



MSDP Configuration Guide, 17.2.0

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About This Guide

This guide describes how to run MSDP on run on the AT&T Vyatta Network Operating System (referred to as a virtual router, vRouter, or router in the guide).



MSDP overview

MSDP allows a domain to receive advertised messages of the availability of multicast sources from other domains and to connect with them.

When a rendezvous point (RP) in the Protocol Independent Multicast Sparse Mode (PIM-SM) domain learns of a new source, it constructs a source-active (SA) message and sends it to its MSDP peers. The MSDP peers use a Reverse Path Forwarding (RPF) check mechanism to find an appropriate MSDP peer to receive the SA message. All RPs, which aim to originate or receive SA messages, must establish MSDP peering with other RPs, either directly or through an intermediate MSDP peer.

When an RP receives the advertisements about the required multicast sources, PIM-SM uses a source-tree building mechanism to deliver multicast data over an interdomain distribution tree.

MSDP uses important communication information that is provided by Border Gateway Protocol (BGP) and uses Transmission Control Protocol (TCP) as its transport protocol.

MSDP is defined by *Multicast Source Discovery Protocol (MSDP)*, RFC 3618 at <https://tools.ietf.org/rfc/rfc3618.txt>.

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Configuration modes

The following table describes the configuration mode types used with MSDP.

Table 1: Configuration mode types

Mode Type	Description
Standard mode	When a parameter is applied to a group, it is applied identically to all peers in the group. When a parameter has not been configured for a single peer, the parameter is defined by the parameter that is defined for the group.



Mode Type	Description
Peer mode	A parameter that is configured for a peer takes precedence over a parameter that is configured for the peer group to which the peer belongs. For example, if the keepalive interval parameter has been configured for 60 seconds on a peer and 70 seconds for the group to which it belongs, then the parameter of 60 seconds applies to that peer.

Group types

The following table describes the group types.

Table 2: Group types

Group Type	Description
Standard group	A peer that is a member of a group uses the configuration parameters that are configured for the group.
Peer group	MSDP speakers that have fully peered MSDP connectivity among themselves form a peer group. Any SA messages received from a peer in a peer group are not forwarded to other peers in the same peer group. Peer groups can be used to reduce SA message flooding, or to simplify peer-RPF flooding (there is no need to run BGP or MBGP among MSDP peers).



MSDP Configuration

This chapter provides examples of Multicast Source Discovery Protocol (MSDP) configuration.

Configuration

This section presents the following topics:

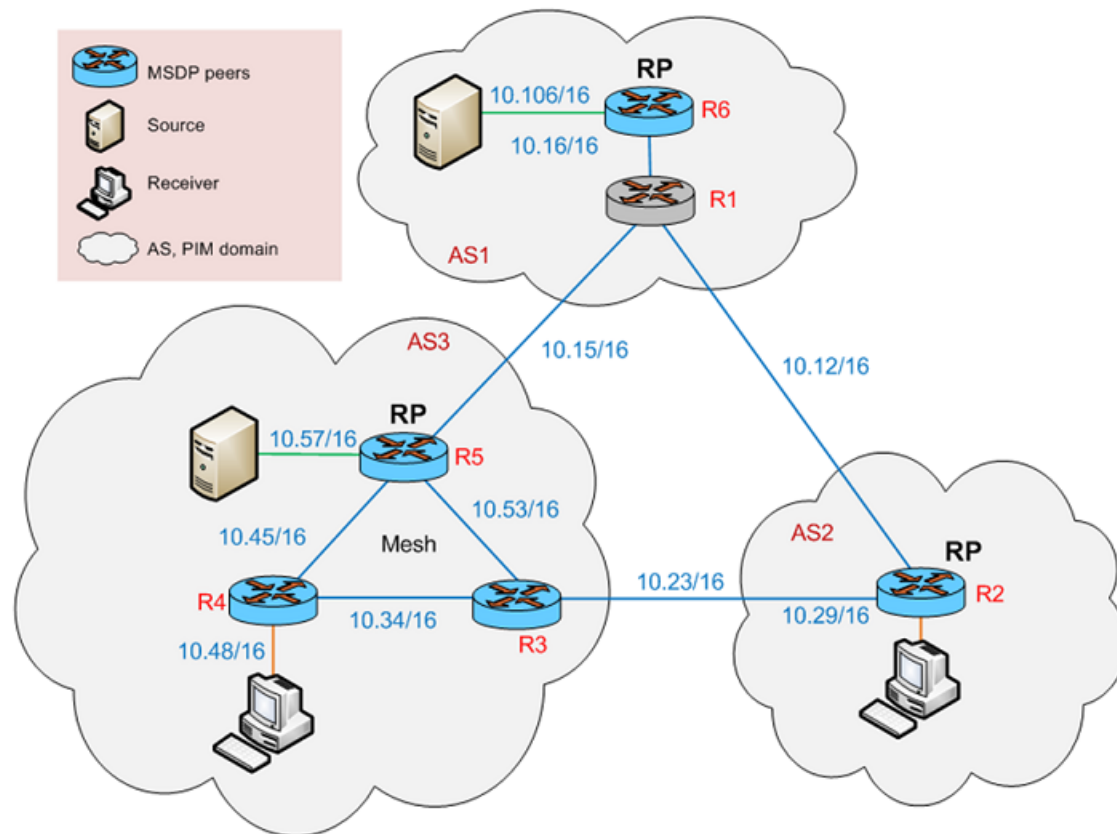
- [Configuring the PIM domain \(page 10\)](#)
- [Configuring BGP \(page 11\)](#)
- [Configuring MSDP peers \(page 14\)](#)
- [Configuring an MSDP peer group \(page 16\)](#)
- [Configuring MSDP filters \(page 17\)](#)
- [Verifying the status of MSDP-PIM \(page 18\)](#)
- [MSDP configuration example \(page 19\)](#)

Figure 1 (page 9) is a sample of the MSDP topology in three domains, or IPv4 autonomous systems (AS), each with an RP in a different AS configuration. This example shows how to deliver the multicast data to receivers from another multicast domain, for example, for AS2 receivers from AS1 or AS3 senders.

All routers in this scheme are MSDP peers except R1, which is a border router with the R6 MSDP peer situated behind it in the AS1 autonomous system.

To view the steps to achieve this configuration, refer to [MSDP configuration example \(page 19\)](#).

Figure 1: Sample MSDP topology





Configuring the PIM domain

The following commands show how to configure the PIM-SM scheme shown in [Configuration \(page 9\)](#).

Table 3: Configuring PIM-SM and BGP

Router	Step	Commands
R2	Configure the interfaces on R2 router for sparse mode.	<pre>vyatta@R2# set interfaces dataplane dp0p192p1 ip pim mode sparse</pre> <pre>vyatta@R2# set interfaces dataplane dp0p224p1 ip pim mode sparse</pre> <pre>vyatta@R2# set interfaces dataplane dp0p256p1 ip pim mode sparse</pre>
R2	Enable multicast routing on R2.	<pre>vyatta@R2# set protocols multicast ip routing</pre>
R2	Configure the RP on R2.	<pre>vyatta@R2# set protocols pim rp-address 10.29.0.2</pre>
R3	Configure the interfaces on R3 router for sparse mode.	<pre>vyatta@R3# set interfaces dataplane dp0p192p1 ip pim mode sparse</pre> <pre>vyatta@R3# set interfaces dataplane dp0p224p1 ip pim mode sparse</pre> <pre>vyatta@R3# set interfaces dataplane dp0p256p1 ip pim mode sparse</pre>
R3	Enable multicast on R3.	<pre>vyatta@R3# set protocols multicast ip routing</pre>
R3	Configure the RP for multicast groups on R3.	<pre>vyatta@R3# set protocols pim rp-address 10.34.0.3</pre>
R4	Configure the interfaces on R4 router for sparse mode.	<pre>vyatta@R4# set interfaces dataplane dp0p192p1 ip pim mode sparse</pre> <pre>vyatta@R4# set interfaces dataplane dp0p224p1 ip pim mode sparse</pre> <pre>vyatta@R4# set interfaces dataplane dp0p256p1 ip pim mode sparse</pre>



Router	Step	Commands
R4	Enable multicast on R4.	<pre>vyatta@R4# set protocols multicast ip routing</pre>
R4	Configure the RP for multicast groups on R4.	<pre>vyatta@R4# set protocols pim rp-address 10.48.0.4</pre>
R5	Configure the interfaces on R5 router for sparse mode.	<pre>vyatta@R5# set interfaces dataplane dp0p161p1 ip pim mode sparse vyatta@R5# set interfaces dataplane dp0p192p1 ip pim mode sparse vyatta@R5# set interfaces dataplane dp0p224p1 ip pim mode sparse vyatta@R5# set interfaces dataplane dp0p256p1 ip pim mode sparse</pre>
R5	Enable multicast on R5.	<pre>vyatta@R5# set protocols multicast ip routing</pre>
R5	Configure the RP for multicast groups on R5.	<pre>vyatta@R5# set protocols pim rp-address 10.53.0.5</pre>
R6	Configure the interfaces on R6 router for sparse mode.	<pre>vyatta@R6# set interfaces dataplane dp0p160p1 ip pim mode sparse vyatta@R6# set interfaces dataplane dp0p192p1 ip pim mode sparse vyatta@R6# set interfaces dataplane dp0p224p1 ip pim mode sparse</pre>
R6	Enable multicast on R6.	<pre>vyatta@R6# set protocols multicast ip routing</pre>
R6	Configure the RP for multicast groups on R6.	<pre>vyatta@R6# set protocols pim rp-address 10.16.0.6</pre>

Configuring BGP

The following commands show how to configure the BGP scheme shown in [Configuration \(page 9\)](#).

