.

Using PIM-SM, multicast sources and receivers register with their local RP by the closest multicast router. The RP maintains information about the sources and receivers for any particular group. RPs in other domains do not have any knowledge about sources located in other domains.

MSDP is required to provide inter-domain multicast services using Any Source Multicast (ASM). Anycast RP for MSDP enables fast convergence when should an MSDP/PIM PR router fail by allowing receivers and sources to rendezvous at the closest RP.

## 6.2.2 MSDP Procedure

When an RP in a PIM-SM domain first learns of a new sender, for example, by PIM register messages, it constructs a source-active (SA) message and sends it to its MSDP peers. The SA message contains the following fields:

- Source address of the data source
- Group address the data source sends to
- IP address of the RP



**Note:** An RP that is not a designated router on a shared network does not originate SAs for directly-connected sources on that shared network. It only originates in response to receiving register messages from the designated router.

Each MSDP peer receives and forwards the message away from the RP address in a peer-RPF flooding fashion. The notion of peer-RPF flooding is with respect to forwarding SA messages. The Multicast RPF Routing Information Base (MRIB) is examined to determine which peer towards the originating RP of the SA message is selected. Such a peer is called an RPF peer.

If the MSDP peer receives the SA from a non-RPF peer towards the originating RP, it will drop the message. Otherwise, it forwards the message to all its MSDP peers (except the one from which it received the SA message).

When an MSDP peer which is also an RP for its own domain receives a new SA message, it determines if there are any group members within the domain interested in any group described by an (S,G) entry within the SA message. That is, the RP checks for a (\*,G) entry with a non-empty outgoing interface list. This implies that some system in the domain is interested in the group. In this case, the RP triggers an (S,G) join event toward the data source as if a join/prune message was received addressed to the RP. This sets up a branch of the source-tree to this domain. Subsequent data packets arrive at the RP by this tree branch and are forwarded down the shared-tree inside the domain. If leaf routers choose to join the source-tree they have the option to do so according to existing PIM-SM conventions. If an RP in a domain receives a PIM join message for a new group G, the RP must trigger an (S,G) join event for each active (S,G) for that group in its SA cache.

This procedure is called flood-and-join because if any RP is not interested in the group, the SA message can be ignored, otherwise, they join a distribution tree.

### 6.2.2.1 MSDP Peering Scenarios

Draft-ietf-mboned-msdp-deploy-nn.txt, *Multicast Source Discovery Protocol (MSDP) Deployment Scenarios*, describes how protocols work together to provide intra- and inter-domain ASM service.

Inter-domain peering:

- Peering between PIM border routers (single-hop peering)
- Peering between non-border routers (multi-hop peering)
- MSDP peering without BGP
- MSDP peering between mesh groups
- MSDP peering at a multicast exchange

Intra-domain peering:

- Peering between routers configured for both MSDP and MBGP
- MSDP peer is not BGP peer (meaning, no BGP peer)

---

### 6.2.3 MSDP Peer Groups

MSDP peer groups are typically created when multiple peers have a set of common operational parameters. Group parameters not specifically configured are inherited from the global level.

### 6.2.4 MSDP Mesh Groups

MSDP mesh groups are used to reduce source active flooding primarily in intra-domain configurations. When a number of speakers in an MSDP domain are fully meshed they can be configured as a mesh group. The originator of the source active message forwards the message to all members of the mesh group. Because of this, forwarding the SA between non-originating members of the mesh group is not necessary.

### 6.2.5 MSDP Routing Policies

MSDP routing policies allow for filtering of inbound and/or outbound active source messages. Policies can be configured at different levels:

- Global level — Applies to all peers
- Group level — Applies to all peers in peer-group
- Neighbor level — Applies only to specified peer

The most specific level is used. If multiple policy names are specified, the policies are evaluated in the order they are specified. The first policy that matches is applied. If no policy is applied source active messages are passed.

Match conditions include:

- Neighbor — Matches on a neighbor address is the source address in the IP header of the source active message.
- Route filter — Matches on a multicast group address embedded in the source active message.
- Source address filter — Matches on a multicast source address embedded in the source active message.

## 6.2.6 Multicast in Virtual Private Networks

### 6.2.6.1 Draft Rosen

RFC 4364, *BGP/MPLS IP Virtual Private Networks (VPNs)*, describes a method of providing a VPN service. A VPN provides secure connections to the network, allowing more efficient service to remote users without compromising the security of firewalls. The Rosen draft specifies the protocols and procedures which must be implemented in order for a service provider to provide a unicast VPN. The draft extends that specification by describing the protocols and procedures which a service provider must implement in order to support multicast traffic in a VPN, assuming that PIM [PIMv2] is the multicast routing protocol used within the VPN, and the SP network can provide PIM as well.

IGMP is not supported for receivers or senders directly attached to the PE.

For further information, refer to the *Virtual Private Routed Network Service* section of the *Layer 3 Services Guide*.



---

## 6.3 Configuring MSDP with CLI

This section provides information to configure MSDP using the command line interface.

Topics in this section include:

- [Basic MSDP Configuration](#)
- [Configuring MSDP Parameters](#)
- [Disabling MSDP](#)

### 6.3.1 Basic MSDP Configuration

Perform the following basic MSDP configuration tasks:

- Enable MSDP (required)
- Configure peer
- Configure local address

### 6.3.2 Configuring MSDP Parameters

Use the following commands to configure basic MSDP parameters:

**CLI Syntax:**

```
config>router# msdp
peer ip-address
active-source-limit number
authentication-key [authentication-key|hash-
key] [hash|hash2]
default-peer
export policy-name [policy-name...(up to 5
max)]
import policy-name [policy-name...(up to 5
max)]
local-address ip-address
receive-msdp-msg-rate number interval seconds
[threshold threshold]
no shutdown
no shutdown
```

Use the following CLI syntax to configure MSDP parameters.

**Example:**

```
config>router>msdp# peer 10.20.1.1
config>router>msdp>peer# local-address 10.20.1.6
config>router>msdp>peer# no shutdown
config>router>msdp>peer# exit
config>router>msdp# no shutdown
config>router>msdp#
```

The following example displays the MSDP configuration:

```
ALA-48>config>router>msdp# info

 peer 10.20.1.1
 local-address 10.20.1.6
 exit

ALA-48>config>router>msdp#
```

### 6.3.3 Disabling MSDP

Use the following CLI syntax to disable PIM.

**CLI Syntax:**

```
config>router#
 msdp
 shutdown
```

The following example displays the command usage to disable multicast:

**Example:**

```
config>router#
config>router>msdp# shutdown
config>router>msdp# exit
```

The following example displays the configuration output:

```
A:LAX>config>router# info

...
#-----
echo "MSDP Configuration"
#-----
 msdp
 shutdown
 peer 10.20.1.1
 local-address 10.20.1.6
 exit
 group "test"
 active-source-limit 50000
 receive-msdp-msg-rate 100 interval 300 threshold 5000
 export "LDP-export"
 import "LDP-import"
 local-address 10.10.10.103
```

---

```
 mode mesh-group
 peer 10.10.10.104
 exit
 exit
exit
#-----
```



## 6.4 MSDP Configuration Command Reference

### 6.4.1 Command Hierarchies

- [Configuration Commands](#)

#### 6.4.1.1 Configuration Commands

```

config
 — router
 — [no] msdp
 — [no] active-source-limit number
 — [no] data-encapsulation
 — export policy-name [policy-name...(up to 5 max)]
 — no export
 — [no] group group-name
 — active-source-limit number
 — no active-source-limit
 — export policy-name [policy-name...(up to 5 max)]
 — no export
 — import policy-name [policy-name...(up to 5 max)]
 — no import
 — local-address address
 — no local-address
 — mode {mesh-group | standard}
 — [no] peer peer-address
 — active-source-limit number
 — no active-source-limit
 — authentication-key [authentication-key | hash-key] [hash |
 hash2]
 — no authentication-key
 — [no] default-peer
 — export policy-name [policy-name...(up to 5 max)]
 — no export
 — import policy-name [policy-name...(up to 5 max)]
 — no import
 — local-address address
 — no local-address
 — receive-msdp-msg-rate number interval seconds [threshold
 number]
 — no receive-msdp-msg-rate
 — [no] shutdown
 — receive-msdp-msg-rate number interval seconds [threshold number]
 — no receive-msdp-msg-rate
 — [no] shutdown
 — import policy-name [policy-name...(up to 5 max)]

```

- **no import**
- **local-address** *address*
- **no local-address**
- **[no] peer** *peer-address*
  - **active-source-limit** *number*
  - **no active-source-limit**
  - **authentication-key** [*authentication-key* | *hash-key*] [**hash** | **hash2**]
  - **no authentication-key**
  - **[no] default-peer**
  - **export** *policy-name* [*policy-name...*(up to 5 max)]
  - **no export**
  - **import** *policy-name* [*policy-name...*(up to 5 max)]
  - **no import**
  - **local-address** *address*
  - **no local-address**
  - **receive-msdp-msg-rate** *number interval seconds* [**threshold** *number*]
  - **no receive-msdp-msg-rate**
  - **[no] shutdown**
- **receive-msdp-msg-rate** *number interval seconds* [**threshold** *number*]
- **no receive-msdp-msg-rate**
- **rpf-table** {**rtable-m** | **rtable-u** | **both**}
- **no rpf-table**
- **sa-timeout** *seconds*
- **no sa-timeout**
- **[no] shutdown**
- **[no] source** *prefix/mask*
  - **active-source-limit** *number*
  - **no active-source-limit**

## 6.4.2 Command Descriptions

### 6.4.2.1 MSDP Commands

msdp

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] msdp</b>                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Context</b>     | config>router                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Description</b> | <p>This command enables a Multicast Source Discovery Protocol (MSDP) instance. When an MSDP instance is created, the protocol is enabled. To start or suspend execution of the MSDP protocol without affecting the configuration, use the <b>[no] shutdown</b> command.</p> <p>For the MSDP protocol to function, at least one peer must be configured.</p> <p>When MSDP is configured and started an appropriate event message should be generated.</p> |

When **the** no form of the command is executed, all sessions must be terminated and an appropriate event message should be generated.

When all peering sessions are terminated, an event message per peer is not required.

The **no** form of the command deletes the MSDP protocol instance, removing all associated configuration parameters.

**Default** no msdp

## active-source-limit

**Syntax** **active-source-limit** *number*  
**no active-source-limit**

**Context** config>router>msdp  
config>router>msdp>group  
config>router>msdp>group>peer

**Description** This option controls the maximum number of active source messages that will be accepted by Multicast Source Discovery Protocol (MSDP), effectively controlling the number of active sources that can be stored on the system.

The **no** form of this command reverts the number of source message limit to default operation.

**Default** No limit is placed on the number of source active records

**Parameters** *number* — This parameter defines how many active sources can be maintained by MSDP.

**Values** 0 to 1000000

## receive-msdp-msg-rate

**Syntax** **receive-msg-rate** *number interval seconds [threshold number]*  
**no receive-msg-rate**

**Context** config>router>msdp  
config>router>msdp>peer  
config>router>msdp>group  
config>router>msdp>group>peer

**Description** This command limits the number of Multicast Source Discovery Protocol (MSDP) messages that are read from the TCP session. It is possible that an MSDP/ RP router may receive a large number of MSDP protocol message packets in a particular source active message.

After the number of MSDP packets (including source active messages) defined in the threshold have been processed, the rate of all other MSDP packets is rate limited by no longer accepting messages from the TCP session until the time (seconds) has elapsed.

The **no** form of this command reverts this active-source limit to default operation.

**Default** No limit is placed on the number of MSDP and source active limit messages will be accepted.

**Parameters** *number* — Defines the number of MSDP messages (including source active messages) that are read from the TCP session per the number of seconds.

**Values** 10 to 10000

**Default** 0

**interval seconds** — This defines the time that, together with the *number* parameter, defines the number of MSDP messages (including source active messages) that are read from the TCP session within the configured number of seconds.

**Values** 1 to 600

**Default** 0

**threshold number** — This number reflects the number of MSDP messages can be processed before the MSDP message rate limiting function described above is activated; this is particularly of use during at system startup and initialization.

**Values** 1 to 1000000

**Default** 0

## shutdown

**Syntax** **[no] shutdown**

**Context**  
config>router>msdp  
config>router>msdp>peer  
config>router>msdp>group

**Description** The **shutdown** command administratively disables the entity. When disabled, an entity does not change, reset, or remove any configuration settings or statistics. Many entities must be explicitly enabled using the **no shutdown** command and must be shut down before they may be deleted.

Unlike other commands and parameters where the default state is not indicated in the configuration file, **shutdown** and **no shutdown** are always indicated in system generated configuration files.

The **no** form of the command puts an entity into the administratively enabled state.

**Default** no shutdown

---

## authentication-key

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>authentication-key</b> [ <i>authentication-key</i>   <i>hash-key</i> ] [ <b>hash</b>   <b>hash2</b> ]<br><b>no authentication-key</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Context</b>     | config>router>msdp>peer<br>config>router>msdp>group>peer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Description</b> | This command configures a Message Digest 5 (MD5) authentication key to be used with a specific Multicast Source Discovery Protocol (MSDP) peering session. The authentication key must be configured per peer as such no global or group configuration is possible.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Default</b>     | Authentication-key. All MSDP messages are accepted and the MD5 signature option authentication key is disabled.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Parameters</b>  | <p><i>authentication-key</i> — The authentication key. Allowed values are any string up to 256 characters long composed of printable, 7-bit ASCII characters. If the string contains special characters (#, \$, spaces, etc.), enclose the entire string in quotation marks (“ ”).</p> <p><i>hash-key</i> — The hash key. The key can be any combination of ASCII characters up to 451 characters in length (encrypted). If spaces are used in the string, enclose the entire string in quotation marks (“ ”).</p> <p>This is useful when a user must configure the parameter, but, for security purposes, the actual unencrypted key value is not provided.</p> <p><b>hash</b> — Specifies the key is entered in an encrypted form. If the <b>hash</b> or <b>hash2</b> parameter is not used, the key is assumed to be in an unencrypted, clear text form. For security, all keys are stored in encrypted form in the configuration file with the <b>hash</b> or <b>hash2</b> parameter specified</p> <p><b>hash2</b> — Specifies the key is entered in a more complex encrypted form that involves more variables than the key value alone, meaning that the <b>hash2</b> encrypted variable cannot be copied and pasted. If the <b>hash</b> or <b>hash2</b> parameter is not used, the key is assumed to be in an unencrypted, clear text form. For security, all keys are stored in encrypted form in the configuration file with the <b>hash</b> or <b>hash2</b> parameter specified.</p> |

## data-encapsulation

|                    |                                                                                                                                                                                                                 |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] data-encapsulation</b>                                                                                                                                                                                  |
| <b>Context</b>     | config>router>msdp                                                                                                                                                                                              |
| <b>Description</b> | This command configures a rendezvous point (RP) using Multicast Source Discovery Protocol (MSDP) to encapsulate multicast data received in MSDP register messages inside forwarded MSDP source-active messages. |
| <b>Default</b>     | data-encapsulation                                                                                                                                                                                              |

---

## default-peer

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>default-peer</b><br><b>no default-peer</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Context</b>     | config>router>msdp>peer<br>config>router>msdp>group>peer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Description</b> | <p>Using the default peer mechanism, a peer can be selected as the default Multicast Source Discovery Protocol (MSDP) peer. As a result, all source-active messages from the peer will be accepted without the usual peer-reverse-path-forwarding (RPF) check.</p> <p>The MSDP peer-RPF check is different from the normal multicast RPF checks. The peer-RPF check is used to stop source-active messages from looping. A router validates source-active messages originated from other routers in a deterministic fashion.</p> <p>A set of rules is applied in order to validate received source-active messages, and the first rule that applies determines the peer-RPF neighbor. All source-active messages from other routers are rejected. The rules applied to source-active messages originating at Router S received at Router R from Router N are as follows:</p> <ul style="list-style-type: none"> <li>• If Router N and router S are one and the same, then the message is originated by a direct peer-RPF neighbor and will be accepted.</li> <li>• If Router N is a configured peer, or a member of the Router R mesh group then its source-active messages are accepted.</li> <li>• If Router N is the Border Gateway Protocol (BGP) next hop of the active multicast RPF route toward Router S then Router N is the peer-RPF neighbor and its source-active messages are accepted.</li> <li>• If Router N is an external BGP peer of Router R and the last autonomous system (AS) number in the BGP AS-path to Router S is the same as Router N's AS number, then Router N is the peer-RPF neighbor, and its source-active messages are accepted.</li> <li>• If Router N uses the same next hop as the next hop to Router S, then Router N is the peer-RPF neighbor, and its source-active messages are accepted.</li> <li>• If Router N fits none of the above rules, then Router N is not a peer-RPF neighbor, and its source-active messages are rejected.</li> </ul> |
| <b>Default</b>     | No default peer is established and all active source messages must be RPF checked.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |

## export

|                |                                                                                                            |
|----------------|------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>  | <b>export</b> <i>policy-name</i> [ <i>policy-name...</i> (up to 5 max)]<br><b>no export</b>                |
| <b>Context</b> | config>router>msdp<br>config>router>msdp>peer<br>config>router>msdp>group<br>config>router>msdp>group>peer |

**Description** This command specifies the policies to export source active state from the source active list into Multicast Source Discovery Protocol (MSDP).

If multiple policy names are specified, the policies are evaluated in the order they are specified. The first policy that matches is applied. If multiple export commands are issued, the last command entered will override the previous command. A maximum of five policy names can be specified.

The **no** form of the command removes all policies from the configuration.

**Default** No export policies are applied and all SA entries are announced.

**Parameters** *policy-name* — Specifies the export policy name. Up to five *policy-name* arguments can be specified.

If you configure an export policy at the global level, each individual peer inherits the global policy. If you configure an export policy at the group level, each individual peer in a group inherits the group's policy. If you configure an export policy at the peer level, then policy only applies to the peer where it is configured.

## group

**Syntax** [**no**] **group** *group-name*

**Context** config>router>msdp

**Description** This command enables access to the context to create or modify a Multicast Source Discovery Protocol (MSDP) group. To configure multiple MSDP groups, include multiple group statements.

By default, the group's options are inherited from the global MSDP options. To override these global options, group-specific options within the group statement can be configured.

If the group name provided is already configured then this command only provides the context to configure the options pertaining to this group.

If the group name provided is not already configured, then the group name must be created and the context to configure the parameters pertaining to the group should be provided. In this case, the \$ prompt to indicate that a new entity (group) is being created should be used.

For a group to be of use, at least one peer must be configured.

**Default** no group

**Parameters** *group-name* — Species a unique name for the MSDP group.

## import

**Syntax** **import** *policy-name* [*policy-name...*(**up to 5 max**)]

**no import**

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Context</b>     | config>router>msdp<br>config>router>msdp>peer<br>config>router>msdp>group<br>config>router>msdp>group>peer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Description</b> | <p>This command specifies the policies to import source active state from Multicast Source Discovery Protocol (MSDP) into source active list.</p> <p>If multiple policy names are specified, the policies are evaluated in the order they are specified. The first policy that matches is applied. If multiple import commands are issued, the last command entered will override the previous command. A maximum of five policy names can be specified.</p> <p>If you configure an import policy at the global level, each individual peer inherits the global policy.</p> <p>If you configure an import policy at the group level, each individual peer in a group inherits the group's policy.</p> <p>If you configure an import policy at the peer level, then policy only applies to the peer where it is configured.</p> <p>The <b>no</b> form of the command removes all policies from the configuration.</p> |
| <b>Default</b>     | No import policies are applied and all source active messages are allowed.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Parameters</b>  | <i>policy-name</i> — Specifies the import policy name. Up to five policy-name arguments can be specified.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |

**local-address**

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>local-address</b> <i>address</i><br><b>no local-address</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Context</b>     | config>router>msdp<br>config>router>msdp>peer<br>config>router>msdp>group<br>config>router>msdp>group>peer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Description</b> | <p>This command configures the local end of a Multicast Source Discovery Protocol (MSDP) session. For MSDP to function, at least one peer must be configured. When configuring a peer, you must include this local-address command to configure the local end of the MSDP session. This address must be present on the node and is used to validate incoming connections to the peer and to establish connections to the remote peer.</p> <p>If the user enters this command, then the address provided is validated and will be used as the local address for MSDP peers from that point. If a subsequent local-address command is entered, it will replace the existing configuration and existing sessions will be terminated.</p> |

Similarly, when the **no** form of this command is entered, the existing local-address will be removed from the configuration and the existing sessions will be terminated.

