



MPLS Traffic Engineering—RSVP Graceful Restart

The Multiprotocol Label Switching (MPLS) Traffic Engineering (TE)—Resource Reservation Protocol (RSVP) Graceful Restart feature allows a neighboring route processor (RP) to recover from disruption in control plane service (specifically, the Label Distribution Protocol (LDP) component) without losing its MPLS forwarding state.

Feature History for MPLS TE—RSVP Graceful Restart

Release	Modification
12.0(29)S	This feature was introduced.

Finding Support Information for Platforms and Cisco IOS Software Images

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/fn>. 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.

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Prerequisites for MPLS TE—RSVP Graceful Restart

- Configure RSVP on routers.
- Enable MPLS.
- Configure TE on routers.
- Enable graceful restart.

Restrictions for MPLS TE—RSVP Graceful Restart

- Graceful restart supports node failure only.
- Graceful restart does not support restart or recovery on Cisco nodes, but helps in recovering a neighbor that is restart capable. Cisco routers advertise a restart time of 5 milliseconds and a recovery time of 0 in hello messages.
- Unnumbered interfaces are not supported.

Information About MPLS TE—RSVP Graceful Restart

To configure MPLS TE—RSVP Graceful Restart, you need to understand the following concepts:

- [Graceful Restart, page 2](#)
- [Benefits, page 4](#)

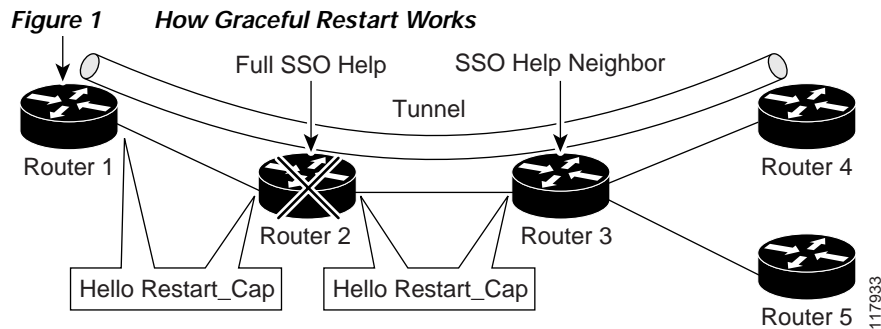
Graceful Restart

Graceful restart allows RSVP TE enabled nodes to start 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 as far as the RSVP state is concerned.

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

Graceful restart depends on RSVP hello messages that include Hello Request or Hello Acknowledgment (ACK) objects between two neighbors.

As shown in [Figure 1](#), the graceful restart extension to these messages adds an object called `Restart_Cap`, which tells neighbors that a node may be capable of restarting if a failure occurs. The TTL in these messages is set to 255 so that adjacencies can be maintained through alternate paths even if the link between two neighbors goes down.



The 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/MPLS databases.

In [Figure 1](#), graceful restart is enabled on Router 1, Router 2, Router 3, and Router 4. For simplicity, assume that all routers are restart capable. A TE label-switched path (LSP) is signaled from Router 1 to Router 4.

