NSF/SSO—MPLS TE and RSVP Graceful Restart

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The NSF/SSO—MPLS TE and RSVP Graceful Restart feature allows a Route Processor (RP) to recover from disruption in control plane service without losing its Multiprotocol Label Switching (MPLS) forwarding state.

Cisco nonstop forwarding (NSF) with stateful switchover (SSO) provides continuous packet forwarding, even during a network processor hardware or software failure. In a redundant system, the secondary processor recovers control plane service during a critical failure in the primary processor. SSO synchronizes the network state information between the primary and the secondary processor.

Finding Feature Information in This Module

Your Cisco IOS software release may not support all of the features documented in this module. To reach links to specific feature documentation in this module and to see a list of the releases in which each feature is supported, use the "Feature Information for NSF/SSO—MPLS TE and RSVP Graceful Restart" section on page 77.

Finding Support Information for Platforms and Cisco IOS and Catalyst OS Software Images

Use Cisco Feature Navigator to find information about platform support and Cisco IOS and Catalyst OS software image support. To access Cisco Feature Navigator, go to http://www.cisco.com/go/cfn. An account on Cisco.com is not required.

Content

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Prerequisites for NSF/SSO—MPLS TE and RSVP Graceful Restart

- Configure Resource Reservation Protocol (RSVP) graceful restart in full mode.
- Configure RSVP graceful restart on all interfaces of the neighbor that you want to be restart-capable.
- Configure the redundancy mode as SSO. See the *Stateful Switchover* feature module for more information.
- Enable NSF on the routing protocols running among the provider routers (P), provider edge (PE) routers, and customer edge (CE) routers. The routing protocols are as follows:
  - Border Gateway Protocol (BGP)
  - Open Shortest Path First (OSPF)
  - Intermediate System-to-Intermediate System (IS-IS)

  See the *Cisco Nonstop Forwarding* feature module for more information.
- Enable MPLS.
- Configure traffic engineering (TE).

Restrictions for NSF/SSO—MPLS TE and RSVP Graceful Restart

- RSVP graceful restart supports node failure only.
- Unnumbered interfaces are not supported.
- You cannot enable RSVP fast reroute (FRR) hello messages and RSVP graceful restart on the same router.
- Configure this feature on Cisco 7600 series routers with dual RPs only.
- You cannot enable primary one-hop autotunnels, backup autotunnels, or autotunnel mesh groups on a router that is also configured with SSO and Route Processor Redundancy Plus (RPR+). This restriction does not prevent an MPLS TE tunnel that is automatically configured by TE autotunnel from being successfully recovered if any midpoint router along the label-switched path (LSP) of the router experiences an SSO.
- MPLS TE LSPs that are fast reroutable cannot be successfully recovered if the LSPs are FRR active and the Point of Local Repair (PLR) router experiences an SSO.
- When you configure RSVP graceful restart, you must use the neighbor's interface IP address.

Information About NSF/SSO—MPLS TE and RSVP Graceful Restart

To configure the NSF/SSO—MPLS TE and RSVP Graceful Restart feature, you should understand the following concepts:

Overview of MPLS TE and RSVP Graceful Restart

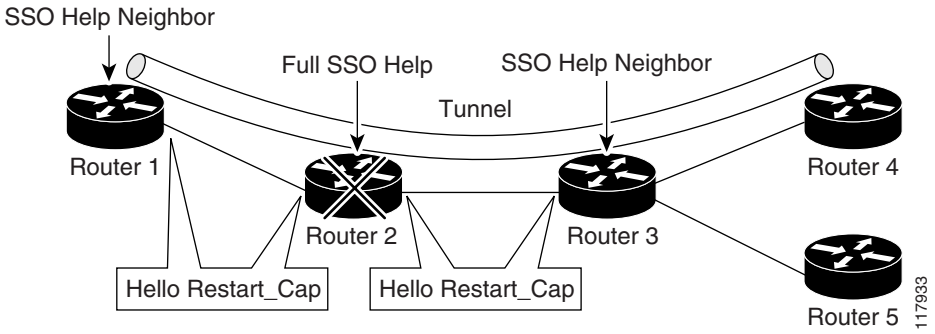
RSVP graceful restart allows RSVP TE-enabled nodes to recover gracefully following a node failure in the network such that the RSVP state after the failure is restored as quickly as possible. The node failure may be completely transparent to other nodes in the network.

RSVP graceful restart preserves the label values and forwarding information and works with third-party or Cisco routers seamlessly.

RSVP graceful restart depends on RSVP hello messages to detect that a neighbor went down. Hello messages include Hello Request or Hello Acknowledgment (ACK) objects between two neighbors.

As shown in Figure 1, the RSVP graceful restart extension to these messages adds an object called Hello Restart_Cap, which tells neighbors that a node may be capable of recovering if a failure occurs.

Figure 1 How RSVP Graceful Restart Works



The Hello Restart_Cap object has two values: the restart time, which is the sender's time to restart the RSVP_TE component and exchange hello messages after a failure; and the recovery time, which is the desired time that the sender wants the receiver to synchronize the RSVP and MPLS databases.

In Figure 1, RSVP graceful restart help neighbor support is enabled on Routers 1 and 3 so that they can help a neighbor recover after a failure, but they cannot perform self recovery. Router 2 has full SSO help support enabled, meaning it can perform self recovery after a failure or help its neighbor to recover. Router 2 has two RPs, one that is active and one that is standby (backup). A TE LSP is signaled from Router 1 to Router 4.

Router 2 performs checkpointing; that is, it copies state information from the active RP to the standby RP, thereby ensuring that the standby RP has the latest information. If an active RP fails, the standby RP can take over.

Routers 2 and 3 exchange periodic graceful restart hello messages every 10,000 milliseconds (ms) (10 seconds), and so do Routers 2 and 1 and Routers 3 and 4. Assume that Router 2 advertises its restart time = 60,000 ms (60 seconds) and its recovery time = 60,000 ms (60 seconds) as shown in the following example:

```
23:33:36: Outgoing Hello:
23:33:36:   version:1 flags:0000 cksum:883C ttl:255 reserved:0 length:32
23:33:36:  HELLO               type HELLO REQUEST length 12:
23:33:36:   Src_Instance: 0x6EDA8BD7, Dst_Instance: 0x00000000
23:33:36:  RESTART_CAP         type 1 length 12:
23:33:36:   Restart_Time: 0x0000EA60, Recovery_Time: 0x0000EA60
```

Router 3 records this into its database. Also, both neighbors maintain the neighbor status as UP. However, Router 3's control plane fails at some point (for example, a primary RP failure). As a result, RSVP and TE lose their signaling information and states although data packets continue to be forwarded by the line cards.

When Router 3 declares communication with Router 2 lost, Router 3 starts the restart time to wait for the duration advertised in Router 2's restart time previously recorded (60 seconds). Routers 1 and 2 suppress all RSVP messages to Router 3 except hellos. Router 3 keeps sending the RSVP PATH and RESV refresh messages to Routers 4 and 5 so that they do not expire the state for the LSP; however, Routers 1 and 3 suppress these messages for Router 2.

When Routers 1 and 3 receive the hello message from Router 2, Routers 1 and 3 check the recovery time value in the message. If the recovery time is 0, Router 3 knows that Router 2 was not able to preserve its forwarding information, and Routers 1 and 3 delete all RSVP state that they had with Router 2.

If the recovery time is greater than 0, Router 1 sends Router 2 PATH messages for each LSP that it had previously sent through Router 2. If these messages were previously refreshed in summary messages, they are sent individually during the recovery time. Each of these PATH messages includes a Recovery_Label object containing the label value received from Router 2 before the failure.

When Router 3 receives a PATH message from Router 2, Router 3 sends a RESV message upstream. However, Router 3 suppresses the RESV message until it receives a PATH message. When Router 2 receives the RESV message, it installs the RSVP state and reprograms the forwarding entry for the LSP.

Benefits of MPLS TE and RSVP Graceful Restart

State Information Recovery

RSVP graceful restart allows a node to perform self recovery or to help its neighbor recover state information when there is an RP failure or the device has undergone an SSO.

Session Information Recovery

RSVP graceful restart allows session information recovery with minimal disruption to the network.

Increased Availability of Network Services

A node can perform a graceful restart to help itself or a neighbor recover its state by keeping the label bindings and state information, thereby providing a faster recovery of the failed node and not affecting currently forwarded traffic.

How to Configure NSF/SSO—MPLS TE and RSVP Graceful Restart

This section contains the following procedures:

Enabling RSVP Graceful Restart Globally

Perform this task to enable RSVP graceful restart globally.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **ip rsvp signalling hello graceful-restart mode** {**help-neighbor** | **full**}
4. **exit**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** `Router> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Router# configure terminal`	Enters global configuration mode.
Step 3	**ip rsvp signalling hello graceful-restart mode** (**help-neighbor** | **full**) **Example:** `Router(config)# ip rsvp signalling hello graceful-restart mode full`	Enables RSVP TE graceful restart capability on an RP. • Enter the **help-neighbor** keyword to enable a neighboring router to restart after a failure. • Enter the **full** keyword to enable a router to perform self recovery or to help a neighbor recover after a failure.
Step 4	**exit** **Example:** `Router(config)# exit`	(Optional) Returns to privileged EXEC mode.

Enabling RSVP Graceful Restart on an Interface

Perform this task to enable RSVP graceful restart on an interface.

Note You must repeat this procedure for each of the neighbor router's interfaces.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **interface** *type number*
4. Repeat Step 3 as needed to configure additional interfaces.
5. **ip rsvp signalling hello graceful-restart neighbor** *ip-address*
6. Repeat Step 5 as needed to configure additional IP addresses on a neighbor router's interfaces.
7. **exit**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** `Router> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Router# configure terminal`	Enters global configuration mode.
Step 3	**interface** *type number* **Example:** `Router(config)# interface POS 1/0/0`	Configures the interface type and number and enters interface configuration mode.
Step 4	Repeat Step 3 as needed to configure additional interfaces.	(Optional) Configures additional interfaces.
Step 5	**ip rsvp signalling hello graceful-restart neighbor** *ip-address* **Example:** `Router(config-if)# ip rsvp signalling hello graceful-restart neighbor 10.0.0.0`	Enables support for RSVP graceful restart on routers helping their neighbors recover TE tunnels following SSO. **Note** The IP address must be that of the neighbor's interface.

	Command or Action	Purpose
Step 6	Repeat Step 5 as needed to configure additional IP addresses on a neighbor router's interfaces.	(Optional) Configures additional IP addresses on a neighbor router's interfaces.
Step 7	**exit** **Example:** `Router(config-if)# exit`	(Optional) Returns to privileged EXEC mode.

Setting a DSCP Value

Perform this task to set a differentiated services code point (DSCP) value.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **ip rsvp signalling hello graceful-restart dscp** *num*
4. **exit**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** `Router> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Router# configure terminal`	Enters global configuration mode.
Step 3	**ip rsvp signalling hello graceful-restart dscp** *num* **Example:** `Router(config)# ip rsvp signalling hello graceful-restart dscp 30`	Sets a DSCP value on a router with RSVP graceful restart enabled.
Step 4	**exit** **Example:** `Router(config)# exit`	(Optional) Returns to privileged EXEC mode.

Setting a Value to Control the Hello Refresh Interval

Perform this task to set a value to control the hello refresh interval.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **ip rsvp signalling hello graceful-restart refresh interval** *interval-value*
4. **exit**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** `Router> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Router# configure terminal`	Enters global configuration mode.
Step 3	**ip rsvp signalling hello graceful-restart refresh interval** *interval-value* **Example:** `Router(config)# ip rsvp signalling hello graceful-restart refresh interval 5000`	Sets the value to control the request interval in graceful restart hello messages. This interval represents the frequency at which RSVP hello messages are sent to a neighbor; for example, one hello message is sent per each interval. **Note** If you change the default value for this command and you also changed the RSVP refresh interval using the **ip rsvp signalling refresh interval** command, ensure that the value for the **ip rsvp signalling hello graceful-restart refresh interval** command is less than the value for the **ip rsvp signalling hello refresh interval** command. Otherwise, some or all of the label-switched paths (LSPs) may not be recovered after an SSO has occurred.
Step 4	**exit** **Example:** `Router(config)# exit`	(Optional) Returns to privileged EXEC mode.

Setting a Value to Control the Missed Refresh Limit

Perform this task to set a value to control the missed refresh limit.

SUMMARY STEPS

1. **enable**
2. **configure terminal**

3. **ip rsvp signalling hello graceful-restart refresh misses** *msg-count*
4. **exit**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** `Router> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Router# configure terminal`	Enters global configuration mode.
Step 3	**ip rsvp signalling hello graceful-restart refresh misses** *msg-count* **Example:** `Router(config)# ip rsvp signalling hello graceful-restart refresh misses 5`	Specifies how many sequential RSVP TE graceful restart hello acknowledgments (ACKs) a node can miss before the node considers communication with its neighbor lost. **Note** If you change the default value for this command and you are also using the **ip rsvp signalling hello refresh misses** command, ensure that the value for the **ip rsvp signalling hello graceful-restart refresh misses** command is less than the value for the **ip rsvp signalling hello refresh misses** command. Otherwise, some or all of the LSPs may not be recovered after an SSO has occurred.
Step 4	**exit** **Example:** `Router(config)# exit`	(Optional) Returns to privileged EXEC mode.

Verifying the RSVP Graceful Restart Configuration

Perform this task to verify the RSVP graceful restart configuration.

SUMMARY STEPS

1. **enable**
2. **show ip rsvp hello graceful-restart**
3. **exit**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** `Router> enable`	(Optional) Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**show ip rsvp hello graceful-restart** **Example:** `Router# show ip rsvp hello graceful-restart`	Displays information about the status of RSVP graceful restart and related parameters.
Step 3	**exit** **Example:** `Router# exit`	(Optional) Returns to user EXEC mode.

Configuration Examples for NSF/SSO—MPLS TE and RSVP Graceful Restart

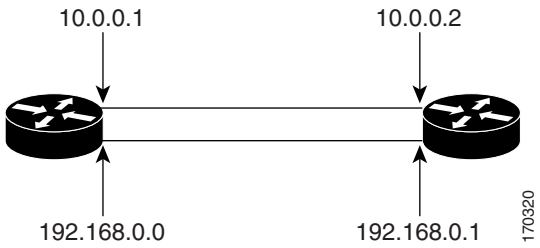
This section provides the following configuration examples:

- Configuring NSF/SSO—MPLS TE and RSVP Graceful Restart: Example, page 10
- Verifying the NSF/SSO—MPLS TE and RSVP Graceful Restart Configuration: Example, page 11

Configuring NSF/SSO—MPLS TE and RSVP Graceful Restart: Example

In the following example, RSVP graceful restart is enabled globally and on a neighbor router's interfaces as shown in Figure 2. Related parameters, including a DSCP value, a refresh interval, and a missed refresh limit are set.