Whenever a session is terminated, all information pertaining to and learned from that peer will be removed.

Whenever a new peering session is created or a peering session is lost, an event message should be generated.

The **no** form of this command removes the local-address from the configuration.

**Default** No local address is configured.

**Parameters** *address* — Specifies an existing address on the node.

## mode

**Syntax** **mode** {**mesh-group** | **standard**}

**Context** config>router>msdp>group

**Description** This command configures groups of peers in a full mesh topology to limit excessive flooding of source-active messages to neighboring peers.

Multicast Source Discovery Protocol (MSDP) peers can be configured grouped in a full-mesh topology that prevents excessive flooding of source-active messages to neighboring peers.

In a meshed configuration, all members of the group must have a peer connection with every other mesh group member. If this rule is not adhered to, then unpredictable results may occur.

**Default** standard (non-meshed)

**Parameters** **mesh-group** — Specifies that source-active message received from a mesh group member are always accepted but are not flooded to other members of the same mesh group. These source-active messages are only flooded to non-mesh group peers or members of other mesh groups.

**standard** — Specifies a non-meshed mode.

## peer

**Syntax** [**no**] **peer** *peer-address*

**Context** config>router>msdp  
config>router>msdp>group

---

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Description</b> | <p>This command configures peer parameters. Multicast Source Discovery Protocol (MSDP) must have at least one peer configured. A peer is defined by configuring a local-address that can be used by this node to set up a peering session and the address of a remote MSDP router. It is the address of this remote peer that is configured in this command and it identifies the remote MSDP router address.</p> <p>After peer relationships are established, the MSDP peers exchange messages to advertise active multicast sources. It may be required to have multiple peering sessions in which case multiple peer statements should be included in the configurations.</p> <p>By default, the options applied to a peer are inherited from the global or group-level. To override these inherited options, include peer-specific options within the peer statement.</p> <p>If the peer address provided is already a configured peer, then this command only provides the context to configure the parameters pertaining to this peer.</p> <p>If the peer address provided is not already a configured peer, then the peer instance must be created and the context to configure the parameters pertaining to this peer should be provided. In this case, the \$ prompt to indicate that a new entity (peer) is being created should be used.</p> <p>The peer address provided will be validated and, if valid, will be used as the remote address for an MSDP peering session.</p> <p>When the <b>no</b> form of this command is entered, the existing peering address will be removed from the configuration and the existing session will be terminated. Whenever a session is terminated, all source active information pertaining to and learned from that peer will be removed. Whenever a new peering session is created or a peering session is lost, an event message should be generated.</p> <p>At least one peer must be configured for MSDP to function.</p> |
| <b>Default</b>     | none                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Parameters</b>  | <i>peer-address</i> — The address configured in this statement must identify the remote MSDP router that the peering session must be established with.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |

## rpf-table

|                    |                                                                                                                                                                                                                                                                                                                                                   |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>rpf-table</b> { <i>rtable-m</i>   <i>rtable-u</i>   <b>both</b> }<br><b>no rpf-table</b>                                                                                                                                                                                                                                                       |
| <b>Context</b>     | config>router>msdp                                                                                                                                                                                                                                                                                                                                |
| <b>Description</b> | <p>This command configures the sequence of route tables used to find a Reverse Path Forwarding (RPF) interface for a particular multicast route.</p> <p>By default, only the unicast route table is looked up to calculate RPF interface towards the source/rendezvous point. However, the operator can specify one of the following options:</p> |

- use the unicast route table only
- use the multicast route table only
- use both the route tables

**Default** rtable-u

**Parameters** **rtable6-m** — Specifies that only the multicast route table will be used by the multicast protocol (PIM) for IPv4 RPF checks. This route table will contain routes submitted by static routes, ISIS and OSPF.

**rtable6-u** — Specifies only that the unicast route table will be used by the multicast protocol (PIM) for IPv4 RPF checks. This route table will contain routes submitted by all the unicast routing protocols.

**both** — Will always look up first in the multicast route table and, if there is a route, it will use it. If PIM does not find a route in the first lookup, it will try to find it in the unicast route table. Rtable-m is checked before rtable6-u.

## sa-timeout

**Syntax** **sa-timeout** *seconds*  
**no sa-timeout**

**Context** config>router>msdp

**Description** This command configures the value for the SA entries in the cache. If these entries are not refreshed within the timeout value, they are removed from the cache. Normally, the entries are refreshed at least once a minute. But under high load with many of MSDP peers, the refresh cycle could be incomplete. A higher timeout value (more than 90) could be useful to prevent instabilities in the MSDP cache.

**Default** 90

**Parameters** *seconds* — Specifies the time, in seconds, to wait for a response from the peer before declaring the peer unavailable.

**Values** 90 to 600

## SOURCE

**Syntax** [**no**] **source** *ip-prefix/mask*

**Context** config>router>msdp

**Description** This command limits the number of active source messages the router accepts from sources in the specified address range.

If the prefix and mask provided is already a configured then this command only provides the context to configure the parameters pertaining to this active source-message filter.

---

If the prefix and mask provided is not already a configured, then the source node instance must be created and the context to configure the parameters pertaining to this node should be provided. In this case, the \$ prompt to indicate that a new entity (source) is being created should be used.

The **no** form of this message removes the source active rate limiter for this source address range.

**Default** None. The source active **msdp** messages are not rate limited based on the source address range.

**Parameters** *ip-prefix* — The IP prefix in dotted decimal notation for the range used by the ABR to advertise that summarizes the area into another area.

**Values** ip-prefix/mask: ip-prefix a.b.c.d (host bits must be 0)

*mask* — The subnet mask for the range expressed as a decimal integer mask length or in dotted decimal notation.

**Values** 0 to 32 (mask length), 0.0.0.0 to 255.255.255.255 (dotted decimal)

## 6.5 Show, Clear, and Debug Command Reference

### 6.5.1 Command Hierarchies

- [Show Commands](#)
- [Clear Commands](#)
- [Debug Commands](#)

#### 6.5.1.1 Show Commands

```
show
 — router
 — msdp
 — group [group-name] [detail]
 — peer [ip-address] [group group-name] [detail]
 — source [ip-address/mask] [type {configured | dynamic | both}] [detail]
 — source-active [{group ip-address | local | originator ip-address | peer ip-
 address | source ip-address | group ip-address source ip-address}]
 [detail]
 — source-active-rejected [peer-group name] [group ip-address] [source ip-
 address] [originator ip-address] [peer ip-address]
 — statistics [peer ip-address]
 — status
```

#### 6.5.1.2 Clear Commands

```
clear
 — router
 — msdp
 — cache [peer ip-address] [group ip-address] [source ip-address] [originrp ip-
 address]
 — statistics [peer ip-address]
```

#### 6.5.1.3 Debug Commands

```
debug
 — router
 — [no] msdp
 — packet [pkt-type] [peer ip-address]
```

- **no packet**
- **pim** [*grp-address*]
- **no pim**
- **rtm** [*rp-address*]
- **no rtm**
- **sa-db** [**group** *grpAddr*] [**source** *srcAddr*] [**rp** *rpAddr*]
- **no sa-db**

## 6.5.2 Command Descriptions

### 6.5.2.1 Show Commands

The command outputs in the following section are examples only; actual displays may differ depending on supported functionality and user configuration.

#### group

**Syntax** **group** [*group-name*] [**detail**]

**Context** show>router>msdp

**Description** This command displays information about MSDP groups.

**Parameters** *group-name* — Displays information about the specified group name. If no *group-name* is specified, information about all group names display.  
**detail** — Displays detailed MSDP group information.

**Output** MSDP Group Output

The following table provides MSDP group field descriptions.

**Table 21** MSDP Group Fields

| Label         | Description                                                                                                                      |
|---------------|----------------------------------------------------------------------------------------------------------------------------------|
| Group Name    | Displays the MSDP group name.                                                                                                    |
| Mode          | Displays the groups of peers in a full mesh topology to limit excessive flooding of source-active messages to neighboring peers. |
| Act Srcs      | Displays the configured maximum number of active source messages that will be accepted by MSDP.                                  |
| Local Address | Displays the local end of a MSDP session.                                                                                        |

**Table 21 MSDP Group Fields (Continued)**

| Label            | Description                                                                                                                 |
|------------------|-----------------------------------------------------------------------------------------------------------------------------|
| Admin State      | Displays the administrative state.                                                                                          |
| Receive Msg Rate | Displays rate that the messages are read from the TCP session.                                                              |
| Receive Msg Time | Displays the time of MSDP messages that are read from the TCP session within the configured number of seconds.              |
| Receive Msg Thd  | Displays the configured threshold number of MSDP messages can be processed before the MSDP message rate limiting function . |
| SA Limit         | Displays the source-active limit.                                                                                           |

**Sample Output**

```
*A:ALA-48>show>router>msdp# group
=====
MSDP Groups
=====
Group Name Mode Act Srcs Local Address

main Mesh-group None None
loop1 Mesh-group None None
loop2 Mesh-group None None
loop3 Mesh-group None None
loop4 Mesh-group None None
loop5 Mesh-group None None

Groups : 6
=====
*A:ALA-48>show>router>msdp#

*A:ALA-48>show>router>msdp# group test
=====
MSDP Groups
=====
Group Name Mode Act Srcs Local Address

test Mesh-group 50000 10.10.10.103

Groups : 1
=====
*A:ALA-48>show>router>msdp#

*A:ALA-48>show>router>msdp# group test detail
=====
MSDP Groups
=====
Group Name : test

Local Address : 10.10.10.103
```

```

Admin State : Up Receive Msg Rate : None
Receive Msg Time : None Receive Msg Thd : None
Mode : Mesh-group SA Limit : 50000
Export Policy : None Specified / Inherited
Import Policy : None Specified / Inherited

```

```

Groups : 1
=====
*A:ALA-48>show>router>msdp#

```

## peer

- Syntax**     **peer** [*ip-address*] [**group** *group-name*] [**detail**]
- Context**    show>router>msdp
- Description** This command displays information about an MSDP peer.
- Parameters**
  - ip-address* — Displays information about the specified IP address. If no IP address specified, information about all MSDP IP addresses display.
  - group group-name* — Displays information about the specified group name. If no *group-name* is specified, information about all MSDP peers display.
  - detail** — Displays detailed MSDP peer information.
- Output**     MSDP Peer Output

The following table provides MSDP field descriptions.

**Table 22     MSDP Fields**

| Label             | Description                                                 |
|-------------------|-------------------------------------------------------------|
| Peer              | Displays the IP address of the peer.                        |
| Local Address     | Displays the local IP address.                              |
| State             | Displays the current state of the peer.                     |
| Last State Change | Displays the date and time of the peer's last state change. |
| SA Learn          | The number of SAs learned through a peer.                   |

### Sample Output

```

A:ALA-48# show router msdp peer
=====
MSDP Peers
=====
Peer Local Address State Last State Change SA Learnt

```

```

10.20.1.1 10.20.1.6 Established 08/30/2002 03:22:131008

Peers : 1
=====
A:ALA-48#

A:ALA-48# show router msdp peer detail
=====
MSDP Peers

Peer Address : 10.20.1.1

Group Name : None
Local Address : 10.20.1.6
Last State Change : 08/30/2002 03:22:13 Last Act Src Limit : N/A
Peer Admin State : Up Default Peer : No
Peer Connect Retry : 0 State : Established
SA accepted : 1008 SA received : 709
State timer expires: 18 Peer time out : 62
Active Source Limit: None Receive Msg Rate : 0
Receive Msg Time : 0 Receive Msg Thd : 0
Auth Status : Disabled Auth Key : None
Export Policy : None Specified / Inherited
Import Policy : None Specified / Inherited

Peers : 1
=====
A:ALA-48#

```

## SOURCE

- Syntax** `source [ip-address/mask] [type {configured | dynamic | both}] [detail]`
- Context** show>router>msdp
- Description** This command displays the discovery method for this multicast source.
- Parameters**
- configured** — Displays user-created sources.
  - dynamic** — Displays dynamically created sources.
  - both** — Displays both user-configured and dynamically created sources.
  - detail** — Displays detailed MSDP source information.
- Output** MSDP Source Output

The following table provides MSDP source field descriptions.

**Table 23 MSDP Source Fields**

| Label  | Description                          |
|--------|--------------------------------------|
| Source | Displays the IP address of the peer. |

**Table 23 MSDP Source Fields (Continued)**

| Label         | Description                                                                     |
|---------------|---------------------------------------------------------------------------------|
| Type          | Displays the type of peer.                                                      |
| SA limit      | Displays the local IP address.                                                  |
| State         | Displays the current state of the peer.                                         |
| Num excd      | Indicates the number of times the global active source limit has been exceeded. |
| Last exceeded | Displays the date and time of the peer's last state change.                     |

## source-active

**Syntax** **source-active** [{**group** *ip-address* | **local** | **originator** *ip-address* | **peer** *ip-address* | **source** *ip-address* | **group** *ip-address* **source** *ip-address*}] [**detail**]

**Context** show>router>msdp

**Description** This command displays source active messages accepted by MSDP.

**Parameters** **group** *ip-address* — Displays information about the specified group IP address.  
**local** — Displays information about local source-active messages.  
**originator** *ip-address* — Displays information about the specified originator IP address.  
**peer** *ip-address* — Displays information about the specified peer IP address.  
**source** *ip-address* — Displays information about the specified source IP address.  
**group** *ip-address* — Displays information about the specified group IP address.  
**detail** — Displays detailed MSDP source-active information.

**Output** MSDP Source-Active Output

The following table provides MSDP source-active field descriptions.

**Table 24 MSDP Source-Active Fields**

| Label       | Description                                             |
|-------------|---------------------------------------------------------|
| Grp Address | Displays the IP address of the group.                   |
| Src Address | Displays the IP address of the source.                  |
| Origin RP   | Displays the origination rendezvous point (RP) address. |

**Table 24 MSDP Source-Active Fields (Continued)**

| Label        | Description                                                       |
|--------------|-------------------------------------------------------------------|
| Peer Address | Displays the address of the peer.                                 |
| State Timer  | The time-out value. If the value reaches zero, the SA is removed. |

**Sample Output**

```
A:ALA-48# show router msdp source-active
=====
MSDP Source Active Info
=====
Grp Address Src Address Origin RP Peer Address State Timer

228.100.0.0 100.112.1.2 10.20.1.1 10.20.1.1 69
228.100.0.1 100.112.1.2 10.20.1.1 10.20.1.1 69
228.100.0.2 100.112.1.2 10.20.1.1 10.20.1.1 69
228.100.0.3 100.112.1.2 10.20.1.1 10.20.1.1 69
228.100.0.4 100.112.1.2 10.20.1.1 10.20.1.1 69
228.100.0.5 100.112.1.2 10.20.1.1 10.20.1.1 69
228.100.0.6 100.112.1.2 10.20.1.1 10.20.1.1 69
228.100.0.7 100.112.1.2 10.20.1.1 10.20.1.1 69
228.100.0.8 100.112.1.2 10.20.1.1 10.20.1.1 69
228.100.0.9 100.112.1.2 10.20.1.1 10.20.1.1 69

MSDP Source Active : 10
=====
A:ALA-48#
```

```
A:ALA-48# show router msdp source-active detail
=====
MSDP Source Active
=====
Group Address : 228.100.0.0 Source Address : 100.112.1.2
Origin RP : 10.20.1.1 Peer Address : 10.20.1.1
State Timer : 64 Up Time : 3d 01:44:25
Group Address : 228.100.0.1 Source Address : 100.112.1.2
Origin RP : 10.20.1.1 Peer Address : 10.20.1.1
State Timer : 64 Up Time : 48d 18:22:29
Group Address : 228.100.0.2 Source Address : 100.112.1.2
Origin RP : 10.20.1.1 Peer Address : 10.20.1.1
State Timer : 64 Up Time : 48d 18:22:29
Group Address : 228.100.0.3 Source Address : 100.112.1.2
Origin RP : 10.20.1.1 Peer Address : 10.20.1.1
State Timer : 64 Up Time : 48d 18:22:29
Group Address : 228.100.0.4 Source Address : 100.112.1.2
Origin RP : 10.20.1.1 Peer Address : 10.20.1.1
State Timer : 64 Up Time : 48d 18:22:29
Group Address : 228.100.0.5 Source Address : 100.112.1.2
Origin RP : 10.20.1.1 Peer Address : 10.20.1.1
State Timer : 64 Up Time : 48d 18:22:29
Group Address : 228.100.0.6 Source Address : 100.112.1.2
Origin RP : 10.20.1.1 Peer Address : 10.20.1.1
State Timer : 64 Up Time : 48d 18:22:29
```

```

Group Address : 228.100.0.7 Source Address : 100.112.1.2
Origin RP : 10.20.1.1 Peer Address : 10.20.1.1
State Timer : 64 Up Time : 48d 18:22:29
Group Address : 228.100.0.8 Source Address : 100.112.1.2
Origin RP : 10.20.1.1 Peer Address : 10.20.1.1
State Timer : 64 Up Time : 48d 18:22:29
Group Address : 228.100.0.9 Source Address : 100.112.1.2
Origin RP : 10.20.1.1 Peer Address : 10.20.1.1
State Timer : 64 Up Time : 48d 18:22:29

```

```

MSDP Source Active : 10
=====
```

```
A:ALA-48#
```

## source-active-rejected

- Syntax** **source-active-rejected** [**peer-group** *name*] [**group** *ip-address*] [**source** *ip-address*] [**originator** *ip-address*] [**peer** *ip-address*]
- Context** show>router>msdp
- Description** This command displays source-active messages rejected by MSDP.
- Parameters**
- peer-group** *name* — Displays information about rejected source-active messages for the specified peer group.
  - group** *ip-address* — Displays information about the specified group IP address.
  - source** *ip-address* — Displays information about the source address of the source active entry that is rejected.
  - originator** *ip-address* — Displays information about the specified originator IP address.
  - peer** *ip-address* — Displays information about the peer from which this rejected source active entry was last received.
- Output** MSDP Source-Active Output

The following table provides MSDP source-active field descriptions.

**Table 25 MSDP Source-Active Fields**

| Label         | Description                                                   |
|---------------|---------------------------------------------------------------|
| Grp Address   | Displays the IP address of the group.                         |
| Src Address   | Displays the IP address of the source.                        |
| Origin RP     | Displays the origination rendezvous point (RP) address.       |
| Peer Address  | Displays the address of the peer.                             |
| Reject Reason | Displays the reason why this source active entry is rejected. |

**Sample Output**

```
*A:ALA-48# show router msdp source-active-rejected
=====
MSDP Source Active Rejected Info
=====
Grp Address Src Address Origin RP Peer Address Reject Reason

228.100.0.1 110.0.0.1 10.20.0.1 20.0.0.1 Import Policy
228.100.0.2 110.0.0.2 10.20.0.2 20.0.0.2 Export Policy
228.100.0.3 110.0.0.3 10.20.0.3 20.0.0.3 RPF Failure
228.100.0.4 110.0.0.4 10.20.0.4 20.0.0.4 Limit Exceeded
228.100.0.5 110.0.0.5 10.20.0.5 20.0.0.5 Limit Exceeded
228.100.0.6 110.0.0.6 10.20.0.6 20.0.0.6 Limit Exceeded
228.100.0.7 110.0.0.7 10.20.0.7 20.0.0.7 Limit Exceeded

SA Rejected Entries : 7
=====
*A:ALA-48#
```

statistics

- Syntax** `statistics [peer ip-address]`
- Context** `show>router>msdp`
- Description** This command displays statistics information related to a MSDP peer.
- Parameters** *ip-address* — Displays information about the specified peer IP address
- Output** MSDP Statistics Output

The following table provides MSDP statistics field descriptions.