**Table 4: Configuring BGP**

Router	Step	Commands
R1	On R1, which belong to AS1, assign the remote AS numbers to its BGP neighbors.	<pre>vyatta@R1# set protocols bgp 1 neighbor 10.12.0.2 remote-as 2 vyatta@R1# set protocols bgp 1 neighbor 10.15.0.5 remote-as 3 vyatta@R1# set protocols bgp 1 neighbor 10.16.0.6 remote-as 1</pre>
R1	On R1, specify the IPv4 address that BGP advertises to its neighbor.	<pre>vyatta@R1# set protocols bgp 1 network 10.12.0.0/16 vyatta@R1# set protocols bgp 1 network 10.15.0.0/16 vyatta@R1# set protocols bgp 1 network 10.16.0.0/16</pre>
R2	On R2, which belong to AS2, assign the remote AS numbers to its BGP neighbors.	<pre>vyatta@R2# set protocols bgp 2 neighbor 10.12.0.1 remote-as 1 vyatta@R2# set protocols bgp 2 neighbor 10.23.0.3 remote-as 3</pre>
R2	On R2, specify the IPv4 address and prefix of its network address connections.	<pre>vyatta@R2# set protocols bgp 2 network 10.12.0.0/16 vyatta@R2# set protocols bgp 2 network 10.23.0.0/16 vyatta@R2# set protocols bgp 2 network 10.29.0.0/16</pre>
R3	On R3, which belong to AS3, assign the remote AS numbers to its BGP neighbors.	<pre>vyatta@R3# set protocols bgp 3 neighbor 10.23.0.2 remote-as 2 vyatta@R3# set protocols bgp 3 neighbor 10.34.0.4 remote-as 3 vyatta@R3# set protocols bgp 3 neighbor 10.53.0.5 remote-as 3</pre>



Router	Step	Commands
R3	On R3, specify the IPv4 address and prefix of its network address connections.	<pre>vyatta@R3# set protocols bgp 3 network 10.23.0.0/16 vyatta@R3# set protocols bgp 3 network 10.34.0.0/16 vyatta@R3# set protocols bgp 3 network 10.53.0.0/16</pre>
R4	On R4, which belong to AS3, assign the remote AS numbers to its BGP neighbors.	<pre>vyatta@R4# set protocols bgp 3 neighbor 10.34.0.3 remote-as 3 vyatta@R4# set protocols bgp 3 neighbor 10.45.0.5 remote-as 3</pre>
R4	On R4, specify the IPv4 address and prefix of its network address connections.	<pre>vyatta@R4# set protocols bgp 3 network 10.34.0.0/16 vyatta@R4# set protocols bgp 3 network 10.43.0.0/16 vyatta@R4# set protocols bgp 3 network 10.48.0.0/16</pre>
R5	On R5, which belong to AS3, assign the remote AS numbers to its BGP neighbors.	<pre>vyatta@R5# set protocols bgp 3 neighbor 10.15.0.1 remote-as 1 vyatta@R5# set protocols bgp 3 neighbor 10.45.0.4 remote-as 3 vyatta@R5# set protocols bgp 3 neighbor 10.53.0.3 remote-as 3</pre>
R5	On R5, specify the IPv4 address and prefix of its network address connections.	<pre>vyatta@R5# set protocols bgp 3 network 10.15.0.0/16 vyatta@R5# set protocols bgp 3 network 10.45.0.0/16 vyatta@R5# set protocols bgp 3 network 10.53.0.0/16 vyatta@R5# set protocols bgp 3 network 10.57.0.0/16</pre>



Router	Step	Commands
R6	On R6, which belong to AS1, assign the remote AS number to its BGP neighbor.	<pre>vyatta@R6# set protocols bgp 1 neighbor 10.16.0.1 remote-as 1</pre>
R6	On R6, specify the IPv4 address and prefix of its network address connections.	<pre>vyatta@R6# set protocols bgp 1 network 10.16.0.0/16 vyatta@R6# set protocols bgp 1 network 10.106.0.0/16</pre>

Configuring MSDP peers

The following commands shows how to configure MSDP peering between two routers.

Table 5: Configuring MSDP peers between two routers

Description	Commands
Use either command to configure MSDP as the protocol between two peers. Use the second command to specify the source IP address for TCP connections to this peer.	<pre>vyatta@R4# set protocols msdp peer remote-ip-peer</pre> <p>or</p> <pre>vyatta@R4# set protocols msdp peer remote-ip-peer local-address local-ip-peer</pre>
Check the status of the MSDP peer.	<pre>vyatta@R1% show ip msdp peer remote-ip-peer</pre>
Check the configuration.	<pre>vyatta@R4# show protocols msdp</pre>

The following commands show how to configure the MSDP peers for each AS illustrated in the scheme shown in [Configuration \(page 9\)](#).

Table 6: Configuring MSDP peers for each AS

Description	Command
Specify the MSDP peers for R2.	<pre>vyatta@R2# set protocols msdp peer 10.12.0.1</pre> <pre>vyatta@R2# set protocols msdp peer 10.23.0.3</pre>
Specify the MSDP peers for R3.	<pre>vyatta@R3# set protocols msdp peer 10.23.0.2</pre> <pre>vyatta@R3# set protocols msdp peer 10.34.0.4</pre> <pre>vyatta@R3# set protocols msdp peer 10.53.0.5</pre>



Description	Command
Specify the MSDP peers for R4.	<pre>vyatta@R4# set protocols msdp peer 10.45.0.5 vyatta@R4# set protocols msdp peer 10.34.0.3</pre>
Specify the MSDP peers for R5.	<pre>vyatta@R5# set protocols msdp peer 10.16.0.6 vyatta@R5# set protocols msdp peer 10.53.0.3 vyatta@R5# set protocols msdp peer 10.45.0.4</pre>
Specify the MSDP peers for R6.	<pre>vyatta@R6# set protocols msdp peer 10.15.0.5 vyatta@R6# set protocols msdp peer 10.12.0.2</pre>

MSDP peers output example

The following example shows the MSDP peer configuration in the scheme illustrated in [Configuring MSDP peers \(page 14\)](#):

Verifying the status of the MSDP peer configuration on R5

```
vyatta@R5:~$ show ip msdp peer
MSDP Peer 10.16.0.6, AS 1 (configured AS)
Description:
  Connection status:
    State: Up, Resets: 1, Connection source: 10.15.0.5 (?)
    Uptime(Downtime): 00:31:35, Messages sent/received: 102/0
    Output messages discarded: 0
    Local role: active
    Connection and counters cleared 01:58:54 ago
  SA Filtering:
Input (S,G) filter: none
Input RP filter: none
Output (S,G) filter: none
Output RP filter: none
  Peer ttl threshold: 16
  SAs learned from this peer: 0, SAs limit: 0
MSDP Peer 10.45.0.4 (?), AS 0 (configured AS)
Description:
  Connection status:
    State: Up, Resets: 1, Connection source: 10.45.0.5 (?)
    Uptime(Downtime): 01:24:14, Messages sent/received: 103/0
    Output messages discarded: 0
    Local role: passive
    Connection and counters cleared 01:58:56 ago
  SA Filtering:
Input (S,G) filter: none
Input RP filter: none
Output (S,G) filter: none
Output RP filter: none
  Peer ttl threshold: 16
  SAs learned from this peer: 0, SAs limit: 0
```



Configuring an MSDP peer group

Because peers in a group have the same properties as that of an MSDP peer, you can facilitate the MSDP configuration process by configuring a peer group as you would a single peer.

Creating an MSDP peer group

The following commands show how to configure an MSDP peer group.

Table 7: Configuring an MSDP peer as a group

Description	Command
Configure a peer to join a group.	<pre>vyatta@R3# set protocols msdp peer-group pgroupR3 peer 10.53.0.5</pre>
Check the configuration.	<pre>vyatta@R3# show protocols msdp peer-group</pre>

Adding MSDP peers to a peer group

Configuration (page 9) shows that AS3 has the R3, R4, and R5 routers as members in a peer group. This group is created by configuring a peer group on each router and adding other members to the group.

The following example shows how to add peers to the MSDP peer groups that are named pgroupR3, pgroupR4, and pgroupR5:

Table 8: Adding peers to MSDP peer groups

Router	Description	Commands
R3	Add peers to MSDP peer group pgroupR3.	<pre>vyatta@R3# set protocols msdp peer-group pgroupR3 peer 10.53.0.5</pre> <pre>vyatta@R3# set protocols msdp peer-group pgroupR3 peer 10.34.0.4</pre>
R4	Add peers to MSDP peer group pgroupR4.	<pre>vyatta@R4# set protocols msdp peer-group pgroupR4 peer 10.34.0.3</pre> <pre>vyatta@R4# set protocols msdp peer-group pgroupR4 peer 10.45.0.5</pre>
R5	Add peers to MSDP peer group pgroupR5.	<pre>vyatta@R5# set protocols msdp peer-group pgroupR5 peer 10.53.0.3</pre> <pre>vyatta@R5# set protocols msdp peer-group pgroupR5 peer 10.45.0.4</pre>



Configuring a peer-group as a single peer

The following example shows an example of configuring, as you would a single peer, the hold time for the MSDP peer groups that are named pgroupR3, pgroupR4, and pgroupR5. Holdtime is just an example used in order to show how to configure an entire peer group as you would a single peer.

Table 9: Configuring MSDP peer groups as you would a single peer

Router	Description	Commands
R3	Configure hold time for all members of the pgroupR3 peer group.	<pre>vyatta@R3# set protocols msdp peer-group pgroupR3 holdtime 3</pre>
R4	Configure hold time for all members of the pgroupR4 peer group.	<pre>vyatta@R4# set protocols msdp peer-group pgroupR4 holdtime 3</pre>
R5	Configure hold time for all members of the pgroupR5 peer group.	<pre>vyatta@R5# set protocols msdp peer-group pgroupR5 holdtime 3</pre>

Configuring MSDP filters

The following example shows how to configure MSDP with an access control list as a filter and applying it to a peer.