Router 2 and Router 3 exchange periodic graceful restart hello messages every 10000 milliseconds (10 seconds), and so do Router 2 and Router 1 and Router 3 and Router 4. Assume that Router 2 advertises its restart time = 60000 milliseconds (60 seconds) and its recovery time = 60000 milliseconds (60 seconds) as shown below:

```
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 Route Processor failure). As a result, RSVP and TE lose their signaling information/states although data packets are kept forwarded by the line cards.

When four ACK messages are missed from Router 2 (40 seconds), Router 3 declares communication with Router 2 lost indicated by LOST and starts the restart time to wait for the duration advertised in Router 2's restart time previously and recorded (60 seconds). Router 1 and Router 2 suppress all RSVP messages to Router 3 except hellos. Router 3 keeps sending the RSVP Path and Resv refresh messages to Router 4 and Router 5 so that they do not expire the state for the LSP; however, Router 3 suppresses these messages for Router 2.



Note

A node is restarting if it misses four ACKs or its hello src_instance (last source instance sent to its neighbor) changes so that its restart time = 0.

Before the restart time expires, Router 2 restarts and loads its configuration and graceful restart makes it send the hello messages with a new source instance to all the datalinks attached. However, since Router 2 has lost the neighbor states, it does not know what destination instance it should use in those messages; therefore, all destination instances are set to 0.

When Router 3 sees the hello from Router 2, Router 3 stops the restart time for Router 2 and sends an ACK message back. When Router 3 sees a new source instance value in Router 2's hello message, Router 3 knows that Router 2 had a control plane failure. Router 2 gets Router 3's source instance value and uses it as the destination instance going forward.

Router 3 also checks the recovery time value in the hello message from Router 2. If the recovery time is 0, Router 3 knows that Router 2 was not able to preserve its forwarding information and Router 3 deletes all RSVP state that it 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.

Benefits

State Information Recovery

Graceful restart allows a node to recover state information from its neighbor when there is a route processor (RP) failure or the device has undergone a stateful switchover (SSO).

Session Information Recovery

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 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 MPLS TE—RSVP Graceful Restart

This section contains the following procedures:

- [Enabling Graceful Restart, page 5](#) (required)
- [Setting a DSCP Value, page 6](#) (optional)
- [Setting a Hello Refresh Interval, page 6](#) (optional)
- [Setting a Missed Refresh Limit, page 7](#) (optional)
- [Verifying Graceful Restart Configuration, page 8](#) (optional)

Enabling Graceful Restart

Perform this task to enable graceful restart.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **ip rsvp signalling hello graceful-restart mode help-neighbor**
4. **end**

DETAILED STEPS

	Command or Action	Purpose
Step 1	<code>enable</code> Example: Router> enable	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	<code>configure terminal</code> Example: Router# configure terminal	Enters global configuration mode.
Step 3	<code>ip rsvp signalling hello graceful-restart mode help-neighbor</code> Example: Router(config)# ip rsvp signalling hello graceful-restart mode help-neighbor	Enables graceful restart on a neighboring router with restart capability.
Step 4	<code>end</code> Example: Router(config)# end	Exits to privileged EXEC mode.

Setting a DSCP Value

Perform this task to set a DSCP value.

SUMMARY STEPS

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

DETAILED STEPS

	Command or Action	Purpose
Step 1	<code>enable</code> Example: Router> enable	Enables privileged EXEC mode. <ul style="list-style-type: none">• Enter your password if prompted.
Step 2	<code>configure terminal</code> Example: Router# configure terminal	Enters global configuration mode.
Step 3	<code>ip rsvp signalling hello graceful-restart dscp <i>num</i></code> Example: Router(config)# ip rsvp signalling hello graceful-restart dscp 30	Sets a DSCP value on a router with graceful restart enabled.
Step 4	<code>end</code> Example: Router(config)# end	Exits to privileged EXEC mode.

Setting a Hello Refresh Interval

Perform this task to set a hello refresh interval.

SUMMARY STEPS

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

DETAILED STEPS

	Command or Action	Purpose
Step 1	<code>enable</code> Example: Router> <code>enable</code>	Enables privileged EXEC mode. <ul style="list-style-type: none">Enter your password if prompted.
Step 2	<code>configure terminal</code> Example: Router# <code>configure terminal</code>	Enters global configuration mode.
Step 3	<code>ip rsvp signalling hello graceful-restart refresh interval interval-value</code> Example: Router(config)# <code>ip rsvp signalling hello graceful-restart refresh interval 5000</code>	Sets a hello refresh interval on a router with graceful restart enabled.
Step 4	<code>end</code> Example: Router(config)# <code>end</code>	Exits to privileged EXEC mode.

Setting a Missed Refresh Limit

Perform this task to set a missed refresh limit.

SUMMARY STEPS

- `enable`
- `configure terminal`
- `ip rsvp signalling hello graceful-restart refresh misses msg-count`
- `end`

DETAILED STEPS

	Command or Action	Purpose
Step 1	<code>enable</code> Example: Router> <code>enable</code>	Enables privileged EXEC mode. <ul style="list-style-type: none">Enter your password if prompted.
Step 2	<code>configure terminal</code> Example: Router# <code>configure terminal</code>	Enters global configuration mode.

	Command or Action	Purpose
Step 3	<pre>ip rsvp signalling hello graceful-restart refresh misses msg-count</pre> <p>Example: Router(config)# ip rsvp signalling hello graceful-restart refresh misses 5</p>	Sets a refresh limit on a router with graceful restart enabled.
Step 4	<pre>end</pre> <p>Example: Router(config)# end</p>	Exits to privileged EXEC mode.

Verifying Graceful Restart Configuration

Perform this task to verify graceful restart configuration.

SUMMARY STEPS

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

DETAILED STEPS

	Command or Action	Purpose
Step 1	<pre>enable</pre> <p>Example: Router> enable</p>	Enables privileged EXEC mode. <ul style="list-style-type: none"> • Enter your password if prompted.
Step 2	<pre>show ip rsvp hello graceful-restart</pre> <p>Example: Router# show ip rsvp hello graceful-restart</p>	Displays information about the status of graceful restart and related parameters.
Step 3	<pre>end</pre> <p>Example: Router# end</p>	Exits to user EXEC mode.

Configuration Examples for MPLS TE—RSVP Graceful Restart

This section provides a configuration example for the MPLS TE—RSVP Graceful Restart feature.

- [MPLS TE—RSVP Graceful Restart: Example, page 9](#)

MPLS TE—RSVP Graceful Restart: Example

In the following example, graceful restart is enabled, and related parameters, including a DSCP value, a refresh interval, and a missed refresh limit are set.