**Table 26 MSDP Statistics Fields**

| Label               | Description                                                    |
|---------------------|----------------------------------------------------------------|
| Last State Change   | Displays the date and time the peer state changed.             |
| RPF Failures        | Displays the number of reverse path forwarding (RPF) failures. |
| SA Msgs Sent        | Displays the number of source-active messages sent.            |
| SA req. Msgs Sent   | Displays the number of source-active request messages sent.    |
| SA res. Msgs Sent   | Displays the number of source-active response messages sent.   |
| KeepAlive Msgs Sent | Displays the number of keepalive messages sent.                |
| Unknown Msgs Sent   | Displays the number of unknown messages received.              |

**Table 26 MSDP Statistics Fields (Continued)**

| Label               | Description                                                      |
|---------------------|------------------------------------------------------------------|
| Last message Peer   | Displays the time the last message was received from the peer.   |
| Remote Closes       | Displays the number of times the remote peer close.              |
| SA Msgs Recvd       | Displays the number of source-active messages received.          |
| SA req. Msgs Recvd  | Displays the number of source-active request messages received.  |
| SA res. Msgs Recvd  | Displays the number of source-active response messages received. |
| KeepAlive Msgs Recd | Displays the number of keepalive messages received.              |
| Error Msgs Recvd    | Displays the number of unknown messages received.                |

**Sample Output**

```
A:ALA-48# show router msdp statistics
=====
MSDP Statistics
=====
Glo ActSrc Lim Excd: 0

Peer Address : 10.20.1.1

Last State Change : 0d 11:33:16 Last message Peer : 0d 00:00:17
RPF Failures : 0 Remote Closes : 0
SA Msgs Sent : 0 SA Msgs Recvd : 709
SA req. Msgs Sent : 0 SA req. Msgs Recvd : 0
SA res. Msgs Sent : 0 SA res. Msgs Recvd : 0
KeepAlive Msgs Sent: 694 KeepAlive Msgs Recd: 694
Unknown Msgs Sent : 0 Error Msgs Recvd : 0

Peers : 1
=====
A:ALA-48#
```

**status**

- Syntax**     **status**
- Context**    show>router>msdp
- Description** This command displays MSDP status information.
- Output**      MSDP Status Output

The following table provides MSDP status field descriptions.

**Table 27 MSDP Status Fields**

| Label              | Description                                                                                                                                                               |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Admin State        | Displays the administrative state.                                                                                                                                        |
| Local Address      | Displays the local IP address.                                                                                                                                            |
| Active Src Limit   | Displays the active source limit.                                                                                                                                         |
| Act Src Lim Excd   | Displays the active source limit which has been exceeded.                                                                                                                 |
| Num. Peers         | Displays the number of peers.                                                                                                                                             |
| Num. Peers Estab   | Displays the number of peers established.                                                                                                                                 |
| Num. Source Active | Displays the number of active sources.                                                                                                                                    |
| Policies           | The policy to export source active state from the source active list into MSDP.                                                                                           |
| Data Encapsulation | The rendezvous point (RP) using MSDP to encapsulate multicast data received in MSDP register messages inside forwarded MSDP source-active messages - enabled or disabled. |
| Rate               | The receive message rate.                                                                                                                                                 |
| Time               | The receive message time.                                                                                                                                                 |
| Threshold          | The number of MSDP messages that can be processed before the MSDP message rate limiting function is activated.                                                            |
| RPF Table          | The name of the reverse path forwarding table.                                                                                                                            |
| Last mdsp Enabled  | The time the last MDSP was triggered.                                                                                                                                     |

**Sample Output**

```
A:ALA-48# show router msdp status
=====
MSDP Status
=====
Admin State : Up
Local Address : None
Global Statistics
Active Src Limit : None
Act Src Lim Excd : 0
Num. Peers : 1
Num. Peers Estab : 1
Num. Source Active : 10
Policies : None
Data Encapsulation : Enabled
Receive Msg Rate
Rate : 0
Time : 0
Threshold : 0
```

```
Last Msdp Enabled : 08/30/2002 03:21:43
```

```
=====
A:ALA-48#
```

## 6.5.2.2 Clear Commands

### msdp

|                    |                                                                                                                         |
|--------------------|-------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>msdp</b>                                                                                                             |
| <b>Context</b>     | clear>router                                                                                                            |
| <b>Description</b> | This command enables the context to clear and reset Multicast Source Discovery protocol (MSDP) entities and statistics. |

### cache

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>cache</b> [ <b>peer</b> <i>ip-address</i> ] [ <b>group</b> <i>ip-address</i> ] [ <b>source</b> <i>ip-address</i> ] [ <b>originrp</b> <i>ip-address</i> ]                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Context</b>     | clear>router>msdp                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Description</b> | This command clears the MSDP cache.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Parameters</b>  | <p><b>peer</b> <i>ip-address</i> — Clears the cache of the IP address of the peer to which Multicast Source Discovery protocol (MSDP) source-active ( SA) requests for groups matching this entry's group range were sent.</p> <p><b>group</b> <i>ip-address</i> — Clears the group IP address of the SA entry.</p> <p><b>source</b> <i>ip-address</i> — Clears the source IP address of the SA entry.</p> <p><b>originrp</b> <i>ip-address</i> — Clears the origin rendezvous point (RP) address type of the SA entry.</p> |

### statistics

|                    |                                                                                                                                                                                               |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>statistics</b> [ <b>peer</b> <i>ip-address</i> ]                                                                                                                                           |
| <b>Context</b>     | clear>router>msdp                                                                                                                                                                             |
| <b>Description</b> | This command clears IP address statistics of the peer to which Multicast Source Discovery Protocol (MSDP) source-active (SA) requests for groups matching this entry's group range were sent. |
| <b>Parameters</b>  | <i>ip-address</i> — Clears the statistics of the specified IP address.                                                                                                                        |

---

### 6.5.2.3 Debug Commands

#### msdp

- Syntax** [no] msdp
- Context** debug>router
- Description** This command enables debugging for Multicast Source Discovery Protocol (MSDP).  
The **no** form of the command disables MSDP debugging.

#### packet

- Syntax** packet [*pkt-type*] [*peer ip-address*]
- Context** debug>router>msdp
- Description** This command enables debugging for Multicast Source Discovery Protocol (MSDP) packets.  
The **no** form of the command disables MSDP packet debugging.
- Parameters** *pkt-type* — Debugs information associated with the specified packet type.  
**Values** keep-alive, source-active, sa-request, sa-response  
*ip-address* — Debugs information associated with the specified peer IP address.

#### pim

- Syntax** pim [*grp-address*]  
no pim
- Context** debug>router>msdp
- Description** This command enables debugging for Multicast Source Discovery Protocol (MSDP) PIM.  
The **no** form of the command disables MSDP PIM debugging.
- Parameters** *grp-address* — Debugs the IP multicast group address for which this entry contains information.

#### rtm

- Syntax** rtm [*rp-address*]  
no rtm

---

|                    |                                                                                                                                                                                |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Context</b>     | debug>router>msdp                                                                                                                                                              |
| <b>Description</b> | This command enables debugging for Multicast Source Discovery Protocol (MSDP) route table manager (RTM).<br><br>The <b>no</b> form of the command disables MSDP RTM debugging. |
| <b>Parameters</b>  | <i>rp-address</i> — Debugs the IP multicast address for which this entry contains information.                                                                                 |

## sa-db

|                    |                                                                                                                                                                                                    |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>sa-db</b> [ <b>group</b> <i>grpAddr</i> ] [ <b>source</b> <i>srcAddr</i> ] [ <b>rp</b> <i>rpAddr</i> ]<br><b>no sadb</b>                                                                        |
| <b>Context</b>     | debug>router>msdp                                                                                                                                                                                  |
| <b>Description</b> | This command enables debugging for Multicast Source Discovery Protocol (MSDP) source-active requests.<br><br>The <b>no</b> form of the command disables the MSDP source-active database debugging. |
| <b>Parameters</b>  | <i>grpAddr</i> — Debugs the IP address of the group.<br><i>srcAddr</i> — Debugs the source IP address.<br><i>rpAddr</i> — Debugs the specified rendezvous point RP address.                        |

---

## 7 MLDP

### 7.1 In This Chapter

This chapter provides information to configure Multicast Label Distribution Protocol (MLDP).

Topics in this chapter include:

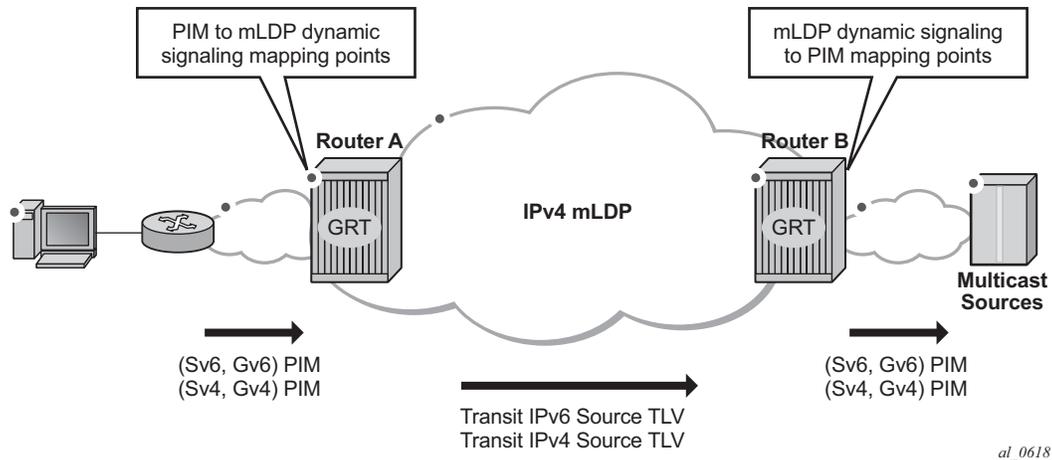
- [Dynamic Multicast Signaling over P2MP in GRT Instance](#)
- [Inter-AS Non-segmented MLDP](#)

### 7.2 Dynamic Multicast Signaling over P2MP in GRT Instance

This feature provides a flexible multicast signaling solution to connect native IP multicast source and receivers running PIM multicast protocol via an intermediate MPLS (P2MP LDP LSP) network. The feature allows each native IP multicast flow to be connected via an intermediate P2MP LSP by dynamically mapping each PIM multicast flow to a P2MP LDP LSP.

The feature uses procedures defined in RFC 6826: *Multipoint LDP In-Band Signaling for Point-to-Multipoint and Multipoint-to-Multipoint Label Switched Paths*. On the leaf node of a P2MP LSP, PIM signaling is dynamically mapped to P2MP LDP tree setup. On the root node of P2MP LSP, P2MP LDP signaling is handed back to PIM. Due to dynamic mapping of multicast IP flow to P2MP LSP, provisioning and maintenance overhead is eliminated as multicast distribution services are added and removed from the network. Per (S,G) IP multicast state is also removed from the network where P2MP LSPs are used to transport multicast flows.

[Figure 5](#) illustrates dynamic MLDP signaling for IP multicast in GRT.

**Figure 5** Dynamic MLDP Signaling for IP Multicast in GRT

As illustrated in [Figure 5](#), P2MP LDP LSP signaling is initiated from the router that receives PIM JOIN from a downstream router (Router A). To enable dynamic multicast signaling, `p2mp-ldp-tree-join` must be configured on PIM outgoing interface of Router A. This enables handover of multicast tree signaling from PIM to P2MP LDP LSP. Being a leaf node of P2MP LDP LSP, Router A selects the upstream-hop as the root node of P2MP LDP FEC based on routing table lookup. If an ECMP path is available for a given route, then the number of trees are equally balanced towards multiple root nodes. The PIM Joins are carried in Transit IPv4 (IPv4 PIM SSM) or IPv6 (IPv6 PIM SSM) MLDP TLVs. On the root node of P2MP LDP LSP (Router B), multicast tree signaling is handed back to PIM and propagated upstream as native-IP PIM JOIN.

The feature is supported with IPv4 and IPv6 PIM SSM and IPv4 MLDP. Directly connected IGMP/MLD receivers are also supported with PIM enabled on outgoing interfaces and SSM mapping configured if required.

If multiple criteria exist to setup a multicast flow, the following priority is given as follows:

1. Multicast (statically provisioned) over P2MP LSP (RSVP-TE or LDP)
2. Dynamic multicast signaling over P2MP LDP
3. PIM native-IP multicast

The following are feature caveats:

- A single instance of P2MP LDP LSP is supported between the root and leaf nodes per multicast flow; there is no stitching of dynamic trees.
- Extranet functionality is not supported.

- The router LSA link ID or the advertising router ID must be a routable IPv4 address (including IPv6 into IPv4 MLDP use cases).
- IPv6 PIM with dynamic IPv4 MLDP signaling is not supported with e-BGP or i-BGP with IPv6 next-hop.
- Inter-AS and IGP inter-area scenarios where the originating router is altered at the ASBR and ABR respectively, (hence PIM has no way to create the LDP LSP towards the source), are not supported.
- The feature requires chassis mode C.

## 7.3 Inter-AS Non-segmented MLDP

This feature allows multicast services to use segmented protocols and span them over multiple autonomous systems (ASs), as done in unicast services. As IP VPN or GRT services span multiple IGP areas or multiple ASs, either for a network designed to deal with scale or as result of commercial acquisitions, operators may require Inter-AS VPN (unicast) connectivity. For example, an Inter-AS VPN can break the IGP, MPLS and BGP protocols into access segments and core segments, allowing higher scaling of protocols by segmenting them into their own islands. SR OS also allows for similar provision of multicast services and for spanning these services over multiple IGP areas or multiple ASs.

For multicast VPN (MVPN), SR OS previously supported Inter-AS option A/B/C for Rosen MVPN; however, when MPLS was used, only option A was supported for Next Generation Multicast VPN (NG-MVPN) or d-MLDP signaling. MLDP now supports non-segmented MLDP trees for inter-AS solutions, applicable for multicast services in the GRT (Global Routing Table) where they need to ride over MLDP point-to-multipoint tunnels as well as NG-MVPN services.

Refer to the “ECMP Support” subsection of the “Inter-AS Non-segmented MLDP” section in the *MPLS Guide* for more information.

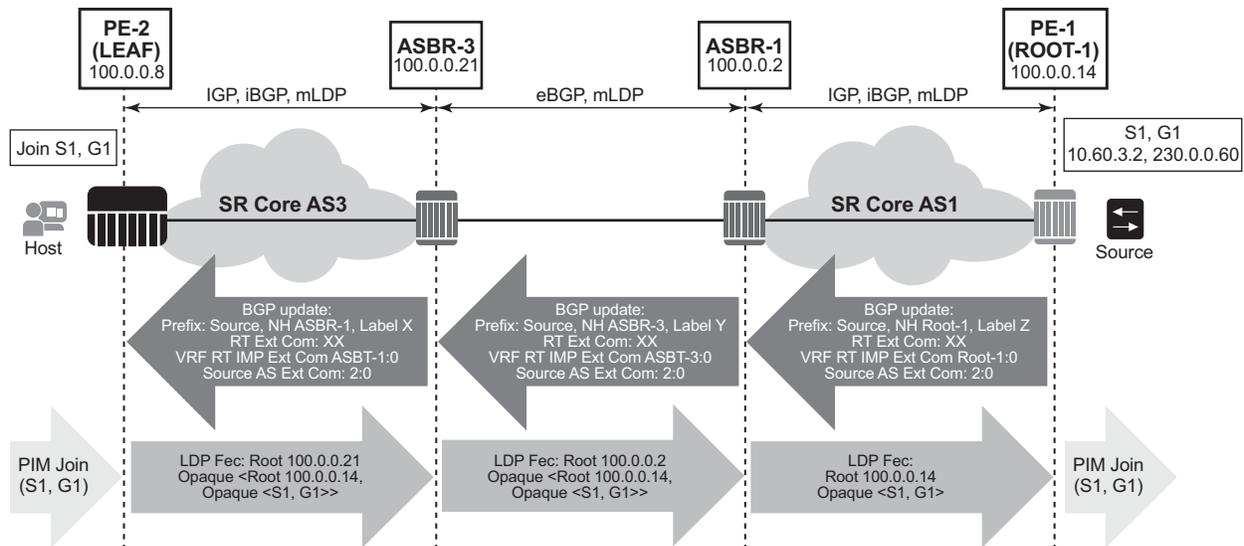
Refer to the “Dynamic mLDP and Static mLDP Co-existing on Same Node” section in the *MPLS Guide* for more information.

### 7.3.1 d-MLDP Inter-AS Trees in GRT

[Figure 6](#) shows the processing required for d-mLDP with non-segmented mLDP Inter-AS trees in GRT (routers in AS3, including ASBR 1, have no route to ROOT-1 in IGP and must use BGP unicast routes to resolve route to ROOT-1 and to multicast source).

PE-1 (ROOT-1) is the root node of the MLDP tree, and PE-2 (LEAF) is the leaf node.

**Figure 6 In-band Signaling with Non-segmented Inter-AS MLDP Trees in GRT**



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### 7.3.1.1 Routing

BGP unicast routes must advertise to the VRF Route Import Ext Community, identifying the root PE, for the feature to operate properly. Failure to do so will result in PIM Inter-AS joins being dropped.

The community is an address-based community where the global administrator field is the address of the root PE and local administrator field is set to 0 (GRT). No new configuration is required; however, an operator must enable inter-AS VPN and configure export policy to ensure the community is added to the BGP routes as required. The BGP unicast route is propagated across the AS, as shown in [Figure 6](#) (the same processing, not shown, applies to a BGP route specifying address used to build mLDP tree rooted at ROOT-1). The following configuration example shows an export policy configuration.

**Example:**

```

policy-options
begin
community "A" members "target:1.1.1.1:0"
community "B" members "ext:010b:0a1401060000"
policy-statement "fromlocal"
entry 10
from
protocol direct

```

```

 exit
 to
 protocol bgp
 exit
 action accept
 community add "A" "B"
 exit
 exit
 default-action reject
exit
policy-statement "accept_all"
 default-action accept
 exit
exit
commit
exit
bgp
...
 enable-inter-as-vpn
 ...
 export "fromlocal" "accept_all"
 ...
 no shutdown
exit

```

Static routes must be configured on inter-ASBR LDP-enabled links because the BGP peer uses a host address from the local subnet of the links (for GRT and VPN option C), or the BGP peer uses a system IP address that is not in the base routing table (for VPN option B).

- For system-IP to system-IP, static-routes are required for bringing up the EBGP/LDP session.
- If the link IP is used for creation of EBGP and ILDP, then static-routes are not required; however, static-route (host-route) is mandatory on ASBR2 for the resolution of MLDP FEC, as the link LSR ID is not resolved by LDP using a /24 route; it needs a /32 route.

### 7.3.1.2 Join Processing

To traverse an inter-AS domain, recursive FECs are required (refer to the “Inter-AS Non-segmented MLDP” section in the *MPLS Guide* for more information).

The operator must enable dynamic signaling on interfaces where Inter-AS joins are expected to be received using the existing configuration (**p2mp-ldp-tree-join [ipv4 [ipv6]]**). Once enabled, the following describes the required processing of a PIM join, as shown in [Figure 6](#).

When the leaf receives a PIM join for group (S1, G1) and, through configuration, knows dynamic signaling is required, the leaf fails to resolve the source S1 via IGP and attempts to resolve route via BGP. The leaf learns that source is reachable via Next-Hop ASBR3 and the route was advertised by PE1 (Root-1) (from VRF Import Ext Community). PE2 (leaf) sources a Recursive mLDP FEC with a root node of ASBR3, and an opaque value containing the MLDP in-band signaling information identifying the (S1, G1) group and the Root-1 (the root of the inter-AS non-segmented MLDP tree), as shown below:

**LEAF FEC {Root = ASBR3, Opaque Value = {Root: ROOT-1, Opaque Value (S1, G1)}}**

The FEC is forwarded using IGP to ASBR3.