Figure 2 Sample Network Configuration




```
enable
configure terminal
ip rsvp signalling hello graceful-restart mode full
interface POS 1/0/0
 ip rsvp signalling hello graceful-restart neighbor 10.0.0.1
 ip rsvp signalling hello graceful-restart neighbor 10.0.0.2
 exit
```

```
ip rsvp signalling hello graceful-restart dscp 30
ip rsvp signalling hello graceful-restart refresh interval 50000
ip rsvp signalling hello graceful-restart refresh misses 5
exit
```

Verifying the NSF/SSO—MPLS TE and RSVP Graceful Restart Configuration: Example

The following example verifies the status of RSVP graceful restart and the configured parameters:

```
Router# show ip rsvp hello graceful-restart

Graceful Restart: Enabled (full mode)
  Refresh interval: 10000 msecs
  Refresh misses: 4
  DSCP:0x30
  Advertised restart time: 30000 msecs
  Advertised recovery time: 120000 msecs
  Maximum wait for recovery: 3600000 msecs
```

Additional References

The following sections provide references related to the NSF/SSO—MPLS TE and RSVP Graceful Restart feature.

Related Documents

Related Topic	Document Title
RSVP commands: complete command syntax, command mode, defaults, usage guidelines, and examples	*Cisco IOS Quality of Service Solutions Command Reference*, Release 12.2SX
Quality of service (QoS) features including signaling, classification, and congestion management	*Cisco IOS Quality of Service Solutions Configuration Guide,* Release 12.4
Stateful switchover	*Stateful Switchover* feature module
Cisco nonstop forwarding	*Cisco Nonstop Forwarding* feature module
Information on stateful switchover, Cisco nonstop forwarding, graceful restart	*NSF/SSO - MPLS LDP and LDP Graceful Restart* feature module
Hello messages for state timeout	*MPLS Traffic Engineering—RSVP Hello State Timer* feature module

Standards

Standards	Title
No new or modified standards are supported by this feature, and support for existing standards has not been modified by this feature.	—

MIBs

MIBs	MIBs Link
No new or modified MIBS are supported by this feature, and support for existing MIBs has not been modified by this feature.	To locate and download MIBs for selected platforms, Cisco IOS releases, and feature sets, use Cisco MIB Locator found at the following URL: http://www.cisco.com/go/mibs

RFCs

RFCs	Title
RFC 3209	*RSVP-TE: Extensions to RSVP for LSP Tunnels*
RFC 3473	*Generalized Multi-Protocol Label Switching (GMPLS) Signaling Resource Reservation Protocol-Traffic Engineering (RSVP-TE) Extensions*
RFC 4558	*Node-ID Based Resource Reservation Protocol (RSVP) Hello: A Clarification Statement*

Technical Assistance

Description	Link
The Cisco Support website provides extensive online resources, including documentation and tools for troubleshooting and resolving technical issues with Cisco products and technologies. To receive security and technical information about your products, you can subscribe to various services, such as the Product Alert Tool (accessed from Field Notices), the Cisco Technical Services Newsletter, and Really Simple Syndication (RSS) Feeds. Access to most tools on the Cisco Support website requires a Cisco.com user ID and password.	http://www.cisco.com/techsupport

Command Reference

This section documents only commands that are new or modified.

- clear ip rsvp high-availability counters
- debug ip rsvp high-availability
- debug ip rsvp sso
- debug mpls traffic-eng ha sso
- ip rsvp signalling hello graceful-restart dscp
- ip rsvp signalling hello graceful-restart mode
- ip rsvp signalling hello graceful-restart mode help-neighbor
- ip rsvp signalling hello graceful-restart neighbor
- ip rsvp signalling hello graceful-restart refresh interval
- ip rsvp signalling hello graceful-restart refresh misses
- show ip rsvp counters
- show ip rsvp counters state teardown
- show ip rsvp hello
- show ip rsvp hello client lsp detail
- show ip rsvp hello client lsp summary
- show ip rsvp hello client neighbor detail
- show ip rsvp hello client neighbor summary
- show ip rsvp hello graceful-restart
- show ip rsvp hello instance detail
- show ip rsvp hello instance summary
- show ip rsvp high-availability counters
- show ip rsvp high-availability database
- show ip rsvp high-availability summary

clear ip rsvp high-availability counters

To clear (set to zero) the Resource Reservation Protocol (RSVP) traffic engineering (TE) high availability (HA) counters that are being maintained by a Route Processor (RP), use the **clear ip rsvp high-availability counters** command in privileged EXEC mode.

clear ip rsvp high-availability counters

Syntax Description

This command has no arguments or keywords.

Command Default

No counters are cleared until you issue the command.

Command Modes

Privileged EXEC

Command History

Release	Modification
12.2(33)SRA	This command was introduced.
12.2(33)SRB	Support for In-Service Software Upgrade (ISSU) was added.
12.2(33)SXH	This command was integrated into Cisco IOS Release 12.2(33)SXH.

Usage Guidelines

Use the **clear ip rsvp high-availability counters** command to clear (set to zero) the HA counters, which include state, ISSU, resource failures, and historical information.

Examples

The following example clears all the HA information currently being maintained by the RP:

```
Router# clear ip rsvp high-availability counters
```

Related Commands

Command	Description
show ip rsvp high-availability counters	Displays the RSVP-TE HA counters that are being maintained by an RP.

debug ip rsvp high-availability

To display debugging output for Resource Reservation Protocol traffic engineering (RSVP-TE) high availability (HA) activities that improve the accessibility of network resources, use the **debug ip rsvp high-availability** command in privileged EXEC mode. To disable debugging output, use the **no** form of this command.

debug ip rsvp high-availability {**all** | **database** | **errors** | **events** | **fsm** | **issu** | **messages**}

no debug ip rsvp high-availability {**all** | **database** | **errors** | **events** | **fsm** | **issu** | **messages**}

Syntax Description

all	Displays debugging output for all RSVP-TE HA categories except for the dumping of messages.
database	Displays information about read and write operations to and from the checkpointed database during the RSVP-TE HA activities.
errors	Displays errors encountered by RSVP-TE during HA activities.
events	Displays significant RSVP-TE stateful switchover (SSO) events during RSVP-TE HA activities, such as: • RSVP-TE process events • RSVP-TE Route Processor (RP) state (active, standby, and recovery) changes • Recovery period beginning and end • Redundant Facility (RF) events handled by RSVP-TE
fsm	Displays significant events for the RSVP-TE checkpointed database finite state machine (fsm) during the RSVP-TE HA activities.
issu	Displays information about RSVP-TE In-Service Software Upgrade (ISSU) activity.
messages	Displays information about Checkpointing Facility (CF) messages sent by RSVP-TE between the active RP and the standby RP.

Command Default

Debugging is not enabled.

Command Modes

Privileged EXEC

Command History

Release	Modification
12.2(33)SRA	This command was introduced.
12.2(33)SRB	Support for ISSU was added.
12.2(33)SXH	This command was integrated into Cisco IOS Release 12.2(33)SXH.

Usage Guidelines

This command displays information about RSVP-TE activities, before and after SSO, that improve the availability of network resources and services.

Examples

The following example is sample output from the **debug ip rsvp high-availability all** command, which turns on debugging for IP RSVP-TE HA events, messages, database, errors, fsm, and ISSU:

```
Router# debug ip rsvp high-availability all

RSVP HA all debugging is on

Router# show debug        <---- This command displays the debugging that is enabled.

IP RSVP HA debugging is on for:
   events
   messages
   database
   errors
   fsm
   issu
```

This sample debugging output is displayed as an SSO recovery begins on the standby router in the process of the standby router becoming active.

Note The prefix in the debug output is composed of label switched path (LSP) 5-tuples in the following format: 10.0.0.3_61->10.0.0.9_10[10.0.0.3]. The 10.0.0.3 represents the source address, the 61 represents the LSP ID, the 10.0.0.9 represents the tunnel destination (tunnel tail), the10 represents the tunnel ID, and the [10.0.0.3] represents the extended tunnel ID.

```
*May 12 19:46:14.267: RSVP-HA: session
65.39.97.4_18698[0.0.0.0]:rsvp_ha_read_lsp_head_info: Read LSP Head info: tun_id: 10
*May 12 19:46:14.267: RSVP-HA: session 10.0.0.1_10[0.0.0.0]: rsvp_ha_db_entry_find:
lsp_head entry found
*May 12 19:46:14.267: rsvp_ha_read_lsp_head_info: entry found
*May 12 19:46:14.267: RSVP-HA:rsvp_ha_read_lsp_head_info: Read LSP Head info: tun_id: 10
*May 12 19:46:14.267: RSVP-HA: session 10.221.123.48_10[0.0.0.0]: rsvp_ha_db_entry_find:
lsp_head entry found
*May 12 19:46:14.267: rsvp_ha_read_lsp_head_info: entry found
*May 12 19:46:15.995: %SYS-5-CONFIG_I: Configured from console by console
*May 12 19:46:20.803: RSVP-HA: 10.0.0.3_61->10.0.0.9_10[10.0.0.3]: rsvp_ha_db_entry_find:
lsp entry found
*May 12 19:46:20.803: rsvp_ha_read_generic_info: lsp entry found
*May 12 19:46:20.807: RSVP-HA: session 10.0.0.9_10[0.0.0.0]:rsvp_ha_write_generic_info:
Writing lsp_head info
*May 12 19:46:20.807: RSVP-HA: session 10.0.0.9_10[0.0.0.0]: rsvp_ha_db_entry_find:
lsp_head entry not found
*May 12 19:46:20.807: RSVP-HA: session 10.0.0.9_10[0.0.0.0]:
rsvp_ha_handle_wr_entry_not_found:
entry not found, type =lsp_head, action: Add
*May 12 19:46:20.807: RSVP-HA: session 10.0.0.9_10[0.0.0.0]: rsvp_ha_db_entry_create:
Created lsp_head entry
*May 12 19:46:20.807: RSVP-HA: session 10.0.0.9_10[0.0.0.0]:rsvp_ha_set_entry_state: None
-> Send-Pending
*May 12 19:46:20.807: RSVP-HA: session 10.0.0.9_10[0.0.0.0]: rsvp_ha_db_wavl_entry_insert:
Inserted entry into lsp_head Write DB, Send_Pending tree
*May 12 19:46:20.807: RSVP-HA: session
10.0.0.9_10[0.0.0.0]:rsvp_ha_fsm_wr_event_add_entry: add lsp_head entry to Write DB
*May 12 19:46:20.807: RSVP-HA: 10.0.0.3_61->10.0.0.9_10[10.0.0.3]:
rsvp_ha_write_generic_info: Writing lsp info
*May 12 19:46:20.807: RSVP-HA: 10.0.0.3_61->10.0.0.9_10[10.0.0.3]: rsvp_ha_db_entry_find:
lsp entry not found
*May 12 19:46:20.807: RSVP-HA: 10.0.0.3_61->10.0.0.9_10[10.0.0.3]:
rsvp_ha_handle_wr_entry_not_found: entry not found, type =lsp, action: Add
```

```
*May 12 19:46:20.807: RSVP-HA: 10.0.0.3_61->10.0.0.9_10[10.0.0.3]:
rsvp_ha_db_entry_create: Created lsp entry
*May 12 19:46:20.807: RSVP-HA:10.0.0.3_61->10.0.0.9_10[10.0.0.3]:
rsvp_ha_set_entry_state: None -> Send-Pending
*May 12 19:46:20.807: RSVP-HA: 10.0.0.3_61->10.0.0.9_10[10.0.0.3]:
rsvp_ha_db_wavl_entry_insert: Inserted entry into lsp Write DB, Send_Pending tree
*May 12 19:46:20.807: RSVP-HA: 10.0.0.3_61->10.0.0.9_10[10.0.0.3]:
rsvp_ha_fsm_wr_event_add_entry: add lsp entry to Write DB
*May 12 19:46:20.807: rsvp_ha_rd_remove_lsp_head_info: Event RD: remove lsp_head_info
*May 12 19:46:20.807: RSVP-HA: session 10.27.90.140_10[0.0.0.0]:
rsvp_ha_db_entry_find: lsp_head entry found
*May 12 19:46:20.807: RSVP-HA: session 10.0.0.9_10[0.0.0.0]: rsvp_ha_db_wavl_entry_remove:
Removed entry from lsp_head Read DB, Checkpointed tree
*May 12 19:46:20.807: RSVP-HA: session 10.0.0.9_10[0.0.0.0]: rsvp_ha_db_entry_free:
Freeing lsp_head entry
*May 12 19:46:20.807: RSVP-HA: session 10.0.0.9_10[0.0.0.0]:rsvp_ha_set_entry_state:
Checkpointed -> None
.
.
.
```

The following example shows how to turn debugging off for this command:

```
Router# no debug ip rsvp high-availability all

RSVP HA all debugging is off
```

Related Commands

Command	Description
debug ip rsvp sso	Displays debugging output for RSVP signalling when the graceful restart feature is configured.
debug mpls traffic-eng ha sso	Displays debugging output for MPLS traffic engineering HA activities during the graceful switchover from an active RP to a redundant standby RP.

debug ip rsvp sso

To display debugging output for Resource Reservation Protocol (RSVP) signaling when the graceful restart feature is configured, use the **debug ip rsvp sso** command in privileged EXEC mode. To disable debugging, use the **no** form of this command.

debug ip rsvp sso

no debug ip rsvp sso

Syntax Description

This command has no arguments or keywords.

Command Default

Debugging is disabled.

Command Modes

Privileged EXEC

Command History

Release	Modification
12.2(33)SRA	This command was introduced.
12.2(33)SXH	This command was integrated into Cisco IOS Release 12.2(33)SXH.

