Configuring MSDP

This chapter describes how to configure Multicast Source Discovery Protocol (MSDP) on a Cisco NX-OS device.

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About MSDP

You can use the Multicast Source Discovery Protocol (MSDP) to exchange multicast source information between multiple Border Gateway Protocol (BGP) enabled Protocol Independent Multicast (PIM) sparse-mode domains. In addition, MSDP can be used to create an Anycast-RP configuration to provide RP redundancy and load sharing. For information about BGP, see the *Cisco Nexus 9000 Series NX-OS Unicast Routing Configuration Guide*.

MSDP is supported on all Cisco Nexus 9000 series switches.

Beginning with Cisco NX-OS Release 10.3(1)F, MSDP is supported on Cisco Nexus 9808 platform switches.

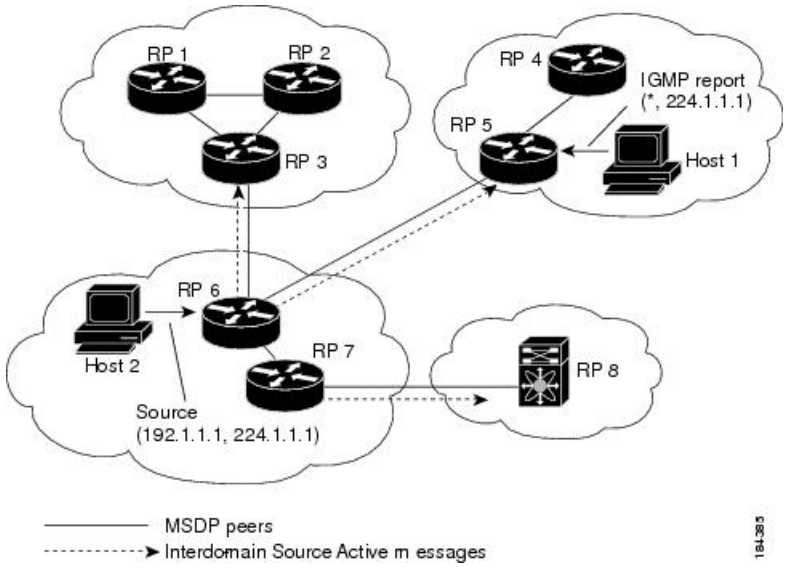
- Beginning with Cisco NX-OS Release 10.4(1)F, MSDP is supported on Cisco Nexus X98900CD-A and X9836DM-A line cards with Cisco Nexus 9808 switches.

Beginning with Cisco NX-OS Release 10.4(1)F, MSDP is supported on Cisco Nexus 9804 platform switches, and Cisco Nexus X98900CD-A and X9836DM-A line cards.

When a receiver joins a group that is transmitted by a source in another domain, the rendezvous point (RP) sends PIM join messages in the direction of the source to build a shortest path tree. The designated router (DR) sends packets on the sourcetree within the source domain, which can travel through the RP in the source domain and along the branches of the sourcetree to other domains. In domains where there are receivers, RPs in those domains can be on the sourcetree. The peering relationship is conducted over a TCP connection.

The following figure shows four PIM domains. The connected RPs (routers) are called MSDP peers because they are exchanging active source information with each other. Each MSDP peer advertises its own set of multicast source information to the other peers. Source Host 2 sends the multicast data to group 224.1.1.1. On RP 6, the MSDP process learns about the source through PIM register messages and generates Source-Active (SA) messages to its MSDP peers that contain information about the sources in its domain. When RP 3 and RP 5 receive the SA messages, they forward them to their MSDP peers. When RP 5 receives the request from Host 1 for the multicast data on group 224.1.1.1, it builds a shortest path tree to the source by sending a PIM join message in the direction of Host 2 at 192.1.1.1.

Figure 1: MSDP Peering Between RPs in Different PIM Domains



When you configure MSDP peering between each RP, you create a full mesh. Full MSDP meshing is typically done within an autonomous system, as shown between RPs 1, 2, and 3, but not across autonomous systems. You use BGP to do a loop suppression and MSDP peer-RPF to suppress looping SA messages.

Note You do not need to configure BGP in order to use Anycast-RP (a set of RPs that can perform load balancing and failover) within a PIM domain.

Note You can use PIM Anycast (RFC 4610) to provide the Anycast-RP function instead of MSDP.

For detailed information about MSDP, see RFC 3618.