When the Recursive MLDP FEC arrives at ASBR3, it notes that it is the identified root node in the local AS, and that the opaque value is a Recursive Opaque Value. Because ASBR3 fails to resolve the Recursive FEC's root (Root-1) in IGP, ASBR3 attempts to resolve the root via BGP. Similarly to processing on LEAF, this yields a Next-Hop of ASBR1. ASBR3 creates a new mLDP FEC element with a root node of ASBR1, and the Opaque value as per received opaque value, as shown below:

**ASBR3 FEC {Root = ASBR1, Opaque Value = {Root: Root-1, Opaque Value: (S1, G1)}}**

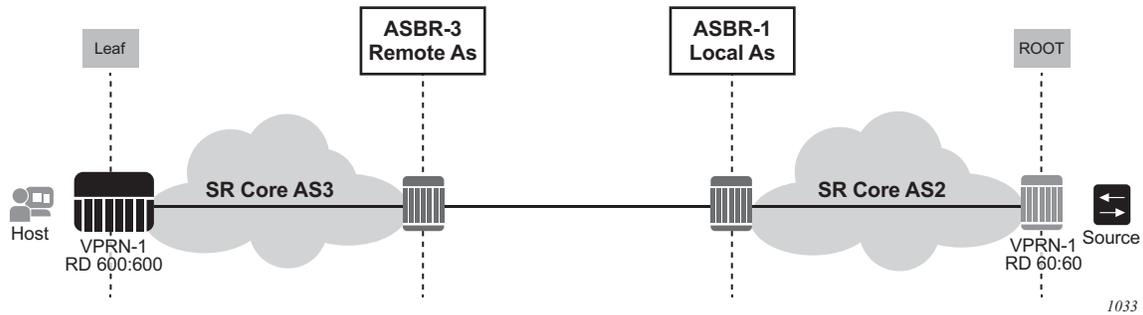
ASBR 3 forwards the FEC using IGP or eBGP.

When the MLDP FEC arrives at ASBR1, it notes that it is the identified root node, and that the opaque value is a Recursive Opaque value. Because ASBR1 can resolve the Recursive FEC's root (Root-1) via IGP, no further recursive processing is required. ASBR 1 forwards mLDP FEC containing in-band signaling using IGP towards ROOT-1.

### 7.3.2 ASBR Support of PE Functionality

[Figure 7](#) displays remote and local ASBRs.

**Figure 7 Remote and Local ASBRs**



While ASBRs can also act as a PE node, SR OS does not support all PE functionalities in the ASBR node. [Table 28](#) lists supported PE features on local and remote ASBRs.

**Table 28 PE Features on Local and Remote ASBRs**

|                                   | Local AS ASBR Node |                | Remote AS ASBR Node |                |
|-----------------------------------|--------------------|----------------|---------------------|----------------|
|                                   | Leaf or Bud        | Root or Source | Leaf or Bud         | Root or Source |
| <b>Inter-AS Multicast Context</b> |                    |                |                     |                |
| GRT                               | ✓                  | X              | ✓                   | X              |
| VPN                               | ✓                  | X              | ✓                   | X              |



## 8 Multicast Extensions to BGP

### 8.1 In This Chapter

This chapter provides information to configure multicast extensions to BGP.

Topics in this chapter include:

- [Multicast Extensions to BGP](#)

### 8.2 Multicast Extensions to BGP

This section describes the implementation of extensions to MBGP to support multicast. Rather than assuming that all unicast routes are multicast-capable, some routed environments, in some cases, some ISPs do not support or have limited support for multicast throughout their AS.

BGP is capable of supporting two sets of routing information, one set for unicast routing and the other for multicast routing. The unicast and multicast routing sets either partially or fully overlay one another. To achieve this, BGP has added support for IPv4 and mcast-IPv4 address families. Routing policies can be imported or exported.

The multicast routing information can subsequently be used by the Protocol Independent Multicast (PIM) protocol to perform its Reverse Path Forwarding (RPF) lookups for multicast-capable sources. Thus, multicast traffic can only be routed across a multicast topology and not a unicast topology.

#### 8.2.1 MBGP Multicast Topology Support

##### 8.2.1.1 Recursive Lookup for BGP Next Hops

The next hop for multicast RPF routes learned by MBGP is not always the address of a directly-connected neighbor. For unicast routing, a router resolves the directly-connected next-hop by repeating the IGP routes. For multicast RPF routes, there are different ways to find the real next-hops.

- 
- Scanning to see if a route encompasses the BGP next hop. If one exists, this route is used. If not, the tables are scanned for the best matching route.
  - Check to see if the recursed next hop is taken from the protocol routing table with the lowest administrative distance (protocol preference). This means that the operating system algorithm must perform multiple lookups in the order of the lowest admin distance. Unlike recursion on the unicast routing table, the longest prefix match rule does not take effect; protocol preference is considered prior to prefix length. For example, the route 12.0.0.0/14 learned via MBGP will be selected over the route 12.0.0.0/16 learned via BGP.

---

## 9 MCAC

### 9.1 In This Chapter

This chapter provides information to configure Multicast Connection Admission Control (MCAC).

Topics in this chapter include:

- [MCAC Overview](#)
- [Configuring MCAC with CLI](#)
- [MCAC Configuration Command Reference](#)

### 9.2 MCAC Overview

Multicast Connection Admission Control (MCAC) allows a router to limit bandwidth used by multicast channels, either on a router, on access links, or by an ESM subscriber, by controlling the number of channels that are accepted. When a pre-configured limit is reached, the router prevents receivers from joining any new channels not currently established. By rejecting new channel establishment during an overload condition, the degradation of the quality of the existing multicast service offering is avoided. However, as result, running the MCAC function might cause some channels to be temporarily unavailable to receivers under overload.

Operators can configure one or more MCAC bundle policies (**configure>router>mcac>policy**) to specify multicast channel admission rules and then reference a required MCAC bundle policy on multicast-enabled IPv4 and IPv6 interfaces or group-interfaces. In addition, operators can configure per-interface MCAC behavior.

MCAC is supported on ESM subscriber interfaces as well as multicast interfaces in base router instance, VPLS, and in MVPNs. MCAC is supported for IGMP, IGMP-snooping, MLD, and PIM.

The amount of bandwidth multicast channels can consume is limited by operator-configured unconstrained and mandatory bandwidth values. Those values can be configured on a per-MCAC bundle policy, per subscriber, per interface, and per MCAC interface policy. The bandwidth limits configured for a subscriber or interface limit multicast bandwidth for that particular subscriber or that interface only. The

bandwidth limits configured for an MCAC interface policy limit multicast bandwidth across a set of interfaces that share the same interface policy. If bandwidth limits are defined on multiple levels, all level limits must be satisfied for a channel to be admitted. See [MCAC Algorithm](#) for more information.

Feature caveats:

- MCAC is not applicable to PIM snooping and MLD snooping

## 9.2.1 MCAC Bundle Policy Overview

MCAC bundle policy (shortened here to “MCAC policy” or “policy”) is used to define MCAC rules to be applied on an MCAC interface when receivers are trying to join multicast channels. Within each policy, an operator can define:

- Multicast channel:
  - A channel can be defined using multicast group address only or both source and group addresses. Ranges can be used to group multiple multicast channels into a single MCAC channel. When ranges are used, each multicast channel within range will use the same channel BW (bandwidth), class, and priority configuration.
  - Channel BW: a bandwidth value to be used for a channel in MCAC.
  - Channel type (mandatory or optional): mandatory channels have BW pre-reserved on interfaces as soon as they are defined in MCAC policy, while optional channels consume BW on-demand; only when there are active receivers for that channel and the remaining BW allows for channels to be admitted.
  - Channel class: high and low classes are supported. For LAG interfaces, the class parameter allows further prioritizing of the mandatory or optional channels. This brings the number of priority levels to four during reshuffles of the joined channels when LAG ports are changing state.



**Note:** Multicast channels not specified in an MCAC policy applicable on a given interface are not subject to MCAC. Treatment of such channels is configurable as either accept or discard.

- Multicast channel bundle:
  - Multicast bundle defines multicast channels as described above. A channel can only be part of one bundle.
  - Maximum bundle BW – the maximum bandwidth the channels forming a given bundle can consume on an interface.

- 
- MCAC constraints – set of rules governing available BW for multicast channels over LAG as LAG ports are changing state.

## 9.2.2 MCAC Algorithm

It is important to point out that the MCAC algorithm is based on configured BW values. The configured channel BW based on MCAC policy is CAC-ed against pre-configured maximum bundle BW and pre-configured subscriber, interface, or MCAC interface-policy multicast BW limits. A channel must pass all levels of CAC before it is accepted. The statements outline the CAC algorithm for a multicast channel defined in MCAC policy:

A join for a particular multicast channel is allowed under the following conditions.

- **Mandatory channels**—A sufficient bandwidth exists on the interface according to the policy settings for the interface (Interface-level MCAC and MCAC-interface-policy-level MCAC) and BW setting for a channel (Bundle-level MCAC). There is always sufficient BW available on the bundle level because mandatory channels get pre-reserved bandwidth.
- **Optional channels**—A sufficient BW exists on both interface (Interface-level MCAC and MCAC-interface-policy-level MCAC) and bundle level (Bundle-Level MCAC) based on channel configured BW and currently available BW on both interface and bundle.

When a policy is evaluated over a set of existing channels (applicable for MCAC on LAG when the number of ports in the LAG changes and applicable to subscribers when the submac policy is enabled on a subscriber), the channels are evaluated and admitted/dropped based on the following priority order: mandatory-high, mandatory-low, optional-high, optional-low.

This method does not guarantee that all bundles are fully allocated. However, this method does ensure that all mandatory-high channels are allocated before any mandatory-low channels are allocated.

When a new MCAC bundle policy is applied, the algorithm is forced to admit all currently joined channels to prevent any drops. This can result in an oversubscription until some of the joined channels disconnect. The same behavior applies when adding a new MCAC interface policy: all the joined channels will be admitted, without dropping anything.

### 9.2.2.1 Interface-level MCAC details

Interface-level MCAC constraints are applied to the interface on which the join was received. Mandatory and optional channels are allowed under the following conditions.

- Mandatory channels—The bandwidth for the already-accepted mandatory channels plus the bandwidth of this channel cannot be greater than the configured mandatory bandwidth on this interface.
- Optional channels—The bandwidth for the already-accepted optional channels plus the bandwidth of this channel cannot be greater than the configured amount of unconstrained bandwidth less the configured amount of mandatory bandwidth on this interface.

#### 9.2.2.1.1 MCAC-interface-policy-level MCAC details

MCAC interface policies are defined system wide and used on MCAC interfaces via assignment of the policy to one or more interfaces to, for example, limit multicast BW across a group of interfaces/ports, across a line card or across a system. If an MCAC interface policy is assigned to an interface with Interface-level constraints configured, then both Interface-level MCAC as described above and MCAC-interface-policy-level MCAC must be satisfied for a channel to be admitted.

Mandatory and optional channels are allowed under the following conditions.

- Mandatory channels—The bandwidth for the already-accepted mandatory channels on this and any other interface using this MCAC interface policy plus the bandwidth of this channel cannot be greater than the configured mandatory bandwidth for this MCAC interface policy.
- Optional channels—The bandwidth for the already-accepted optional channels on this and any other interface using this MCAC interface policy plus the bandwidth of this channel cannot be greater than the configured amount of unconstrained bandwidth less the configured amount of mandatory bandwidth for this MCAC interface policy.

Thus, when MCAC interface policy is used, admitting a channel on one interface affects all interfaces sharing the same MCAC interface policy.

---

### 9.2.2.2 Bundle-level MCAC details

Bundle-level CAC is applied to the bundle to which the channel that triggered the MCAC algorithm belongs.

Mandatory and optional channels are allowed under the following conditions.

- Mandatory channels—Always.
- Optional channels—The allocated bundle bandwidth cannot exceed the configured bandwidth. The allocated bandwidth equals the bandwidth of all the mandatory channels belonging to that bundle plus the bandwidth of the optional channels already accepted plus the bandwidth of this optional channel.

### 9.2.3 MCAC on Link Aggregation Group Interfaces

When MCAC enabled interfaces reside on a LAG, SR OS allows operators to change MCAC behavior when the number of active ports in a LAG changes. Both MCAC policy bundle and MCAC interface allows operators to define multiple MCAC levels per LAG based on the number of active ports in the LAG. For each level, operators can configure corresponding BW limits.

When MCAC LAG constraints are enabled, the level to use is selected automatically based on the configuration and a currently active number of LAG ports. In a case of the available bandwidth reduction (for example, a LAG link failure causes change to a level with smaller BW configured), MCAC attempts first to fit all mandatory channels (in an arbitrary order). If there is no sufficient capacity to carry all mandatory channels in the degraded mode, some channels are dropped and all optional channels are dropped. If after evaluation of mandatory channels, there remains available bandwidth, then all optional channels are re-evaluated (in an arbitrary order). Channel re-evaluation employs the above-described MCAC algorithm applied at the interface and bundle levels that use the constraints for the degraded mode of operation.



---

## 9.3 Configuring MCAC with CLI

This section provides information to configure MCAC using the command line interface.

Topics in this section include:

- [Basic MCAC Configuration](#)
- [Configuring MCAC Parameters](#)

### 9.3.1 Basic MCAC Configuration

Perform the following basic MCAC configuration tasks:

- configure policy name
- configure bundle parameters
- specify default action

The following example displays the enabled IGMP and PIM configurations:

```
A:LAX>config>router>igmp# info

 interface "lax-vls"
 exit
 interface "pl-ix"
 exit

A:LAX>config>router>igmp# info detail

 interface "lax-vls"
 no import
 version 3
 no shutdown
 exit
 interface "pl-ix"
 no import
 version 3
 no shutdown
 exit
 query-interval 125
 query-last-member-interval 1
 query-response-interval 10
 robust-count 2
 no shutdown

A:LAX>config>router>igmp# exit
A:LAX>config>router# pim
A:LAX>config>router>pim# info

```

```
interface "system"
exit
interface "lax-vls"
exit
interface "lax-sjc"
exit
interface "pl-ix"
exit
rp
 static
 address 2.22.187.237
 group-prefix 224.24.24.24/32
 exit
 exit
 bsr-candidate
 shutdown
 exit
 rp-candidate
 shutdown
 exit
exit

A:LAX>config>router>pim# info detail

no import join-policy
no import register-policy
interface "system"
 priority 1
 hello-interval 30
 multicast-senders auto
 no tracking-support
 bsm-check-rtr-alert
 no shutdown
exit
interface "lax-vls"
 priority 1
 hello-interval 30
 multicast-senders auto
 no tracking-support
 bsm-check-rtr-alert
 no shutdown
exit
interface "lax-sjc"
 priority 1
 hello-interval 30
 multicast-senders auto
 no tracking-support
 bsm-check-rtr-alert
 no shutdown
exit
interface "pl-ix"
 priority 1
 hello-interval 30
 multicast-senders auto
 no tracking-support
 bsm-check-rtr-alert
 no shutdown
exit
apply-to none
```

```

rp
 no bootstrap-import
 no bootstrap-export
 static
 address 2.22.187.237
 no override
 group-prefix 224.24.24.24/32
 exit
 exit
 bsr-candidate
 shutdown
 priority 0
 hash-mask-len 30
 no address
 exit
 rp-candidate
 shutdown
 no address
 holdtime 150
 priority 192
 exit
exit
no shutdown

A:LAX>config>router>pim#

```

## 9.3.2 Configuring MCAC Parameters

The MCAC policies can be added to a SAP, spoke-SDP, mesh-SDP, an IGMP interface, and a PIM interface.

The following example displays the command usage to create MCAC policies.

**Example:**

```

config>router# mcac
config>router>mcac# policy "btv_fr"
config>router>mcac>policy# description "foreign TV offering"
config>router>mcac>policy# bundle "FOR" create
config>router>mcac>policy>bundle# bandwidth 30000
config>router>mcac>policy>bundle# channel 224.0.3.1
224.0.3.1 bw 4000
config>router>mcac>policy>bundle# channel 224.0.3.2
224.0.3.2 bw 4000
config>router>mcac>policy>bundle# channel 224.0.4.1
224.0.4.1 bw 3500 class high type mandatory
config>router>mcac>policy>bundle# channel 224.0.4.2
224.0.4.2 bw 3500 class high
config>router>mcac>policy>bundle# channel 224.0.4.3
224.0.4.3 bw 2800 type mandatory

```

```
config>router>mcac>policy>bundle# channel 224.0.4.4
224.0.4.4 bw 2800
config>router>mcac>policy>bundle# mc-constraints
config>router>mcac>policy>bundle>mc-constraints# level 1
bw 20000
config>router>mcac>policy>bundle>mc-constraints# level 2
bw 20000
config>router>mcac>policy>bundle>mc-constraints# level 3
bw 20000
config>router>mcac>policy>bundle>mc-constraints# level 4
bw 20000
config>router>mcac>policy>bundle>mc-constraints# level 5
bw 20000
config>router>mcac>policy>bundle>mc-constraints# level 6
bw 20000
config>router>mcac>policy>bundle>mc-constraints# lag-
port-down 1 number-down 1 level 1
config>router>mcac>policy>bundle>mc-constraints# lag-
port-down 1 number-down 2 level 3
config>router>mcac>policy>bundle>mc-constraints# lag-
port-down 1 number-down 3 level 5
config>router>mcac>policy>bundle>mc-constraints# lag-
port-down 2 number-down 1 level 1
config>router>mcac>policy>bundle>mc-constraints# lag-
port-down 2 number-down 2 level 3
config>router>mcac>policy>bundle>mc-constraints# lag-
port-down 2 number-down 3 level 5
config>router>mcac>policy>bundle>mc-constraints# exit
config>router>mcac>policy>bundle# no shutdown
config>router>mcac>policy>bundle# exit
config>router>mcac>policy# exit
config>router>mcac# policy "btv_v1"
config>router>mcac>policy# description "eastern TV
offering"
config>router>mcac>policy# bundle "VRT" create
config>router>mcac>policy>bundle# bandwidth 120000
config>router>mcac>policy>bundle# channel 224.1.2.0
224.1.2.4 bw 4000 class high type mandatory
config>router>mcac>policy>bundle# channel 224.1.2.5
224.1.2.5 bw 20000 type mandatory
config>router>mcac>policy>bundle# channel 224.1.2.10
224.1.2.10 bw 8000 type mandatory
config>router>mcac>policy>bundle# channel 224.2.2.0
224.2.2.4 bw 4000
config>router>mcac>policy>bundle# channel 224.2.2.5
224.2.2.5 bw 10000 class high
config>router>mcac>policy>bundle# channel 224.2.2.6
224.2.2.6 bw 10000 class high
```

```

config>router>mcac>policy>bundle# channel 224.2.2.7
224.2.2.7 bw 10000
onfig>router>mcac>policy>bundle# channel 224.2.2.8
224.2.2.8 bw 10000
config>router>mcac>policy>bundle# mc-constraints
config>router>mcac>policy>bundle>mc-constraints# level 1
bw 60000
config>router>mcac>policy>bundle>mc-constraints# level 2
bw 50000
config>router>mcac>policy>bundle>mc-constraints# level 3
bw 40000
config>router>mcac>policy>bundle>mc-constraints# level 4
bw 30000
config>router>mcac>policy>bundle>mc-constraints# level 5
bw 20000
config>router>mcac>policy>bundle>mc-constraints# level 6
bw 10000
config>router>mcac>policy>bundle>mc-constraints# lag-
port-down 1 number-down 1 level 1
config>router>mcac>policy>bundle>mc-constraints# lag-
port-down 1 number-down 2 level 3
config>router>mcac>policy>bundle>mc-constraints# lag-
port-down 1 number-down 3 level 5
config>router>mcac>policy>bundle>mc-constraints# lag-
port-down 2 number-down 1 level 1
config>router>mcac>policy>bundle>mc-constraints# lag-
port-down 2 number-down 2 level 3
config>router>mcac>policy>bundle>mc-constraints# lag-
port-down 2 number-down 3 level 5
config>router>mcac>policy>bundle>mc-constraints# exit
config>router>mcac>policy>bundle# no shutdown
config>router>mcac>policy>bundle# exit
config>router>mcac>policy# exit

```

The following example displays the configuration:

```

*A:ALA-48>config>router>mcac# info

policy "btv_fr"
description "foreign TV offering"
bundle "FOR" create
bandwidth 30000
channel 224.0.3.1 224.0.3.1 bw 4000
channel 224.0.3.2 224.0.3.2 bw 4000
channel 224.0.4.1 224.0.4.1 bw 3500 class high type mandatory
channel 224.0.4.2 224.0.4.2 bw 3500 class high
channel 224.0.4.3 224.0.4.3 bw 2800 type mandatory
channel 224.0.4.4 224.0.4.4 bw 2800
mc-constraints
level 1 bw 20000
level 2 bw 20000
level 3 bw 20000