Table 10: Configuring MSDP filters

Description	Command
Create an access list with the name of acl1.	<pre>vyatta@R2# set protocols msdp export access- list acl1</pre>
Create an RP list with the name of rplist.	<pre>vyatta@R2# set protocols msdp export rp-list rplist1</pre>
Apply the acl1 filter as an outgoing filter on peer1.	<pre>vyatta@R2# set protocols msdp peer peer1 export access-list acl1</pre>
Apply rplist as an outgoing filter on peer2.	<pre>vyatta@R2# set protocols msdp peer peer2 export rp-list rplist1</pre>

The following definitions apply to the preceding commands:

- The global **import** keyword filters incoming SA messages.
- The global **export** keyword filters originated SA messages.
- The peer **import** keyword filters incoming SA messages from a particular peer.
- The peer **export** keyword filters outgoing SA messages to a particular peer.



MSDP filter example

To configure MSDP to deny access to the 226.0.100.1/2/3 groups and the 10.57.0.7 source host, add the appropriate ACL list to the router by performing the following steps:

Table 11: Configuring an MSDP filter

Description	Command
Configure the policy action to deny access on access list 100 and on rule 1.	<pre>vyatta@R2# set policy route access-list 100 rule 1 action deny</pre>
Configure the destination by using an inverse mask.	<pre>vyatta@R2# set policy route access-list 100 rule 1 destination inverse-mask 0.0.0.3</pre>
Configure the network destination.	<pre>vyatta@R2# set policy route access-list 100 rule 1 destination network 226.0.100.0</pre>
Configure the source host.	<pre>vyatta@R2# set policy route access-list 100 rule 1 source host 10.57.0.7</pre>
Configure the policy action to permit access on access list 100 and on rule 2.	<pre>vyatta@R2# set policy route access-list 100 rule 2 action permit</pre>
Configure the destination on any packets.	<pre>vyatta@R2# set policy route access-list 100 rule 2 destination any</pre>
Configure the source host on any packets.	<pre>vyatta@R2# set policy route access-list 100 rule 2 source any</pre>
On R2, add the ACL list to the appropriate MSDP filter.	<pre>vyatta@R2# set protocols msdp import acl-list 100</pre>

Verifying the status of MSDP-PIM

When MSDP receives a new (S,G) pair from the RP as part of an SA message, if PIM has subscribers for this group, then MSDP sends the (S,G) pair to the PIM. The multicast (S,G) tree is then built as a common PIM SPT-tree towards the source.

For more information, refer to *Protocol Independent Multicast - Sparse Mode (PIM-SM): Protocol Specification (Revised), RFC 4601* at <https://tools.ietf.org/html/rfc4601>.

The following example shows how to check the status of an (S,G) pair:

Verifying the status of an (S,G) pair using show ip pim mroute

```
vyatta@R1:~$ show ip pim mroute
Multicast Routing Table:
Flags: D - Dense, S - Sparse, C - Connected, P - Pruned, s - SSM group
R - RP-bit set, F - Register flag, T - SPT-bit set, J - Joined to SPT
M - Learned from MSDP, A - Candidate for advertising by MSDP
Timers: uptime, expires
Outgoing interface flags: A - Assert winner
Interface state: Interface, Next-Hop, State
```



```
(* , 226.0.100.2) , uptime: 00:00:04, expires: 0 secs, RP: 10.48.0.4, flags: SC  
(10.57.0.7, 226.0.100.2), uptime: 00:00:04, expires: 206 secs, flags: SCJTM
```

MSDP configuration example

The following example shows routers being configured for the MSDP configuration that is illustrated in [Configuration \(page 9\)](#).

**Table 12: Configuring MSDP peer-groups**

Description	Command
Configure R1.	<code>vyatta@R1# set interfaces dataplane dp0p160p1 address 10.10.10.1/24</code>
	<code>vyatta@R1# set interfaces dataplane dp0p192p1 address 10.12.0.1/16</code>
	<code>vyatta@R1# set interfaces dataplane dp0p224p1 address 10.15.0.1/16</code>
	<code>vyatta@R1# set interfaces dataplane dp0p256p1 address 10.16.0.1/16</code>
	<code>vyatta@R1# set interfaces dataplane dp0p192p1 ip pim mode sparse</code>
	<code>vyatta@R1# set interfaces dataplane dp0p224p1 ip pim mode sparse</code>
	<code>vyatta@R1# set interfaces dataplane dp0p256p1 ip pim mode sparse</code>
	<code>vyatta@R1# set protocols bgp 1 neighbor 10.12.0.2 remote-as 2</code>
	<code>vyatta@R1# set protocols bgp 1 neighbor 10.15.0.5 remote-as 3</code>
	<code>vyatta@R1# set protocols bgp 1 neighbor 10.16.0.6 remote-as 1</code>
	<code>vyatta@R1# set protocols bgp 1 network 10.12.0.0/16</code>
	<code>vyatta@R1# set protocols bgp 1 network 10.15.0.0/16</code>
	<code>vyatta@R1# set protocols bgp 1 network 10.16.0.0/16</code>
	<code>vyatta@R1# set protocols multicast ip routing</code>
	<code>vyatta@R1# set protocols pim rp-address 10.16.0.6</code>
	<code>vyatta@R1# set service ssh</code>
	<code>vyatta@R1# set system host-name R1</code>



Description	Command
Configure R2.	<pre>vyatta@R2# set interfaces dataplane dp0p160p1 address 10.10.10.2/24 vyatta@R2# set interfaces dataplane dp0p192p1 address 10.12.0.2/16 vyatta@R2# set interfaces dataplane dp0p224p1 address 10.23.0.2/16 vyatta@R2# set interfaces dataplane dp0p256p1 address 10.29.0.2/16 vyatta@R2# set interfaces dataplane dp0p192p1 ip pim mode sparse vyatta@R2# set interfaces dataplane dp0p224p1 ip pim mode sparse vyatta@R2# set interfaces dataplane dp0p256p1 ip pim mode sparse vyatta@R2# set protocols bgp 2 neighbor 10.12.0.1 remote-as 1 vyatta@R2# set protocols bgp 2 neighbor 10.23.0.3 remote-as 3 vyatta@R2# set protocols bgp 2 network 10.12.0.0/16 vyatta@R2# set protocols bgp 2 network 10.23.0.0/16 vyatta@R2# set protocols bgp 2 network 10.29.0.0/16 vyatta@R2# set protocols msdp peer 10.16.0.6 vyatta@R2# set protocols msdp peer 10.23.0.3 vyatta@R2# set protocols multicast ip routing vyatta@R2# set protocols pim rp-address 10.29.0.2 vyatta@R2# set service ssh vyatta@R2# set system host-name R2</pre>



Description	Command
Configure R3.	<pre>vyatta@R3# set interfaces dataplane dp0p160p1 address 10.10.10.3/24</pre>
	<pre>vyatta@R3# set interfaces dataplane dp0p192p1 address 10.23.0.3/16</pre>
	<pre>vyatta@R3# set interfaces dataplane dp0p224p1 address 10.34.0.3/16</pre>
	<pre>vyatta@R3# set interfaces dataplane dp0p256p1 address 10.53.0.3/16</pre>
	<pre>vyatta@R3# set interfaces dataplane dp0p192p1 ip pim mode sparse</pre>
	<pre>vyatta@R3# set interfaces dataplane dp0p224p1 ip pim mode sparse</pre>
	<pre>vyatta@R3# set interfaces dataplane dp0p256p1 ip pim mode sparse</pre>
	<pre>vyatta@R3# set protocols bgp 3 neighbor 10.23.0.2 remote-as 2</pre>
	<pre>vyatta@R3# set protocols bgp 3 neighbor 10.34.0.4 remote-as 3</pre>
	<pre>vyatta@R3# set protocols bgp 3 neighbor 10.53.0.5 remote-as 3</pre>
	<pre>vyatta@R3# set protocols bgp 3 network 10.23.0.0/16</pre>
	<pre>vyatta@R3# set protocols bgp 3 network 10.34.0.0/16</pre>
	<pre>vyatta@R3# set protocols bgp 3 network 10.53.0.0/16</pre>
	<pre>vyatta@R3# set protocols msdp peer-group peer1 peer 10.53.0.5</pre>
	<pre>vyatta@R3# set protocols msdp peer-group peer1 peer 10.34.0.4</pre>
	<pre>vyatta@R3# set protocols msdp peer 10.23.0.2</pre>
	<pre>vyatta@R3# set protocols msdp peer 10.34.0.4</pre>
	<pre>vyatta@R3# set protocols msdp peer 10.53.0.5</pre>
	<pre>vyatta@R3# set protocols multicast ip routing</pre>
	<pre>vyatta@R3# set protocols pim rp-address 10.34.0.3</pre>
	<pre>vyatta@R3# set service ssh</pre>
<pre>vyatta@R3# set system host-name R3</pre>	



Description	Command
Configure R4.	<pre>vyatta@R4# set interfaces dataplane dp0p160p1 address 10.10.10.4/24 vyatta@R4# set interfaces dataplane dp0p192p1 address 10.34.0.4/16 vyatta@R4# set interfaces dataplane dp0p224p1 address 10.45.0.4/16 vyatta@R4# set interfaces dataplane dp0p256p1 address 10.48.0.4/16 vyatta@R4# set interfaces dataplane dp0p192p1 ip pim mode sparse vyatta@R4# set interfaces dataplane dp0p224p1 ip pim mode sparse vyatta@R4# set interfaces dataplane dp0p256p1 ip pim mode sparse vyatta@R4# set protocols bgp 3 neighbor 10.34.0.3 remote-as 3 vyatta@R4# set protocols bgp 3 neighbor 10.45.0.5 remote-as 3 vyatta@R4# set protocols bgp 3 network 10.34.0.0/16 vyatta@R4# set protocols bgp 3 network 10.43.0.0/16 vyatta@R4# set protocols bgp 3 network 10.48.0.0/16 vyatta@R4# set protocols msdp peer-group peer1 peer 10.34.0.3 vyatta@R4# set protocols msdp peer-group peer1 peer 10.45.0.5 vyatta@R4# set protocols msdp peer 10.34.0.3 vyatta@R4# set protocols msdp peer 10.45.0.5 vyatta@R4# set protocols multicast ip routing vyatta@R4# set protocols pim rp-address 10.48.0.4 vyatta@R4# set service ssh vyatta@R4# set system host-name R4</pre>