PFM-SD multi-site loop prevention

When interconnecting multiple PFM-SD domains using MSDP, there is a risk of creating an advertisement loop where source information is learned simultaneously from both PFM-SD and MSDP. This loop prevents (S,G) entries in the SA-cache from expiring, even after traffic has ceased.

- **Mandatory configuration**: You must configure the **ip pim pfm-sd boundary both** command on all interfaces connecting to external PFM-SD domains. This is essential to prevent source advertisement loops between the MSDP and PFM-SD mechanisms.
- **Best practice**: It is also recommended to apply **ip pim pfm-sd boundary both** on interfaces facing traditional PIM-ASM domains. This prevents unnecessary PFM-SD control plane traffic from flooding into the non-PFM-SD domain.

SA Messages and Caching

MSDP peers exchange Source-Active (SA) messages to propagate information about active sources. SA messages contain the following information:

- Source address of the data source
- Group address that the data source uses
- IP address of the RP or the configured originator ID

When a PIM register message advertises a new source, the MSDP process reencapsulates the message in an SA message that is immediately forwarded to all MSDP peers.

The SA cache holds the information for all sources learned through SA messages. Caching reduces the join latency for new receivers of a group because the information for all known groups can be found in the cache. You can limit the number of cached source entries by configuring the SA limit peer parameter. You can limit the number of cached source entries for a specific group prefix by configuring the group limit global parameter. The SA cache is enabled by default and cannot be disabled.

The MSDP software sends SA messages for each group in the SA cache every 60 seconds or at the configured SA interval global parameter. An entry in the SA cache is removed if an SA message for that source and group is not received within the SA interval plus 3 seconds.

MSDP Peer-RPF Forwarding

MSDP peers forward the SA messages that they receive away from the originating RP. This action is called peer-RPF flooding. The router examines the BGP or MBGP routing table to determine which peer is the next hop in the direction of the originating RP of the SA message. This peer is called a reverse path forwarding (RPF) peer.

If the MSDP peer receives the same SA message from a non-RPF peer in the direction of the originating RP, it drops the message. Otherwise, it forwards the message to all its MSDP peers.

MSDP Mesh Groups

You can use MSDP mesh groups to reduce the number of SA messages that are generated by peer-RPF flooding. By configuring a peering relationship between all the routers in a mesh and then configuring a mesh group of these routers, the SA messages that originate at a peer are sent by that peer to all other peers. SA messages received by peers in the mesh are not forwarded.

A router can participate in multiple mesh groups. By default, no mesh groups are configured.

Prerequisites for MSDP

MSDP has the following prerequisites:

- You are logged onto the device.
- For global commands, you are in the correct virtual routing and forwarding (VRF) mode. The default configuration mode shown in the examples in this chapter applies to the default VRF.
- You configured PIM for the networks where you want to configure MSDP.

Default Settings

This table lists the default settings for MSDP parameters.

Table 1: Default MSDP Parameters

Parameters	Default
Description	Peer has no description
Administrative shutdown	Peer is enabled when it is defined
MD5 password	No MD5 password is enabled
SA policy IN	All SA messages are received
SA policy OUT	All registered sources are sent in SA messages
SA limit	No limit is defined
Originator interface name	RP address of the local system
Group limit	No group limit is defined
SA interval	60 seconds

Configuring MSDP

You can establish MSDP peering by configuring the MSDP peers within each PIM domain as follows:

1. Select the routers to act as MSDP peers.
2. Enable the MSDP feature.
3. Configure the MSDP peers for each router identified in Step 1.
4. Configure the optional MSDP peer parameters for each MSDP peer.
5. Configure the optional global parameters for each MSDP peer.

6. Configure the optional mesh groups for each MSDP peer.

Note The MSDP commands that you enter before you enable MSDP are cached and then run when MSDP is enabled. Use the **ip msdp peer** or **ip msdp originator-id** command to enable MSDP.

Note If you are familiar with the Cisco IOS CLI, be aware that the Cisco NX-OS commands for this feature might differ from the Cisco IOS commands that you would use.

Enabling the MSDP Feature

SUMMARY STEPS

1. **configure terminal**
2. **feature msdp**
3. (Optional) **show running-configuration msdp**
4. (Optional) **copy running-config startup-config**

DETAILED STEPS

Procedure

	Command or Action	Purpose

Step 1	**configure terminal**
	Example:
	`switch# configure terminal`
	`switch(config)#`
		Enters global configuration mode.