```

```
 level 4 bw 20000
 level 5 bw 20000
 level 6 bw 20000
 lag-port-down 1 number-down 1 level 1
 lag-port-down 1 number-down 2 level 3
 lag-port-down 1 number-down 3 level 5
 lag-port-down 2 number-down 1 level 1
 lag-port-down 2 number-down 2 level 3
 lag-port-down 2 number-down 3 level 5
 exit
 no shutdown
 exit
exit
policy "btv_vl"
 description "eastern TV offering"
 bundle "VRT" create
 bandwidth 120000
 channel 224.1.2.0 224.1.2.4 bw 4000 class high type mandatory
 channel 224.1.2.5 224.1.2.5 bw 20000 type mandatory
 channel 224.1.2.10 224.1.2.10 bw 8000 type mandatory
 channel 224.2.2.0 224.2.2.4 bw 4000
 channel 224.2.2.5 224.2.2.5 bw 10000 class high
 channel 224.2.2.6 224.2.2.6 bw 10000 class high
 channel 224.2.2.7 224.2.2.7 bw 10000
 channel 224.2.2.8 224.2.2.8 bw 10000
 mc-constraints
 level 1 bw 60000
 level 2 bw 50000
 level 3 bw 40000
 level 4 bw 30000
 level 5 bw 20000
 level 6 bw 10000
 lag-port-down 1 number-down 1 level 1
 lag-port-down 1 number-down 2 level 3
 lag-port-down 1 number-down 3 level 5
 lag-port-down 2 number-down 1 level 1
 lag-port-down 2 number-down 2 level 3
 lag-port-down 2 number-down 3 level 5
 exit
 no shutdown
exit
exit

*A:ALA-48>config>router>mcac#
```

## 9.4 MCAC Configuration Command Reference

### 9.4.1 Command Hierarchies

- [MCAC Configuration Commands](#)
- [MCAC Policy Commands](#)

#### 9.4.1.1 MCAC Configuration Commands

```

config
 — router
 — [no] igmp
 — [no] group-interface ip-int-name
 — mcac
 — if-policy mcac-if-policy-name
 — no if-policy
 — mc-constraints
 — [no] shutdown
 — policy policy-name
 — no policy
 — unconstrained-bw bandwidth mandatory-bw mandatory-bw
 — no unconstrained-bw
 — [no] interface ip-int-name
 — mcac
 — if-policy mcac-if-policy-name
 — no if-policy
 — mc-constraints
 — level level-id bw bandwidth
 — no level level-id
 — number-down number-lag-port-down level level-id
 — no number-down number-lag-port-down
 — [no] shutdown
 — [no] use-lag-port-weight
 — policy mcac-policy-name
 — no policy
 — unconstrained-bw bandwidth mandatory-bw mandatory-bw
 — no unconstrained-bw

config
 — [no] router
 — [no] mld
 — [no] group-interface ip-int-name
 — mcac
 — if-policy mcac-if-policy-name
 — no if-policy
 — mc-constraints

```

```

 — [no] shutdown
 — [no] use-lag-port-weight
 — policy policy-name
 — no policy
 — unconstrained-bw bandwidth mandatory-bw mandatory-bw
 — no unconstrained-bw
— interface ip-int-name
 — mcac
 — if-policy mcac-if-policy-name
 — no if-policy
 — mc-constraints
 — level level-id bw bandwidth
 — no level level-id
 — number-down number-lag-port-down level level-id
 — no number-down number-lag-port-down
 — [no] shutdown
 — [no] use-lag-port-weight
 — policy policy-name
 — no policy
 — unconstrained-bw bandwidth mandatory-bw mandatory-bw
 — no unconstrained-bw

config
 — router
 — [no] pim
 — [no] interface ip-int-name
 — mcac
 — if-policy mcac-if-policy-name
 — no if-policy
 — mc-constraints
 — level level bw bandwidth
 — no level level
 — number-down number-lag-port-down level level-id
 — no number-down number-lag-port-down
 — [no] shutdown
 — [no] use-lag-port-weight
 — policy policy-name
 — no policy
 — unconstrained-bw bandwidth mandatory-bw mandatory-bw
 — no unconstrained-bw

```

### 9.4.1.2 MCAC Policy Commands

```

config
 — [no] router
 — mcac
 — [no] if-policy if-policy-name
 — description description-string
 — no description
 — [no] shutdown
 — unconstrained-bw bandwidth mandatory-bw mandatory-bw

```

- **no unconstrained-bw**
- [no] **policy** *policy-name*
- [no] **bundle** *bundle-name*
  - **bandwidth** *bandwidth*
  - **no bandwidth**
  - **channel** *start-address end-address bw bandwidth [class class]*  
*[type type] [source prefix/prefix-length]*
  - **no channel** *start-address end-address [source prefix/prefix-length]*
  - **description** *description-string*
  - **no description**
  - **mc-constraints**
    - **lag-port-down** *lag-id number-down number-lag-port-down level level-id*
    - **no lag-port-down** *lag-id number-down number-lag-port-down*
    - **level** *level bw bandwidth*
    - **no level** *level*
    - [no] **use-lag-port-weight**
- [no] **shutdown**
- **default-action** {**accept** | **discard**}
- **description** *description-string*
- **no description**

## 9.4.2 Command Descriptions

### 9.4.2.1 MCAC Configuration Commands

#### shutdown

|                    |                                                                                                                                                                                                                                                                                                        |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] shutdown</b>                                                                                                                                                                                                                                                                                   |
| <b>Context</b>     | config>router>igmp>interface>mcac>mc-constraints<br>config>router>mcac>if-policy<br>config>router>mcac>policy>bundle<br>config>router>mld>grp-if>mcac>mc-constraints<br>config>router>pim>interface>mcac>mc-constraints                                                                                |
| <b>Description</b> | The <b>shutdown</b> command administratively disables the entity. When disabled, an entity does not change, reset, or remove any configuration settings or statistics. Many entities must be explicitly enabled using the <b>no shutdown</b> command and must be shut down before they may be deleted. |

Unlike other commands and parameters where the default state is not indicated in the configuration file, **shutdown** and **no shutdown** are always indicated in system generated configuration files.

---

The **no** form of the command puts an entity into the administratively enabled state.

**Default** no shutdown

## mcac

**Syntax** **mcac**

**Context** config>router  
config>router>igmp>group-interface  
config>router>igmp>interface  
config>router>mld>group-interface  
config>router>mld>interface  
config>router>pim>if

**Description** This command enables the context to configure multicast CAC parameters.

**Default** none

## if-policy

**Syntax** **ip-policy** *mcac-if-policy-name*  
**no if-policy**

**Context** config>router>igmp>grp-if>mcac  
config>router>igmp>if>mcac  
config>router>mld>grp-if>mcac  
config>router>mld>if>mcac  
config>router>pim>if>mcac

**Description** This command assigns an existing MCAC interface policy to the interface.

The **no** form removes the MCAC interface policy association.

**Default** no if-policy

**Parameters** *mcac-if-policy-name* — Specifies an existing MCAC interface policy

## if-policy

**Syntax** **if-policy** *if-policy-name*  
**no if-policy**  
**no if-policy** *if-policy-name*

**Context** config>router>mcac

---

**Description** This command creates an MCAC interface policy and enables the context to configure parameters for the policy.

The **no** form deletes the MCAC interface policy.

**Default** No policy is created by default.

**Parameters** *if-policy-name* — Specifies the name of the MCAC interface policy.

**Values** Any string, up to 32 characters long.

## mc-constraints

**Syntax** **mc-constraints**

**Context** config>router>mcac>policy>bundle  
config>router>igmp>grp-if>mcac  
config>router>igmp>interface>mcac  
config>router>mld>grp-if>mcac  
config>router>mld>interface>mcac  
config>router>pim>interface>mcac

**Description** This command enables the context to configure the level and its associated bandwidth for a bundle or a logical interface.

**Default** none

## policy

**Syntax** **policy** *policy-name*  
**no policy**

**Context** config>router>igmp>grp-if>mcac  
config>router>igmp>interface>mcac  
config>router>mcac  
config>router>mld>group-interface  
config>router>mld>interface  
config>router>pim>interface

**Description** This command references the global channel bandwidth definition policy that is used for (H)MCAC and HQoS adjustment.

Within the scope of HQoS adjustment, the channel definition policy under the group-interface is used if redirection is disabled. In this case, the HQoS adjustment can be applied to IPoE subscribers in per-SAP replication mode.

If redirection is enabled, the channel bandwidth definition policy applied under the Layer 3 redirected interface is in effect.

Hierarchical MCAC (HMCAC) is supported on two levels simultaneously:

- subscriber level and redirected interface in case that redirection is enabled
- subscriber level and group-interface level in case that redirection is disabled

In HMCAC, the subscriber is first checked against its bandwidth limits followed by the check on the redirected interface (or group-interface) against the bandwidth limits there.

In the case that the redirection is enabled but the policy is referenced ONLY under the group-interface, no admission control will be executed (HMCAC or MCAC).

**Default** No policy is referenced.

**Parameters** *policy-name* — Specifies the name of the global MCAC channel definition policy defined under the hierarchy **configure>router>mcac>policy**.

## unconstrained-bw

**Syntax** **unconstrained-bw** *bandwidth* **mandatory-bw** *mandatory-bw*  
**no unconstrained-bw**

**Context** config>router>igmp>grp-if>mcac  
config>router>igmp>interface>mcac  
config>router>mcac>if-policy  
config>router>mld>grp-if>mcac  
config>router>mld>interface>mcac  
config>router>pim>interface>mcac

**Description** This command enables MCAC (or HMCAC) function on the corresponding level (subscriber, group-interface or redirected interface). When MCAC (or HMCAC) is enabled and a channel definition policy is referenced, admission control is performed. The allocated bandwidth for optional channels should not exceed the unconstrained-bw minus the mandatory-bw. The mandatory channels have to stay below the specified value for the mandatory-bw.

In HMCAC, the subscriber is checked first against its bandwidth limits followed by the check on the redirected interface or the group-interface against the bandwidth limits defined there.

In case that redirection is enabled and HMCAC enabled, the channel definition policy must be referenced under the redirected interface level. If it is referenced under the group-interface level, it will be ignored.

Subscriber MCAC (only subscriber is checked for available resources) is supported only with direct subscriber replication (no redirection). In this case the channel definition policy must be referenced under the group-interface.

In the case that the redirection is enabled but the policy is referenced ONLY under the group-interface, no admission control will be executed (HMCAC or MCAC).

**Default** none

- Parameters** *bandwidth* — Specifies the unconstrained bandwidth in kbps for the MCAC policy.  
**Values** 0 to 2147483647
- mandatory-bw** *mandatory-bw* — Specifies the mandatory bandwidth in kbps for the MCAC policy.  
**Values** 0 to 2147483647

## level

- Syntax** **level** *level* **bw** *bandwidth*  
**no level** *level*
- Context** config>router>igmp>interface>mcac>mc-constraints  
config>router>mcac>policy>bundle>mc-constraints  
config>router>mld>interface>mcac>mc-constraints  
config>router>pim>interface>mcac>mc-constraints
- Description** This command configures the amount of bandwidth available within a given bundle for MC traffic for a specified level. The amount of allowable BW for the specified level is expressed in kbps and this can be defined for up to eight different levels.
- The **no** form of the command removes the level from the configuration.
- Default** none (If no bandwidth is defined for a given level then no limit is applied.)
- Parameters** *level* — Specifies the bandwidth for a given level. Level 1 has the highest priority. Level 8 has the lowest priority.  
**Values** 1 to 8
- bw** *bandwidth* — Specifies the bandwidth, in kbps, for the level.  
**Values** 1 to 2147483647 kbps  
**Default** 1

## number-down

- Syntax** **number-down** *number-lag-port-down* **level** *level-id*  
**no number-down** *number-lag-port-down*
- Context** config>router>igmp>if>mcac>mc-constraints  
config>router>mld>if>mcac>mc-constraints  
config>router>pim>if>mcac>mc-constraints
- Description** This command configures the number of ports down along with level for the MCAC policy on this interface.
- Default** none

---

|                   |                                                                                                                                                                                                                                                      |
|-------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Parameters</b> | <i>number-lag-port-down</i> — If the number of ports available in the LAG is reduced by the number of ports configured in this command here then bandwidth allowed for bundle and/or interface will be as per the levels configured in this context. |
| <b>Values</b>     | 1 to 64 (for 64-link LAG)<br>1 to 32 (for other LAGs)                                                                                                                                                                                                |
| <b>level</b>      | <i>level-id</i> — Specifies the bandwidth for a given level. Level 1 has the highest priority. Level 8 has the lowest priority.                                                                                                                      |
| <b>Values</b>     | 1 to 8                                                                                                                                                                                                                                               |

## use-lag-port-weight

|                    |                                                                                                                                                                                                                                                         |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>use-lag-port-weight</b><br><b>no use-lag-port-weight</b>                                                                                                                                                                                             |
| <b>Context</b>     | config>router>igmp>interface>mcac>mc-constraints<br>config>router>mld>interface>mcac>mc-constraints<br>config>router>pim>interface>mcac>mc-constraints<br>config>router>mcac>policy>bundle>mc-constraints                                               |
| <b>Description</b> | This command enables port weight to be used when determining available bandwidth per level when LAG ports go down/come up. The command is required for proper operation on mixed port-speed LAGs and can be used for non-mixed port-speed LAGs as well. |
| <b>Default</b>     | no use-lag-port-weight                                                                                                                                                                                                                                  |
|                    | The port number is used when determining available BW per level when LAG ports go down/come up.                                                                                                                                                         |

## bundle

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] bundle</b> <i>bundle-name</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Context</b>     | config>router>mcac>policy                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Description</b> | This command creates the context that enables the grouping of MCAC group addresses into bundles.<br><br>When a number of multicast groups or BTV channels are grouped into a single bundle, then policing, if a join for a particular MC-group (BTV channel), can depend on whether: <ol style="list-style-type: none"> <li>1. There is enough physical bandwidth on the egress interface.</li> <li>2. The given channel is a mandatory or optional channel. <ul style="list-style-type: none"> <li>– If optional, is there sufficient bandwidth according to the policy settings for the relevant interface.</li> <li>– If optional, is there sufficient bandwidth within the bundle.</li> </ul> </li> </ol> |

The **no** form of the command removes the named bundle from the configuration.

|                   |                                                                                                                                                                                                                                                                                           |
|-------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Default</b>    | none                                                                                                                                                                                                                                                                                      |
| <b>Parameters</b> | <i>bundle-name</i> — Specifies the multicast bundle name. Allowed values are any string up to 32 characters long composed of printable, 7-bit ASCII characters. If the string contains special characters (#, \$, spaces, etc.), the entire string must be enclosed within double quotes. |

## bandwidth

|                    |                                                                   |
|--------------------|-------------------------------------------------------------------|
| <b>Syntax</b>      | <b>bandwidth</b> <i>bandwidth</i><br><b>no bandwidth</b>          |
| <b>Context</b>     | config>router>mcac>policy>bundle                                  |
| <b>Description</b> | This command configures the MCAC policy bundle maximum bandwidth. |
| <b>Parameters</b>  | <i>bandwidth</i> — Specifies the MCAC policy bandwidth.           |

## channel

|               |                                                                                                                                                                                                                                                                                                              |
|---------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b> | <b>channel</b> <i>start-address end-address</i> <b>bw</b> <i>bandwidth</i> [ <b>class</b> <i>class</i> ] [ <b>type</b> <i>type</i> ] [ <b>source</b> <i>prefix/</i><br><i>prefix-length</i> ]<br><b>no channel</b> <i>start-address end-address</i> [ <b>source</b> <i>prefix/</i><br><i>prefix-length</i> ] |
|---------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

|                    |                                                                                                                                                  |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Context</b>     | config>router>mcac>policy>bundle                                                                                                                 |
| <b>Description</b> | This command creates a multicast channel within the bundle where it is configured. A join for a particular multicast channel can be accepted if: |

1. Mandatory channels:

A sufficient bandwidth exists on the interface according to the policy settings for the interface. There is always sufficient BW available on the bundle level because mandatory channels get BW pre-reserved.

2. Optional channels:

A sufficient BW exists on both interface and bundle level.

A channel definition can be either IPv4 (*start-address*, *end-address*, *source-address* are IPv4 addresses) or IPv6. A single bundle can have either IPv4 or IPv6 or IPv6 and IPv4 channel definitions. A single policy can mix any of those bundles.

Overlapping channels are not allowed. Two channels overlap if they contain same groups and the same source address prefix (or both do not specify source address prefix). Two channels with same groups and different source prefixes (including one of the channels having no source configured or one of the channels having more specific prefix than the other) do not overlap and are treated as separate channels.

When joining a group from multiple sources, MCAC accounts for that only once when no source address is specified or a prefix for channel covers both sources. Channel BW should be adjusted accordingly or source-aware channel definition should be used if that is not desired.

If a bundle is removed, the channels associated are also removed and every multicast group that was previously policed (because it was in the bundle that contained the policy) becomes free of constraints.

When a new bundle is added to a MCAC policy, the bundle's established groups on a given interfaces are accounted by the policy. Even if this action results in exceeding the bundle's constrain, no active multicast groups are removed. When a leave message is received for an existing optional channel, then the multicast stream is pruned and subsequent new joins may be denied in accordance with the policy. It is possible that momentarily there may be insufficient bandwidth, even for mandatory channels, in this bundle.

**Default** No channels are specified as part of a bundle on default.

**Parameters** *start-address* — Specifies the beginning multicast IP address that identifies a multicast stream (BTV channel). Both addresses have to be either IPv4 or IPv6.

**Values** This must be a valid IPv4 or IPv6 multicast group address

*end-address* — Specifies the ending multicast IP address that identifies a multicast stream (BTV channel). Both addresses have to be either IPv4 or IPv6.

**Values** This must be a valid IPv4 or IPv6 multicast group address

*prefix/prefix-length* — Specifies the source of the multicast IP stream. This must be a valid IPv4 or IPv6 multicast source address prefix.

**Values** address-prefix/prefix-length

address-prefix is valid IPv4/IPv6 multicast source IP address prefix (local scope excluded)

prefix-length [0 to 32] for IPv4 [0 to 128] for IPv6

*bandwidth* — Specifies the bandwidth required by this channel in kbps. If this bandwidth is configured for a mandatory channel then this bandwidth is reserved by subtracting the amount from the total available bandwidth for all potential egress interfaces and the bundle.

If this bandwidth is configured as an optional channel then this bandwidth must be available for both the bundle and the egress interface requesting the channel to be added. Once the channel has been added the available bandwidth for the bundle and the interface must be reduced by the configured bandwidth of channel.

**Values** 10 to 10000000 kbps

*class* — Provides deeper classification of channels used in the algorithm when LAG ports change state.

**Values** high | low

**Default** low

*type* — Specifies the channel to be either mandatory or optional.

**mandatory** — When the **mandatory** keyword is specified, then the bandwidth is reserved by subtracting it from the total available for all the potential egress interfaces and the bundle.

**optional** — When the **optional** keyword is specified then the bandwidth must be available on both the bundle and the egress interface that requests the channel to be added. Once the channel has been added the available bandwidth for the bundle and the interface must be reduced by the configured bandwidth of channel.