Description	Command
Configure R5.	<pre>vyatta@R5# set interfaces dataplane dp0p160p1 address 10.10.10.5/14 vyatta@R5# set interfaces dataplane dp0p161p1 address 10.57.0.5/16 vyatta@R5# set interfaces dataplane dp0p192p1 address 10.15.0.5/16 vyatta@R5# set interfaces dataplane dp0p224p1 address 10.45.0.5/16 vyatta@R5# set interfaces dataplane dp0p256p1 address 10.53.0.5/16 vyatta@R5# set interfaces dataplane dp0p161p1 ip pim mode sparse vyatta@R5# set interfaces dataplane dp0p192p1 ip pim mode sparse vyatta@R5# set interfaces dataplane dp0p224p1 ip pim mode sparse vyatta@R5# set interfaces dataplane dp0p256p1 ip pim mode sparse vyatta@R5# set protocols bgp 3 neighbor 10.15.0.1 remote-as 1 vyatta@R5# set protocols bgp 3 neighbor 10.45.0.4 remote-as 3 vyatta@R5# set protocols bgp 3 neighbor 10.53.0.3 remote-as 3 vyatta@R5# set protocols bgp 3 network 10.15.0.0/16 vyatta@R5# set protocols bgp 3 network 10.45.0.0/16 vyatta@R5# set protocols bgp 3 network 10.53.0.0/16 vyatta@R5# set protocols bgp 3 network 10.57.0.0/16 vyatta@R5# set protocols msdp peer-group peer1 peer 10.53.0.3 vyatta@R5# set protocols msdp peer-group peer1 peer 10.45.0.4 vyatta@R5# set protocols msdp peer 10.16.0.6 vyatta@R5# set protocols msdp peer 10.45.0.4 vyatta@R5# set protocols msdp peer 10.53.0.3 vyatta@R5# set protocols multicast ip routing vyatta@R5# set protocols pim rp-address 10.53.0.5 vyatta@R5# set service ssh vyatta@R5# set system host-name R5</pre>



Description	Command
Configure R6.	<pre>vyatta@R6# set interfaces dataplane dp0p160p1 address '10.10.10.6/24' vyatta@R6# set interfaces dataplane dp0p192p1 address '10.16.0.6/16' vyatta@R6# set interfaces dataplane dp0p224p1 address '10.106.0.6/16' vyatta@R6# set interfaces dataplane dp0p160p1 ip pim mode 'sparse' vyatta@R6# set interfaces dataplane dp0p192p1 ip pim mode 'sparse' vyatta@R6# set interfaces dataplane dp0p224p1 ip pim mode 'sparse' vyatta@R6# set protocols bgp 1 neighbor 10.16.0.1 remote-as '1' vyatta@R6# set protocols bgp 1 network '10.16.0.0/16' vyatta@R6# set protocols bgp 1 network '10.106.0.0/16' vyatta@R6# set protocols msdp peer 10.12.0.2 vyatta@R6# set protocols msdp peer 10.15.0.5 vyatta@R6# set protocols multicast ip routing vyatta@R6# set protocols pim rp-address 10.16.0.6 vyatta@R6# set service ssh vyatta@R6# set system host-name R6</pre>



MSDP Commands

monitor protocol multicast msdp <state>

Starts or stops background monitoring of all enabled MSDP monitoring features.

Syntax:

```
monitor protocol multicast msdp { enable | disable }
```

Background monitoring is enabled for all MSDP events.

enable

Turns on background monitoring.

disable

Turns off background monitoring.

Operational mode

```
{
monitor {
  protocol multicast {
    msdp
      enable
      disable
  }
}
```

Use this command to start or stop background monitoring of all enabled MSDP monitor commands.

protocols msdp export access-list <access-list-name>

Restricts which cache entries are advertised by (S,G).

Syntax:

```
set protocols msdp export access-list access-list-name
```

Syntax:

```
delete protocols msdp export access-list [ access-list-name ]
```

Syntax:

```
show protocols msdp export access-list
```

All (S,G) pairs are advertised.

access-list-name

The name of the access list. The global (common) (S,G) entry filter specifies which entries should be advertised.

If a list is not specified, all multicast (S,G) entries are advertised.

This parameter is a numeric identifier of a previously defined access list and can be a number from either of the following ranges:

100 through 199: IP standard access list.

2000 through 2699: IP standard access list (expanded range).

Note: You cannot configure an empty access list.



Configuration mode

```
protocols {
  msdp {
    export {
      access-list access-list-name
    }
  }
}
```

This command controls which cache entries are advertised. This command applies to the SA message origination, and not to SA-message forwarding.

Use the `set` form of this command to configure which cache entries are advertised.

Use the `delete` form of this command to delete the configuration of which cache entries are advertised.

Use the `show` form of this command to display the configuration of which cache entries are advertised.

protocols msdp export rp-list <prefix-list-name>

Restricts which cache entries are advertised by RP address.

Syntax:

`set protocols msdp export rp-list prefix-list-name`

Syntax:

`delete protocols msdp export rp-list [prefix-list-name]`

Syntax:

`show protocols msdp export rp-list`

All (S,G) pairs are advertised.

prefix-list-name

The name of a previously defined prefix list. This list is the global RP-address filter that specifies RP addresses that determine which cache entries are advertised. The RP address is gained from the RP Address field of an MSDP SA packet.

Configuration mode

```
protocols {
  msdp {
    export {
      rp-list prefix-list-name
    }
  }
}
```

This command controls which cache entries are advertised. This command applies to the SA message origination, and not to SA-message forwarding.

Use the `set` form of this command to configure which cache entries are advertised.

Use the `delete` form of this command to delete the configuration of which cache entries are advertised.

Use the `show` form of this command to display the configuration of which cache entries are advertised.

protocols msdp import access-list <access-list-name>

Restricts which (S,G)s are accepted by (S,G).

Syntax:



```
set protocols msdp import access-list access-list-name
```

Syntax:

```
delete protocols msdp import access-list [ access-list-name ]
```

Syntax:

```
show protocols msdp import access-list
```

All (S,G) pairs are accepted.

access-list-name

The name of the access list. The global (common) (S,G) entry filter specifies which entries should be accepted.

If a list is not specified, all multicast (S,G) pairs are accepted.

This parameter is a numeric identifier of a previously defined access list and can be a number from either of the following ranges:

100 through 199: IP standard access list.

2000 through 2699: IP standard access list (expanded range).

Note: You cannot configure an empty access list.

Configuration mode

```
protocols {
  msdp {
    import {
      access-list access-list-name
    }
  }
}
```

This command controls which (S,G) pairs are accepted. This command applies to the SA message receipt, and not to SA-message forwarding.

Use the `set` form of this command to configure which (S,G) pairs are accepted.

Use the `delete` form of this command to delete the configuration of which (S,G) pairs are accepted.

Use the `show` form of this command to display the configuration that specifies which (S,G) pairs are accepted.

protocols msdp import rp-list <prefix-list-name>

Restricts which (S,G)s are accepted by RP address

Syntax:

```
set protocols msdp import rp-list prefix-list-name
```

Syntax:

```
delete protocols msdp import rp-list [ prefix-list-name ]
```

Syntax:

```
show protocols msdp import rp-list
```

All (S,G) pairs are accepted.

prefix-list-name

The name of a previously defined prefix list. This list is the global RP-address filter that specifies the RP addresses for which the MSDP speaker accepts (that is, caches). The RP address is gained from the RP Address field of an MSDP SA packet.



Configuration mode

```

protocols {
  msdp {
    import {
      rp-list prefix-list-name
    }
  }
}

```

The prefix list applies to incoming SA messages that are received from a specific RP address. This attribute is not defined by default. All (S,G) pairs are cached.

Use the `set` form of this command to configure which (S,G)s are accepted.

Use the `delete` form of this command to delete the configuration of which (S,G)s are accepted.

Use the `show` form of this command to display the configuration of which (S,G)s are accepted.

protocols msdp log <log>

Configures MSDP logging.

Syntax:

```
set protocols msdp log { all | bgp | cache | events | fsm | other | packet | pim | rpfcheck | snmp }
```

Syntax:

```
delete protocols msdp log [ all | bgp | cache | events | fsm | other | packet | pim | rpfcheck | snmp ]
```

Syntax:

```
show protocols msdp log
```

MSDP logging is disabled.

log *log*

Any of the following options:

all	Specifies all logs.
bgp	Specifies BGP logs.
cache	Specifies cache logs.
events	Specifies events logs.
fsm	Specifies FSM logs.
other	Specifies other logs.
packet	Specifies packet logs.
pim	Specifies PIM logs.
rpfcheck	Specifies RPF-check logs.
snmp	Specifies SNMP logs.

Configuration mode

```

protocols {
  msdp {
    log all
    log bgp
    log cache
    log events
    log fsm
    log other
  }
}

```



```
    log packet
    log pim
    log rpfcheck
    log snmp
  }
}
```

Use the `set` form of this command to enable MSDP logging.

Use the `delete` form of this command to disable MSDP logging.

Use the `show` form of this command to display the MSDP logging configuration.

protocols msdp mesh-group <mesh-group-name>

Creates an MSDP mesh group.

Syntax:

```
set protocols msdp mesh-group mesh-group-name
```

Syntax:

```
delete protocols msdp mesh-group [ mesh-group-name ]
```

Syntax:

```
show protocols msdp mesh-group
```

mesh-group-name

The name of a mesh group.