Step 2	**feature msdp** **Example:** `switch# feature msdp`	Enables the MSDP feature so that you can enter MSDP commands. By default, the MSDP feature is disabled.
Step 3	(Optional) **show running-configuration msdp** **Example:** `switch# show running-configuration msdp`	Shows the running-configuration information for MSDP.
Step 4	(Optional) **copy running-config startup-config** **Example:** `switch(config)# copy running-config startup-config`	Copies the running configuration to the startup configuration.

Configuring MSDP Peers

You can configure an MSDP peer when you configure a peering relationship with each MSDP peer that resides either within the current PIM domain or in another PIM domain. MSDP is enabled on the router when you configure the first MSDP peering relationship.

Before you begin

Ensure that you have installed the Enterprise Services license and enabled PIM and MSDP.

Ensure that you configured PIM in the domains of the routers that you will configure as MSDP peers.

SUMMARY STEPS

1. **configure terminal**
2. **ip msdp peer** *peer-ip-address* **connect-source** *interface* [**remote-as** *as-number*]
3. **ip msdp** *peer-ip-address*
4. Repeat Step 2-3 for each MSDP peering relationship by changing the peer IP address, the interface, and the AS number as appropriate.
5. (Optional) **show ip msdp summary** [**vrf** [*vrf-name* | **all**]]
6. (Optional) **copy running-config startup-config**

DETAILED STEPS

Procedure

	Command or Action	Purpose

Step 1	**configure terminal**
	Example:
	`switch# configure terminal`
	`switch(config)#`
		Enters global configuration mode.

Step 2	**ip msdp peer** *peer-ip-address* **connect-source** *interface* [**remote-as** *as-number*] **Example:** `switch(config)# ip msdp peer 192.168.1.10 connect-source ethernet 2/1 remote-as 8`	Configures an MSDP peer with the specified peer IP address. The software uses the source IP address of the interface for the TCP connection with the peer. The interface can take the form of *type slot/port*. If the AS number is the same as the local AS, then the peer is within the PIM domain; otherwise, this peer is external to the PIM domain. By default, MSDP peering is disabled. **Note** MSDP peering is enabled when you use this command.
Step 3	**ip msdp** *peer-ip-address* **Example:**	
Step 4	Repeat Step 2-3 for each MSDP peering relationship by changing the peer IP address, the interface, and the AS number as appropriate.	

	Command or Action	Purpose
Step 5	(Optional) **show ip msdp summary** [**vrf** [*vrf-name* | **all**]] **Example:** `switch# show ip msdp summary`	Displays a summary of MSDP peers.
Step 6	(Optional) **copy running-config startup-config** **Example:** `switch(config)# copy running-config startup-config`	Copies the running configuration to the startup configuration.

Configuring MSDP Peer Parameters

You can configure the optional MSDP peer parameters described in this table. You configure these parameters in global configuration mode for each peer based on its IP address.

Table 2: MSDP Peer Parameters

Parameter	Description
Description	Description string for the peer. By default, the peer has no description.
Administrative shutdown	Method to shut down the MSDP peer. The configuration settings are not affected by this command. You can use this parameter to allow configuration of multiple parameters to occur before making the peer active. The TCP connection with other peers is terminated by the shutdown. By default, a peer is enabled when it is defined.
MD5 password	MD5-shared password key used for authenticating the peer. By default, no MD5 password is enabled.
TCP keychain	TCP keychain is used for MSDP peering authentication.
SA policy IN	Route-map policy for incoming SA messages. By default, all SA messages are received. **Note** To configure route-map policies, see the *Cisco Nexus 9000 Series NX-OS Unicast Routing Configuration Guide*.
SA policy OUT	Route-map policy for outgoing SA messages. By default, all registered sources are sent in SA messages. **Note** To configure route-map policies, see the *Cisco Nexus 9000 Series NX-OS Unicast Routing Configuration Guide*.

Parameter	Description
SA limit	Number of (S, G) entries accepted from the peer and stored in the SA cache. By default, there is no limit.

Before you begin

Ensure that you have installed the Enterprise Services license and enabled PIM and MSDP.