**Values** mandatory | optional

**Default** optional

## description

|                    |                                                                                                                                                                                                                                                                                                                                                     |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>description</b> <i>description-string</i><br><b>no description</b>                                                                                                                                                                                                                                                                               |
| <b>Context</b>     | config>router>mcac>if-policy<br>config>router>mcac>policy<br>config>router>mcac>policy>bundle                                                                                                                                                                                                                                                       |
| <b>Description</b> | This command creates a text description stored in the configuration file for a configuration context.<br><br>The <b>description</b> command associates a text string with a configuration context to help identify the context in the configuration file.<br><br>The <b>no</b> form of the command removes any description string from the context. |
| <b>Default</b>     | No description associated with the configuration context.                                                                                                                                                                                                                                                                                           |
| <b>Parameters</b>  | <i>string</i> — The description character string. Allowed values are any string up to 80 characters long composed of printable, 7-bit ASCII characters. If the string contains special characters (#, \$, spaces, etc.), the entire string must be enclosed within double quotes.                                                                   |

## lag-port-down

|                    |                                                                                                                                                              |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>lag-port-down</b> <i>lag-id number-down number-lag-port-down level level-id</i><br><b>no lag-port-down</b> <i>lag-id number-down number-lag-port-down</i> |
| <b>Context</b>     | config>router>mcac>policy>bundle>mc-constraints                                                                                                              |
| <b>Description</b> | This command configures the bandwidth available both at the interface and bundle level when a specific number of ports in a LAG group fail.                  |
| <b>Default</b>     | none                                                                                                                                                         |

- Parameters** *lag-id* — When the number of ports available in the LAG link is reduced by the number of ports configured in this context then the *level-id* specified here must be applied.
- number-down** *number-lag-port-down* — If the number of ports available in the LAG is reduced by the number of ports configured in this command here then bandwidth allowed for bundle and/or interface will be as per the levels configured in this context.
- Values** 1 to 64 (for 64-link LAG)  
1 to 32 (for other LAGs)
- level** *level-id* — Specifies the amount of bandwidth available within a given bundle for MC traffic for a specified level.

## default-action

- Syntax** **default-action {accept | discard}**
- Context** config>router>mcac>policy
- Description** This command specifies the action to be applied to multicast streams (channels) when the streams do not match any of the multicast addresses defined in the MCAC policy.
- When multiple default-action commands are entered, the last command will overwrite the previous command.
- Default** discard (all multicast stream not defined in a MCAC policy will be discarded)
- Parameters** **accept** — Specifies multicast streams (channels) not defined in the MCAC policy will be accepted.
- discard** — Specifies multicast streams (channels) not defined in the MCAC policy will be dropped.

## 9.5 Show, Clear, and Debug Command Reference

### 9.5.1 Command Hierarchies

- [Show Commands](#)

#### 9.5.1.1 Show Commands

```

show
 — router
 — mcac
 — if-policy [if-policy-name]
 — if-policy if-policy-name users
 — policy [policy-name [bundle bundle-name] [protocol protocol-name]
 [interface if-name] [detail]]
 — statistics policy policy-name [bundle bundle-name] [protocol {igmp | pim |
 igmpSnpng | mld}]
 — statistics

```

### 9.5.2 Command Descriptions

#### 9.5.2.1 Show Commands

The command outputs in the following section are examples only; actual displays may differ depending on supported functionality and user configuration.

##### 9.5.2.1.1 Show MCAC Commands

mcac

|                    |                                                                                |
|--------------------|--------------------------------------------------------------------------------|
| <b>Syntax</b>      | mcac                                                                           |
| <b>Context</b>     | show>router                                                                    |
| <b>Description</b> | This command enables the context to display multicast CAC related information. |

## if-policy

- Syntax** **if-policy** [*if-policy-name*]  
**if-policy** *if-policy-name* **users**
- Context** show>router>mcac
- Description** This command displays information about MCAC interface policies. Display options are:
- no parameters: displays summary of configured MCAC interface policies in the system
  - *if-policy-name*: if an existing interface policy name is specified, the configuration and operational details for the specified policy are displayed
  - *if-policy-name users*: if **user** options is specified with the existing MCAC interface policy, then all instances where a given MCAC interface policy is used are listed

### Output

#### Sample Output

```
*A:bkvm34>show>router>mcac# if-policy
=====
Multicast CAC If-Policies
=====
If-Policy Description

if_poll test policy
if_poll2

If-Policies : 2
=====
```

```
*A:bkvm34>show>router>mcac# if-policy "if_poll"
=====
Multicast CAC If-Policy
=====
If-Policy : if_poll
Description : test policy
Admin state : enabled
Unconstrained BW : 100000
Pre rsvd mand BW : 10000
In use mand BW : 0
In use opt BW : 0
Avail mand BW : 10000
Avail opt BW : 90000
=====
```

```
*A:bkvm34>show>router>mcac# if-policy "if_poll" users
=====
Multicast CAC If-Plcy if_poll Application Interfaces
=====
Application Service ID Interface

IGMP 1 redir_itf1
```

```

IGMP 1 gi_1_1
MLD 1 redir_itf1
MLD 1 gi_1_1
IGMP 2 to_B2
MLD 2 to_B2
PIM 3 to_B3

Application Interfaces : 7
=====
Multicast CAC If-Plcy if_poll1 Application Ports
=====
Application Service ID Sap/Sdp

IGMP-Snpg 4 Sap:lag-1:4
IGMP-Snpg 5 Sdp:22:5
IGMP-Snpg 6 Sdp:23:6
IGMP-Snpg 7 Sap:lag-1:7

Application Ports : 4
=====

```

## policy

**Syntax** `policy [policy-name [bundle bundle-name] [protocol protocol-name] [interface if-name] [detail]]`

**Context** show>router>mcac

**Description** This command displays MCAC policy information.

**Parameters** *policy-name* — Specifies an existing multicast CAC (MCAC) policy name.  
**bundle** *bundle-id* — Specifies an existing multicast bundle name.  
**protocol** *protocol-name* — specifies an applicable protocol to display.

**Values** igmp, pim, igmpSnpg

**interface** *if-name* — Specifies an interface name to display.

**detail** — Displays detailed information.

## Output

### Sample Output

```

*A:ALA-48>show>router>mcac# policy
=====
Multicast CAC Policies
=====
Policy Description

btv_fr foreign TV offering
btv_vl eastern TV offering
policy1 this is policy1

```

```

policy2 this is policy 2

Policies : 4
=====
*A:ALA-48>show>router>mcac#

*A:ALA-48>show>router>mcac# policy btv_fr
=====
Multicast CAC policy
=====
Policy : btv_fr
Description : foreign TV offering
Default Action : discard
Bundle(s) : FOR
=====
*A:ALA-48>show>router>mcac#

```

### statistics

- Syntax**     **statistics policy** *policy-name* [**bundle** *bundle-name*] [**protocol** {**igmp** | **pim** | **igmpSnpng** | **mld**}]
- statistics**
- Context**    show>router>mcac
- Description** This command displays MCAC statistics.
- Parameters**
  - policy-name* — Specifies an existing multicast CAC (MCAC) policy name.
  - bundle-name* — Displays statistics for the specified existing multicast bundle name.
  - protocol** {**igmp** | **pim** | **igmpSnpng** | **mld**} — Displays statistics for the specified applicable protocol.
- Values**     igmp, pim, igmpSnpng, mld

## 10 Troubleshooting Tools

### 10.1 In This Chapter

This chapter provides information about multicast troubleshooting tools.

Topics in this chapter include:

- [Mtrace](#)
- [Mstat](#)
- [Mrinfo](#)
- [Troubleshooting Configuration Command Reference](#)

### 10.2 Mtrace

Assessing problems in the distribution of IP multicast traffic can be difficult. The **mtrace** feature utilizes a tracing feature implemented in multicast routers that is accessed via an extension to the IGMP protocol. The **mtrace** feature is used to print the path from the source to a receiver; it does this by passing a trace query hop-by-hop along the reverse path from the receiver to the source. At each hop, information such as the hop address, routing error conditions and packet statistics should be gathered and returned to the requestor.

Data added by each hop includes:

- query arrival time
- incoming interface
- outgoing interface
- previous hop router address
- input packet count
- output packet count
- total packets for this source/group
- routing protocol
- TTL threshold
- forwarding/error code

---

The information enables the network administrator to determine:

- where multicast flows stop
- the flow of the multicast stream

When the trace response packet reaches the first hop router (the router that is directly connected to the source's net), that router sends the completed response to the response destination (receiver) address specified in the trace query.

If some multicast router along the path does not implement the multicast traceroute feature or if there is some outage, then no response is returned. To solve this problem, the trace query includes a maximum hop count field to limit the number of hops traced before the response is returned. This allows a partial path to be traced.

The reports inserted by each router contain not only the address of the hop, but also the TTL required to forward and some flags to indicate routing errors, plus counts of the total number of packets on the incoming and outgoing interfaces and those forwarded for the specified group. Taking differences in these counts for two traces separated in time and comparing the output packet counts from one hop with the input packet counts of the next hop allows the calculation of packet rate and packet loss statistics for each hop to isolate congestion problems.

## 10.2.1 Finding the Last Hop Router

The trace query must be sent to the multicast router which is the last hop on the path from the source to the receiver. If the receiver is on the local subnet (as determined using the subnet mask), then the default method is to multicast the trace query to all-routers.mcast.net (224.0.0.2) with a TTL of 1. Otherwise, the trace query is multicast to the group address since the last hop router will be a member of that group if the receiver is. Therefore, it is necessary to specify a group that the intended receiver has joined. This multicast is sent with a default TTL of 64, which may not be sufficient for all cases.

When tracing from a multihomed host or router, the default receiver address may not be the desired interface for the path from the source. In that case, the desired interface should be specified explicitly as the receiver.

---

## 10.2.2 Directing the Response

By default, `mtrace` first attempts to trace the full reverse path, unless the number of hops to trace is explicitly set with the `hop` option. If there is no response within a 3 second timeout interval, a "\*" is printed and the probing switches to hop-by-hop mode. Trace queries are issued starting with a maximum hop count of one and increasing by one until the full path is traced or no response is received. At each hop, multiple probes are sent. The first attempt is made with the unicast address of the host running `mtrace` as the destination for the response. Since the unicast route may be blocked, the remainder of attempts request that the response be multicast to `mtrace.mcast.net` (224.0.1.32) with the TTL set to 32 more than what's needed to pass the thresholds seen so far along the path to the receiver. For the last attempts the TTL is increased by another 32.

Alternatively, the TTL may be set explicitly with the `TTL` option.

For each attempt, if no response is received within the timeout, a "\*" is printed. After the specified number of attempts have failed, `mtrace` will try to query the next hop router with a `DVMRP_ASK_NEIGHBORS2` request (as used by the `mrinfo` program) to determine the router type.

The output of `mtrace` is a short listing of the hops in the order they are queried, that is, in the reverse of the order from the source to the receiver. For each hop, a line is printed showing the hop number (counted negatively to indicate that this is the reverse path); the multicast routing protocol; the threshold required to forward data (to the previous hop in the listing as indicated by the up-arrow character); and the cumulative delay for the query to reach that hop (valid only if the clocks are synchronized). The response ends with a line showing the round-trip time which measures the interval from when the query is issued until the response is received, both derived from the local system clock.

`Mtrace/mstat` packets use special IGMP packets with IGMP type codes of 0x1E and 0x1F.

## 10.3 Mstat

The `mstat` command adds the capability to show the multicast path in a limited graphic display and provide drops, duplicates, TTLs and delays at each node. This information is useful to the network operator because it identifies nodes with high drop and duplicate counts. Duplicate counts are shown as negative drops.

The output of **mstat** provides a limited pictorial view of the path in the forward direction with data flow indicated by arrows pointing downward and the query path indicated by arrows pointing upward. For each hop, both the entry and exit addresses of the router are shown if different, along with the initial ttl required on the packet in order to be forwarded at this hop and the propagation delay across the hop assuming that the routers at both ends have synchronized clocks. The output consists of two columns, one for the overall multicast packet rate that does not contain lost/sent packets and a column for the (S,G)-specific case. The S,G statistics do not contain lost/sent packets.

## 10.4 Mrinfo

The simple **mrinfo** mechanism is based on the **ask\_neighbors igmp** to display the configuration information from the target multicast router. The type of information displayed includes the Multicast of the router, code version, metrics, ttl-thresholds, protocols and status. This information, for instance, can be used by network operators to verify if bi-directional adjacencies exist. After the specified multicast router responds, the configuration is displayed.

---

## 10.5 Troubleshooting Configuration Command Reference

### 10.5.1 Command Hierarchies

- [Operational Commands](#)

#### 10.5.1.1 Operational Commands

<GLOBAL>

- **mrinfo** *ip-address* [**router** *router-name* | *service*]
- **mstat source** *ip-address* [**group** *grp-ip-address*] [**destination** *dst-ip-address*] [**hop** *hop*] [**router** *router-name* | *service*] [**wait-time** *wait-time*]
- **mtrace source** *ip-address* [**group** *grp-ip-address*][**destination** *dst-ip-address*] [**hop** *hop*] [**router** *router-name* | *service*] [**wait-time** *wait-time*]

### 10.5.2 Command Descriptions

#### 10.5.2.1 Operational Commands

##### mrinfo

|                    |                                                                                                                                                                                                                                                                                                                                            |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>mrinfo</b> <i>ip-address</i> [ <b>router</b> <i>router-name</i>   <i>service</i> ]                                                                                                                                                                                                                                                      |
| <b>Context</b>     | <GLOBAL>                                                                                                                                                                                                                                                                                                                                   |
| <b>Description</b> | This command is used to display relevant multicast information from the target multicast router. Information displayed includes adjacency information, protocol, metrics, thresholds, and flags from the target multicast router. This information can be used by network operators to determine whether bi-directional adjacencies exist. |
| <b>Parameters</b>  | <i>ip-address</i> — Specifies the IP address of the multicast capable target router should be entered.<br><b>router</b> <i>router-name</i> — Specifies the router instance that this command applies to.                                                                                                                                   |
| <b>Default</b>     | management Base                                                                                                                                                                                                                                                                                                                            |

*service* — Specifies the service instance that this command applies to.

**Values** 1 to 2147483647

**Output**

**Table 29 Mrinfo Output Fields**

| Label           | Description                                        |
|-----------------|----------------------------------------------------|
| General flags   |                                                    |
| version         | Indicates software version on queried router.      |
| prune           | Indicates that router understands pruning.         |
| genid           | Indicates that router sends generation IDs.        |
| mtrace          | Indicates that the router handles mtrace requests. |
| Neighbors flags |                                                    |
| 1               | Metric                                             |
| 0               | Threshold (multicast time-to-live)                 |
| pim             | PIM enabled on interface.                          |
| down            | Operational status of interface.                   |
| disabled        | Administrative status of interface.                |
| leaf            | No downstream neighbors on interface.              |
| querier         | Interface is IGMP querier.                         |
| tunnel          | Neighbor reached via tunnel.                       |

**Output Sample**

```
A:dut-f# mrinfo 10.1.1.2

10.1.1.2 [version 3.0,prune,genid,mtrace]:
 10.1.1.2 -> 10.1.1.1 [1/0/pim]
 16.1.1.1 -> 0.0.0.0 [1/0/pim/down/disabled]
 17.1.1.1 -> 0.0.0.0 [1/0/pim/querier/leaf]
 200.200.200.3 -> 200.200.200.5 [1/0/tunnel/pim]...
```

**mstat**

**Syntax** **mstat source** *ip-address* **group** *grp-ip-address* [**destination** *dst-ip-address*] [**hop** *hop*] [**router** *router-name* | *service*] [**wait-time** *wait-time*]

**Context** <GLOBAL>

**Description** This command traces a multicast path from a source to a receiver and displays multicast packet rate and loss information. The **mstat** command adds the capability to show the multicast path in a limited graphic display and provide drops, duplicates, TTLs, and delays at each node. This information is useful to network operators because it identifies nodes with high drop and duplicate counts. Duplicate counts are shown as negative drops.

**Parameters** **source** *ip-address* — Specifies the IP address of the multicast-capable source. This is a unicast address of the beginning of the path to be traced.

**group** *group-ip-address* — Specifies the multicast address that will be used.

**destination** *dst-ip-address* — Specifies the IP address of the unicast destination. If this parameter is omitted, the IP address of the system where the command is entered is used. The destination parameter can also be used to specify a local interface address as the destination address to send the trace query.

**Default** The default address for the destination address is the incoming IETF format for that (S,G)

**hop** *hop* — Specifies the maximum number of hops that will be traced from the receiver back toward the source.

**Values** 1 to 255

**Default** 32 (infinity for the DVMRP routing protocol).

**router** *router-name* — Specifies the router instance that this command applies to.

**service** — Specifies the service instance that this command applies to.

**Values** 1 to 2147483647

**wait-time** *wait-time* — Specifies the number of seconds to wait for the response.

**Values** 1 to 60

**Default** 10

**Output**

**Table 30 Mstat Output Fields**

| Label           | Description                                                                                                           |
|-----------------|-----------------------------------------------------------------------------------------------------------------------|
| hop             | Number of hops from the source to the listed router.                                                                  |
| router name     | Name of the router for this hop or “?” when not reverse DNS translated.                                               |
| address         | Address of the router for this hop.                                                                                   |
| protocol        | Protocol used.                                                                                                        |
| ttl             | Forward TTL threshold. TTL that a packet is required to have before it will be forwarded over the outgoing interface. |
| forwarding code | Forwarding information/error code for this hop.                                                                       |

For each interface between 2 nodes a line is printed, following the same layout as other routers with an implementation derived from mroute. Consider the following:

- The forwarding information/error code is only displayed when different from “No Error”.
- “?” means the there is no reverse DNS translation.
- There is no “Overall Mcast Pkt Rate” available in the PE for the VPRN case.

**Output Sample**

| Source          | Response Dest | Overall         | Packet Statistics for Traffic Fro |
|-----------------|---------------|-----------------|-----------------------------------|
| m<br>10.10.16.9 | 10.20.1.6     | Mcast Pkt       | 10.10.16.9 to 224.5.6.7           |
|                 | rtt 29 ms     | Rate            | Lost/Sent = Pct Rate              |
| v               | /             | -----           | -----                             |
| 10.10.16.3      |               |                 |                                   |
| 10.10.2.3       | ?             |                 |                                   |
|                 | ^ ttl 2       | 1pps            | 0/0 = -- 0 pps                    |
| v               |               |                 |                                   |
| 10.10.2.1       |               |                 |                                   |
| 10.10.1.1       | ?             |                 |                                   |
|                 | ^ ttl 3       | 1pps            | 0/0 = -- 0 pps                    |
| v               |               |                 |                                   |
| 10.10.1.2       |               |                 |                                   |
| 10.10.4.2       | ?             | Reached RP/Core |                                   |
|                 | ^ ttl 4       | 1pps            | 0/0 = -- 0 pps                    |
| v               |               |                 |                                   |
| 10.10.4.4       |               |                 |                                   |
| 10.10.6.4       | ?             |                 |                                   |
|                 | ^ ttl 5       | 1pps            | 0/0 = -- 0 pps                    |
| v               |               |                 |                                   |
| 10.10.6.5       |               |                 |                                   |
| 10.10.10.5      | ?             |                 |                                   |
|                 | \_ ttl 6      | 1pps            | 0/0 = -- 0 pps                    |
| v               | \             |                 |                                   |
| 10.10.10.6      | 10.20.1.6     |                 |                                   |
| Receiver        | Query Source  |                 |                                   |

**mtrace**

**Syntax** **mtrace source** *ip-address* **group** *grp-ip-address* [**destination** *dst-ip-address*] [**hop** *hop*] [**router** *router-name* | *service*] [**wait-time** *wait-time*]

**Context** <GLOBAL>

**Description** This command traces the multicast path from a source to a receiver by passing a trace query hop-by-hop along the reverse path from the receiver to the source. At each hop, information such as the hop address, routing error conditions, and packet statistics are gathered and returned to the requester. A network administrator can determine where multicast flows stop and verify the flow of the multicast stream.

**Parameters** **source** *ip-address* — Specifies the IP address of the multicast-capable source. This is a unicast address of the beginning of the path to be traced.

**group** *group-ip-address* — Specifies the multicast address that will be used.

**destination** *dst-ip-address* — Specifies the IP address of the unicast destination. If this parameter is omitted, the IP address of the system where the command is entered is used. The destination parameter can also be used to specify a local interface address as the destination address to send the trace query.

**Default** The default address for the destination address is the incoming IETF format for that (S,G)

**hop** *hop* — Specifies the maximum number of hops that will be traced from the receiver back toward the source.

**Values** 1 to 255

**Default** 32 (infinity for the DVMRP routing protocol).

**router** *router-name* — Specifies the router instance that this command applies to.

*service* — Specifies the service instance that this command applies to.