Configuration mode

```
protocols {
  msdp {
    mesh-group mesh-group-name {
    }
  }
}
```

Using mesh groups reduces SA message flooding or simplifies peer-RPF flooding and eliminates the need to run BGP or Multiprotocol BGP (MBGP) among MSDP peers.

A mesh group is a group of MSDP speakers that have fully meshed MSDP connectivity among themselves. No SA messages received from a peer in a mesh group are forwarded to other peers in the same mesh group.

Use the `set` form of this command to create an MSDP mesh group.

Use the `delete` form of this command to delete an MSDP mesh group.

Use the `show` form of this command to display a list of MSDP mesh group names.

protocols msdp mesh-group <mesh-group-name> peer <peer-address>

Configures a peer as a member of a mesh group.

Syntax:

```
set protocols msdp mesh-group mesh-group-name peer peer-address
```

Syntax:

```
delete protocols msdp mesh-group mesh-group-name peer [ peer-address ]
```

**Syntax:**

```
show protocols msdp mesh-group mesh-group-name peer
```

mesh-group-name

The name of a mesh group.

peer-address

An IPv4 peer address.

Configuration mode

```
protocols {
  msdp {
    mesh-group mesh-group-name {
      peer peer-address1
      peer peer-address2
      peer peer-address3
    }
  }
}
```

Using mesh groups reduces SA message flooding or simplifies peer-RPF flooding and eliminates the need to run BGP or Multiprotocol BGP (MBGP) among MSDP peers.

A mesh group is a group of MSDP speakers that have fully meshed MSDP connectivity among themselves. No SA messages received from a peer belonging to a mesh group are forwarded to other peers from that mesh group.

Use the `set` form of this command to configure a peer as a member of a mesh group.

Use the `delete` form of this command to delete a peer from a mesh group.

Use the `show` form of this command to display the current members of a mesh group.

protocols msdp originated-id <address>

Configures the RP address to be placed in the RP address field of an MSDP SA packet that is originated by an MSDP speaker.

Syntax:

```
set protocols msdp originated-id address
```

Syntax:

```
delete protocols msdp originated-id [ address ]
```

Syntax:

```
show protocols msdp originated-id
```

SA messages use the IP address of the RP.

address

An IPv4 address in the format `x.x.x.x`. The IP address allows an MSDP speaker that originates an SA message to use the address as the RP address in the SA message.

Configuration mode

```
protocols {
  msdp {
    originated-id address
  }
}
```

This command replaces the accepted RP address for (S,G) entries with one of the interface addresses of the MSDP speaker. In normal mode, MSDP typically advertises the multicast group and uses the IP address of the RP



found in the packets. This command enables MSDP to specify another IP address instead of actual IP address of the RP.

Use the `set` form of this command to configure an MSDP speaker, which originates an SA message, to use an IP address as the RP address in the message.

Use the `delete` form of this command to delete the IP address from the SA message.

Use the `show` form of this command to display the current IP address in the SA message.

protocols msdp peer <peer-address>

Configures the MSDP peer address.

Syntax:

```
set protocols msdp peer peer-address
```

Syntax:

```
delete protocols msdp peer peer-address
```

Syntax:

```
show protocols msdp peer peer-address
```

peer-address

An IPv4 MSDP peer address.

Configuration mode

```
protocols {
  msdp {
    peer peer-address {
    }
  }
}
```

Use the `set` form of this command to configure the MSDP peer address.

Use the `delete` form of this command to delete the MSDP peer address.

Use the `show` form of this command to display the MSDP peer address.

protocols msdp peer <peer-address> connect-retry <time-interval>

Adjusts the connect retry time interval.

Syntax:

```
set protocols msdp peer peer-address connect-retry time-interval
```

Syntax:

```
delete protocols msdp peer peer-address connect-retry [ time-interval ]
```

Syntax:

```
show protocols msdp peer peer-address connect-retry
```

The time interval is 30 seconds.

peer-address

An IPv4 MSDP peer address.

time-interval

A time interval in seconds interval. The interval ranges from 1 through 60 seconds.



Configuration mode

```
protocols {
  msdp {
    peer peer-address {
      connect-retry time-interval
    }
  }
}
```

Use the `set` form of this command to adjust the interval for which a peer waits after peering sessions are reset before attempting to re-establish the peering sessions.

Use the `delete` form of this command to restore the default reconnect time interval of 30 seconds.

Use the `show` form of this command to display the current reconnect time interval.

protocols msdp peer <peer-address> default-peer prefix-list <prefix-list-name>

Configures a default peer filter for a MSDP peer from which to accept all SA messages that are received from a specific RP address.

Syntax:

```
set protocols msdp peer peer-address default-peer prefix-list prefix-list-name
```

Syntax:

```
delete protocols msdp peer peer-address default-peer prefix-list [ prefix-list-name ]
```

Syntax:

```
show protocols msdp peer peer-address default-peer prefix-list
```

peer-address

The IPv4 address of an MSDP peer.

prefix-list-name

The name of a previously defined prefix list. This list is the per-peer RP-address filter that specifies RP addresses for which the MSDP speaker accepts (that is, caches). The RP address is gained from the RP Address field of an MSDP SA packet.

Configuration mode

```
protocols {
  msdp {
    peer peer-address {
      default-peer {
        prefix-list prefix-list-name
      }
    }
  }
}
```

Choose a name for the prefix list that reflects the default peer. Configuring multiple default peers with the same prefix list name enables you to use all the default peers simultaneously for multiple RP prefixes. Configuring multiple default peers without specifying a prefix list name means that all SA messages are accepted by active peers. If a default peer fails, the next configured default peer accepts the SA messages.

Use the `set` form of this command to define a default peer from which to accept all SA messages. The RPF check is not applied to the SA messages that are received from the default peer.

Use the `delete` form of this command to delete a default peer from which to accept all SA messages.



Use the `show` form of this command to display the default peers from which to accept all SA messages.

protocols msdp peer <peer-address> default-peer priority <number>

Defines a priority value for a default peer.

Syntax:

`set protocols msdp peer peer-address default-peer priority number`

Syntax:

`delete protocols msdp peer peer-address default-peer priority [number]`

Syntax:

`show protocols msdp peer peer-address default-peer priority`

When no priority is specified, the default is set at zero.

peer-address

An IPv4 MSDP peer address.

number

The priority number. The numbers range from 1 through 2000.

Configuration mode

```
protocols {
  msdp {
    peer peer-address {
      default-peer {
        priority number
      }
    }
  }
}
```

Use this command to specify a priority value for a default peer. The user can specify several peers with, or without, prefix-lists of which there can be common or identical occurrences of peers. In such cases, the MSDP daemon chooses only one of the specified peers with which to work. For this purpose, MSDP chooses the peer with the highest priority (the lowest number) to be used as the default. You must specify one default peer with a specific priority or MSDP returns an error message.

Use the `set` form of this command to specify a priority value for the default peer.

Use the `delete` form of this command to delete the priority value of the default peer.

Use the `show` form of this command to display the priority value of the default peer.

protocols msdp peer <peer-address> export access-list <access-list-name>

Applies a (S,G) filter to outgoing SA messages that are sent to an MSDP peer.

Syntax:

`set protocols msdp peer peer-address export access-list access-list-name`

Syntax:

`delete protocols msdp peer peer-address export access-list [access-list-name]`

Syntax:



```
show protocols msdp peer peer-address export access-list
```

No pairs are filtered.

peer-address

An IPv4 MSDP peer address.

access-list-name

The name of the access list. The per-peer (S,G) entry filter specifies which entries should be advertised.

If a list is not specified, all multicast (S,G) entries are advertised.

This parameter is a numeric identifier of a previously defined access list and can be a number from either of the following ranges:

100 through 199: IP standard access list.

2000 through 2699: IP standard access list (expanded range).

Note: You cannot configure an empty access list.

Configuration mode

```
protocols {
  msdp {
    peer peer-address {
      export {
        access-list access-list-name
      }
    }
  }
}
```

Use the set form of this command to apply an outgoing filter to SA messages that are sent to an MSDP peer.

Use the delete form of this command to delete the filter on SA messages that are sent to an MSDP peer.

Use the show form of this command to display the existing filter on SA messages that are sent to an MSDP peer.

protocols msdp peer <peer-address> export rp-list <prefix-list-name>

Applies an RP address filter to outgoing SA messages that are sent to an MSDP peer.

Syntax:

```
set protocols msdp peer peer-address export rp-list prefix-list-name
```

Syntax:

```
delete protocols msdp peer peer-address export rp-list [ prefix-list-name ]
```

Syntax:

```
show protocols msdp peer peer-address export rp-list
```

No pairs are filtered.

peer-address

An IPv4 MSDP peer address.

prefix-list-name

The name of a previously defined prefix list. This list is the per-peer RP-address filter that specifies RP addresses that determine which cache entries are advertised to the peer. The RP address is gained from the RP Address field of an MSDP SA packet.

Configuration mode



```
protocols {
  msdp {
    peer peer-address {
      export {
        rp-list prefix-list-name
      }
    }
  }
}
```

Use the `set` form of this command to apply an outgoing filter to SA messages that are sent to an MSDP peer.

Use the `delete` form of this command to delete the outgoing filter on SA messages that are sent to an MSDP peer.

Use the `show` form of this command to display the outgoing filter on SA messages that are sent to an MSDP peer.

protocols msdp peer <peer-address> holdtime <holdtime-interval>

Adjusts the holdtime time interval.

Syntax:

```
set protocols msdp peer peer-address holdtime holdtime-interval
```

Syntax:

```
delete protocols msdp peer peer-address holdtime [ holdtime-interval ]
```

Syntax:

```
show protocols msdp peer peer-address holdtime
```

The time interval is 75 seconds.

peer-address

The IP address of a peer.

holdtime-interval

A time interval in seconds. The interval ranges from 3 through 75 seconds. The holdtime interval should be greater than the keepalive interval.