SUMMARY STEPS

1. **configure terminal**
2. **ip msdp description** *peer-ip-address description*
3. **ip msdp shutdown** *peer-ip-address*
4. **ip msdp password** *peer-ip-address password*
5. **ip msdp sa-policy** *peer-ip-address policy-name* **in**
6. **ip msdp sa-policy** *peer-ip-address policy-name* **out**
7. **ip msdp sa-limit** *peer-ip-address limit*
8. (Optional) **ip msdp keychain** *peer-ip-address name*
9. (Optional) **show ip msdp peer** [*peer-address*] [**vrf** [*vrf-name* | **all**]]
10. (Optional) **copy running-config startup-config**

DETAILED STEPS

Procedure

	Command or Action	Purpose

Step 1	**configure terminal**
	Example:
	`switch# configure terminal`
	`switch(config)#`
		Enters global configuration mode.
		Note
		Use the commands listed from step-2 to configure the MSDP peer parameters.

Step 2	**ip msdp description** *peer-ip-address description* **Example:** `switch(config)# ip msdp description 192.168.1.10 peer in Engineering network`	Sets a description string for the peer. By default, the peer has no description.
Step 3	**ip msdp shutdown** *peer-ip-address* **Example:** `switch(config)# ip msdp shutdown 192.168.1.10`	Shuts down the peer. By default, the peer is enabled when it is defined.
Step 4	**ip msdp password** *peer-ip-address password* **Example:** `switch(config)# ip msdp password 192.168.1.10 my_md5_password`	Enables an MD5 password for the peer. By default, no MD5 password is enabled.

	Command or Action	Purpose
Step 5	**ip msdp sa-policy** *peer-ip-address policy-name* **in** **Example:** `switch(config)# ip msdp sa-policy 192.168.1.10 my_incoming_sa_policy in`	Enables a route-map policy for incoming SA messages. By default, all SA messages are received.
Step 6	**ip msdp sa-policy** *peer-ip-address policy-name* **out** **Example:** `switch(config)# ip msdp sa-policy 192.168.1.10 my_outgoing_sa_policy out`	Enables a route-map policy for outgoing SA messages. By default, all registered sources are sent in SA messages.
Step 7	**ip msdp sa-limit** *peer-ip-address limit* **Example:** `switch(config)# ip msdp sa-limit 192.168.1.10 5000`	Sets a limit on the number of (S, G) entries accepted from the peer. By default, there is no limit.
Step 8	(Optional) **ip msdp keychain** *peer-ip-address name* **Example:** `switch(config)# ip msdp keychain 192.168.1.10 5000 mykeychain`	Enables the keychain authentication for the peer. Where <keychain> is the name of a keychain. **Note** • Authentication can be configured with specific keychain name before the keychain is configured, but authentication will pass only if the keychain is present with a valid key. • If keychain authentication is configured, the old password based authentication will be ignored if present.
Step 9	(Optional) **show ip msdp peer** [*peer-address*] [**vrf** [*vrf-name* | **all**]] **Example:** `switch(config)# show ip msdp peer 192.168.1.10`	Displays detailed MSDP peer information.
Step 10	(Optional) **copy running-config startup-config** **Example:** `switch(config)# copy running-config startup-config`	Copies the running configuration to the startup configuration.

Configuring MSDP Global Parameters

You can configure the optional MSDP global parameters described in this table.

Table 3: MSDP Global Parameters

Parameter	Description
Originator interface name	IP address used in the RP field of an SA message entry. When Anycast RPs are used, all RPs use the same IP address. You can use this parameter to define a unique IP address for the RP of each MSDP peer. By default, the software uses the RP address of the local system. **Note** We recommend that you use a loopback interface for the RP address.
Group limit	Maximum number of (S, G) entries that the software creates for the specified prefix. The software ignores groups when the group limit is exceeded and logs a violation. By default, no group limit is defined.
SA interval	Interval at which the software transmits Source-Active (SA) messages. The range is from 60 to 65,535 seconds. The default is 60 seconds.

Before you begin

Ensure that you have installed the Enterprise Services license and enabled PIM and MSDP.

SUMMARY STEPS

1. **configure terminal**
2. **ip msdp originator-id** *interface*
3. **ip msdp group-limit** *limit* **source** *source-prefix*
4. **ip msdp sa-interval** *seconds*
5. (Optional) **show ip msdp summary** [**vrf** [*vrf-name* | **all**]]
6. (Optional) **copy running-config startup-config**

DETAILED STEPS

Procedure

	Command or Action	Purpose

Step 1	**configure terminal**
	Example:
	`switch# configure terminal`
	`switch(config)#`
		Enters global configuration mode.

Step 2	**ip msdp originator-id** *interface* **Example:**	Sets a description string for the peer. By default, the peer has no description.