Usage Guidelines

This command displays debugging output from RSVP signaling during and after the Route Processor (RP) stateful switchover when system control and routing protocol execution is transferred from the active RP to the redundant standby RP. The SSO process occurs when the active router becomes unavailable, so that no interruption of network services occurs. The command displays information about the activities that RSVP performs when you configure a graceful restart, such as:

- Writing checkpointing information into the write database when a new traffic engineering (TE) label switched path (LSP) is signaled on the active RP
- Recovering the LSP checkpointed information from the read database after SSO
- Displaying information about LSPs not recovered

Examples

The following is sample output from the **debug ip rsvp sso** command that was displayed during a successful SSO on the standby router as it became active:

```
Router# debug ip rsvp sso

RSVP sso debugging is on

Router#
```

Note The prefix in the debug output is composed of LSP 5-tuples in the following format: 10.0.0.3_61->10.0.0.9_10[10.0.0.3]. The 10.0.0.3 represents the source address, the 61 represents the LSP ID, the 10.0.0.9 represents the tunnel destination (tunnel tail), the10 represents the tunnel ID, and the [10.0.0.3] represents the extended tunnel ID.

```
*May 12 20:12:38.175: RSVP-HA: begin recovery, send msg to RSVP
*May 12 20:12:38.175: RSVP: 10.0.0.3_61->10.0.0.9_10[10.0.0.3]: event: new Path received
during RSVP or IGP recovery period
*May 12 20:12:38.175: RSVP: 10.0.0.3_61->10.0.0.9_10[10.0.0.3]:
rsvp_ha_sb_event_new_path_received: lsp_info found, attempt to recover lsp
*May 12 20:12:38.175: RSVP: 10.0.0.3_61->10.0.0.9_10[10.0.0.3]: set psb_is_recovering flag
*May 12 20:12:38.179: RSVP: 10.0.0.3_61->10.0.0.9_10[10.0.0.3]:rsvp_ha_sb_set_path_info:
Recovering: Set next_hop and next_idb in psb
*May 12 20:12:38.179: RSVP:
10.0.0.3_61->10.0.0.9_10[10.0.0.3]:rsvp_ha_mark_lsp_if_recoverable: LSP is recoverable
(ERO expansion. not needed)
*May 12 20:12:38.179: RSVP-HA: rsvp_ha_sb_handle_recovery_start: Recovery period start:
set GR recovery time.
*May 12 20:12:38.179: RSVP_HA: checkpoint hello_globals_info
*May 12 20:12:38.179: RSVP-HELLO: rsvp_ha_update_all_gr_hi: Updating all GR HIs with new
src_instance
*May 12 20:12:38.183: RSVP: 10.0.0.3_61->10.0.0.9_10[10.0.0.3]: prevent populating output;
LSP is recovering
*May 12 20:12:38.187: RSVP: 10.0.0.3_61->10.0.0.9_10[10.0.0.3]: prevent populating output;
LSP is recovering
*May 12 20:12:38.939: RSVP: 10.0.0.3_61->10.0.0.9_10[10.0.0.3]:
rsvp_ha_sb_event_new_resv_received: event: Resv for LSP received during recovery period
*May 12 20:12:38.943: RSVP: 10.0.0.3_61->10.0.0.9_10[10.0.0.3]:
rsvp_ha_event_lsp_create_head: psb found
*May 12 20:12:38.943: RSVP: 10.0.0.3_61->10.0.0.9_10[10.0.0.3]:
rsvp_ha_event_lsp_create_head: event: LSP created at head-end, try to checkpoint it
*May 12 20:12:38.943: RSVP: 10.0.0.3_61->10.0.0.9_10[10.0.0.3]: LSP was checkpointed
*May 12 20:12:38.943: RSVP-HA: 10.0.0.3_61->10.0.0.9_10[10.0.0.3]:
rsvp_ha_sb_event_lsp_head_recovered: event: LSP head was recovered
*May 12 20:12:38.943: RSVP-HA: recovery period over, send msg to RSVP
*May 12 20:12:38.947: RSVP-HA: rsvp_ha_sb_handle_recovery_end: Deleting state for LSPs not
recovered
Router#
```

The following example shows how to turn debugging off for this command:

```
Router# no debug ip rsvp sso

RSVP sso debugging is off
```

Related Commands

Command	Description
debug ip rsvp high-availability	Displays debugging output for RSVP-TE HA activities that improve the accessibility of network resources.
debug mpls traffic-eng ha sso	Displays debugging output for MPLS traffic engineering HA activities during the graceful switchover from an active RP to a redundant standby RP.

debug mpls traffic-eng ha sso

To display debugging output for Multiprotocol Label Switching (MPLS) traffic engineering high availability (HA) activities during the graceful switchover from an active Route Processor (RP) to a redundant standby RP, use the **debug mpls traffic-eng ha sso** command in privileged EXEC mode. To disable debugging output, use the **no** form of this command.

debug mpls traffic-eng ha sso {**auto-tunnel** | **errors** | **link-management** {**events** | **standby** | **recovery** | **checkpoint**} | **tunnel** {**events** | **standby** | **recovery**}}

no debug mpls traffic-eng ha sso {**auto-tunnel** | **errors** | **link-management** {**events** | **standby** | **recovery** | **checkpoint**} | **tunnel** {**events** | **standby** | **recovery**}}

Syntax Description

auto-tunnel	Displays information about autotunnel activity during the MPLS traffic engineering stateful switchover (SSO) process.
errors	Displays errors encountered during the MPLS traffic engineering SSO process.
link-management	Displays information about link management activity during the MPLS traffic engineering SSO process.
events	Displays significant events that occur during the MPLS traffic engineering SSO process.
standby	Displays information about the standby behavior during the MPLS traffic engineering SSO process.
recovery	Displays information about recovery activity during the MPLS traffic engineering SSO process.
checkpoint	Display information about checkpointing activities during the MPLS traffic engineering SSO process. Checkpointing occurs when a message is sent and acknowledged.
tunnel	Displays information about tunnel activity during the MPLS traffic engineering SSO process.

Command Default

Debugging is disabled until you issue this command with one or more keywords.

Command Modes

Privileged EXEC

Command History

Release	Modification
12.2(33)SRA	This command was introduced.
12.2(33)SXH	This command was integrated into Cisco IOS Release 12.2(33)SXH.

Usage Guidelines

This command displays debugging output about the SSO process for MPLS traffic engineering tunnels, autotunnels, and link management systems. The SSO process occurs when the active router becomes unavailable and system control and routing protocol execution is transferred from the now inactive RP to the redundant standby RP, thus providing uninterrupted network services.

Examples

The following is sample output from the **debug mpls traffic-eng ha sso** command when you enabled debugging keywords to monitor the SSO process for tunnels and link management systems as the standby router becomes active:

```
Router# debug mpls traffic-eng ha sso link-management events

MPLS traffic-eng SSO link management events debugging is on

Router# debug mpls traffic-eng ha sso link-management recovery

MPLS traffic-eng SSO link management recovery debugging is on

Router# debug mpls traffic-eng ha sso link-management standby

MPLS traffic-eng SSO link management standby behavior debugging is on

Router# debug mpls traffic-eng ha sso link-management checkpoint

MPLS traffic-eng SSO link management checkpointed info debugging is on

Router# debug mpls traffic-eng ha sso tunnel standby

MPLS traffic-eng SSO tunnel standby behavior debugging is on

Router# debug mpls traffic-eng ha sso tunnel recovery

MPLS traffic-eng SSO tunnel head recovery debugging is on

Router# debug mpls traffic-eng ha sso tunnel events

MPLS traffic-eng SSO events for tunnel heads debugging is on

Router# debug mpls traffic-eng ha sso errors

MPLS traffic-eng SSO errors debugging is on

Router# show debug      <-----This command displays the debugging that is enabled.

MPLS TE:
  MPLS traffic-eng SSO link management events debugging is on
  MPLS traffic-eng SSO link management recovery debugging is on
  MPLS traffic-eng SSO link management standby behavior debugging is on
  MPLS traffic-eng SSO link management checkpointed info debugging is on
  MPLS traffic-eng SSO tunnel standby behavior debugging is on
  MPLS traffic-eng SSO tunnel head recovery debugging is on
  MPLS traffic-eng SSO events for tunnel heads debugging is on
  MPLS traffic-eng SSO errors debugging is on
Router#

Standby-Router#
```

Following is the sample debugging output displayed during a successful SSO recovery on the standby router as it becomes active:

```
*May 12 20:03:15.303: RRR_HA_STATE: Told to wait for IGP convergence
```

```
*May 12 20:03:14.807: %FABRIC-SP-STDBY-5-FABRIC_MODULE_ACTIVE: The Switch Fabric Module in
slot 5 became active.
*May 12 20:03:15.763: RRR_HA_REC: Attempting to recover last flooded info; protocol: OSPF,
area: 0
*May 12 20:03:15.763: RRR_HA_REC: recovered ospf area 0 instance 0x48FFF240
*May 12 20:03:15.763: RRR_HA_REC: recovered system info
*May 12 20:03:15.763: RRR_HA_REC: recovered link[0] info
*May 12 20:03:15.763: RRR_HA: Recovered last flooded info for igp: OSPF, area: 0
*May 12 20:03:15.763: Pre announce tunnel 10
*May 12 20:03:15.763: TSPVIF_HA_EVENT: added Router_t10 to dest list
*May 12 20:03:15.763: TSPVIF_HA_EVENT: Completed announcement of 1 tunnel heads to IGP
*May 12 20:03:15.763: TSPVIF_HA_REC: Attempting to recover Tunnel10 after SSO
*May 12 20:03:15.763: LSP-TUNNEL-REOPT: Tunnel10 [61] set to recover
*May 12 20:03:15.763: TSPVIF_HA_REC: Recovered number hops = 5
*May 12 20:03:15.763: TSPVIF_HA_REC: recovered ospf area 0 instance 0x48FFF240
*May 12 20:03:15.763: TSPVIF_HA_REC: Recovered Hop 0: 10.0.3.1, Id: 10.0.0.3 Router Node
(ospf) flag:0x0
*May 12 20:03:15.763: TSPVIF_HA_REC: Recovered Hop 1: 10.0.3.2, Id: 10.0.0.7 Router Node
(ospf) flag:0x0
*May 12 20:03:15.763: TSPVIF_HA_REC: Recovered Hop 2: 10.0.6.1, Id: 10.0.0.7 Router Node
(ospf) flag:0x0
*May 12 20:03:15.763: TSPVIF_HA_REC: Recovered Hop 3: 10.0.6.2, Id: 10.0.0.9 Router Node
(ospf) flag:0x0
*May 12 20:03:15.763: TSPVIF_HA_REC: Recovered Hop 4: 10.0.0.9, Id: 10.0.0.9 Router Node
(ospf) flag:0x0
*May 12 20:03:15.763: TSPVIF_HA_REC: signalling recovered setup for Tunnel10: popt 1
[61], weight 2
*May 12 20:03:15.891: TSPVIF_HA_REC: recovered Tu10 forwarding info needed by query
*May 12 20:03:15.891: TSPVIF_HA_REC:     output_idb: GigabitEthernet3/2, output_nhop:
180.0.3.2
Standby-Router#
Router#
*May 12 20:03:25.891: TSPVIF_HA_REC: recovered Tu10 forwarding info needed by query
*May 12 20:03:25.891: TSPVIF_HA_REC:     output_idb: GigabitEthernet3/2, output_nhop:
10.0.3.2
*May 12 20:03:35.891: TSPVIF_HA_REC: recovered Tu10 forwarding info needed by query
*May 12 20:03:35.891: TSPVIF_HA_REC:     output_idb: GigabitEthernet3/2, output_nhop:
10.0.3.2
*May 12 20:03:35.895: RRR_HA_STATE: IGP flood prevented during IGP recovery
*May 12 20:03:38.079: LSP-TUNNEL-REOPT: Tunnel10 [61] received RESV for recovered setup
*May 12 20:03:38.079: LSP-TUNNEL-REOPT: Tunnel10 [61] removed as recovery
*May 12 20:03:38.079: TSPVIF_HA_EVENT: notifying RSVP HA to add lsp_info using key
10.0.0.3->10.0.0.9 Tu10 [61] 10.0.0.3
*May 12 20:03:38.079: TSPVIF_HA_EVENT: updated 7600-1_t10 state; action = add; result =
success
*May 12 20:03:38.079: TSPVIF_HA_EVENT: 7600-1_t10 fully recovered; rewrite refreshed
*May 12 20:03:38.079: TSPVIF_HA_EVENT: notifying CBTS bundle about Router_t10
*May 12 20:03:38.079: TSPVIF_HA_EVENT: notifying RSVP HA to remove lsp_info using key
10.0.0.3->10.0.0.9 Tu10 [61] 10.0.0.3
*May 12 20:03:38.079: RRR_HA: Received notification recovery has ended.  Notify IGP to
flood.
*May 12 20:03:38.079: TSPVIF_HA_EVENT: Received notification recovery has ended
*May 12 20:03:38.079: TSPVIF_HA_STANDBY: prevent verifying setups; IGP has not converged
*May 12 20:03:38.083: TSPVIF_HA_STANDBY: preventing new setups; reason: IGP recovering
*May 12 20:03:38.083: TSPVIF_HA_STANDBY: prevent verifying setups; IGP has not converged
*May 12 20:03:38.083: TSPVIF_HA_STANDBY: preventing new setups; reason: IGP recovering
*May 12 20:03:38.083: RRR_HA_STATE: IGP flood prevented during IGP recovery
7600-1#
*May 12 20:03:47.723: RRR_HA: Received notification that RIB table 0 has converged.
*May 12 20:03:47.723: RRR_HA: Received notification all RIBs have converged.  Notify IGP
to flood.
*May 12 20:03:47.723: RRR_HA_STATE: Told not to wait for IGP convergence
*May 12 20:03:47.723: RRR_HA_INFO: update flooded system info; action = add; result =
success
```

```
*May 12 20:03:47.723: LM System key::
*May 12 20:03:47.723:   Flooding Protocol: ospf
*May 12 20:03:47.723:   IGP Area ID: 0
*May 12 20:03:47.723: LM Flood Data::
*May 12 20:03:47.723:   LSA Valid flags: 0x0  Node LSA flag: 0x0
*May 12 20:03:47.723:   IGP System ID: 10.0.0.3  MPLS TE Router ID: 10.0.0.3
*May 12 20:03:47.723:   Flooded links: 1  TLV length: 0 (bytes)
*May 12 20:03:47.723:   Fragment id: 0
*May 12 20:03:47.723: rrr_ha_lm_get_link_info_size: link size: 212 bytes; num TLVs: 0
*May 12 20:03:47.723: rrr_ha_sizeof_lm_link_info: link size: 212 bytes; num TLVs: 0
*May 12 20:03:47.723: RRR_HA_INFO: update flooded link[0] info; action = add;
result = success
*May 12 20:03:47.723: RRR HA Checkpoint Info Buffer::
*May 12 20:03:47.723:   Info Handle:          0x490BB1C8
*May 12 20:03:47.723:   Max Size:             212
*May 12 20:03:47.723:   Info Size:            212
*May 12 20:03:47.723:   Info Write Pointer:   0x490BB29C
*May 12 20:03:47.723: LM Link key::
*May 12 20:03:47.723:   Flooding Protocol: ospf  IGP Area ID: 0  Link ID: 0
(GigabitEthernet3/2)
*May 12 20:03:47.723:     Ifnumber: 5  Link Valid Flags: 0x193B
*May 12 20:03:47.723      Link Subnet Type: Broadcast
*May 12 20:03:47.723:     Local Intfc ID: 0  Neighbor Intf ID: 0
*May 12 20:03:47.723:     Link IP Address: 10.0.3.1
*May 12 20:03:47.723:     Neighbor IGP System ID: 10.0.3.2  Neighbor IP Address: 10.0.0.0
*May 12 20:03:47.723:     IGP Metric: 1  TE Metric: 1
*May 12 20:03:47.723:     Physical Bandwidth: 1000000 kbits/sec
*May 12 20:03:47.723:     Res. Global BW: 3000 kbits/sec
*May 12 20:03:47.723:     Res. Sub BW: 0 kbits/sec
*May 12 20:03:47.723:     Upstream::
Router#
*May 12 20:03:47.723:                                 Global Pool   Sub Pool
*May 12 20:03:47.723:                                 -----------   ----------
*May 12 20:03:47.723:     Reservable Bandwidth[0]:           0            0 kbits/sec
*May 12 20:03:47.723:     Reservable Bandwidth[1]:           0            0 kbits/sec
*May 12 20:03:47.723:     Reservable Bandwidth[2]:           0            0 kbits/sec
*May 12 20:03:47.723:     Reservable Bandwidth[3]:           0            0 kbits/sec
*May 12 20:03:47.723:     Reservable Bandwidth[4]:           0            0 kbits/sec
*May 12 20:03:47.723:     Reservable Bandwidth[5]:           0            0 kbits/sec
*May 12 20:03:47.723:     Reservable Bandwidth[6]:           0            0 kbits/sec
*May 12 20:03:47.723:     Reservable Bandwidth[7]:           0            0 kbits/sec
*May 12 20:03:47.723:     Downstream::
*May 12 20:03:47.723:                                 Global Pool   Sub Pool
*May 12 20:03:47.723:                                 -----------   ----------
*May 12 20:03:47.723:     Reservable Bandwidth[0]:        3000            0 kbits/sec
*May 12 20:03:47.723:     Reservable Bandwidth[1]:        3000            0 kbits/sec
*May 12 20:03:47.723:     Reservable Bandwidth[2]:        3000            0 kbits/sec
*May 12 20:03:47.723:     Reservable Bandwidth[3]:        3000            0 kbits/sec
*May 12 20:03:47.727:     Reservable Bandwidth[4]:        3000            0 kbits/sec
*May 12 20:03:47.727:     Reservable Bandwidth[5]:        3000            0 kbits/sec
*May 12 20:03:47.727:     Reservable Bandwidth[6]:        3000            0 kbits/sec
*May 12 20:03:47.727:     Reservable Bandwidth[7]:        2900            0 kbits/sec
*May 12 20:03:47.727:     Affinity Bits: 0x0
*May 12 20:03:47.727:     Protection Type: Capability 0,  Working Priority 0
*May 12 20:03:47.727:     Number of TLVs: 0
*May 12 20:03:47.727: RRR_HA: Updated flood state for ospf area 0 with 1 links); result =
success
Router#
```