**Values** 1 to 2147483647

**wait-time** *wait-time* — Specifies the number of seconds to wait for the response.

**Values** 1 to 60

**Default** 10

**Output**

**Table 31 Mtrace Output Fields**

| Label           | Description                                                                                                           |
|-----------------|-----------------------------------------------------------------------------------------------------------------------|
| hop             | Number of hops from the source to the listed router.                                                                  |
| router name     | Name of the router for this hop. If a DNS name query is not successful a “?” displays.                                |
| address         | Address of the router for this hop.                                                                                   |
| protocol        | Protocol used.                                                                                                        |
| ttl             | Forward TTL threshold. TTL that a packet is required to have before it will be forwarded over the outgoing interface. |
| forwarding code | Forwarding information/error code for this hop.                                                                       |

**Output Sample**

```
A:Dut-F# mtrace source 10.10.16.9 group 224.5.6.7
```

```
Mtrace from 10.10.16.9 via group 224.5.6.7
Querying full reverse path...
```

```
0 ? (10.10.10.6)
-1 ? (10.10.10.5) PIM thresh^ 1 No Error
-2 ? (10.10.6.4) PIM thresh^ 1 No Error
```

```
-3 ? (10.10.4.2) PIM thresh^ 1 Reached RP/Core
-4 ? (10.10.1.1) PIM thresh^ 1 No Error
-5 ? (10.10.2.3) PIM thresh^ 1 No Error
-6 ? (10.10.16.9)
```

```
Round trip time 29 ms; total ttl of 5 required.
```

---

## 10.6 Show Command Reference

### 10.6.1 Command Hierarchies

- [Show Commands](#)

#### 10.6.1.1 Show Commands

```
show
 — router
 — tunnel-interface [protocol protocol] [senderAddr senderAddr] [rootNode rootNode]

show
 — router
 — ldp
 — bindings active
 — mvpn
 — mvpn-list [type type] [auto-discovery auto-discovery] [signalling signalling] [group
 group]

show
 — router
 — tunnel-table [summary] [{ipv4 | ipv6}]
 — tunnel-table [protocol protocol] [{ipv4 | ipv6}]
 — tunnel-table [ip-prefix/mask] [alternative] [{ipv4 | ipv6}] [detail]
 — tunnel-table mpls-tp
 — tunnel-table [ip-prefix/mask] protocol protocol [detail]
 — tunnel-table [ip-prefix/mask] sdp sdp-id
```

### 10.6.2 Command Descriptions

#### 10.6.2.1 Show Commands

The command outputs in the following section are examples only; actual displays may differ depending on supported functionality and user configuration.

## tunnel-interface

- Syntax** `tunnel-interface [protocol protocol] [senderAddr senderAddr] [rootNode rootNode]`
- Context** `show>router`
- Description** This command displays tunnel interface information.
- Parameters**
  - protocol* — Specifies the protocol.
  - Values** `ldp | rsvp`
  - senderAddr* — Specifies the IP address of the sender.
  - rootNode* — Specifies to show root nodes.
  - Values** `Yes | No`

### Output

#### Sample Output

```
*A:Dut-C# show router tunnel-interface
=====
P2MP-RSVP P2MP-LDP Tunnel-Interfaces
=====
LSP/LDP Type SenderAddr IfIndex RootNode

1 ldp 110.20.1.2 73728 No
2 ldp 110.20.1.2 73729 No
3 ldp 110.20.1.2 73730 No
4 ldp 110.20.1.2 73731 No
5 ldp 110.20.1.2 73732 No

Interfaces : 5
=====
*A:Dut-B# show router tunnel-interface
=====
P2MP-RSVP P2MP-LDP Tunnel-Interfaces
=====
LSP/LDP Type SenderAddr IfIndex RootNode

1 ldp 110.20.1.2 73728 Yes
2 ldp 110.20.1.2 73729 Yes
3 ldp 110.20.1.2 73730 Yes
4 ldp 110.20.1.2 73731 Yes
5 ldp 110.20.1.2 73732 Yes

Interfaces : 5
=====
```

## bindings

- Syntax** `bindings active`

**Context** show>router>ldp

**Description** This command displays LDP bindings information.

**Output**

**Sample Output**

```
*A:Dut-A# show router ldp bindings active

=====
Legend: U - Label In Use, N - Label Not In Use, W - Label Withdrawn
 WP - Label Withdraw Pending, BU - Alternate For Fast Re-Route
 (S) - Static (M) - Multi-homed Secondary Support
 (B) - BGP Next Hop (BU) - Alternate Next-hop for Fast Re-Route
=====
LDP IPv4 Prefix Bindings (Active)
=====
Prefix Op IngLbl EgrLbl EgrIntf/LspId EgrNextHop

10.20.1.1/32 Pop 131071 -- -- --
10.20.1.2/32 Push -- 131071 1/1/1 10.10.1.2
10.20.1.2/32 Swap 131070 131071 1/1/1 10.10.1.2
10.20.1.2/32 Push -- 262141BU 1/1/2 10.10.2.3
10.20.1.2/32 Swap 131070 262141BU 1/1/2 10.10.2.3
10.20.1.3/32 Push -- 131069BU 1/1/1 10.10.1.2
10.20.1.3/32 Swap 131069 131069BU 1/1/1 10.10.1.2
10.20.1.3/32 Push -- 262143 1/1/2 10.10.2.3
10.20.1.3/32 Swap 131069 262143 1/1/2 10.10.2.3
10.20.1.4/32 Push -- 131068 1/1/1 10.10.1.2
10.20.1.4/32 Swap 131068 131068 1/1/1 10.10.1.2
10.20.1.4/32 Push -- 262140BU 1/1/2 10.10.2.3
10.20.1.4/32 Swap 131068 262140BU 1/1/2 10.10.2.3
10.20.1.5/32 Push -- 131067BU 1/1/1 10.10.1.2
10.20.1.5/32 Swap 131067 131067BU 1/1/1 10.10.1.2
10.20.1.5/32 Push -- 262139 1/1/2 10.10.2.3
10.20.1.5/32 Swap 131067 262139 1/1/2 10.10.2.3
10.20.1.6/32 Push -- 131066 1/1/1 10.10.1.2
10.20.1.6/32 Swap 131066 131066 1/1/1 10.10.1.2
10.20.1.6/32 Push -- 262138BU 1/1/2 10.10.2.3
10.20.1.6/32 Swap 131066 262138BU 1/1/2 10.10.2.3

No. of IPv4 Prefix Active Bindings: 10
=====

LDP IPv6 Prefix Bindings (Active)
=====
Prefix Op IngLbl EgrLbl
EgrNextHop EgrIf/LspId

No Matching Entries Found
=====

LDP Generic IPv4 P2MP Bindings (Active)
```

```
=====
P2MP-Id Interface
RootAddr Op IngLbl EgrLbl
EgrNH EgrIf/LspId

No Matching Entries Found
=====
```

```
=====
LDP Generic IPv6 P2MP Bindings (Active)
=====
P2MP-Id Interface
RootAddr Op IngLbl EgrLbl
EgrNH EgrIf/LspId

No Matching Entries Found
=====
```

```
=====
LDP In-Band-SSM IPv4 P2MP Bindings (Active)
=====
Source
Group Interface
RootAddr Op IngLbl EgrLbl
EgrNH EgrIf/LspId

No Matching Entries Found
=====
```

```
=====
LDP In-Band-SSM IPv6 P2MP Bindings (Active)
=====
Source
Group Interface
RootAddr Op IngLbl EgrLbl
EgrNH EgrIf/LspId

No Matching Entries Found
=====
```

```
=====
LDP In-Band-VPN-SSM IPv4 P2MP Bindings (Active)
=====
Source
Group RD Op
RootAddr Interface IngLbl EgrLbl
EgrNH EgrIf/LspId

No Matching Entries Found
=====
```

```
=====
LDP In-Band-VPN-SSM IPv6 P2MP Bindings (Active)
=====
Source
Group RD Op
RootAddr Interface IngLbl EgrLbl
EgrNH EgrIf/LspId

```

No Matching Entries Found

\*A:Dut-A# show router ldp bindings

LDP Bindings (IPv4 LSR ID 1.1.1.1:0)  
(IPv6 LSR ID ::[0])

Legend: U - Label In Use, N - Label Not In Use, W - Label Withdrawn  
S - Status Signaled Up, D - Status Signaled Down  
E - Epipe Service, V - VPLS Service, M - Mirror Service  
A - Apipe Service, F - Fpipe Service, I - IES Service, R - VPRN service  
P - Ipipe Service, WP - Label Withdraw Pending, C - Cpipe Service  
BU - Alternate For Fast Re-Route, TLV - (Type, Length: Value)

LDP IPv4 Prefix Bindings

| Prefix       | Peer      | IngLbl   | EgrLbl | EgrIntf/<br>LspId | EgrNextHop |
|--------------|-----------|----------|--------|-------------------|------------|
| 10.20.1.1/32 | 10.20.1.2 | 131071U  | --     | --                | --         |
| 10.20.1.1/32 | 10.20.1.3 | 131071U  | --     | --                | --         |
| 10.20.1.2/32 | 10.20.1.2 | --       | 131071 | 1/1/1             | 10.10.1.2  |
| 10.20.1.2/32 | 10.20.1.3 | 131070U  | 262141 | 1/1/2             | 10.10.2.3  |
| 10.20.1.3/32 | 10.20.1.2 | 131069U  | 131069 | 1/1/1             | 10.10.1.2  |
| 10.20.1.3/32 | 10.20.1.3 | --       | 262143 | 1/1/2             | 10.10.2.3  |
| 10.20.1.4/32 | 10.20.1.2 | 131068N  | 131068 | 1/1/1             | 10.10.1.2  |
| 10.20.1.4/32 | 10.20.1.3 | 131068BU | 262140 | 1/1/2             | 10.10.2.3  |
| 10.20.1.5/32 | 10.20.1.2 | 131067U  | 131067 | 1/1/1             | 10.10.1.2  |
| 10.20.1.5/32 | 10.20.1.3 | 131067N  | 262139 | 1/1/2             | 10.10.2.3  |
| 10.20.1.6/32 | 10.20.1.2 | 131066N  | 131066 | 1/1/1             | 10.10.1.2  |
| 10.20.1.6/32 | 10.20.1.3 | 131066BU | 262138 | 1/1/2             | 10.10.2.3  |

No. of IPv4 Prefix Bindings: 12

LDP IPv6 Prefix Bindings

| Prefix     | IngLbl        | EgrLbl |
|------------|---------------|--------|
| Peer       | EgrIntf/LspId |        |
| EgrNextHop |               |        |

No Matching Entries Found

LDP Generic IPv4 P2MP Bindings

| P2MP-Id    | Interface   | IngLbl | EgrLbl |
|------------|-------------|--------|--------|
| RootAddr   | EgrIf/LspId |        |        |
| EgrNH      |             |        |        |
| Peer       |             |        |        |
| 100        |             |        |        |
| 1.1.1.1    | Unknw       | --     | 131051 |
| 90.90.90.2 | 1/1/6       |        |        |

```

2.2.2.2:0

104
1.1.1.1 Unknw -- 131050
90.90.90.2 1/1/6
2.2.2.2:0

600
1.1.1.1 Unknw -- 131049
90.90.90.2 1/1/6
2.2.2.2:0

700
1.1.1.1 Unknw -- 131048
90.90.90.2 1/1/6
2.2.2.2:0

800
1.1.1.1 Unknw -- 131047
90.90.90.2 1/1/6
2.2.2.2:0

900
1.1.1.1 Unknw -- 131046
90.90.90.2 1/1/6
2.2.2.2:0

1500
1.1.1.1 Unknw -- 131045
90.90.90.2 1/1/6
2.2.2.2:0

100
6.6.6.6 Unknw -- 131044
90.90.90.2 1/1/6
2.2.2.2:0

900
6.6.6.6 Unknw -- 131043
90.90.90.2 1/1/6
2.2.2.2:0

```

```

No. of Generic IPv4 P2MP Bindings: 9
=====

```

```

=====
LDP Generic IPv6 P2MP Bindings
=====

```

```

P2MP-Id
RootAddr Interface IngLbl EgrLbl
EgrNH EgrIf/LspId
Peer

```

```

No Matching Entries Found
=====

```

```

=====
LDP In-Band-SSM IPv4 P2MP Bindings

```

```

=====
Source
Group
RootAddr Interface IngLbl EgrLbl
EgrNH EgrIf/LspId
Peer

No Matching Entries Found
=====

```

```

=====
LDP In-Band-SSM IPv6 P2MP Bindings
=====
Source
Group
RootAddr Interface IngLbl EgrLbl
EgrNH EgrIf/LspId
Peer

No Matching Entries Found
=====

```

```

=====
LDP In-Band-VPN-SSM IPv4 P2MP Bindings
=====
Source
Group RD
RootAddr Interface IngLbl EgrLbl
EgrNH EgrIf/LspId
Peer

1.1.1.1
225.0.0.1 1.1.1.1:100
3.3.3.3 Unknwn -- 100
60.60.60.1 1/1/1
2.2.2.2:100

1.1.1.1
225.0.0.1 1.1.1.1:100
3.3.3.3 Unknwn -- 100
60.60.60.1 1/1/1
2.2.2.2:100

1.1.1.1
225.0.0.1 1.1.1.1:100
3.3.3.3 Unknwn -- 100
60.60.60.1 1/1/1
2.2.2.2:100

```

```

No. of In-Band-VPN-SSM IPv4 P2MP Bindings: 3
=====

```

```

=====
LDP In-Band-VPN-SSM IPv6 P2MP Bindings
=====
Source
Group RD

```

| RootAddr<br>EgrNH<br>Peer | Interface<br>EgrIf/LspId | IngLbl | EgrLbl |
|---------------------------|--------------------------|--------|--------|
| -----                     |                          |        |        |
| 1.1.1.1                   |                          |        |        |
| 225.0.0.1                 | 1.1.1.1:100              |        |        |
| 2000::3000                | Unknwn                   | --     | 100    |
| 60.60.60.1                | 1/1/1                    |        |        |
| 2.2.2.2:100               |                          |        |        |
| 1.1.1.1                   |                          |        |        |
| 225.0.0.1                 | 1.1.1.1:100              |        |        |
| 2000::3000                | Unknwn                   | --     | 100    |
| 60.60.60.1                | 1/1/1                    |        |        |
| 2.2.2.2:100               |                          |        |        |
| 1.1.1.1                   |                          |        |        |
| 225.0.0.1                 | 1.1.1.1:100              |        |        |
| 2000::3000                | Unknwn                   | --     | 100    |
| 60.60.60.1                | 1/1/1                    |        |        |
| 2.2.2.2:100               |                          |        |        |

-----  
No. of In-Band-VPN-SSM IPv6 P2MP Bindings: 3  
=====

=====

LDP Service FEC 128 Bindings

=====

| Type<br>Peer | VCId<br>SvcId | SDPId  | IngLbl<br>EgrLbl | LMTU<br>RMTU |
|--------------|---------------|--------|------------------|--------------|
| -----        |               |        |                  |              |
| ?-Eth        | 100           | R. Src | --               | None         |
| 2.2.2.2:0    | Ukwn          |        | 131023D          | 986          |
| ?-Eth        | 500           | R. Src | --               | None         |
| 2.2.2.2:0    | Ukwn          |        | 131022D          | 1386         |
| ?-Eth        | 2001          | R. Src | --               | None         |
| 2.2.2.2:0    | Ukwn          |        | 131019D          | 986          |
| ?-Eth        | 2003          | R. Src | --               | None         |
| 2.2.2.2:0    | Ukwn          |        | 131017D          | 986          |
| ?-Ipipe      | 1800          | R. Src | --               | None         |
| 2.2.2.2:0    | Ukwn          |        | 131014D          | 1486         |

-----  
No. of VC Labels: 5  
=====

=====

LDP Service FEC 129 Bindings

=====

| SAII<br>TAII<br>Peer | AGII<br>Type<br>SvcId | IngLbl<br>EgrLbl | LMTU<br>RMTU |
|----------------------|-----------------------|------------------|--------------|
| -----                |                       |                  |              |
|                      |                       |                  |              |

-----  
No Matching Entries Found

mvpn

- Syntax** mvpn
- Context** show>router router-instance
- Description** This command displays Multicast VPN related information. The router instance must be specified.
- Output**

**Sample Output**

```
=====
*A:Dut-C# show router 1 mvpn
=====
MVPN 1 configuration data
=====
signaling : Bgp auto-discovery : Default
UMH Selection : Highest-Ip SA withdrawn : Disabled
intersite-shared : Enabled Persist SA : Disabled
vrf-import : N/A
vrf-export : N/A
vrf-target : unicast
C-Mcast Import RT : target:10.20.1.4:105

ipmsi : rsvp IpmsiTemplate
i-pmsi P2MP AdmSt : Up
i-pmsi Tunnel Name : IpmsiTemplate-1-74216
enable-bfd-root : false enable-bfd-leaf : false
Mdt-type : sender-receiver

BSR signalling : none
Wildcard s-pmsi : false
spmsi : rsvp SpmsiTemplate
s-pmsi P2MP AdmSt : Up
max-p2mp-spmsi : 4000
data-delay-interval : 3 seconds
enable-asm-mdt : N/A
data-threshold : 224.0.0.0/4 --> 1 kbps
rx-threshold : 224.0.0.0/4 --> pe-thres-add 2 --> pe-thres-delete 4
data-threshold : ff00::/8 --> 1 kbps
rx-threshold : ff00::/8 --> pe-thres-add 2 --> pe-thres-delete 4

=====

*A:Dut-D# show router 21 mvpn
=====
MVPN 21 configuration data
=====
signaling : Bgp auto-discovery : Default
UMH Selection : Highest-Ip SA withdrawn : Disabled
intersite-shared : Enabled Persist SA : Disabled
```

```

vrf-import : N/A
vrf-export : N/A
vrf-target : unicast
C-Mcast Import RT : target:10.20.1.4:106

ipmsi : ldp
i-pmsi P2MP AdmSt : Up
i-pmsi Tunnel Name : mpls-if-74217
Mdt-type : sender-receiver

BSR signalling : none
Wildcard s-pmsi : false
spmsi : ldp
s-pmsi P2MP AdmSt : Up
max-p2mp-spmsi : 4000
data-delay-interval: 3 seconds
enable-asm-mdt : N/A
data-threshold : 224.0.0.0/4 --> 1 kbps
rx-threshold : 224.0.0.0/4 --> pe-thres-add 2 --> pe-thres-delete 4
data-threshold : ff00::/8 --> 1 kbps
rx-threshold : ff00::/8 --> pe-thres-add 2 --> pe-thres-delete 4

=====
*A:Dut-D#

```

## mvpn-list

- Syntax** `mvpn-list [type <type>] [auto-discovery <auto-discovery>] [signalling <signalling>] [group <group>]`
- Context** show>router
- Description** This command displays Multicast VPN list.
- Parameters**
  - type* — Specifies the MVPN type.
  - Values** pim | rsvp | ldp
  - auto-discovery* — Specifies the auto-discovery mode.
  - Values** none | default | mdt-s
  - signalling* — Specifies the signaling type.
  - Values** bgp | pim
  - group* — Specifies the group address.