Configuration mode

```
protocols {
  msdp {
    peer peer-address {
      holdtime holdtime-interval
    }
  }
}
```

The holdtime time interval is the time to which a peer waits for keepalive messages from other peers before declaring them down.

Use the `set` form of this command to adjust the holdtime time interval for which a peer waits for keepalive messages from other peers before declaring them down.

Use the `delete` form of this command to restore the default holdtime time interval of 75 seconds.

Use the `show` form of this command to display the current holdtime time interval.



protocols msdp peer <peer-address> import access-list <access-list-name>

Applies a (S,G) filter to incoming SA messages that are received from an MSDP peer.

Syntax:

```
set protocols msdp peer peer-address import access-list access-list-name
```

Syntax:

```
delete protocols msdp peer peer-address import access-list [ access-list-name ]
```

Syntax:

```
show protocols msdp peer peer-address import access-list
```

No advertised pairs are filtered.

peer-address

An IPv4 MSDP peer address.

access-list-name

The name of the access list. The per-peer (S,G) entry filter specifies which entries should be accepted.

If a list is not specified, all multicast (S,G) pairs are accepted.

This parameter is a numeric identifier of a previously defined access list and can be a number from either of the following ranges:

100 through 199: IP standard access list.

2000 through 2699: IP standard access list (expanded range).

Note: You cannot configure an empty access list.

Configuration mode

```
protocols {
  msdp {
    peer peer-address {
      import {
        access-list access-list-name
      }
    }
  }
}
```

A filter that helps define which (S,G)s are accepted from an MSDP peer. The list specifies a source address and mask, or group address and mask. All pairs are cached when this attribute is not configured.

Use the `set` form of this command to apply an incoming filter to SA messages that are received from an MSDP peer.

Use the `delete` form of this command to delete a filter on SA messages that are received from an MSDP peer.

Use the `show` form of this command to display the existing filter that is applied to SA messages that are received from an MSDP peer.

protocols msdp peer <peer-address> import rp-list <prefix-list-name>

Applies an RP address filter to incoming SA messages that are received from an MSDP peer.

Syntax:



```
set protocols msdp peer peer-address import rp-list prefix-list-name
```

Syntax:

```
delete protocols msdp peer peer-address import rp-list [ prefix-list-name ]
```

Syntax:

```
show protocols msdp peer peer-address import rp-list
```

No pairs are filtered.

peer-address

An IPv4 MSDP peer address.

prefix-list-name

The name of a previously defined prefix list. This list is the per-peer RP-address filter that specifies RP addresses for which the MSDP speaker accepts (that is, caches) from an MSDP peer. The RP address is gained from the RP Address field of an MSDP SA packet.

Configuration mode

```
protocols {
  msdp {
    peer peer-address {
      import {
        rp-list prefix-list-name
      }
    }
  }
}
```

A filter that helps define which (S,G)s are accepted from an MSDP peer. The prefix list applies to incoming SA messages that are received from a specific RP address. The list specifies an RP address and a mask. All pairs are cached when this attribute is not configured.

Use the `set` form of this command to apply an incoming filter to SA messages that are received from a MSDP peer.

Use the `delete` form of this command to delete a filter on SA messages that are received from a MSDP peer.

Use the `show` form of this command to display the filter applied to SA messages that are received from a MSDP peer.

protocols msdp peer <peer-address> keepalive <keepalive-interval>

Adjusts the keepalive time interval at which a peer sends keepalive messages.

Syntax:

```
set protocols msdp peer peer-address keepalive keepalive-interval
```

Syntax:

```
delete protocols msdp peer peer-address keepalive [ keepalive-interval ]
```

Syntax:

```
show protocols msdp peer peer-address keepalive
```

The time interval is 60 seconds.

peer-address

An IPv4 MSDP peer address.

keepalive-interval



A time interval in seconds. The interval ranges from 1 through 60 seconds. The keepalive interval must be less than the holdtime interval.

Configuration mode

```
protocols {
  msdp {
    peer peer-address {
      keepalive keepalive-interval
    }
  }
}
```

The keepalive time interval is the time to which a peer sends keepalive messages.

Use the `set` form of this command to adjust the keepalive time interval to which a peer sends keepalive messages.

Use the `delete` form of this command to restore the default keepalive time interval of 60 seconds.

Use the `show` form of this command to display the current keepalive time interval.

protocols msdp peer <peer-address> local-address <local-ip>

Configures an MSDP peer IP address and a local IP address of the router.

Syntax:

```
set protocols msdp peer peer-address local-address local-ip
```

Syntax:

```
delete protocols msdp peer peer-address local-address [ local-ip ]
```

Syntax:

```
show protocols msdp peer [ peer-address local-address ]
```

peer-address

An IPv4 MSDP (remote) peer address.

local-ip

An IPv4 address of the router, which is used as a source IP address for the TCP connection with the MSDP peer. By default, this address is the most appropriate one to use to connect to an MSDP peer address.

Configuration mode

```
protocols {
  msdp {
    peer peer-address {
      local-address local-ip
    }
  }
}
```

Use the `set` form of this command to configure an MSDP peer with an IPv4 MSDP (remote) peer address.

Use the `delete` form of this command to delete a remote peer address.

Use the `show` form of this command to display the peer IP address and the local IP address of the router.

protocols msdp peer <peer-address> password <password>

Assigns a password for a peer connection.

**Syntax:**

```
set protocols msdp peer peer-address password password
```

peer-address

The IPv4 address of an MSDP peer.

password

A password for the peer.

Configuration mode

```
protocols {
  msdp {
    peer peer-address {
      password password
    }
  }
}
```

The password must match on both the local and remote peers.

protocols msdp peer <peer-address> shutdown

Shuts down a configured MSDP peer.

Syntax:

```
set protocols msdp peer peer-address shutdown
```

Syntax:

```
delete protocols msdp peer peer-address [ shutdown ]
```

Syntax:

```
show protocol msdp peer peer-address
```

peer-address

An IPv4 MSDP peer address

Configuration mode

```
protocols {
  msdp {
    peer peer-address {
      shutdown
    }
  }
}
```

Use the `set` form of this command to administratively shut down a configured MSDP peer. When an MSDP peer is administratively shut down, this command clears all SA cache entries received from the peer and disables the TCP connection.

Use the `delete` form of this command to enable an MSDP peer.

Use the `show` form of this command to display the configured action for shutting down an MSDP peer.

protocols msdp peer-group <group-name>

Creates a peer group and configures its name.

Syntax:

```
set protocols msdp peer-group group-name
```


**Syntax:**

```
delete protocols msdp peer-group group-name
```

Syntax:

```
show protocols msdp peer-group
```

The mode is standard.

group-name

A name for the peer group.

Configuration mode

```
protocols {
  msdp {
    peer-group group-name {
    }
  }
}
```

A peer group should be configured explicitly. A peer group enables you to assign the same configuration parameter to all peers that belong to it. A parameter that has not been configured for a single group member is defined by how the parameter is defined by the group configuration.

A parameter that is configured for a peer takes precedence over a parameter that is configured for a peer group. For example, if the keepalive time interval has been configured for 60 seconds on a peer and 70 seconds for the peer group to which it belongs, then the parameter of 60 seconds applies to that peer.

Use the `set` form of this command to create a group with a name.

Use the `delete` form of this command to delete a group.

Use the `show` form of this command to display the current groups.

protocols msdp peer-group <group-name> connect-retry <time-interval>

Configures the connect-retry time interval.

Syntax:

```
set protocols msdp peer-group group-name connect-retry time-interval
```

Syntax:

```
delete protocols msdp peer-group group-name connect-retry [ time-interval ]
```

Syntax:

```
show protocols msdp peer-group group-name connect-retry
```

The time interval is 30 seconds.

group-name

The name of a peer group.

time-interval

A time interval in seconds. The interval ranges from 1 through 60 seconds.

Configuration mode

```
protocols {
  msdp {
    peer-group group-name {
      connect-retry time-interval
    }
  }
}
```



```
}  
}
```

Use the `set` form of this command to configure the connect-retry time interval and adjust the interval for which peers, belonging to a peer group, wait after peering sessions are reset before attempting to re-establish the peering sessions.

Use the `delete` form of this command to restore the default connect-retry time interval, which is 30 seconds.

Use the `show` form of this command to display the current connect-retry time interval.

protocols msdp peer-group <group-name> export access-list <access-list-name>

Configures a (S,G) filter for outgoing SA messages sent to peers that belong to a peer group.

Syntax:

```
set protocols msdp peer-group group-name export access-list access-list-name
```

Syntax:

```
delete protocols msdp peer-group group-name export access-list [ access-list-name ]
```

Syntax:

```
show protocols msdp peer-group group-name export access-list
```

group-name

The name of a peer group.

access-list-name

The name of the access list. The per-peer-group (S,G) entry filter specifies which entries should be advertised.

If a list is not specified, all multicast (S,G) entries are advertised.

This parameter is a numeric identifier of a previously defined access list and can be a number from either of the following ranges:

100 through 199: IP standard access list.

2000 through 2699: IP standard access list (expanded range).

Note: You cannot configure an empty list.

Configuration mode

```
protocols {  
  msdp {  
    peer-group group-name {  
      export {  
        access-list access-list-name  
      }  
    }  
  }  
}
```

This filter helps define which sources are advertised to members of the MSDP peer group. This filter specifies a source address and mask, or group address and mask. If not configured, no pairs are filtered and all pairs are advertised to members of the MSDP peer group.

Use the `set` form of this command to configure a filter for outgoing SA messages sent to members of a group.

Use the `delete` form of this command to delete the filter for outgoing SA messages sent to members of a group.

Use the `show` form of this command to display the filter for outgoing SA messages sent to members of a group.



protocols msdp peer-group <group-name> export rp-list <prefix-list-name>

Configures an RP address filter for outgoing SA messages sent to peers that belong to a peer group.