The following example shows how to turn off debugging:

```
Router# no debug mpls traffic-eng ha sso link-management events

MPLS traffic-eng SSO link management events debugging is off
```

```
Router# no debug mpls traffic-eng ha sso link-management recovery

MPLS traffic-eng SSO link management recovery debugging is off

Router# no debug mpls traffic-eng ha sso link-management standby

MPLS traffic-eng SSO link management standby behavior debugging is off

Router# no debug mpls traffic-eng ha sso link-management checkpoint

MPLS traffic-eng SSO link management checkpointed info debugging is off

Router# no debug mpls traffic-eng ha sso tunnel standby

MPLS traffic-eng SSO tunnel standby behavior debugging is off

Router# no debug mpls traffic-eng ha sso tunnel recovery

MPLS traffic-eng SSO tunnel head recovery debugging is off

Router# no debug mpls traffic-eng ha sso tunnel events

MPLS traffic-eng SSO events for tunnel heads debugging is off

Router# no debug mpls traffic-eng ha errors

MPLS traffic-eng SSO errors debugging is off
```

Related Commands

Command	Description
debug ip rsvp high-availability	Displays debugging output for RSVP HA activities that improve the accessibility of network resources.
debug ip rsvp sso	Displays debugging output for RSVP activities during the graceful switchover from an active RP to a redundant RP.

ip rsvp signalling hello graceful-restart dscp

To set the differentiated services code point (DSCP) value that is in the IP header of a Resource Reservation Protocol (RSVP) traffic engineering (TE) graceful restart hello message, use the **ip rsvp signalling hello graceful-restart dscp** command in global configuration mode. To set the DSCP to its default value, use the **no** form of this command.

ip rsvp signalling hello graceful-restart dscp *num*

no ip rsvp signalling hello graceful-restart dscp

Syntax Description

num	DSCP value. Valid values are from 0 to 63.

Defaults

The default DSCP value is 48.

Command Modes

Global configuration

Command History

Release	Modification
12.0(29)S	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2(33)SXH	This command was integrated into Cisco IOS Release 12.2(33)SXH.

Usage Guidelines

If a link is congested, set the DSCP to a value higher than 0 to reduce the likelihood that hello messages get dropped.

The DSCP applies to the RSVP hellos created on a specific router. You can configure each router independently for the DSCP.

Examples

In the following example, hello messages have a DSCP value of 30:

```
Router(config)# ip rsvp signalling hello graceful-restart dscp 30
```

Related Commands

Command	Description
ip rsvp signalling hello graceful-restart refresh interval	Sets the hello request interval in graceful restart hello messages.
ip rsvp signalling hello graceful-restart refresh misses	Sets the missed refresh limit in graceful restart hello messages.

ip rsvp signalling hello graceful-restart mode

To enable Resource Reservation Protocol (RSVP) traffic engineering (TE) graceful restart support capability on a Route Processor (RP), use the **ip rsvp signalling hello graceful-restart mode** command in global configuration mode. To disable graceful restart capability, use the **no** form of this command.

ip rsvp signalling hello graceful-restart mode {**help-neighbor** | **full**}

no ip rsvp signalling hello graceful-restart mode

Syntax Description

help-neighbor	Enables support for a neighboring router to restart after a failure.
full	Enables support for a router to perform self recovery or help a neighbor restart after a failure.

Command Default

Graceful restart is disabled until you issue this command.

Command Modes

Global configuration

Command History

Release	Modification
12.0(29)S	This command was introduced as **ip rsvp signalling hello graceful-restart mode help-neighbor**.
12.2(33)SRA	The **full** keyword was added.
12.2(33)SXH	This command was integrated into Cisco IOS Release 12.2(33)SXH.

Usage Guidelines

Use the **ip rsvp signalling hello graceful-restart mode help-neighbor** command to enable support capability for a neighboring router to restart after a failure.

Use the **ip rsvp signalling hello graceful-restart mode full** command to enable support capability for a router to begin self recovery or help its neighbor to restart on platforms that support stateful switchover (SSO), such as Cisco 7600 series routers, provided that you have installed and configured a standby RP.

Examples

In the following example, an RP is configured with support capability to perform self recovery after a failure:

```
Router(config)# ip rsvp signalling hello graceful-restart mode full
```

Related Commands

Command	Description
ip rsvp signalling hello graceful-restart dscp	Sets the DSCP value in the IP header of a RSVP TE graceful restart hello message.

ip rsvp signalling hello graceful-restart neighbor	Enables RSVP-TE graceful restart support capability on a neighboring router.
ip rsvp signalling hello graceful-restart refresh interval	Sets the value to control the request interval in graceful restart hello messages.
ip rsvp signalling hello graceful-restart refresh misses	Sets the value to control the missed refresh limit in graceful restart hello messages.
show ip rsvp hello graceful-restart	Displays information about RSVP-TE graceful restart hello messages.

ip rsvp signalling hello graceful-restart mode help-neighbor

Note Effective with Cisco IOS Release 12.2(33)SRA, the **ip rsvp signalling hello graceful-restart mode help-neighbor** command is replaced by the **ip rsvp signalling hello graceful-restart mode** command. See the **ip rsvp signalling hello graceful-restart mode** command for more information.

To enable Resource Reservation Protocol (RSVP) traffic engineering (TE) graceful restart capability on a neighboring router, use the **ip rsvp signalling hello graceful-restart mode help-neighbor** command in global configuration mode. To disable graceful restart capability, use the **no** form of this command.

ip rsvp signalling hello graceful-restart mode help-neighbor

no ip rsvp signalling hello graceful-restart mode help-neighbor

Syntax Description

This command has no arguments or keywords.

Command Default

Graceful restart is disabled.

Command Modes

Global configuration

Command History

Release	Modification
12.0(29)S	This command was introduced.
12.2(33)SRA	This command was replaced by the **ip rsvp signalling hello graceful-restart mode** command.
12.2(33)SXH	This command was integrated into Cisco IOS Release 12.2(33)SXH.

Usage Guidelines

Use the **ip rsvp signalling hello graceful-restart mode help-neighbor** command to restart a neighboring router.

Examples

In the following example, graceful restart is enabled:

```
Router(config)# ip rsvp signalling hello graceful-restart mode help-neighbor
```

Related Commands

Command	Description
ip rsvp signalling hello graceful-restart dscp	Sets the DSCP value in the IP header of a RSVP TE graceful restart hello message.

ip rsvp signalling hello graceful-restart refresh interval	Sets the value to control the request interval in graceful restart hello messages.
ip rsvp signalling hello graceful-restart refresh misses	Sets the value to control the missed refresh limit in graceful restart hello messages.

ip rsvp signalling hello graceful-restart neighbor

To enable Resource Reservation Protocol (RSVP) traffic engineering (TE) graceful restart support capability on a neighboring router, use the **ip rsvp signalling hello graceful-restart neighbor** command in interface configuration mode. To disable graceful restart capability, use the **no** form of this command.

ip rsvp signalling hello graceful-restart neighbor *ip-address*

no ip rsvp signalling hello graceful-restart neighbor *ip-address*

Syntax Description

ip-address	The IP address of a neighbor on a given interface.

Command Default

No neighboring routers have support for restart capability enabled until you issue this command.

Command Modes

Interface configuration

Command History

Release	Modification
12.2(33)SRA	This command was introduced.
12.2(33)SXH	This command was integrated into Cisco IOS Release 12.2(33)SXH.

Usage Guidelines

Use the **ip rsvp signalling hello graceful-restart neighbor** command to enable support for graceful restart on routers helping their neighbors recover TE tunnels following stateful switchover (SSO).

Note You must issue this command on every interface of the neighboring router that you want to help restart.

Examples

The following example configures graceful restart on POS interface 1/0/0 of a neighboring router with the IP address 10.0.0.1:

```
Router# configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)# interface POS1/0/0
Router(config-if)# ip rsvp signalling hello graceful-restart neighbor 10.0.0.1
```

Related Commands

Command	Description
ip rsvp signalling hello graceful-restart mode	Enables RSVP-TE graceful restart support capability on an RP.
show ip rsvp hello graceful-restart	Displays information about RSVP-TE graceful restart hello messages.

ip rsvp signalling hello graceful-restart refresh interval

To configure the Resource Reservation Protocol (RSVP) traffic engineering (TE) refresh interval in graceful restart hello messages, use the **ip rsvp signalling hello grateful-restart refresh interval** command in global configuration mode. To set the interval to its default value, use the **no** form of this command.

ip rsvp signalling hello graceful-restart refresh interval *interval-value*

no ip rsvp signalling hello graceful-restart refresh interval

Syntax Description

interval-value	Frequency, in milliseconds (ms), at which a node sends hello messages to a neighbor. Valid values are from 1000 to 30000.

Defaults

10000 milliseconds (10 seconds)

Command Modes

Global configuration

Command History

Release	Modification
12.0(29)S	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2(33)SXH	This command was integrated into Cisco IOS Release 12.2(33)SXH.

Usage Guidelines

A node periodically generates a hello message containing a Hello Request object for all its neighbors. The frequency of those hello messages is determined by the hello interval.

Note If you change the default value for this command and you are also using the **ip rsvp signalling refresh interval** command, ensure that the value for the **ip rsvp signalling hello graceful-restart refresh interval** command is less than the value for the **ip rsvp signalling refresh interval** command. Otherwise, some or all of the label-switched paths (LSPs) may not be recovered after a stateful switchover (SSO) has occurred. We recommend that the value for the **ip rsvp signalling refresh interval** command be twice the value for the **ip rsvp signalling hello graceful-restart refresh interval** command**.**

Examples

In the following example, hello requests are sent to a neighbor every 5000 ms:

```
Router(config)# ip rsvp signalling hello graceful-restart refresh interval 5000
```

Related Commands

Command	Description
ip rsvp signalling hello graceful-restart dscp	Sets the DSCP value in the IP header of a RSVP TE graceful restart hello message.
ip rsvp signalling hello graceful-restart refresh misses	Sets the missed refresh limit in graceful restart hello messages.
ip rsvp signalling refresh interval	Specifies the interval between sending refresh messages for each RSVP state.

ip rsvp signalling hello graceful-restart refresh misses

To specify how many sequential Resource Reservation Protocol (RSVP) traffic engineering (TE) graceful restart hello acknowledgments (ACKs) a node can miss before the node considers communication with its neighbor lost, use the **ip rsvp signalling hello graceful-restart refresh misses** command in global configuration mode. To return the missed refresh limit to its default value, use the **no** form of this command.

ip rsvp signalling hello graceful-restart refresh misses *msg-count*

no ip rsvp signalling hello graceful-restart refresh misses

Syntax Description

msg-count	The number of sequential hello acknowledgments (ACKs) that a node can miss before RSVP considers the state expired and tears it down. Valid values are from 4 to 10.

Defaults

The default for the *msg-count* argument is 4.

Command Modes

Global configuration

Command History

Release	Modification
12.0(29)S	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2(33)SXH	This command was integrated into Cisco IOS Release 12.2(33)SXH

Usage Guidelines

A hello message comprises a hello message, a Hello Request object, and a Hello ACK object. Each request is answered by an acknowledgment. If a link is congested or a router has a heavy load, set this number to a value higher than the default value to ensure that hello does not falsely declare that a neighbor is down.

Note If you change the default value for this command and you are also using the **ip rsvp signalling hello refresh misses** command, ensure that the value for the **ip rsvp signalling hello graceful-restart refresh misses** command is less than the value for the **ip rsvp signalling hello refresh misses** command. Otherwise, some or all of the label-switched paths (LSPs) may not be recovered after a stateful switchover (SSO) has occurred. We recommend that the value for the **ip rsvp signalling refresh misses** command be twice the value for the **ip rsvp signalling hello graceful-restart refresh misses** command**.**

Examples

In the following example, if the node does not receive five sequential hello acknowledgments, the node declares that its neighbor is down:

```
Router(config)# ip rsvp signalling hello graceful-restart refresh misses 5
```

Related Commands

Command	Description
ip rsvp signalling hello graceful-restart dscp	Sets the DSCP value in graceful restart hello messages.
ip rsvp signalling hello graceful-restart refresh interval	Sets the refresh interval in graceful restart hello messages.
ip rsvp signalling refresh misses	Specifies the number of successive refresh messages that can be missed before RSVP removes a state from the database.

show ip rsvp counters

To display the number of Resource Reservation Protocol (RSVP) messages that were sent and received on each interface, use the **show ip rsvp counters** command in user EXEC or privileged EXEC mode.

show ip rsvp counters [**authentication**] [**interface** *type number* | **summary** | **neighbor**]

Syntax Description

authentication	(Optional) Displays a list of RSVP authentication counters.
interface *type number*	(Optional) Number of RSVP messages sent and received for the specified interface name.
summary	(Optional) Displays the cumulative number of RSVP messages sent and received by the router over all interfaces.
neighbor	(Optional) Displays the number of RSVP messages sent and received by the specified neighbor.

Defaults

If you enter the **show ip rsvp counters** command without a keyword, the command displays the number of RSVP messages that were sent and received for each interface on which RSVP is configured.

Command Modes

User EXEC
Privileged EXEC

Command History

Release	Modification
12.0(14)ST	This command was introduced.
12.2(13)T	The **neighbor** keyword was added, and the command was integrated into Cisco IOS Release 12.2(13)T.
12.2(15)T	The output was modified to show the errors counter incrementing whenever an RSVP message is received on an interface with RSVP authentication enabled, but the authentication checks failed on that message.
12.2(11)S	This command was integrated into Cisco IOS Release 12.2(11)S.
12.0(22)S	This command was integrated into Cisco IOS Release 12.0(22)S.
12.0(29)S	The **authentication** keyword was added and the command output was modified to include hello and message queues information.
12.2(28)SB	This command was integrated into Cisco IOS Release 12.2(28)SB.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2(33)SXH	This command was integrated into Cisco IOS Release 12.2(33)SXH.