### Output

#### Sample Output

```

*A:Dut-D# show router mvpn-list

Legend: Sig = Signal Pim-a = pim-asm Pim-s = pim-ssm A-D = Auto-Discovery

```

SR = Sender-Receiver SO = Sender-Only RO = Receiver-Only

```

=====
MVPN List
=====
VprnID A-D iPmsi/sPmsi GroupAddr/Lsp-Template IPv4 (S,G) / (*,G)
 Sig Mdt-Type

100 None Pim-a/None 224.100.201.101 0/0
 Pim N/A

Total Mvpngs : 1
=====

=====
Total PIM RSVP MLDP

I-PMSI tunnels 1 0 0
TX S-PMSI tunnels 0 0 0
RX S-PMSI tunnels 0 0 0
RX PSEUDO S-PMSI tunnels 0 0 0

Total IPv4 (S,G)/(*,G) : 0/0
Total IPv6 (S,G)/(*,G) : 0/0
=====
*A:Dut-D#

```

## tunnel-table

- Syntax**
- tunnel-table [summary] [{ipv4 | ipv6}]**
  - tunnel-table [protocol *protocol*] {ipv4 | ipv6}**
  - tunnel-table [*ip-prefix[/mask]*] [alternative] [{ipv4 | ipv6}] [detail]**
  - tunnel-table mpls-tp**
  - tunnel-table [*ip-prefix[/mask]*] protocol *protocol* [detail]**
  - tunnel-table [*ip-prefix[/mask]*] sdp *sdp-id***
- Context** show>router
- Description** This command displays tunnel table information.
- Parameters**
- summary** — displays a summary of the tunnel table information
  - ipv4** — displays only tunnel table information for IPv4 addresses
  - ipv6** — displays only tunnel table information for IPv6 addresses
  - protocol*** — specifies the protocol
- Values** bgp | ldp | rsvp | sdp | ospf | isis | sr-te
- ip-prefix/mask*** — the IPv4 or IPv6 prefix and, optionally, the mask of the tunnel
- alternative** — displays backup route details
  - detail** — displays detailed tunnel table information
  - mpls-tp** — displays MPLS TP tunnel table information

*sdp-id* — specifies the SDP ID

**Values** 1 to 17407

**Output**

**Sample Output**

A:Dut-C# show router tunnel-table

```
=====
Tunnel Table (Router: Base)
=====
Destination Owner Encap TunnelId Pref Nexthop Metric

4.0.0.1/32 isis (0) MPLS 524309 11 1.3.4.4 10
10.20.1.2/32 isis (0) MPLS 524312 11 1.2.3.2 10
10.20.1.4/32 isis (0) MPLS 524310 11 1.3.4.4 10
10.20.1.5/32 isis (0) MPLS 524311 11 1.2.3.2 20

Flags: B = BGP backup route available
 E = inactive best-
external BGP route
=====
```

A:Dut-C#

\*A:Dut-C# show router tunnel-table

```
=====
IPv4 Tunnel Table (Router: Base)
=====
Destination Owner Encap TunnelId Pref Nexthop Metric

10.20.1.1/32 ospf (0) MPLS 524395 10 1.1.3.1 1000
10.20.1.2/32 ospf (0) MPLS 524399 10 2.2.3.2 1000
10.20.1.4/32 ospf (0) MPLS 524398 10 1.3.5.5 2000
10.20.1.4/32 ospf (0) MPLS 524398 10 2.2.3.2 2000
10.20.1.5/32 ospf (0) MPLS 524397 10 1.3.5.5 1000
10.20.1.6/32 ospf (0) MPLS 524396 10 1.3.5.5 2000

Flags: B = BGP backup route available
 E = inactive best-external BGP route
=====
```

\*A:Dut-C#

\*A:Dut-C# show router tunnel-table sdp 17407

```
=====
Tunnel Table (Router: Base)
=====
Destination Owner Encap TunnelId Pref Nexthop Metric

127.0.68.0/32 sdp MPLS 17407 5 127.0.68.0 0

```

=====

\*A:Dut-C>config>router>mpls>lsp# show router tunnel-table detail

=====

Tunnel Table (Router: Base)

=====

```
Destination : 1.0.0.2/32
NextHop : 1.1.4.4
Tunnel Flags : exclude-for-lfa
Age : 00h17m58s
Owner : rsvp
Tunnel ID : 115
Tunnel Label : 262054
Tunnel MTU : 1496
LSP ID : 26116
LSP Bandwidth : 0
Encap : MPLS
Preference : 7
Tunnel Metric : 9
Bypass Label : 0
LSP Weight : 2
```

-----

show router tunnel-table detail

=====

Tunnel Table (Router: Base)

=====

```
Destination : 4.0.0.1/32
NextHop : 1.3.4.4
Tunnel Flags : has-lfa exclude-for-igpshortcuts
Age : 20h34m58s
Owner : isis (0)
Tunnel ID : 524309
Tunnel Label : 20001
Tunnel MTU : 1382
Encap : MPLS
Preference : 11
Tunnel Metric : 10
```

-----

```
Destination : 10.20.1.2/32
NextHop : 1.2.3.2
Tunnel Flags : has-lfa exclude-for-igpshortcuts
Age : 20h35m04s
Owner : isis (0)
Tunnel ID : 524312
Tunnel Label : 21002
Tunnel MTU : 1382
Encap : MPLS
Preference : 11
Tunnel Metric : 10
```

-----

```
Destination : 10.20.1.4/32
NextHop : 1.3.4.4
Tunnel Flags : has-lfa exclude-for-igpshortcuts
Age : 20h34m58s
Owner : isis (0)
Tunnel ID : 524310
Tunnel Label : 21004
Tunnel MTU : 1382
Encap : MPLS
Preference : 11
Tunnel Metric : 10
```

-----

```
Destination : 10.20.1.5/32
NextHop : 1.2.3.2
Tunnel Flags : has-lfa exclude-for-igpshortcuts
Age : 20h34m58s
Owner : isis (0)
Encap : MPLS
```

```
Tunnel ID : 524311 Preference : 11
Tunnel Label : 21005 Tunnel Metric : 20
Tunnel MTU : 1382
```

```

Number of tunnel-table entries : 4
Number of tunnel-table entries with LFA : 4
```

```
=====
A:Dut-C#
```

## 11 Standards and Protocol Support



**Note:** The information presented is subject to change without notice.

It also assumes no responsibility for inaccuracies contained herein.

### Access Node Control Protocol (ANCP)

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RFC 3507, *Internet Content Adaptation Protocol (ICAP)*

### Asynchronous Transfer Mode (ATM)

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AF-TM-0121.000, *Traffic Management Specification Version 4.1*

AF-TM-0150.00, *Addendum to Traffic Management v4.1 optional minimum desired cell rate indication for UBR*

GR-1113-CORE, *Asynchronous Transfer Mode (ATM) and ATM Adaptation Layer (AAL) Protocols Generic Requirements, Issue 1*

GR-1248-CORE, *Generic Requirements for Operations of ATM Network Elements (NEs), Issue 3*

ITU-T I.432.1, *B-ISDN user-network interface - Physical layer specification: General characteristics (02/99)*

ITU-T I.610, *B-ISDN operation and maintenance principles and functions (11/95)*

RFC 1626, *Default IP MTU for use over ATM AAL5*

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### Border Gateway Protocol (BGP)

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draft-ietf-idr-bgp-gr-notification-01, *Notification Message support for BGP Graceful Restart*  
draft-ietf-idr-error-handling-03, *Revised Error Handling for BGP UPDATE Messages*  
draft-ietf-sidr-origin-validation-signaling-04, *BGP Prefix Origin Validation State Extended Community*  
RFC 1772, *Application of the Border Gateway Protocol in the Internet*  
RFC 1997, *BGP Communities Attribute*  
RFC 2385, *Protection of BGP Sessions via the TCP MD5 Signature Option*  
RFC 2439, *BGP Route Flap Damping*  
RFC 2545, *Use of BGP-4 Multiprotocol Extensions for IPv6 Inter-Domain Routing*  
RFC 2858, *Multiprotocol Extensions for BGP-4*  
RFC 2918, *Route Refresh Capability for BGP-4*  
RFC 3107, *Carrying Label Information in BGP-4*  
RFC 3392, *Capabilities Advertisement with BGP-4*  
RFC 4271, *A Border Gateway Protocol 4 (BGP-4)*  
RFC 4360, *BGP Extended Communities Attribute*  
RFC 4364, *BGP/MPLS IP Virtual Private Networks (VPNs)*  
RFC 4456, *BGP Route Reflection: An Alternative to Full Mesh Internal BGP (IBGP)*  
RFC 4486, *Subcodes for BGP Cease Notification Message*  
RFC 4659, *BGP/MPLS IP Virtual Private Network (VPN) Extension for IPv6 VPN*  
RFC 4684, *Constrained Route Distribution for Border Gateway Protocol/  
MultiProtocol Label Switching (BGP/MPLS) Internet Protocol (IP) Virtual  
Private Networks (VPNs)*  
RFC 4724, *Graceful Restart Mechanism for BGP (helper mode)*  
RFC 4760, *Multiprotocol Extensions for BGP-4*  
RFC 4798, *Connecting IPv6 Islands over IPv4 MPLS Using IPv6 Provider Edge  
Routers (6PE)*  
RFC 4893, *BGP Support for Four-octet AS Number Space*  
RFC 5004, *Avoid BGP Best Path Transitions from One External to Another*  
RFC 5065, *Autonomous System Confederations for BGP*  
RFC 5291, *Outbound Route Filtering Capability for BGP-4*  
RFC 5575, *Dissemination of Flow Specification Rules*  
RFC 5668, *4-Octet AS Specific BGP Extended Community*  
RFC 6810, *The Resource Public Key Infrastructure (RPKI) to Router Protocol*  
RFC 6811, *Prefix Origin Validation*  
RFC 7607, *Codification of AS 0 Processing*

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- MEF-8, *Implementation Agreement for the Emulation of PDH Circuits over Metro Ethernet Networks*, October 2004
- RFC 4553, *Structure-Agnostic Time Division Multiplexing (TDM) over Packet (SAToP)*
- RFC 5086, *Structure-Aware Time Division Multiplexed (TDM) Circuit Emulation Service over Packet Switched Network (CESoPSN)*
- RFC 5287, *Control Protocol Extensions for the Setup of Time-Division Multiplexing (TDM) Pseudowires in MPLS Networks*

## Ethernet

- IEEE 802.1AB, *Station and Media Access Control Connectivity Discovery*
- IEEE 802.1ad, *Provider Bridges*
- IEEE 802.1ag, *Connectivity Fault Management*
- IEEE 802.1ah, *Provider Backbone Bridges*
- IEEE 802.1ak, *Multiple Registration Protocol*
- IEEE 802.1aq, *Shortest Path Bridging*
- IEEE 802.1ax, *Link Aggregation*
- IEEE 802.1D, *MAC Bridges*
- IEEE 802.1p, *Traffic Class Expediting*
- IEEE 802.1Q, *Virtual LANs*
- IEEE 802.1s, *Multiple Spanning Trees*
- IEEE 802.1w, *Rapid Reconfiguration of Spanning Tree*
- IEEE 802.1X, *Port Based Network Access Control*
- IEEE 802.3ab, *1000BASE-T*
- IEEE 802.3ac, *VLAN Tag*
- IEEE 802.3ad, *Link Aggregation*
- IEEE 802.3ae, *10 Gb/s Ethernet*
- IEEE 802.3ah, *Ethernet in the First Mile*
- IEEE 802.3ba, *40 Gb/s and 100 Gb/s Ethernet*
- IEEE 802.3i, *Ethernet*
- IEEE 802.3u, *Fast Ethernet*
- IEEE 802.3x, *Ethernet Flow Control*
- IEEE 802.3z, *Gigabit Ethernet*
- ITU-T G.8031/Y.1342, *Ethernet Linear Protection Switching*
- ITU-T G.8032/Y.1344, *Ethernet Ring Protection Switching*
- ITU-T Y.1731, *OAM functions and mechanisms for Ethernet based networks*

## **Ethernet VPN (EVPN)**

draft-ietf-bess-evpn-overlay-02, *A Network Virtualization Overlay Solution using EVPN*

draft-ietf-bess-evpn-prefix-advertisement-02, *IP Prefix Advertisement in EVPN*

draft-ietf-bess-evpn-proxy-arp-nd-00, *Operational Aspects of Proxy-ARP/ND in EVPN Networks*

draft-ietf-bess-evpn-vpls-seamless-integ-00, *(PBB-)EVPN Seamless Integration with (PBB-)VPLS*

draft-ietf-bess-evpn-vpws-06, *VPWS support in EVPN*

RFC 7432, *BGP MPLS-Based Ethernet VPN*

RFC 7623, *Provider Backbone Bridging Combined with Ethernet VPN (PBB-EVPN)*

## **Frame Relay**

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FRF.1.2, *PVC User-to-Network Interface (UNI) Implementation Agreement*

FRF.12, *Frame Relay Fragmentation Implementation Agreement*

FRF.16.1, *Multilink Frame Relay UNI/NNI Implementation Agreement*

FRF.5, *Frame Relay/ATM PVC Network Interworking Implementation*

FRF2.2, *PVC Network-to-Network Interface (NNI) Implementation Agreement*

ITU-T Q.933 Annex A, *Additional procedures for Permanent Virtual Connection (PVC) status management*

## **Generalized Multiprotocol Label Switching (GMPLS)**

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RFC 3471, *Generalized Multi-Protocol Label Switching (GMPLS) Signaling Functional Description*

RFC 3473, *Generalized Multi-Protocol Label Switching (GMPLS) Signaling Resource ReserVation Protocol-Traffic Engineering (RSVP-TE) Extensions*

RFC 4204, *Link Management Protocol (LMP)*

RFC 4208, *Generalized Multiprotocol Label Switching (GMPLS) User-Network Interface (UNI): Resource ReserVation Protocol-Traffic Engineering (RSVP-TE) Support for the Overlay Model*

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- draft-ietf-isis-mi-02, *IS-IS Multi-Instance*
- draft-ietf-isis-segment-routing-extensions-04, *IS-IS Extensions for Segment Routing*
- draft-kaplan-isis-ext-eth-02, *Extended Ethernet Frame Size Support*
- ISO/IEC 10589:2002, Second Edition, Nov. 2002, *Intermediate system to Intermediate system intra-domain routing information exchange protocol for use in conjunction with the protocol for providing the connectionless-mode Network Service (ISO 8473)*
- RFC 1195, *Use of OSI IS-IS for Routing in TCP/IP and Dual Environments*
- RFC 2973, *IS-IS Mesh Groups*
- RFC 3359, *Reserved Type, Length and Value (TLV) Codepoints in Intermediate System to Intermediate System*
- RFC 3719, *Recommendations for Interoperable Networks using Intermediate System to Intermediate System (IS-IS)*
- RFC 3787, *Recommendations for Interoperable IP Networks using Intermediate System to Intermediate System (IS-IS)*
- RFC 4971, *Intermediate System to Intermediate System (IS-IS) Extensions for Advertising Router Information*
- RFC 5120, *M-ISIS: Multi Topology (MT) Routing in IS-IS*
- RFC 5130, *A Policy Control Mechanism in IS-IS Using Administrative Tags*
- RFC 5301, *Dynamic Hostname Exchange Mechanism for IS-IS*
- RFC 5302, *Domain-wide Prefix Distribution with Two-Level IS-IS*
- RFC 5303, *Three-Way Handshake for IS-IS Point-to-Point Adjacencies*
- RFC 5304, *IS-IS Cryptographic Authentication*
- RFC 5305, *IS-IS Extensions for Traffic Engineering TE*
- RFC 5306, *Restart Signaling for IS-IS (helper mode)*
- RFC 5307, *IS-IS Extensions in Support of Generalized Multi-Protocol Label Switching (GMPLS)*
- RFC 5308, *Routing IPv6 with IS-IS*
- RFC 5309, *Point-to-Point Operation over LAN in Link State Routing Protocols*
- RFC 5310, *IS-IS Generic Cryptographic Authentication*
- RFC 6213, *IS-IS BFD-Enabled TLV*
- RFC 6232, *Purge Originator Identification TLV for IS-IS*
- RFC 6233, *IS-IS Registry Extension for Purges*
- RFC 6329, *IS-IS Extensions Supporting IEEE 802.1aq Shortest Path Bridging*

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## Internet Protocol (IP) — Fast Reroute

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RFC 5286, *Basic Specification for IP Fast Reroute: Loop-Free Alternates*

RFC 7431, *Multicast-Only Fast Reroute*

RFC 7490, *Remote Loop-Free Alternate (LFA) Fast Reroute (FRR)*

## Internet Protocol (IP) — General

draft-grant-tacacs-02, *The TACACS+ Protocol*

draft-ietf-rrp-unified-spec-02, *Virtual Router Redundancy Protocol Version 3 for IPv4 and IPv6*

RFC 768, *User Datagram Protocol*

RFC 793, *Transmission Control Protocol*

RFC 854, *Telnet Protocol Specifications*

RFC 951, *Bootstrap Protocol (BOOTP)*

RFC 1034, *Domain Names - Concepts and Facilities*

RFC 1035, *Domain Names - Implementation and Specification*

RFC 1350, *The TFTP Protocol (revision 2)*

RFC 1534, *Interoperation between DHCP and BOOTP*

RFC 1542, *Clarifications and Extensions for the Bootstrap Protocol*

RFC 2131, *Dynamic Host Configuration Protocol*

RFC 2132, *DHCP Options and BOOTP Vendor Extensions*

RFC 2347, *TFTP Option Extension*

RFC 2348, *TFTP Blocksize Option*

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RFC 2866, *RADIUS Accounting*

RFC 2867, *RADIUS Accounting Modifications for Tunnel Protocol Support*

RFC 2868, *RADIUS Attributes for Tunnel Protocol Support*

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- RFC 4251, *The Secure Shell (SSH) Protocol Architecture*
- RFC 4252, *The Secure Shell (SSH) Authentication Protocol* (publickey, password)
- RFC 4253, *The Secure Shell (SSH) Transport Layer Protocol*
- RFC 4254, *The Secure Shell (SSH) Connection Protocol*
- RFC 4632, *Classless Inter-domain Routing (CIDR): The Internet Address Assignment and Aggregation Plan*
- RFC 5082, *The Generalized TTL Security Mechanism (GTSM)*
- RFC 5656, *Elliptic Curve Algorithm Integration in the Secure Shell Transport Layer (ECDSA)*
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- RFC 5883, *Bidirectional Forwarding Detection (BFD) for Multihop Paths*
- RFC 6398, *IP Router Alert Considerations and Usage (MLD)*
- RFC 6528, *Defending against Sequence Number Attacks*
- RFC 6929, *Remote Authentication Dial-In User Service (RADIUS) Protocol Extensions*
- RFC 7130, *Bidirectional Forwarding Detection (BFD) on Link Aggregation Group (LAG) Interfaces*

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- draft-dolganow-bess-mvpn-expl-track-01, *Explicit Tracking with Wild Card Routes in Multicast VPN*
- draft-ietf-idmr-traceroute-ipm-07, *A "traceroute" facility for IP Multicast*
- draft-ietf-l2vpn-vpls-pim-snooping-07, *Protocol Independent Multicast (PIM) over Virtual Private LAN Service (VPLS)*
- RFC 1112, *Host Extensions for IP Multicasting*
- RFC 2236, *Internet Group Management Protocol, Version 2*
- RFC 2375, *IPv6 Multicast Address Assignments*
- RFC 2710, *Multicast Listener Discovery (MLD) for IPv6*
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- RFC 3376, *Internet Group Management Protocol, Version 3*
- RFC 3446, *Anycast Rendezvous Point (RP) mechanism using Protocol Independent Multicast (PIM) and Multicast Source Discovery Protocol (MSDP)*
- RFC 3590, *Source Address Selection for the Multicast Listener Discovery (MLD) Protocol*
- RFC 3618, *Multicast Source Discovery Protocol (MSDP)*

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- RFC 3810, *Multicast Listener Discovery Version 2 (MLDv2) for IPv6*
- RFC 3956, *Embedding the Rendezvous Point (RP) Address in an IPv6 Multicast Address*
- RFC 3973, *Protocol Independent Multicast - Dense Mode (PIM-DM): Protocol Specification (Revised) (auto-RP groups)*
- RFC 4541, *Considerations for Internet Group Management Protocol (IGMP) and Multicast Listener Discovery (MLD) Snooping Switches*
- RFC 4601, *Protocol Independent Multicast - Sparse Mode (PIM-SM): Protocol Specification (Revised)*
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- RFC 4610, *Anycast-RP Using Protocol Independent Multicast (PIM)*
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- RFC 5059, *Bootstrap Router (BSR) Mechanism for Protocol Independent Multicast (PIM)*
- RFC 5186, *Internet Group Management Protocol Version 3 (IGMPv3) / Multicast Listener Discovery Version 2 (MLDv2) and Multicast Routing Protocol Interaction*
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- RFC 6515, *IPv4 and IPv6 Infrastructure Addresses in BGP Updates for Multicast VPNs*
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- RFC 2003, *IP Encapsulation within IP*
- RFC 2401, *Security Architecture for Internet Protocol*
- RFC 3021, *Using 31-Bit Prefixes on IPv4 Point-to-Point Links*

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RFC 4588, *RTP Retransmission Payload Format*

## **Wireless Local Area Network (WLAN) Gateway**

3GPP TS 23.402, *Architecture enhancements for non-3GPP accesses (S2a roaming based on GPRS)*

# Customer Document and Product Support



## Customer Documentation

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