```
Router# configure terminal

Enter configuration commands, one per line. End with CNTL/Z.

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

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

Router(config)# ip rsvp signalling hello graceful-restart refresh interval 10000

Router(config)# ip rsvp signalling hello graceful-restart refresh misses 4

Router(config)# end
```

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

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

Graceful Restart:Enabled (help-neighbor only)
Refresh interval:10000 msec
Refresh misses:4
DSCP:0x30
Advertised restart time:0 secs
Advertised recovery time:0 secs
Maximum wait for recovery:3600000 secs
```

Additional References

The following sections provide references related to the MPLS TE—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 12.3 T
QoS features including signaling, classification, and congestion management	Cisco IOS Quality of Service Solutions Configuration Guide , Release 12.3
Stateful Switchover	Stateful Switchover feature module
MPLS Label Distribution Protocol	MPLS Label Distribution Protocol (LDP) feature module
Cisco Nonstop Forwarding	Cisco Nonstop Forwarding feature module
Information on Stateful Switchover, Cisco Nonstop Forwarding, graceful restart	MPLS LDP: SSO/NSF Support and Graceful Restart feature module
Hellos for state timeout	MPLS TE—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

RFCs	Title
RFC 3473	<i>Generalized Multi-Protocol Label Switching (GMPLS) Signaling Resource Reservation Protocol-Traffic Engineering (RSVP-TE) Extensions</i>
RFC 3478	<i>Graceful Restart Mechanism for Label Distribution</i>

Technical Assistance

Description	Link
Technical Assistance Center (TAC) home page, containing 30,000 pages of searchable technical content, including links to products, technologies, solutions, technical tips, and tools. Registered Cisco.com users can log in from this page to access even more content.	http://www.cisco.com/public/support/tac/home.shtml

Command Reference

This section documents new and modified commands. All other commands used with this feature are documented in the Cisco IOS Release 12.3 command reference publications.

New Commands

- **ip rsvp signalling hello graceful-restart dscp**
- **ip rsvp signalling hello graceful-restart mode help-neighbor**
- **ip rsvp signalling hello graceful-restart refresh interval**
- **ip rsvp signalling hello graceful-restart refresh misses**
- **show ip rsvp counters state teardown**
- **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**

Modified Commands

- **show ip rsvp counters**
- **show ip rsvp hello**
- **show ip rsvp hello instance detail**
- **show ip rsvp hello instance summary**

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	<i>num</i>	DSCP value. Valid values are from 0 to 63.
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Defaults	The default value is 48.
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Command Modes	Global configuration
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Command History	Release	Modification
	12.0(29)S	This command was introduced.