	Command or Action	Purpose
	`switch(config)# ip msdp originator-id loopback0`	Sets the IP address used in the RP field of an SA message entry. By default, the software uses the RP address of the local system. **Note** We recommend that you use a loopback interface for the RP address.
Step 3	**ip msdp group-limit** *limit* **source** *source-prefix* **Example:** `switch(config)# ip msdp group-limit 1000 source 192.168.1.0/24`	Maximum number of (S, G) entries that the software creates for the specified prefix. The software ignores groups when the group limit is exceeded and logs a violation. By default, no group limit is defined.
Step 4	**ip msdp sa-interval** *seconds* **Example:** `switch(config)# ip msdp sa-interval 80`	Interval at which the software transmits Source-Active (SA) messages. The range is from 60 to 65,535 seconds. The default is 60 seconds.
Step 5	(Optional) **show ip msdp summary** [**vrf** [*vrf-name* | **all**]] **Example:** `switch(config)# show ip msdp summary`	Displays a summary of the MSDP configuration.
Step 6	(Optional) **copy running-config startup-config** **Example:** `switch(config)# copy running-config startup-config`	Copies the running configuration to the startup configuration.

Configuring MSDP Mesh Groups

You can configure optional MSDP mesh groups in global configuration mode by specifying each peer in the mesh. You can configure multiple mesh groups on the same router and multiple peers per mesh group.

Before you begin

Ensure that you have installed the Enterprise Services license and enabled PIM and MSDP.

SUMMARY STEPS

1. **configure terminal**
2. **ip msdp mesh-group** *peer-ip-addr mesh-name*
3. Repeat Step 2 for each MSDP peer in the mesh by changing the peer IP address.
4. (Optional) **show ip msdp mesh-group** [*mesh-group*] [**vrf** [*vrf-name* | **all**]]
5. (Optional) **copy running-config startup-config**

DETAILED STEPS

Procedure

	Command or Action	Purpose

Step 1	**configure terminal**
	Example:
	`switch# configure terminal`
	`switch(config)#`
		Enters global configuration mode.

Step 2	**ip msdp mesh-group** *peer-ip-addr mesh-name* **Example:** `switch(config)# ip msdp mesh-group 192.168.1.10 my_mesh_1`	Configures an MSDP mesh with the peer IP address specified. You can configure multiple meshes on the same router and multiple peers per mesh group. By default, no mesh groups are configured.
Step 3	Repeat Step 2 for each MSDP peer in the mesh by changing the peer IP address.	—
Step 4	(Optional) **show ip msdp mesh-group** [*mesh-group*] [**vrf** [*vrf-name* | **all**]] **Example:** `switch# show ip msdp mesh-group`	Displays information about the MSDP mesh group configuration.
Step 5	(Optional) **copy running-config startup-config** **Example:** `switch(config)# copy running-config startup-config`	Copies the running configuration to the startup configuration.

Restarting the MSDP Process

Before you begin

You can restart the MSDP process and optionally flush all routes.

SUMMARY STEPS

1. **restart msdp**
2. **configure terminal**
3. **ip msdp flush-routes**
4. (Optional) **show running-configuration | include flush-routes**
5. (Optional) **copy running-config startup-config**

DETAILED STEPS

Procedure

	Command or Action	Purpose
Step 1	**restart msdp** **Example:** `switch# restart msdp`	Restarts the MSDP process.

Step 2	**configure terminal**
	Example:
	`switch# configure terminal`
	`switch(config)#`
		Enters global configuration mode.

Step 3	**ip msdp flush-routes** **Example:** `switch(config)# ip msdp flush-routes`	Removes routes when the MSDP process is restarted. By default, routes are not flushed.
Step 4	(Optional) **show running-configuration | include flush-routes** **Example:** `switch(config)# show running-configuration | include flush-routes`	Displays flush-routes configuration lines in the running configuration.
Step 5	(Optional) **copy running-config startup-config** **Example:** `switch(config)# copy running-config startup-config`	Copies the running configuration to the startup configuration.

Verifying the MSDP Configuration

To display the MSDP configuration information, perform one of the following tasks.

Command	Description
show ip msdp count [*as-number*] [**vrf** [*vrf-name* | **all**]]	Displays MSDP (S, G) entry and group counts by the autonomous system (AS) number.
show ip msdp mesh-group [*mesh-group*] [**vrf** [*vrf-name* | **all**]]	Displays the MSDP mesh group configuration.
show ip msdp peer [*peer-address*] [**vrf** [*vrf-name* | **all**]]	Displays MSDP information for the MSDP peer.
show ip msdp rpf [*rp-address*] [**vrf** [*vrf-name* | **all**]]	Displays the next-hop AS on the BGP path to an RP address.