Examples

The following example shows the values for the number of RSVP messages of each type that were sent and received by the router over all interfaces, including the hello and message queues information:

```
Router# show ip rsvp counters summary

All Interfaces          Recv      Xmit                        Recv      Xmit
    Path                  110        15    Resv                    50        28
```

```
    PathError                0          0    ResvError                0          0
    PathTear                 0          0    ResvTear                 0          0
    ResvConf                 0          0    RTearConf                0          0
    Ack                      0          0    Srefresh                 0          0
    Hello                 5555       5554    IntegrityChalle          0          0
    IntegrityRespon          0          0    DSBM_WILLING             0          0
    I_AM_DSBM                0          0
    Unknown                  0          0    Errors                   0          0

Recv Msg Queues                 Current       Max
    RSVP                              0         2
    Hello (per-I/F)                   0         1
    Awaiting Authentication           0         0
```

Table 1 describes the significant fields shown in the display.

Table 1 show ip rsvp counters summary Field Descriptions

Field	Description
All Interfaces	Types of messages displayed for all interfaces. **Note** Hello is a summary of graceful restart, reroute (hello state timer), and Fast Reroute messages.
Recv	Number of messages received on the specified interface or on all interfaces.
Xmit	Number of messages transmitted from the specified interface or from all interfaces.
Recv Msg Queues	Queues for received messages for RSVP, hello per interface, and awaiting authentication. Current = number of messages queued. Max = maximum number of messages ever queued.

Related Commands

Command	Description
clear ip rsvp counters	Clears (sets to zero) all IP RSVP counters that are being maintained.

show ip rsvp counters state teardown

To display counters for Resource Reservation Protocol (RSVP) events that caused a state to be torn down, use the **show ip rsvp counters state teardown** command in user EXEC or privileged EXEC mode.

show ip rsvp counters state teardown

Syntax Description

This command has no arguments or keywords.

Command Modes

User EXEC
Privileged EXEC

Command History

Release	Modification
12.0(29)S	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2(33)SXH	This command was integrated into Cisco IOS Release 12.2(33)SXH.

Usage Guidelines

Use the **show ip rsvp counters state teardown** command when a label-switched path (LSP) is down. If graceful restart triggered the state teardown, the numbers in the Path, Resv-In, and Resv-Out columns in the example below are greater than 0.

Examples

The following is sample output from the **show ip rsvp counters state teardown** command:

```
Router# show ip rsvp counters state teardown

States
  Reason for Teardown                          State torn down
                                                 Path    Resv-In   Resv-Out
  PathTear arrival                                  0          0          0
  ResvTear arrival                                  0          0          0
  Local application requested tear                  0          0          0
  Output or Input I/F went down                     0          0          0
  Missed refreshes                                  0          0          0
  Preemption                                        0          0          0
  Backup tunnel failed for FRR Active LSP           0          0          0
  Reroutabilty changed for FRR Active LSP           0          0          0
  Hello RR Client (HST) requested tear              0          0          0
  Graceful Restart (GR) requested tear              0          0          0
  Downstream neighbor SSO-restarting                0          0          0
  Resource unavailable                              0          0          0
  Policy rejection                                  0          0          0
  Policy server sync failed                         0          0          0
  Traffic control error                             0          0          0
  Error in received message                         0          0          0
  Non RSVP HOP upstream, TE LSP                     0          0          0
  Other                                             0          0          0
```

Table 2 describes the significant fields shown in the display.

Table 2 show ip rsvp counters state teardown Field Descriptions

Field	Description
States	RSVP state, including path state block (PSB) and reservation state block (RSB) information.
Reason for Teardown	Event triggering the teardown.

Related Commands

Command	Description
clear ip rsvp counters	Clears (sets to zero) all IP RSVP counters that are being maintained.

show ip rsvp hello

To display hello status and statistics for Fast Reroute, reroute (hello state timer), and graceful restart, use the **show ip rsvp hello** command in user EXEC or privileged EXEC mode.

show ip rsvp hello

Syntax Description

This command has no arguments or keywords.

Command Modes

User EXEC
Privileged EXEC

Command History

Release	Modification
12.0(22)S	This command was introduced.
12.0(29)S	The command output was modified to include graceful restart, reroute (hello state timer), and Fast Reroute information.
12.2(18)SXD1	This command was integrated into Cisco IOS Release 12.2(18)SXD1.
12.2(33)SRA	The command output was modified to show whether graceful restart is configured and full mode was added.
12.2(31)SB2	This command was integrated into Cisco IOS Release 12.2(31)SB2.

Examples

The following is sample output from the **show ip rsvp hello** command:

```
Router# show ip rsvp hello

Hello:
    Fast-Reroute/Reroute: Enabled
        Statistics: Disabled
    GracefulRestart: Enabled, mode: full
```

Table 3 describes the significant fields shown in the display. The fields describe the processes for which hello is enabled or disabled.

Table 3 show ip rsvp hello Field Descriptions

Field	Description
Fast-Reroute/Reroute	Status of fast reroute/reroute. Values are as follows: • Enabled—Fast reroute and reroute (hello for state timer) are activated (enabled). • Disabled—Fast reroute and reroute (hello for state timer) are not activated (disabled).
Statistics	Status of hello statistics. Valid values are as follows: • Enabled—Statistics are configured. Hello packets are time-stamped when they arrive in the hello input queue for the purpose of recording the time required until they are processed. • Disabled—Hello statistics are not configured. • Shutdown—Hello statistics are configured but not operational. The input queue is too long (that is, more than 10,000 packets are queued).
GracefulRestart	Restart capability: • Enabled—Restart capability is activated for a router (full mode) or its neighbor (help-neighbor). • Disabled—Restart capability is not activated.

Related Commands

Command	Description
ip rsvp signalling hello (configuration)	Enables hello globally on the router.
ip rsvp signalling hello statistics	Enables hello statistics on the router.
show ip rsvp hello statistics	Displays how long hello packets have been in the hello input queue.

show ip rsvp hello client lsp detail

To display detailed information about Resource Reservation Protocol (RSVP) traffic engineering (TE) client hellos for label-switched paths (LSPs), use the **show ip rsvp hello client lsp detail** command in user EXEC or privileged EXEC mode.

show ip rsvp hello client lsp detail

Syntax Description

This command has no arguments or keywords.

Command Modes

User EXEC
Privileged EXEC

Command History

Release	Modification
12.0(29)S	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2(33)SXH	This command was integrated into Cisco IOS Release 12.2(33)SXH.

Usage Guidelines

Use the **show ip rsvp hello client lsp detail** command to display information about the LSPs, including IP addresses and their types.

Examples

The following is sample output from the **show ip rsvp hello client lsp detail** command:

```
Router# show ip rsvp hello client lsp detail

Hello Client LSPs (all lsp tree)

  Tun Dest: 10.0.1.1  Tun ID: 14  Ext Tun ID: 172.16.1.1
  Tun Sender: 172.16.1.1  LSP ID: 31
    Lsp flags: 0x32
    Lsp GR DN nbr: 192.168.1.1
    Lsp RR DN nbr: 10.0.0.3 HST
```

Table 4 describes the significant fields shown in the display.

Table 4 show ip rsvp hello client lsp detail Field Descriptions

Field	Description
Hello Client LSPs	Current clients include graceful restart (GR), reroute (RR) (hello state timer), and fast reroute (FRR).
Tun Dest	IP address of the destination tunnel.
Tun ID	Identification number of the tunnel.
Ext Tun ID	Extended identification number of the tunnel. Usually, this is the same as the source address.

Table 4 show ip rsvp hello client lsp detail Field Descriptions (continued)

Field	Description
Tun Sender	IP address of the tunnel sender.
LSP ID	Identification number of the LSP.
Lsp flags	LSP database information.
Lsp GR DN nbr	IP address of the LSP graceful restart downstream neighbor.
Lsp RR DN nbr	IP address LSP reroute downstream neighbor; HST = hello state timer.

Related Commands

Command	Description
show ip rsvp hello	Displays hello status and statistics for fast reroute, reroute (hello state timer), and graceful restart.

show ip rsvp hello client lsp summary

To display summary information about Resource Reservation Protocol (RSVP) traffic engineering (TE) client hellos for label-switched paths (LSPs), use the **show ip rsvp hello client lsp summary** command in user EXEC or privileged EXEC mode.

show ip rsvp hello client lsp summary

Syntax Description

This command has no arguments or keywords.

Command Modes

User EXEC
Privileged EXEC

Command History

Release	Modification
12.0(29)S	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2(33)SXH	This command was integrated into Cisco IOS Release 12.2(33)SXH.

Usage Guidelines

Use the **show ip rsvp hello client lsp summary** command to display information about LSPs, including IP addresses and identification numbers.

Examples

The following is sample output from the **show ip rsvp hello client lsp summary** command:

```
Router# show ip rsvp hello client lsp summary

Local           Remote          tun_id  lsp_id  FLAGS
10.1.1.1        172.16.1.1        14      31      0x32
```

Table 5 describes the significant fields shown in the display.

Table 5 show ip rsvp hello client lsp summary Field Descriptions

Field	Description
Local	IP address of the tunnel sender.
Remote	IP address of the tunnel destination.
tun_id	Identification number of the tunnel.
lsp_id	Identification number of the LSP.
FLAGS	Database information.

Related Commands

Command	Description
show ip rsvp hello	Displays hello status and statistics for fast reroute, reroute (hello state timer), and graceful restart.

show ip rsvp hello client neighbor detail

To display detailed information about Resource Reservation Protocol (RSVP) traffic engineering (TE) client hellos for neighbors, use the **show ip rsvp hello client neighbor detail** command in user EXEC or privileged EXEC mode.

show ip rsvp hello client neighbor detail

Syntax Description

This command has no arguments or keywords.

Command Modes

User EXEC
Privileged EXEC

Command History

Release	Modification
12.0(29)S	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2(33)SXH	This command was integrated into Cisco IOS Release 12.2(33)SXH.

Usage Guidelines

Use the **show ip rsvp hello client neighbor detail** command to display information about the hello neighbors, including their state and type.

Examples

The following is sample output from the **show ip rsvp hello client neighbor detail** command:

```
Router# show ip rsvp hello client neighbor detail

Hello Client Neighbors

  Remote addr 10.0.0.1,  Local addr  10.0.0.3
    Nbr State: Normal    Type: Reroute
    Nbr Hello State: Up
    LSPs protecting: 1
    I/F: Et1/3

  Remote addr 172.16.1.1,  Local addr  192.168.1.1
    Nbr State: Normal    Type: Graceful Restart
    Nbr Hello State: Lost
    LSPs protecting: 1
```

Table 6 describes the significant fields shown in the display. The fields provide information that uniquely identifies the neighbors. Clients can include graceful restart, reroute (hello state timer), and fast reroute.

Table 6 show ip rsvp hello client neighbor detail Field Descriptions

Field	Description
Remote addr	IP address of the remote neighbor. For graceful restart, this is the neighbor router's ID; for fast reroute and hello state timer (reroute), this is one of the neighbor's interface addresses.
Local addr	IP address of the local neighbor. For graceful restart, this is the neighbor router's ID; for fast reroute and hello state timer (reroute), this is one of the neighbor's interface addresses.
Nbr State	State of the neighbor; values can be the following: • Normal = neighbor is functioning normally. • Restarting = neighbor is restarting. • Recover Nodal = neighbor is recovering from node failure. • HST_GR_LOST = HST (hello state timer for reroute) is lost; waiting to see if graceful restart (GR) is also lost. • WAIT PathTear = PathTear message is delayed to allow traffic in the pipeline to be transmitted.
Type	Type of client; graceful restart, Reroute (hello state timer), or Fast Reroute.
Nbr Hello State	State of hellos for the neighbor. Values are Up (node is communicating with its neighbor) and Lost (communication has been lost or never was established).
LSPs protecting	Number of LSPs being protected.
I/F	Interface name and number associated with the hello instance.

Related Commands

Command	Description
show ip rsvp hello	Displays hello status and statistics for fast reroute, reroute (hello state timer), and graceful restart.

show ip rsvp hello client neighbor summary

To display summary information about Resource Reservation Protocol (RSVP) traffic engineering (TE) client hellos for neighbors, use the **show ip rsvp hello client neighbor summary** command in user EXEC or privileged EXEC mode.

show ip rsvp hello client neighbor summary

Syntax Description

This command has no arguments or keywords.

Command Modes

User EXEC
Privileged EXEC

Command History

Release	Modification
12.0(29)S	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2(33)SXH	This command was integrated into Cisco IOS Release 12.2(33)SXH.

Usage Guidelines

Use the **show ip rsvp hello client neighbor summary** command to display information about the neighbors,including state, type, and hello instance status.

Examples

The following is sample output from the **show ip rsvp hello client neighbor summary** command:

```
Router# show ip rsvp hello client neighbor summary

LocalRemoteTypeNBR_STATEHI_STATELSPs
10.0.0.110.0.0.3RRNormalUp1
172.16.1.1192.168.1.1GRNormalLost1
```

Table 7 describes the significant fields shown in the display.

Table 7 show ip rsvp hello client neighbor summary Field Descriptions

Field	Description
Local	IP address of the tunnel sender.
Remote	IP address of the tunnel destination.
Type	Type of client; graceful restart (GR), reroute (RR (hello state timer)), or fast reroute (FRR).

Table 7 show ip rsvp hello client neighbor summary Field Descriptions (continued)

Field	Description
NBR_STATE	State of the neighbor; values can be the following: • Normal = neighbor is functioning normally. • Restarting = neighbor is restarting. • Recover Nodal = neighbor is recovering from node failure. • HST_GR_LOST = HST (hello state timer for reroute) is lost; waiting to see if graceful restart (GR) is also lost. • WAIT PathTear = PathTear message is delayed to allow traffic in the pipeline to be transmitted.
HI_STATE	State of hello instances for the neighbor. Values are Up (node is communicating with its neighbor) and Lost (communication has been lost or never was established).
LSPs	Number of LSPs going to or coming from the neighbor.

Related Commands

Command	Description
show ip rsvp hello	Displays hello status and statistics for fast reroute, reroute (hello state timer), and graceful restart.

show ip rsvp hello graceful-restart

To display information about Resource Reservation Protocol (RSVP) traffic engineering (TE) graceful restart hellos, use the **show ip rsvp hello graceful-restart** command in user EXEC or privileged EXEC mode.

show ip rsvp hello graceful-restart

Syntax Description

This command has no arguments or keywords.

Command Modes

User EXEC
Privileged EXEC

Command History

Release	Modification
12.0(29)S	This command was introduced.
12.2(33)SRA	The command output was modified to show whether graceful restart is configured and full mode was added.
12.2(33)SXH	This command was integrated into Cisco IOS Release 12.2(33)SXH.

Usage Guidelines

Use the **show ip rsvp hello graceful-restart** command to display the status of graceful restart and related statistics.

Examples

The following is sample output from the **show ip rsvp hello graceful-restart** command:

```
Router# show ip rsvp hello graceful-restart

Graceful Restart: Enabled (full mode)
  Refresh interval: 10000 msecs
  Refresh misses: 4
  DSCP: 0x30
  Advertised restart time: 30000 msecs
  Advertised recovery time: 120000 msecs
  Maximum wait for recovery: 3600000 msecs
```

Table 8 describes the significant fields shown in the display.