Syntax:

```
set protocols msdp peer-group group-name export rp-list prefix-list-name
```

Syntax:

```
delete protocols msdp peer-group group-name export rp-list [ prefix-list-name ]
```

Syntax:

```
show protocols msdp peer-group group-name export rp-list
```

group-name

The name of a peer group.

prefix-list-name

The name of a previously defined prefix list. This list is the per-peer-group RP-address filter that specifies RP addresses that determine which cache entries are advertised to members of the peer group. The RP address is gained from the RP Address field of an MSDP SA packet.

Configuration mode

```
protocols {
  msdp {
    peer-group group-name {
      export {
        rp-list prefix-list-name
      }
    }
  }
}
```

This filter helps define which sources are advertised to members of the MSDP peer group. This filter specifies an RP address and mask. If not configured, no pairs are filtered and all pairs are advertised to members of the MSDP peer group.

Use the `set` form of this command to configure a filter for outgoing SA messages sent to peers that belong to a peer group.

Use the `delete` form of this command to delete a filter for outgoing SA messages sent to peers that belong to a peer group.

Use the `show` form of this command to display the filters for outgoing SA messages sent to peers that belong to a peer group.

protocols msdp peer-group <group-name> holdtime <holdtime-interval>

Configures the holdtime time interval for a member of a group.

Syntax:

```
set protocols msdp peer-group group-name holdtime holdtime-interval
```

Syntax:

```
delete protocols msdp peer-group group-name holdtime [ holdtime-interval ]
```

Syntax:



```
show protocols msdp peer-group group-name holdtime
```

The default interval is 75 seconds.

group-name

The name of a peer group.

holdtime-interval

A time interval in seconds. The interval ranges from 3 through 75 seconds. The holdtime interval should be greater than the keepalive interval.

Configuration mode

```
protocols {
  msdp {
    peer-group group-name {
      holdtime holdtime-interval
    }
  }
}
```

Use the set form of this command to configure the holdtime time interval in seconds for which a member of a peer group waits for keepalive messages from other peers before declaring the other peers down.

Use the delete form of this command to restore the default holdtime time interval, which is 75 seconds.

Use the show form of this command to display the current holdtime time interval.

protocols msdp peer-group <group-name> import access-list <access-list-name>

Configures a (S,G) filter for incoming SA messages received from the peers that belong to a peer group.

Syntax:

```
set protocols msdp peer-group group-name import access-list access-list-name
```

Syntax:

```
delete protocols msdp peer-group group-name import access-list access-list-name
```

Syntax:

```
show protocols msdp peer-group group-name import access-list
```

group-name

The name of a peer group.

access-list-name

The name of the access list. The per-peer-group (S,G) entry filter specifies which entries should be accepted.

If a list is not specified, all multicast (S,G) pairs are accepted.

This parameter is a numeric identifier of a previously defined access list and can be a number from either of the following ranges:

100 through 199: IP standard access list.

2000 through 2699: IP standard access list (expanded range).

Note: You cannot configure an empty access-list.

Configuration mode

```
protocols {
  msdp {
    peer-group group-name {
```



```
import {
  access-list access-list-name
}
}
```

This filter helps define which sources are accepted from the members of an MSDP peer group. This filter specifies a source address and mask or group address and mask. If not configured, no pairs are filtered and all pairs are accepted from the members of the MSDP peer group.

Use the `set` form of this command to configure a filter for incoming SA messages received from the peers that belong to a peer group.

Use the `delete` form of this command to delete a filter for incoming SA messages received from the peers that belong to a peer group.

Use the `show` form of this command to display the existing filter for incoming SA messages received from the peers that belong to a peer group.

protocols msdp peer-group <group-name> import rp-list <prefix-list-name>

Configures an RP address filter for incoming SA messages received from peers that belong to a peer group.

Syntax:

```
set protocols msdp peer-group group-name import rp-list prefix-list-name
```

Syntax:

```
delete protocols msdp peer-group group-name import rp-list [ prefix-list-name ]
```

Syntax:

```
show protocols msdp peer-group group-name import rp-list
```

group-name

The name of a peer group.

prefix-list-name

The name of a previously defined prefix list. This list is the per-peer-group RP-address filter that specifies RP addresses for which the MSDP speaker accepts (that is, caches) from peers that belong to a peer group. The RP address is gained from the RP address field of an MSDP SA packet.

Configuration mode

```
protocols {
  msdp {
    peer-group group-name {
      import {
        rp-list prefix-list-name
      }
    }
  }
}
```

This filter helps define which sources are accepted from members of this MSDP peer group. This filter specifies a RP address and mask. If not configured, no pairs are filtered and all pairs are accepted from members of the MSDP peer group.

Use the `set` form of this command to configure a filter for incoming SA messages that are received from the peers that belong to a peer group.

Use the `delete` form of this command to delete a filter for incoming SA messages received from the peers that belong to a peer group.



Use the `show` form of this command to display the existing filter for incoming SA messages received from the peers that belong to a peer group.

protocols msdp peer-group <group-name> keepalive <keepalive-interval>

Configures the keepalive message interval for a peer.

Syntax:

```
set protocols msdp peer-group group-name keepalive keepalive-interval
```

Syntax:

```
delete protocols msdp peer-group group-name keepalive [ keepalive-interval ]
```

Syntax:

```
show protocols msdp peer-group group-name keepalive
```

The default interval is 60 seconds.

group-name

The name of a peer group.

keepalive-interval

The time interval in seconds at which a keepalive message is sent. The interval ranges from 1 through 60 seconds.

Configuration mode

```
protocols {
  msdp {
    peer-group group-name {
      keepalive keepalive-interval
    }
  }
}
```

This configuration parameter must be less than the configured holdtime time interval.

Use the `set` form of this command to adjust the interval (in seconds) at which a peer (belonging to a group) sends keepalive messages.

Use the `delete` form of this command to delete the keepalive message interval for a peer. This form of the command can be used to set the default interval to 60 seconds.

Use the `show` form of this command to display the keepalive message interval for a peer.

protocols msdp peer-group <group-name> peer <peer-address>

Adds a peer to a peer group.

Syntax:

```
set protocols msdp peer-group group-name peer peer-address
```

Syntax:

```
delete protocols msdp peer-group group-name peer [ peer-address ]
```

Syntax:

```
show protocols msdp peer-group group-name peer
```

**group-name**

The name of a peer group.

peer-address

An IPv4 MSDP peer address.

Configuration mode

```
protocols {
  msdp {
    peer-group group-name {
      peer peer-address
    }
  }
}
```

A peer group should be configured explicitly.

All parameters that are assigned to a peer group are applied to a peer. A peer can be a member of only one group. A peer group configures several peers with the same parameters.

Use the `set` form of this command to add a peer to a peer group.

Use the `delete` form of this command to delete a peer from a peer group.

Use the `show` form of this command to display the current members of a peer group.

protocols msdp peer-group <group-name> shutdown

Shuts down MSDP peers that belong to a peer group.

Syntax:

```
set protocols msdp peer-group group-name shutdown
```

Syntax:

```
delete protocols msdp peer-group group-name shutdown
```

Syntax:

```
show protocol msdp peer-group group-name
```

group-name

The name of a peer group.

Configuration mode

```
protocols {
  msdp {
    peer-group group-name {
      shutdown
    }
  }
}
```

Use the `set` form of this command to administratively shut down MSDP peers that belong to a peer.

Use the `delete` form of this command to remove the configuration to administratively shut down MSDP peers that belong to a peer.

Use the `show` form of this command to display the state of the configuration to administratively shut down MSDP peers that belong to a peer.

reset ip msdp peer <peer-address>

Resets the TCP connection to a peer.

**Syntax:**

```
reset ip msdp peer peer-address
```

peer-address

An IPv4 MSDP peer address

Operational mode

In addition to resetting the TCP connection to a peer, this command clears all peer statistics and the transmission FIFO.

The following example shows how to reset the TCP connection to the 12.12.12.12 peer.

```
vyatta@vyatta:~$ reset ip msdp peer 12.12.12.12
```

reset ip msdp sa-cache <group-address>

Clears all MSDP SA cache entries.

Syntax:

```
reset ip msdp sa-cache group-address
```

group-address

A multicast group address for which SA entries are cleared from the SA cache.

Operational mode

When the *group-address* parameter is defined, the system clears the SA cache entries for only that group.

The following example shows how to clear MSDP SA cache entries for the 192.168.1.1 group.

```
vyatta@vyatta:~$ reset ip msdp sa-cache 192.168.1.1
```

show ip msdp peer <peer-address>

Displays configuration information for one MSDP peer or all MSDP peers.

Syntax:

```
show ip msdp peer peer-address
```

peer-address

An IPv4 MSDP peer address.

Operational mode

The following example shows how to display configuration information for the 10.2.7.6 MSDP peer.

```
vyatta@R1:~$ show ip msdp peer 10.2.7.6
MSDP Peer 10.2.7.6 , AS 0 (configured AS)
Description:
  Connection status:
    State: Up, Resets: 4, Connection source: 10.2.7.5
    Uptime(Downtime): 00:22:06, Messages sent/received: 28/89
    Output messages discarded: 0
    Local role: active
    Connection and counters cleared 04:45:26 ago
```




```
SA Filtering:
  Input (S,G) filter: 102
  Input RP filter: p1
  Output (S,G) filter: 101
  Output RP filter: p1
Peer ttl threshold: 16
SAs learned from this peer: 0, SAs limit: 0
```

The following example shows the status of an MSDP peer and how to verify the status of that peer.

```
vyatta@r3:~$show ip msdp peer
MSDP Peer 10.23.0.2 (?), AS 0 (configured AS)
Description:
  Connection status:
    State: Listen, Resets: 5, Connection source: 10.23.0.3 (?)
    Uptime(Downtime): 00:36:37, Messages sent/received: 105/0
    Output messages discarded: 0
    Local role: passive
    Connection and counters cleared 02:35:53 ago
  SA Filtering:
    Input (S,G) filter: none
    Input RP filter: none
    Output (S,G) filter: none
    Output RP filter: none
Peer ttl threshold: 16
SAs learned from this peer: 0, SAs limit: 0
...
```

show ip msdp sa-cache

Displays detailed or summary information about the SA cache database.