Command	Description
show ip msdp sources [**vrf** [*vrf-name* | **all**]]	Displays the MSDP-learned sources and violations of configured group limits.
show ip msdp summary [**vrf** [*vrf-name* | **all**]]	Displays a summary of the MSDP peer configuration.

Monitoring MSDP

You can display and clear MSDP statistics by using the features in this section.

Displaying Statistics

You can display MSDP statistics using these commands.

Command	Description
show ip msdp policy statistics sa-policy *peer-address* {**in** | **out**} [**vrf** [*vrf-name* | **all**]]	Displays the MSDP policy statistics for the MSDP peer.
show ip msdp {**sa-cache** | **route**} [*source-address*] [*group-address*] [**vrf** [*vrf-name* | **all**]] [*asn-number*] [**peer** *peer-address*]	Displays the MSDP SA route cache. If you specify the source address, all groups for that source are displayed. If you specify a group address, all sources for that group are displayed.

Clearing Statistics

You can clear the MSDP statistics using these commands.

Command	Description
clear ip msdp peer [*peer-address*] [**vrf** *vrf-name*]	Clears the TCP connection to an MSDP peer.
clear ip msdp policy statistics sa-policy *peer-address* {**in** | **out**} [**vrf** *vrf-name*]	Clears statistics counters for MSDP peer SA policies.
clear ip msdp statistics [*peer-address*] [**vrf** *vrf-name*]	Clears statistics for MSDP peers.
clear ip msdp {**sa-cache** | **route**} [*group-address*] [**vrf** [*vrf-name* | **all**]]	Clears the group entries in the SA cache.

Configuration Examples for MSDP

To configure MSDP peers, some of the optional parameters, and a mesh group, follow these steps for each MSDP peer:

1. Configure the MSDP peering relationship with other routers.

```
switch# configure terminal
switch(config)# ip msdp peer 192.168.1.10 connect-source ethernet 1/0 remote-as 8
```

2. Configure the optional peer parameters.

```
switch# configure terminal
switch(config)# ip msdp password 192.168.1.10 my_peer_password_AB
```

3. Configure the optional global parameters.

```
switch# configure terminal
switch(config)# ip msdp sa-interval 80
```

4. Configure the peers in each mesh group.

```
switch# configure terminal
switch(config)# ip msdp mesh-group 192.168.1.10 mesh_group_1
```

The following example shows how to configure a subset of the MSDP peering that is shown below.

RP 3: 192.168.3.10 (AS 7)

```
configure terminal
  ip msdp peer 192.168.1.10 connect-source ethernet 1/1
  ip msdp peer 192.168.2.10 connect-source ethernet 1/2
  ip msdp peer 192.168.6.10 connect-source ethernet 1/3 remote-as
9
  ip msdp password 192.168.6.10 my_peer_password_36
  ip msdp sa-interval 80
  ip msdp mesh-group 192.168.1.10 mesh_group_123
  ip msdp mesh-group 192.168.2.10 mesh_group_123
  ip msdp mesh-group 192.168.3.10 mesh_group_123
```

RP 5: 192.168.5.10 (AS 8)

```
configure terminal
  ip msdp peer 192.168.4.10 connect-source ethernet 1/1
  ip msdp peer 192.168.6.10 connect-source ethernet 1/2 remote-as
9
  ip msdp password 192.168.6.10 my_peer_password_56
  ip msdp sa-interval 80
```

RP 6: 192.168.6.10 (AS 9)

```
configure terminal
  ip msdp peer 192.168.7.10 connect-source ethernet 1/1
  ip msdp peer 192.168.3.10 connect-source ethernet 1/2 remote-as
7
  ip msdp peer 192.168.5.10 connect-source ethernet 1/3 remote-as
8
  ip msdp password 192.168.3.10 my_peer_password_36
  ip msdp password 192.168.5.10 my_peer_password_56
  ip msdp sa-interval 80
```

Related Documents

Related Topic	Document Title
Configuring MBGP	*Cisco Nexus 9000 Series NX-OS Unicast Routing Configurat*

Standards

Standards	Title
RFC 4624	Multicast Source Discovery Protocol (MSDP) MIB