Table 8 show ip rsvp hello graceful-restart Field Descriptions

Field	Description
Graceful Restart	Restart capability: • Enabled—Restart capability is activated for a router (full mode) or its neighbor (help-neighbor). • Disabled—Restart capability is not activated.
Refresh interval	Frequency in milliseconds (ms) with which a node sends a hello message to its neighbor.

Table 8 show ip rsvp hello graceful-restart Field Descriptions (continued)

Field	Description
Refresh misses	Number of missed hello messages that trigger a neighbor down event upon which stateful switchover (SSO) procedures are started.
DSCP	The differentiated services code point (DSCP) value in the IP header of the hello messages.
Advertised restart time	The time, in ms, that is required for the sender to restart the RSVP-TE component and exchange hello messages after a failure.
Advertised recovery time	The time, in ms, within which a recovering node wants its neighbor router to resynchronize the RSVP or Multiprotocol Label Switching (MPLS) forwarding state after SSO. **Note** A zero value indicates that the RSVP or MPLS forwarding state is not preserved after SSO.
Maximum wait for recovery	The maximum amount of time, in ms, that the router waits for a neighbor to recover.

Related Commands

Command	Description
clear ip rsvp high-availability counters	Clears (sets to zero) the RSVP-TE HA counters that are being maintained by an RP.
ip rsvp signalling hello graceful-restart mode	Enables RSVP-TE graceful restart support capability on an RP.
ip rsvp signalling hello graceful-restart neighbor	Enables RSVP-TE graceful restart support capability on a neighboring router.
show ip rsvp hello	Displays hello status and statistics for fast reroute, reroute (hello state timer), and graceful restart.

show ip rsvp hello instance detail

To display detailed information about a hello instance, use the **show ip rsvp hello instance detail** command in user EXEC or privileged EXEC mode.

show ip rsvp hello instance detail [**filter destination** *ip-address*]

Syntax Description

filter destination *ip-address*	(Optional) IP address of the neighbor node.

Command Default

Detailed information about a hello instance is not displayed.

Command Modes

User EXEC
Privileged EXEC

Command History

Release	Modification
12.0(22)S	This command was introduced.
12.0(29)S	The command output was modified to include graceful restart, hello state timer (reroute), and fast reroute information.
12.2(18)SXD1	This command was integrated into Cisco IOS Release 12.2(18)SXD1.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2(31)SB2	This command was integrated into Cisco IOS Release 12.2(31)SB2.

Usage Guidelines

Use the **show ip rsvp hello instance detail** command to display information about the processes (clients) currently configured.

Examples

The following is sample output from the **show ip rsvp hello instance detail** command:

```
Router# show ip rsvp hello instance detail

Neighbor 10.0.0.3  Source  10.0.0.2
    Type: Active    (sending requests)
    I/F:  Serial2/0
    State:   Up        (for 2d19h2d19h)
    Clients: ReRoute
    LSPs protecting: 1
    Missed acks: 4, IP DSCP: 0x30
    Refresh Interval (msec)
      Configured: 6000
      Statistics: (from 40722 samples)
        Min:      6000
        Max:      6064
        Average:  6000
        Waverage: 6000 (Weight = 0.8)
        Current:  6000
    Last sent Src_instance: 0xE617C847
    Last recv nbr's Src_instance: 0xFEC28E95
```

```
  Counters:
    Communication with neighbor lost:
      Num times:                    0
      Reasons:
        Missed acks:                0
        Bad Src_Inst received:      0
        Bad Dst_Inst received:      0
        I/F went down:              0
        Neighbor disabled Hello:    0
    Msgs Received:   55590
         Sent:       55854
         Suppressed: 521

Neighbor 10.0.0.8 Source  10.0.0.7
  Type: Passive   (responding to requests)
  I/F:  Serial2/1
  Last sent Src_instance: 0xF7A80A52
  Last recv nbr's Src_instance: 0xD2F1B7F7
  Counters:
    Msgs Received:   199442
         Sent:       199442
```

Table 9 describes the significant fields shown in the display.

Table 9 show ip rsvp hello instance detail Field Descriptions

Field	Description
Neighbor	IP address of the adjacent node.
Source	IP address of the node that is sending the hello message.
Type	Values are Active (node is sending a request) and Passive (node is responding to a request).
I/F	Interface from which hellos are sent for this instance. Any means that the hellos can be sent out any interface.
State	Status of communication. Values are as follows: • Up—Node is communicating with its neighbor. • Lost—Communication has been lost. • Init—Communication is being established.
Clients	Clients that created this hello instance; they include graceful restart, ReRoute (hello state timer), and Fast Reroute.
LSPs protecting	Number of LSPs that are being protected by this hello instance.
Missed acks	Number of times that communication was lost due to missed acknowledgments (ACKs).
IP DSCP	IP differentiated services code point (DSCP) value used in the hello IP header.
Refresh Interval (msec)	The frequency (in milliseconds) with which a node generates a hello message containing a Hello Request object for each neighbor whose status is being tracked.
Configured	Configured refresh interval.
Statistics	Refresh interval statistics from a specified number of samples (packets).

Table 9 show ip rsvp hello instance detail Field Descriptions (continued)

Field	Description
Min	Minimum refresh interval.
Max	Maximum refresh interval.
Average	Average refresh interval.
Waverage	Weighted average refresh interval.
Current	Current refresh interval.
Last sent Src_instance	The last source instance sent to a neighbor.
Last recv nbr's Src_instance	The last source instance field value received from a neighbor. (0 means none received.)
Counters	Incremental information relating to communication with a neighbor.
Num times	Total number of times that communication with a neighbor was lost.
Reasons	Subsequent fields designate why communication with a neighbor was lost.
Missed acks	Number of times that communication was lost due to missed ACKs.
Bad Src_Inst received	Number of times that communication was lost due to bad source instance fields.
Bad Dst_Inst received	Number of times that communication was lost due to bad destination instance fields.
I/F went down	Number of times that the interface became unoperational.
Neighbor disabled Hello	Number of times that a neighbor disabled hello messages.
Msgs Received	Number of messages that were received.
Sent	Number of messages that were sent.
Suppressed	Number of messages that were suppressed due to optimization.

Related Commands

Command	Description
ip rsvp signalling hello (configuration)	Enables hello globally on the router.
ip rsvp signalling hello statistics	Enables hello statistics on the router.
show ip rsvp hello	Displays hello status and statistics for Fast reroute, reroute (hello state timer), and graceful restart.
show ip rsvp hello instance summary	Displays summary information about a hello instance.

show ip rsvp hello instance summary

To display summary information about a hello instance, use the **show ip rsvp hello instance summary** command in user EXEC or privileged EXEC mode.

show ip rsvp hello instance summary

Syntax Description

This command has no arguments or keywords.

Command Modes

User EXEC
Privileged EXEC

Command History

Release	Modification
12.0(22)S	This command was introduced.
12.0(29)S	The command output was modified to include graceful restart, reroute (hello state timer), and fast reroute information.
12.2(18)SXD1	This command was integrated into Cisco IOS Release 12.2(18)SXD1.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2(31)SB2	This command was integrated into Cisco IOS Release 12.2(31)SB2.

Examples

The following is sample output from the **show ip rsvp hello instance summary** command:

```
Router# show ip rsvp hello instance summary

Active Instances:
  Client  Neighbor        I/F        State      LostCnt  LSPs Interval
  RR      10.0.0.3        Se2/0      Up               0     1 6000
  GR      10.1.1.1        Any        Up              13     1 10000
  GR      10.1.1.5        Any        Lost             0     1 10000
  GR      10.2.2.1        Any        Init             1     0 5000

Passive Instances:
  Neighbor        I/F
  10.0.0.1        Se2/1

Active = Actively tracking neighbor state on behalf of clients:
         RR = ReRoute, FRR = Fast ReRoute, or GR = Graceful Restart
Passive = Responding to hello requests from neighbor
```

Table 10 describes the significant fields shown in the display.

Table 10 show ip rsvp hello instance summary Field Descriptions

Field	Description
Active Instances	Subsequent fields describe the active nodes that are sending hello requests.
Client	Client(s) on behalf of which hellos are sent; they include GR (graceful restart), RR (reroute = hello state timer), and FRR (Fast Reroute).
Neighbor	IP address of the adjacent node. For graceful restart, this is the neighbor router's ID; for Fast Reroute and hello state timer (reroute), this is one of the neighbor's interface addresses.
I/F	Interface from which hellos are sent for this instance. Any means that the hellos can be sent out any interface.
State	Status of communication. Values are as follows: • Up—Node is communicating with its neighbor. • Lost—Communication has been lost. • Init—Communication is being established.
LostCnt	Number of times that communication was lost with the neighbor.
LSPs	Number of label-switched paths (LSPs) protected by this hello instance.
Interval	Hello refresh interval in milliseconds.
Passive Instances	Subsequent fields describe the passive nodes that are responding to hello requests.
Neighbor	IP address of adjacent node. For graceful restart, this is the neighbor router's ID; for Fast Reroute and hello state timer (reroute), this is one of the neighbor's interface addresses.
I/F	Interface from which hellos are sent for this instance. Any means that the hellos can be sent out any interface.

Related Commands

Command	Description
ip rsvp signalling hello (configuration)	Enables hello globally on the router.
ip rsvp signalling hello statistics	Enables hello statistics on the router.
show ip rsvp hello	Displays hello status and statistics for fast reroute, reroute (hello state timer), and graceful restart.
show ip rsvp hello instance detail	Displays detailed information about a hello instance.

show ip rsvp high-availability counters

To display all Resource Reservation Protocol (RSVP) traffic engineering (TE) high availability (HA) counters that are being maintained by a Route Processor (RP), use the **show ip rsvp high-availability counters** command in user EXEC or privileged EXEC mode.

show ip rsvp high-availability counters

Syntax Description

This command has no arguments or keywords.

Command Modes

User EXEC
Privileged EXEC

Command History

Release	Modification
12.2(33)SRA	This command was introduced.
12.2(33)SRB	Support for In-Service Software Upgrade (ISSU) was added.
12.2(33)SXH	This command was integrated into Cisco IOS Release 12.2(33)SXH.

Usage Guidelines

Use the **show ip rsvp high-availability counters** command to display the HA counters, which include state, ISSU, checkpoint messages, resource failures, and errors.

The command output differs depending on whether the RP is active or standby. (See the "Examples" section for more information.)

Use the **clear ip rsvp high-availability counters** command to clear all counters.

Examples

The following is sample output from the **show ip rsvp high-availability counters** command on the active RP:

```
Router# show ip rsvp high-availability counters

State: Active

Bulk sync
  initiated: 3

Send timer
  started: 1

Checkpoint Messages (Items) Sent
  Succeeded:      3  (6)
    Acks accepted:3  (6)
    Acks ignored:     (0)
    Nacks:        0  (0)
  Failed:         0  (0)
  Buffer alloc:   3
  Buffer freed:   3

ISSU:
```

```
  Checkpoint Messages Transformed:
    On Send:
      Succeeded:          3
      Failed:             0
      Transformations:    0
    On Recv:
      Succeeded:          0
      Failed:             0
      Transformations:    0

  Negotiation:
    Started:               3
    Finished:              3
    Failed to Start:       0
    Messages:
      Sent:
        Send succeeded:    21
        Send failed:       0
        Buffer allocated:          21
        Buffer freed:              0
        Buffer alloc failed:       0
      Received:
        Succeeded:         15
        Failed:            0
        Buffer freed:      15

  Init:
    Succeeded:             1
    Failed:                0

  Session Registration:
    Succeeded:             2
    Failed:                0

  Session Unregistration:
    Succeeded:             2
    Failed:                0

Errors:
  None
```

Table 11 describes the significant fields shown in the display.

Table 11 show ip rsvp high-availability counters—Active RP Field Descriptions

Field	Description
State	The RP state: • Active—Active RP.
Bulk sync	The number of requests made by the standby RP to the active RP to resend all write database entries: • Initiated—The number of bulk sync operations initiated by the standby RP since reboot.
Send timer	The write database timer.
Checkpoint Messages (Items) Sent	The details of the bundle messages or items sent since booting.

Table 11 show ip rsvp high-availability counters—Active RP Field Descriptions (continued)

Field	Description
Succeeded	The number of bundle messages or items sent from the active RP to the standby RP since booting. Values are the following: • Acks accepted—The number of bundle messages or items sent from the active RP to the standby RP. • Acks ignored—The number of bundle messages or items sent by the active RP, but rejected by the standby RP. • Nacks—The number of bundle messages or items given to the checkpointing facility (CF) on the active RP for transmitting to the standby RP, but failed to transmit.
Failed	The number of bundle messages or items the active RP attempted to send the standby RP when the send timer updated, but received an error back from CF.
Buffer alloc	Storage space allocated.
Buffer freed	Storage space available.
ISSU	In-Service Software Upgrade (ISSU) counters.
Checkpoint Messages Transformed	The details of the bundle messages or items transformed (upgraded or downgraded for compatibility) since booting so that the active RP and the standby RP can interoperate.
On Send	The number of messages sent by the active RP that succeeded, failed, or were transformations.
On Recv	The number of messages received by the active RP that succeeded, failed, or were transformations.
Negotiation	The number of times that the active RP and the standby RP have negotiated their interoperability parameters.
Started	The number of negotiations started.
Finished	The number of negotiations finished.
Failed to Start	The number of negotiations that failed to start.
Messages	The number of negotiation messages sent and received. These messages can be succeeded or failed. • Send succeeded—Number of messages sent successfully. • Send failed—Number of messages sent unsuccessfully. • Buffer allocated—Storage space allowed. • Buffer freed—Storage space available. • Buffer alloc failed—No storage space available.
Init	The number of times the RSVP ISSU client has successfully and unsuccefully (failed) initialized.
Session Registration	The number of session registrations, succeeded and failed, performed by the active RP whenever the standby RP reboots.

Table 11 show ip rsvp high-availability counters—Active RP Field Descriptions (continued)

Field	Description
Session Unregistration	The number of session unregistrations, succeeded and failed, before the standby RP resets.
Errors	The details of errors or caveats.

The following is sample output from the **show ip rsvp high-availability counters** command on the standby RP:

```
Router# show ip rsvp high-availability counters

State: Standby

Checkpoint Messages (Items) Received
  Valid:        1  (2)
  Invalid:      0  (0)
  Buffer freed: 1

ISSU:
  Checkpoint Messages Transformed:
    On Send:
      Succeeded:         0
      Failed:            0
      Transformations:   0
    On Recv:
      Succeeded:         1
      Failed:            0
      Transformations:   0

  Negotiation:
    Started:              1
    Finished:             1
    Failed to Start:      0
    Messages:
      Sent:
        Send succeeded:   5
        Send failed:      0
        Buffer allocated:        5
        Buffer freed:            0
        Buffer alloc failed:     0
      Received:
        Succeeded:        7
        Failed:           0
        Buffer freed:     7

  Init:
    Succeeded:            1
    Failed:               0

  Session Registration:
    Succeeded:            0
    Failed:               0

  Session Unregistration:
    Succeeded:            0
    Failed:               0

Errors:
  None
```

Table 12 describes the significant fields shown in the display.