Syntax:

```
show ip msdp sa-cache [ summary ]
```

summary

Shows summary information about the SA cache database, including the number of active sources, RP addresses, and Multiprotocol BGP/autonomous systems (MBGP/AS).

Operational Mode

The following example shows how to display detailed information about the SA cache database:

```
vyatta@R1:~$ show ip msdp sa-cache
MSDP Source-Active Cache - 2398 entries
Active Sources/Group    RP Address MBGP/AS Time in cache/expired
(137.39.41.33, 238.105.148.0), 137.39.3.111, 704, 2d10h/00:05:33
(130.240.112.8, 224.2.0.1), 198.9.200.65, 10888, 00:03:21/00:02:38
(171.69.10.13, 227.37.32.1), 137.39.3.92, 704, 05:22:20/00:03:32
(134.67.66.18, 233.0.0.1), 137.39.3.111, 704, 2d10h/00:05:35
(134.67.66.148, 233.0.0.1), 137.39.3.111, 704, 2d10h/00:05:35
(171.69.10.13, 227.37.32.2), 137.39.3.92, 704, 00:44:30/00:01:31
(128.223.70.203, 224.2.236.2), 128.223.253.7, 3582, 02:34:16/00:05:49
(206.190.42.104, 236.195.56.2), 137.39.3.92, 704, 04:21:13/00:05:22
(171.69.10.13, 227.37.32.3), 137.39.3.92, 704, 00:44:30/00:02:31
(161.44.15.43, 224.0.92.3), 198.9.200.65, 10888, 6d09h/00:05:35
(161.44.15.111, 224.0.92.3), 198.9.200.65, 10888, 16:18:08/00:05:35
(161.44.21.45, 224.0.92.3), 198.9.200.65, 10888, 16:18:08/00:05:35
```



```
(161.44.15.75, 224.0.92.3), 198.9.200.65, 10888, 08:40:52/00:05:35
(161.44.15.100, 224.0.92.3), 198.9.200.65, 10888, 08:40:52/00:05:35
(171.69.10.13, 227.37.32.6), 137.39.3.92, 704, 00:45:30/00:05:31
(137.39.41.33, 224.247.228.10), 137.39.3.111, 704, 2d10h/00:05:35
(128.146.222.210, 224.2.224.13), 137.39.3.92, 704, 01:51:53/00:05:22
(137.39.41.33, 229.231.124.13), 137.39.3.111, 704, 2d10h/00:05:33
(128.223.32.138, 224.2.200.23), 128.223.253.7, 3582, 21:33:40/00:05:49
(128.223.75.244, 224.2.200.23), 128.223.253.7, 3582, 21:33:40/00:05:49
```

The following example shows how to check the detailed status of the SA cache database.

```
vyatta@v5:~$show ip msdp sa-cache
MSDP Source-Active Cache - 20 entries
Active Sources/Group      RP Address      Peer      MBGP      Time
                          in cache/expires
(10.57.0.7,226.0.10.10)  10.53.0.5      Self      0         01:55:59/--
(10.57.0.7,226.0.10.9)  10.53.0.5      Self      0         01:55:59/--
(10.57.0.7,226.0.10.8)  10.53.0.5      Self      0         01:55:59/--
(10.57.0.7,226.0.10.7)  10.53.0.5      Self      0         01:55:59/--
(10.57.0.7,226.0.10.6)  10.53.0.5      Self      0         01:55:59/--
(10.57.0.7,226.0.10.5)  10.53.0.5      Self      0         01:55:59/--
(10.57.0.7,226.0.10.4)  10.53.0.5      Self      0         01:55:59/--
(10.57.0.7,226.0.10.3)  10.53.0.5      Self      0         01:55:59/--
...
```

Table 13: Column headings in the output produced by show ip msdp sa-cache

Column Heading	Description
Active Sources/Group	A source-group pair (S,G).
RP Address	The address of a rendezvous point (RP).
Peer	The remote peer that sent the SA advertisement. self means that the MSDP peer is the originator for this group.
MBGP	The mBGP autonomous system (AS)—the AS number from BGP. If this number is 0, then BGP does not know about the remote AS.
Time	Time until the “Expires time” counter expires for this host system.

The following example shows how to display summary information about the SA cache database.

```
vyatta@R1:~$ show ip msdp sa-cache summary
SA Cache summary:
Active sources: 125
RP address: 15
MBGP/AS : 12
```



show ip msdp summary

Displays configuration information all the MSDP peers.

Syntax:

```
show ip msdp summary
```

Operational mode

The following example shows how to display MSDP configuration information for the peer.

```
vyatta@r3:~$ show ip msdp summary
Peer address  Local address  State    Last up/down  SA Count  Peer/Peer(Group)
10.23.0.2     10.23.0.3     Listen   00:37:35     0/105     0/--
10.34.0.4     10.34.0.3     Up       02:24:00     0/0       1/--
10.53.0.5     10.53.0.3     Up       02:36:48     163/0     1/--
```



List of Acronyms

Acronym	Description
ACL	access control list
ADSL	Asymmetric Digital Subscriber Line
AH	Authentication Header
AMI	Amazon Machine Image
API	Application Programming Interface
AS	autonomous system
ARP	Address Resolution Protocol
AWS	Amazon Web Services
BGP	Border Gateway Protocol
BIOS	Basic Input Output System
BPDU	Bridge Protocol Data Unit
CA	certificate authority
CCMP	AES in counter mode with CBC-MAC
CHAP	Challenge Handshake Authentication Protocol
CLI	command-line interface
DDNS	dynamic DNS
DHCP	Dynamic Host Configuration Protocol
DHCPv6	Dynamic Host Configuration Protocol version 6
DLCI	data-link connection identifier
DMI	desktop management interface
DMVPN	dynamic multipoint VPN
DMZ	demilitarized zone
DN	distinguished name
DNS	Domain Name System
DSCP	Differentiated Services Code Point
DSL	Digital Subscriber Line
eBGP	external BGP
EBS	Amazon Elastic Block Storage
EC2	Amazon Elastic Compute Cloud
EGP	Exterior Gateway Protocol
ECMP	equal-cost multipath
ESP	Encapsulating Security Payload
FIB	Forwarding Information Base
FTP	File Transfer Protocol
GRE	Generic Routing Encapsulation
HDLC	High-Level Data Link Control
I/O	Input/Output
ICMP	Internet Control Message Protocol
IDS	Intrusion Detection System
IEEE	Institute of Electrical and Electronics Engineers



Acronym	Description
IGMP	Internet Group Management Protocol
IGP	Interior Gateway Protocol
IPS	Intrusion Protection System
IKE	Internet Key Exchange
IP	Internet Protocol
IPOA	IP over ATM
IPsec	IP Security
IPv4	IP Version 4
IPv6	IP Version 6
ISAKMP	Internet Security Association and Key Management Protocol
ISM	Internet Standard Multicast
ISP	Internet Service Provider
KVM	Kernel-Based Virtual Machine
L2TP	Layer 2 Tunneling Protocol
LACP	Link Aggregation Control Protocol
LAN	local area network
LDAP	Lightweight Directory Access Protocol
LLDP	Link Layer Discovery Protocol
MAC	medium access control
mGRE	multipoint GRE
MIB	Management Information Base
MLD	Multicast Listener Discovery
MLPPP	multilink PPP
MRRU	maximum received reconstructed unit
MTU	maximum transmission unit
NAT	Network Address Translation
NBMA	Non-Broadcast Multi-Access
ND	Neighbor Discovery
NHRP	Next Hop Resolution Protocol
NIC	network interface card
NTP	Network Time Protocol
OSPF	Open Shortest Path First
OSPFv2	OSPF Version 2
OSPFv3	OSPF Version 3
PAM	Pluggable Authentication Module
PAP	Password Authentication Protocol
PAT	Port Address Translation
PCI	peripheral component interconnect
PIM	Protocol Independent Multicast
PIM-DM	PIM Dense Mode
PIM-SM	PIM Sparse Mode
PKI	Public Key Infrastructure
PPP	Point-to-Point Protocol
PPPoA	PPP over ATM



Acronym	Description
PPPoE	PPP over Ethernet
PPTP	Point-to-Point Tunneling Protocol
PTMU	Path Maximum Transfer Unit
PVC	permanent virtual circuit
QoS	quality of service
RADIUS	Remote Authentication Dial-In User Service
RHEL	Red Hat Enterprise Linux
RIB	Routing Information Base
RIP	Routing Information Protocol
RIPng	RIP next generation
RP	Rendezvous Point
RPF	Reverse Path Forwarding
RSA	Rivest, Shamir, and Adleman
Rx	receive
S3	Amazon Simple Storage Service
SLAAC	Stateless Address Auto-Configuration
SNMP	Simple Network Management Protocol
SMTP	Simple Mail Transfer Protocol
SONET	Synchronous Optical Network
SPT	Shortest Path Tree
SSH	Secure Shell
SSID	Service Set Identifier
SSM	Source-Specific Multicast
STP	Spanning Tree Protocol
TACACS+	Terminal Access Controller Access Control System Plus
TBF	Token Bucket Filter
TCP	Transmission Control Protocol
TKIP	Temporal Key Integrity Protocol
ToS	Type of Service
TSS	TCP Maximum Segment Size
Tx	transmit
UDP	User Datagram Protocol
VHD	virtual hard disk
vif	virtual interface
VLAN	virtual LAN
VPC	Amazon virtual private cloud
VPN	virtual private network
VRRP	Virtual Router Redundancy Protocol
WAN	wide area network
WAP	wireless access point
WPA	Wired Protected Access