Table 12 show ip rsvp high-availability counters—Standby RP Field Descriptions

Field	Description
State	The RP state: • Standby—Standby (backup) RP.
Checkpoint Messages (Items) Received	The details of the messages or items received by the standby RP. Values are the following: • Valid—The number of valid messages or items received by the standby RP. • Invalid—The number of invalid messages or items received by the standby RP. • Buffer freed—Amount of storage space available.
ISSU	ISSU counters. **Note** For descriptions of the ISSU fields, see Table 11.
Errors	The details of errors or caveats.

Related Commands

Command	Description
clear ip rsvp high-availability counters	Clears (sets to zero) the RSVP-TE HA counters that are being maintained by an RP.
show ip rsvp high-availability database	Displays the contents of the RSVP-TE HA read and write databases used in TE SSO.
show ip rsvp high-availability summary	Displays summary information for an RSVP-TE HA RP.

show ip rsvp high-availability database

To display the contents of the Resource Reservation Protocol (RSVP) high availability (HA) read and write databases used in traffic engineering (TE), use the **show ip rsvp high-availability database** command in user EXEC or privileged EXEC mode.

show ip rsvp high-availability database {**hello** | **link-management** {**interfaces** | **system**} | **lsp** [**filter destination** *ip-address* | **filter lsp-id** *lsp-id* | **filter source** *ip-address* | **filter tunnel-id** *tunnel-id*] | **lsp-head** [**filter** *number*] | **summary**}

Syntax Description

hello	Displays information about the hello entries in the read and write databases.
link-management	Displays information about the link-management entries in the read and write databases.
interfaces	Displays information about the link-management interfaces in the read and write databases.
system	Displays information about the link-management system in the read and write databases.
lsp	Displays information about the label-switched path (LSP) entries in the read and write databases.
filter destination *ip-address*	(Optional) Displays filtered information on the IP address of the destination (tunnel tail).
filter lsp-id *lsp-id*	(Optional) Displays filtered information on a specific LSP ID designated by a number from 0 to 65535.
filter source *ip-address*	(Optional) Displays filtered information on the IP address of the source (tunnel head).
filter tunnel-id *tunnel-id*	(Optional) Displays filtered information on a specific tunnel ID designated by a number from 0 to 65535.
lsp-head	Displays information about the LSP-headend entries in the read and write databases.
filter *number*	(Optional) Displays filtered information on a specific LSP-head router designated by a number from 0 to 65535.
summary	Displays cumulative information about the entries in the read and write databases.

Command Default

Information displays for the database selected.

Command Modes

User EXEC
Privileged EXEC

Command History

Release	Modification
12.2(33)SRA	This command was introduced.

Release	Modification
12.2(33)SRB	The command output was modified to display the result of a loose hop expansion performed on the router.
12.2(33)SXH	This command was integrated into Cisco IOS Release 12.2(33)SXH.

Usage Guidelines

Use the **show ip rsvp high-availability database** command to display information about the entries in the read and write databases.

Use the **show ip rsvp high-availability database lsp** command to display loose hop information. A loose hop expansion can be performed on a router when the router processes the explicit router object (ERO) for an incoming path message. After the router removes all local IP addresses from the incoming ERO, it finds the next hop. If the ERO specifies that the next hop is loose instead of strict, the router consults the TE topology database and routing to determine the next hop and output interface to forward the path message. The result of the calculation is a list of hops; that list is placed in the outgoing ERO and checkpointed with the LSP data as the loose hop information.

Use the **show ip rsvp high-availability database lsp-head** command on a headend router only. On other routers, this command gives no information.

Examples

Hello Example on Active RP

The following is sample output from the **show ip rsvp high-availability database hello** command on an active Route Processor (RP):

```
Router# show ip rsvp high-availability database hello

HELLO WRITE DB
   Header:
     State: Checkpointed     Action: Add
     Seq #: 1                Flags: 0x0
   Data:
     Last sent Src_instance: 0xDE435865

HELLO READ DB
```

Table 11 describes the significant fields shown in the displays.

Table 13 show ip rsvp high-availability database hello—Active RP Field Descriptions

Field	Description
HELLO WRITE DB	Storage area for active RP hello data consisting of checkpointed RSVP-TE information that is sent to the standby RP when it becomes the active RP and needs to recover LSPs. This field is blank on a standby RP.
Header	Header information.

Table 13 show ip rsvp high-availability database hello—Active RP Field Descriptions (continued)

Field	Description
State	Status of an entry. Values are as follows: • Checkpointed—Entries have been sent and acknowledged by the standby RP. • Send-Pending—Entries are waiting to be sent. • Ack-Pending—Entries have been sent, but not acknowledged.
Action	Action taken. Values are as follows: • Add—Adding an item to the standby RP. • Modify—Modifying an item on the standby RP. • Remove—Removing an item from the standby RP. • Delete—Deleting an item from the standby RP. This action appears temporarily while the active RP awaits an acknowledgment (ack) of the delete operation.
Seq #	Numbers used by the active and standby RPs to synchronize message acks and negative acknowledgments (nacks) to messages sent.
Flags	Attribute used to identify or track data.
Data	Information.
Last sent SRC_instance	Last source instance identifier sent.
HELLO READ DB	Storage area for standby RP hello data. This field is blank on an active RP except when it is in recovery mode.

Hello Example on Standby RP

The following is sample output from the **show ip rsvp high-availability database hello** command on a standby RP:

```
Router# show ip rsvp high-availability database hello

HELLO WRITE DB

HELLO READ DB
   Header:
     State: Checkpointed     Action: Add
     Seq #: 1                Flags: 0x0
   Data:
     Last sent Src_instance: 0xDE435865
```

These fields are the same as those for the active RP described in Table 11 except they are now in the read database for the standby RP.

Link-Management Interfaces Example on an Active RP

The following is sample output from the **show ip rsvp high-availability database link-management interfaces** command on an active RP:

```
Router# show ip rsvp high-availability database link-management interfaces
```

```
TE LINK WRITE DB
Flooding Protocol: ospf  IGP Area ID: 0  Link ID: 0 (GigabitEthernet3/2)
  Header:
    State: Checkpointed     Action: Add
    Seq #: 4                Flags: 0x0
  Data:
        Ifnumber: 5  Link Valid Flags: 0x193B
        Link Subnet Type: Broadcast
        Local Intfc ID: 0  Neighbor Intf ID: 0
        Link IP Address: 172.16.3.1
        Neighbor IGP System ID: 172.16.3.2  Neighbor IP Address: 10.0.0.0
        IGP Metric: 1  TE Metric: 1
        Physical Bandwidth: 1000000 kbits/sec
        Res. Global BW: 3000 kbits/sec
        Res. Sub BW: 0 kbits/sec
        Upstream::
                                 Global Pool   Sub Pool
                                 -----------   ----------
        Reservable Bandwidth[0]:           0            0 kbits/sec
        Reservable Bandwidth[1]:           0            0 kbits/sec
        Reservable Bandwidth[2]:           0            0 kbits/sec
        Reservable Bandwidth[3]:           0            0 kbits/sec
        Reservable Bandwidth[4]:           0            0 kbits/sec
        Reservable Bandwidth[5]:           0            0 kbits/sec
        Reservable Bandwidth[6]:           0            0 kbits/sec
        Reservable Bandwidth[7]:           0            0 kbits/sec
        Downstream::
                                 Global Pool   Sub Pool
                                 -----------   ----------
        Reservable Bandwidth[0]:        3000            0 kbits/sec
        Reservable Bandwidth[1]:        3000            0 kbits/sec
        Reservable Bandwidth[2]:        3000            0 kbits/sec
        Reservable Bandwidth[3]:        3000            0 kbits/sec
        Reservable Bandwidth[4]:        3000            0 kbits/sec
        Reservable Bandwidth[5]:        3000            0 kbits/sec
        Reservable Bandwidth[6]:        3000            0 kbits/sec
        Reservable Bandwidth[7]:        2900            0 kbits/sec
        Affinity Bits: 0x0
        Protection Type: Capability 0,  Working Priority 0
        Number of TLVs: 0
```

Table 14 describes the significant fields shown in the display.

Table 14 show ip rsvp high-availability database link-management interfaces—Active RP Field Descriptions

Field	Description
TE LINK WRITE DB	Storage area for active TE RP link data. This field is blank on a standby RP.
Flooding Protocol	Protocol that is flooding information for this area. ospf = Open Shortest Path First.
IGP area ID	Interior Gateway Protocol (IGP) identifier for the area being flooded.
Link ID	Link identifier and interface for the area being flooded.
Header	Header information.

Table 14 show ip rsvp high-availability database link-management interfaces—Active RP Field Descriptions (continued)

Field	Description
State	Status of an entry. Values are as follows: • Checkpointed—Entries have been sent and acknowledged by the standby RP. • Send-Pending—Entries are waiting to be sent. • Ack-Pending—Entries have been sent, but not acknowledged.
Action	Action taken. Values are as follows: • Add—Adding an item to the standby RP. • Modify—Modifying an item on the standby RP. • Remove—Removing an item from the standby RP. • Delete—Deleting an item from the standby RP. This action appears temporarily while the active RP awaits an ack of the delete operation.
Seq #	Numbers used by the active and standby RPs to synchronize message acks and nacks to messages sent.
Flags	Attribute used to identify or track data.
Data	Information.
Ifnumber	Interface number.
Link Valid Flags	Attributes used to identify or track links.
Link Subnet Type	Subnet type of the link. Values are as follows: • Broadcast—Data for multiple recipients. • Point-to-Point—Unidirectional or bidirectional connection between two end systems. • Point-to-Multipoint—Unidirectional connection in which a single source end system (known as a root node) connects to multiple destination end systems (known as leaves). • Nonbroadcast Multiaccess—A network in which data is transmitted directly from one computer to another over a virtual circuit or across a switching fabric. • Unknown subnet type—Subnet type not identified.
Local Intfc ID	Local interface identifier.
Neighbor Intf ID	Neighbor's interface identifier.
Link IP Address	IP address of the link.
Neighbor IGP System ID	Neighbor system identifier configured using IGP.
Neighbor IP Address	Neighbor's IP address.
IGP Metric	Metric value for the TE link configured using IGP.

Table 14 show ip rsvp high-availability database link-management interfaces—Active RP Field Descriptions (continued)

Field	Description
TE Metric	Metric value for the TE link configured using Multiprotocol Label Switching (MPLS)-TE.
Physical Bandwidth	Link bandwidth capacity (in kilobits per second).
Res. Global BW	Amount of reservable global pool bandwidth (in kilobits per second) on this link.
Res. Sub BW	Amount of reservable subpool bandwidth (in kilobits per second) on this link.
Upstream	Header for the following section of bandwidth values.
Global Pool	Global pool bandwidth (in kilobits per second) on this link.
Sub Pool	Subpool bandwidth (in kilobits per second) on this link.
Reservable Bandwidth [1]	Amount of bandwidth (in kilobits per second) available for reservations in the global TE topology and subpools.
Downstream	Header for the following section of bandwidth values.
Affinity Bits	Link attributes required in tunnels.
Protection Type	LSPs protected by fast reroute (FRR). Capability = LSPs capable of using FRR. Working Priority = LSPs actually using FRR.
Number of TLVs	Number of type, length, values (TLVs).

The fields for a standby RP are the same as those described in Table 14 except they are now in the TE link read database instead of the TE link write database that is used by an active RP.

Link-Management System Example on an Active RP

The following is sample output from the **show ip rsvp high-availability database link-management system** command on an active RP:

```
Router# show ip rsvp high-availability database link-management system

TE SYSTEM WRITE DB
Flooding Protocol: OSPF  IGP Area ID: 0
  Header:
    State: Checkpointed     Action: Modify
    Seq #: 4                Flags: 0x0
  Data:
    LM Flood Data::
      LSA Valid flags: 0x0  Node LSA flag: 0x0
      IGP System ID: 172.16.3.1  MPLS TE Router ID: 10.0.0.3
      Flooded links: 1  TLV length: 0 (bytes)
      Fragment id: 0


TE SYSTEM READ DB
```

Table 15 describes the significant fields shown in the display.

Table 15 show ip rsvp high-availability database link-management system—Active RP Field Descriptions

Field	Description
TE SYSTEM WRITE DB	Storage area for active TE RP system data. This field is blank on a standby RP.
Flooding Protocol	Protocol that is flooding information for this area. OSPF = Open Shortest Path First.
IGP Area ID	IGP identifier for the area being flooded.
Header	Header information.
State	Status of an entry. Values are as follows: • Checkpointed—Entries have been sent and acknowledged by the standby RP. • Send-Pending—Entries are waiting to be sent. • Ack-Pending—Entries have been sent, but not acknowledged.
Action	Action taken. Values are as follows: • Add—Adding an item to the standby RP. • Modify—Modifying an item on the standby RP. • Remove—Removing an item from the standby RP. • Delete—Deleting an item from the standby RP. This action appears temporarily while the active RP awaits an ack of the delete operation.
Seq #	Numbers used by the active and standby RPs to synchronize message acks and nacks to messages sent.
Flags	Attribute used to identify or track data.
Data	Information.
LM Flood Data	Link management (LM) flood data.
LSA Valid flags	Link-state advertisement (LSA) attributes.
Node LSA flag	LSA attributes used by a router.
IGP System ID	Identification (IP address) that IGP flooding uses in this area to identify this node.
MPLS TE Router ID	MPLS TE router identifier (IP address).
Flooded links	Number of flooded links.
TLV length	TLV length in bytes.
Fragment id	Fragment identifier for this link.
TE SYSTEM READ DB	Storage area for standby TE RP system data. This field is blank on a standby RP.

The fields for a standby RP are the same as those described in Table 15 except they are now in the TE system read database instead of the TE system write database that is used by an active RP.

LSP Example on an Active RP

The following is sample output from the **show ip rsvp high-availability database lsp** command on an active RP:

```
Router# show ip rsvp high-availability database lsp

LSP WRITE DB
Tun ID: 10   LSP ID: 8
  Dest:   10.0.0.9
  Sender: 10.0.0.3     Ext. Tun ID: 10.0.0.3
  Header:
    State: Checkpointed     Action: Add
    Seq #: 3                Flags: 0x0
  Data:
    InLabel: -
    Out I/F: Gi3/2
    Next-Hop: 172.0.3.2
    OutLabel: 17

Loose hop info:
  10.0.0.2 13.0.0.2 13.0.0.3 10.1.1.1

LSP READ DB
```

Table 16 describes the significant fields shown in the display.

Table 16 show ip rsvp high-availability database lsp—Active RP Field Descriptions

Field	Description
LSP WRITE DB	Storage area for active RP LSP data. This field is blank on a standby RP.
Tun ID	Tunnel identifier.
LSP ID	LSP identifier.
Dest	Tunnel destination IP address.
Sender	Tunnel sender IP address.
Ext. Tun ID	Extended tunnel identifier; usually set to 0 or the sender's IP address.
Header	Header information.
State	Status of an entry. Values are as follows: • Checkpointed—Entries have been sent and acknowledged by the standby RP. • Send-Pending—Entries are waiting to be sent. • Ack-Pending—Entries have been sent, but not acknowledged.

Table 16 show ip rsvp high-availability database lsp—Active RP Field Descriptions (continued)

Field	Description
Action	Action taken. Values are as follows: • Add—Adding an item to the standby RP. • Modify—Modifying an item on the standby RP. • Remove—Removing an item from the standby RP. • Delete—Deleting an item from the standby RP. This action appears temporarily while the active RP awaits an ack of the delete operation.
Seq #	Numbers used by the active and standby RPs to synchronize message acks and nacks to messages sent.
Flags	Attribute used to identify or track data.
Data	Information.
InLabel	Incoming label identifier.
Out I/F	Outgoing interface.
Next-Hop	Next hop IP address.
OutLabel	Outgoing label identifier.
Loose hop info	Lists the loose hop expansions performed on the router, or specifies None.
LSP READ DB	Storage area for standby RP LSP data. This field is blank on an active RP.

The fields for a standby RP are the same as those described in Table 16 except they are now in the LSP read database instead of the LSP write database that is used by an active RP.

LSP-Head Example on an Active RP

The following is sample output from the **show ip rsvp high-availability database lsp-head** command on an active RP:

```
Router# show ip rsvp high-availability database lsp-head

LSP_HEAD WRITE DB
  Tun ID: 10
  Header:
    State: Checkpointed     Action: Add
    Seq #: 3                Flags: 0x0
  Data:
    lsp_id: 8, bandwidth: 100, thead_flags: 0x1, popt: 1
    output_if_num: 5, output_nhop: 172.16.3.2
    RRR path setup info
      Destination: 10.0.0.9, Id: 10.0.0.9 Router Node (ospf) flag:0x0
      IGP: ospf, IGP area: 0, Number of hops: 5, metric: 2
      Hop 0: 172.16.3.1, Id: 172.16.3.1 Router Node (ospf), flag:0x0
      Hop 1: 172.16.3.2, Id: 10.0.0.7 Router Node (ospf), flag:0x0
      Hop 2: 172.16.6.1, Id: 10.0.0.7 Router Node (ospf), flag:0x0
      Hop 3: 172.16.6.2, Id: 10.0.0.9 Router Node (ospf), flag:0x0
      Hop 4: 10.0.0.9, Id: 10.0.0.9 Router Node (ospf), flag:0x0


LSP_HEAD READ DB
```

Table 17 describes the significant fields shown in the display.

Table 17 show ip rsvp high-availability database lsp-head—Active RP Field Descriptions

Field	Description
LSP_HEAD WRITE DB	Storage area for active RP LSP-head data. This field is blank on a standby RP.
Tun ID	Tunnel identifier.
Header	Header information.
State	Status of an entry. Values are as follows: • Checkpointed—Entries have been sent and acknowledged by the standby RP. • Send-Pending—Entries are waiting to be sent. • Ack-Pending—Entries have been sent, but not acknowledged.
Action	Action taken. Values are as follows: • Add—Adding an item to the standby RP. • Modify—Modifying an item on the standby RP. • Remove—Removing an item from the standby RP. • Delete—Deleting an item from the standby RP. This action appears temporarily while the active RP awaits an ack of the delete operation.
Seq #	Numbers used by the active and standby RPs to synchronize message acks and nacks to messages sent.
Flags	Attribute used to identify or track data.
Data	Information.
lsp_id	LSP identifier.
bandwidth	Bandwidth on the LSP.
thead_flags	Tunnel head attribute used to identify or track data.
popt	Parsing option number.
output_if_num	Output interface number.
output_nhop	Output next hop IP address.
RRR path setup info	Routing with Resource Reservation (RRR) path information.
Destination	Destination IP address.
Id	IP address and protocol of the routing node. Values are the following: • ospf = Open Shortest Path First. • isis = Intermediate System-to-Intermediate System.
flag	Attribute used to track data.
IGP	Interior Gateway Protocol. ospf = Open Shortest Path First.

Table 17 show ip rsvp high-availability database lsp-head—Active RP Field Descriptions

Field	Description
IGP area	IGP area identifier.
Number of hops	Number of connections or routers.
metric	Routing cost.
Hop	Hop's number and IP address.
Id	IP address and protocol of the routing node. Values are the following: • ospf = Open Shortest Path First. • isis = Intermediate System-to-Intermediate System.
flag	Attribute used to track data.
LSP_HEAD READ DB	Storage area for standby RP LSP-head data. This field is blank on an active RP.

The fields for a standby RP are the same as those described in Table 17 except they are now in the LSP_head read database instead of the LSP_head write database that is used by an active RP.

Summary Example on an Active RP

The following is sample output from the **show ip rsvp high-availability database summary** command on an active RP:

```
Router# show ip rsvp high-availability database summary

Write DB:
  Send-Pending:      0
  Ack-Pending :      0
  Checkpointed:     10
  Total       :     10

Read DB:
  Total       :      0
```

Table 18 describes the significant fields shown in the display.

Table 18 show ip rsvp high-availability database summary—Active RP Field Descriptions

Field	Description
Write DB	Storage area for active RP summary data. This field is blank on a standby RP.
Send-Pending	Entries are waiting to be sent.
Ack-Pending	Entries have been sent, but are waiting to be acknowledged.
Checkpointed	Entries have been sent and acknowledged.
Total	Total number of entries in the write DB.
Read DB	Storage area for standby RP summary data. This field is blank on an active RP.
Total	Total number of entries in the read DB.

Summary Example on a Standby RP

The following is sample output from the **show ip rsvp high-availability database summary** command on a standby RP:

```
Router# show ip rsvp high-availability database summary

Write DB:
  Send-Pending:      0
  Ack-Pending :      0
  Checkpointed:      0
  Total       :      0

Read DB:
  Total       :     10
```

Table 19 describes the significant fields shown in the display.

Table 19 show ip rsvp high-availability database summary—Standby RP Field Descriptions

Field	Description
Write DB	Storage area for active RP summary data.
Send-Pending	Entries are waiting to be sent.
Ack-Pending	Entries have been sent, but are waiting to be acknowledged.
Checkpointed	Entries have been sent and acknowledged.
Total	Total number of entries in the write DB.
Read DB	Storage area for standby RP summary data. This field is blank on an active RP.
Total	Total number of entries in the read DB.

Related Commands

Command	Description
show ip rsvp high-availability counters	Displays all RSVP HA counters that are being maintained by an RP.
show ip rsvp high-availability summary	Displays summary information for an RSVP HA RP.

show ip rsvp high-availability summary

To display summary information for a Resource Reservation Protocol (RSVP) traffic engineering (TE) high availability (HA) Route Processor (RP), use the **show ip rsvp high-availability summary** command in user EXEC or privileged EXEC mode.

show ip rsvp high-availability summary

Syntax Description

This command has no arguments or keywords.

Command Modes

User EXEC
Privileged EXEC

Command History

Release	Modification
12.2(33)SRA	This command was introduced.
12.2(33)SXH	This command was integrated into Cisco IOS Release 12.2(33)SXH.

Usage Guidelines

Use the **show ip rsvp high-availability summary** command to display information about the HA parameters currently configured on an RP.

The command output differs depending on whether the RP is active or standby.

Examples

The following is sample output from the **show ip rsvp high-availability summary** command on an active RP:

```
Router# show ip rsvp high-availability summary

State:
    Graceful-Restart: Enabled, mode: full
    HA state: Active
Checkpointing: Allowed
Messages:
    Send timer: not running (Interval: 1000 msec)
    Items sent per Interval: 200
    CF buffer size used: 2000
```

Note On a standby RP, only the first three lines of the output are displayed. On an active RP, all lines are displayed.

Table 20 describes the significant fields shown in the display.

Table 20 show ip rsvp high-availability summary Field Descriptions

Field	Description
State	Status of graceful restart and HA.
Graceful Restart	Restart capability: • Enabled—Restart capability is activated for a router (full mode) or its neighbor (help-neighbor). • Disabled—Restart capability is not activated.
HA state	The RP state, which is the following: • Active—Active RP. • Standby—Standby (backup) RP. • Recovering—The active RP is in recovery period.
Checkpointing	The function that copies state information (write database entries) from the active RP to the standby RP. Values are the following: • Allowed—Functioning normally. • Not Allowed—Checkpointing is not allowed. Reasons may be that the RP is not present or not ready.
Messages	The checkpointed messages that the active RP sends to the standby RP during a specified interval.
Send timer	The write database timer. Values are the following: • running—Entries are in the write database in the send-pending state and checkpointing is allowed. • not running—Checkpointing is not allowed or the write database is empty. **Note** Entries in the write database can be in the following states: • Send-Pending—The entry has not been sent to the standby RP yet. • Ack-Pending—The entry was sent to the standby RP, but no acknowledgment was received from the standby RP yet. • Checkpointed—The checkpointing facility (CF) message has been acknowledged by the standby RP, which notifies the active RP.
Interval	Time, in milliseconds (ms), when the active RP sends messages to the standby RP.

Table 20 show ip rsvp high-availability summary Field Descriptions (continued)

Field	Description
Items sent per Interval	The number of database entries (data that has been taken from the write database and packed into bundle message for transmitting to the standby RP), which the active RP sends to the standby RP each time the write database timer activates.
CF buffer size used	Amount of storage space, in bytes, used by the checkpointing facility.

In some cases, the checkpointing field displays Not Allowed. Here is an excerpt from sample output:

```
Checkpointing: Not Allowed
    Peer RP Present : No
    RF Comm. Up : No
    Flow Control On : No
    CF Comm. Up : No
    RF Ready to Recv: No
```

Note If checkpointing is allowed, the attributes displayed in the sample output do not appear. Refer to the **show ip rsvp high-availability summary** command output on an active RP for more details.

Table 21 describes the significant fields shown in the display.

Table 21 show ip rsvp high-availability summary—Checkpointing Field Descriptions

Field	Description
Peer RP Present : No	The active RP cannot communicate with any peer RP. **Note** This can happen if the standby RP is removed, or if it is temporarily unavailable, such as during a restart.
RF Comm. Up : No	The redundant facility (RF) on the active RP is unable to communicate with the RF on the standby RP.
Flow Control On : No	The active RP cannot send Internet Protocol communications (IPC) messages (using checkpointing) to the standby RP because flow control is off.
CF Comm. Up : No	The TE CF client on the active RP is unable to communicate with the TE CF client on the standby RP.
RF Ready to Recv : No	The RF on the standby RP is not ready to receive checkpoint messages.

The following is sample output from the **show ip rsvp high-availability summary** command after a stateful switchover (SSO) has occurred.

```
Router# show ip rsvp high-availability summary

State:
 Graceful-Restart: Enabled
 HA state: active
Checkpointing: Allowed
Recovery Time (msec)
 Advertised:    120000 msec
```

```
 Last recorded: 75012 msec
Messages:
 Send timer: not running (Interval:1000)
 Items sent per Interval: 200
```

Table 22 describes the significant fields shown in the display

Table 22 show ip rsvp high-availability summary—After an SSO Field Descriptions

Field	Description
Advertised	The advertised recovery time, in milliseconds.
Last recorded	The last recorded recovery time, in milliseconds.

Related Commands

Command	Description
clear ip rsvp high-availability counters	Clears (sets to zero) the RSVP-TE HA counters that are being maintained by an RP.
show ip rsvp high-availability counters	Displays the RSVP-TE HA counters that are being maintained by an RP.
show ip rsvp high-availability database	Displays the contents of the RSVP-TE HA read and write databases used in TE SSO.

Feature Information for NSF/SSO—MPLS TE and RSVP Graceful Restart

Table 23 lists the release history for this feature.

Not all commands may be available in your Cisco IOS software release. For release information about a specific command, see the command reference documentation.

Cisco IOS software images are specific to a Cisco IOS software release, a feature set, and a platform. Use Cisco Feature Navigator to find information about platform support and Cisco IOS software image support. Access Cisco Feature Navigator at http://www.cisco.com/go/cfn. You must have an account on Cisco.com. If you do not have an account or have forgotten your username or password, click **Cancel** at the login dialog box and follow the instructions that appear.

Note Table 23 lists only the Cisco IOS software release that introduced support for a given feature in a given Cisco IOS software release. Unless noted otherwise, subsequent releases of that Cisco IOS software release also support that feature.

Table 23 Feature Information for NSF/SSO—MPLS TE and RSVP Graceful Restart

Feature Name	Releases	Feature Information
NSF/SSO—MPLS TE and RSVP Graceful Restart	12.0(29)S 12.2(33)SRA 12.2(33)SRB 12.2(33)SXH	The NSF/SSO—MPLS TE and RSVP Graceful Restart feature allows an RP or its neighbor to recover from disruption in control plane service without losing its MPLS forwarding state. In 12.0(29)S, this feature was introduced as MPLS Traffic Engineering—RSVP Graceful Restart and allowed a neighboring RP to recover from disruption in control plane service without losing its MPLS forwarding state. In 12.2(33)SRA, this feature was integrated and new commands were added. In 12.2(33)SRB, support was added for ISSU and SSO recovery of LSPs that include loose hops. In 12.2(33)SXH, this feature was integrated.

Glossary

DSCP—differentiated services code point. Six bits in the IP header, as defined by the IETF. These bits determine the class of service provided to the IP packet.

Fast Reroute—A mechanism for protecting MPLS traffic engineering (TE) LSPs from link and node failure by locally repairing the LSPs at the point of failure, allowing data to continue to flow on them while their headend routers attempt to establish end-to-end LSPs to replace them. FRR locally repairs the protected LSPs by rerouting them over backup tunnels that bypass failed links or nodes.

graceful restart—A process for helping an RP restart after a node failure has occurred.

headend—The router that originates and maintains a given LSP. This is the first router in the LSP's path.

hello instance—A mechanism that implements the RSVP hello extensions for a given router interface address and remote IP address. Active hello instances periodically send hello request messages, expecting Hello ACK messages in response. If the expected ACK message is not received, the active hello instance declares that the neighbor (remote IP address) is unreachable (that is, it is lost). This can cause LSPs crossing this neighbor to be fast rerouted.

IGP—Interior Gateway Protocol. Internet protocol used to exchange routing information within an autonomous system. Examples of common Internet IGPs include IGRP, OSPF, and RIP.

ISSU—In Service Software Upgrade. Software upgrade without service interruption.

label—A short, fixed-length data identifier that tells switching nodes how to forward data (packets or cells).

LSP—label-switched path. A configured connection between two routers, in which MPLS is used to carry packets.

MPLS—Multiprotocol Label Switching. A method for forwarding packets (frames) through a network. MPLS enables routers at the edge of a network to apply labels to packets (frames). ATM switches or existing routers in the network core can switch packets according to the labels.

RSVP—Resource Reservation Protocol. A protocol that supports the reservation of resources across an IP network. Applications running on IP end systems can use RSVP to indicate to other nodes the nature (bandwidth, jitter, maximum burst, and so on) of the packet streams they want to receive.

state—Information that a router must maintain about each LSP. The information is used for rerouting tunnels.

tailend—The router upon which an LSP is terminated. This is the last router in the LSP's path.

TE—traffic engineering. The techniques and processes used to cause routed traffic to travel through the network on a path other than the one that would have been chosen if standard routing methods had been used.