Usage Guidelines	<p>If a link is congested, set the DSCP to a value higher than 0 to reduce the likelihood that hello messages will be dropped.</p> <p>The DSCP applies to all RSVP hellos created on a specific router. You can configure each router independently for the DSCP.</p>
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Examples	<p>In the following example, hello messages have a DSCP value of 30:</p> <pre>Router(config)# ip rsvp signalling hello graceful-restart dscp 30</pre>
-----------------	---

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 help-neighbor

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.

Defaults Graceful restart is disabled.

Command Modes Global configuration

Command History	Release	Modification
	12.0(29)S	This command was introduced.

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 graceful restart hello messages.
	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 refresh interval

To configure the Resource Reservation Protocol (RSVP) Traffic Engineering (TE) graceful restart hello request interval, use the **ip rsvp signalling hello graceful-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	<i>interval-value</i>	Frequency, in milliseconds, 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	<table border="1"> <thead> <tr> <th>Release</th> <th>Modification</th> </tr> </thead> <tbody> <tr> <td>12.0(29)S</td> <td>This command was introduced.</td> </tr> </tbody> </table>	Release	Modification	12.0(29)S	This command was introduced.			
Release	Modification							
12.0(29)S	This command was introduced.							
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.							
Examples	<p>In the following example, hello requests are sent to a neighbor every 5000 milliseconds:</p> <pre>Router(config)# ip rsvp signalling hello graceful-restart refresh interval 5000</pre>							
Related Commands	<table border="1"> <thead> <tr> <th>Command</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>ip rsvp signalling hello graceful-restart dscp</td> <td>Sets the DSCP value in graceful restart hello messages.</td> </tr> <tr> <td>ip rsvp signalling hello graceful-restart refresh misses</td> <td>Sets the missed refresh limit in graceful restart hello messages.</td> </tr> </tbody> </table>	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 misses	Sets the missed refresh limit in graceful restart hello messages.	
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 misses	Sets the missed refresh limit in graceful restart hello messages.							

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 the command.

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

no ip rsvp signalling hello graceful-restart refresh misses

Syntax Description	<i>msg-count</i>	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 is 4.	
Command Modes	Global configuration	
Command History	Release	Modification
	12.0(29)S	This command was introduced.
Usage Guidelines	A hello messages comprises a hello message, a Hello Request object, and a Hello ACK object. Each request is answered by an acknowledgment. If a link is very congested or a router has a very 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.	
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 request interval in graceful restart hello messages.

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 privileged EXEC mode.

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

Syntax Description		
authentication	(Optional) List of RSVP authentication counters.	
interface <i>interface_unit</i>	(Optional) Number of RSVP messages sent and received for the specified interface name.	
neighbor	(Optional) Number of RSVP messages sent and received by the specified neighbor.	
summary	(Optional) Cumulative number of RSVP messages sent and received by the router over all interfaces.	

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 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.
	12.0(24)S	This command was integrated into Cisco IOS Release 12.0(24)S.
	12.0(29)S	The optional authentication keyword was added and the command output was modified to include hello and message queues information.

Examples The following command 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
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

```

■ show ip rsvp counters

```

Unknown                0          0  Errors                0          0

Recv Msg Queues
  RSVP                  Current    Max
  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 presently 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 privileged EXEC mode.

show ip rsvp counters state teardown

Syntax Description This command has no arguments or keywords.

Defaults No default behavior or values

Command Modes Privileged EXEC

Command History	Release	Modification
	12.0(29)S	This command was introduced.

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 display 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
Reroutability 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 <-----GR
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.

■ show ip rsvp counters state teardown

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 the status of Resource Reservation Protocol (RSVP) Traffic Engineering (TE) hellos and statistics, use the **show ip rsvp hello** command in privileged EXEC mode.

show ip rsvp hello

Syntax Description This command has no arguments or keywords.

Defaults No default behavior or values

Command Modes 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.

Usage Guidelines Use the **show ip rsvp hello** command to check the status (enabled or disabled) of graceful restart.

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

```
Router# show ip rsvp hello

Hello:
  Fast-Reroute/Reroute:Enabled
  Statistics:Enabled
  Graceful Restart:Enabled (help-neighbor only)
```

[Table 3](#) describes the significant fields shown in the display.

Table 3 *show ip rsvp hello Field Descriptions*

Field	Description
Hello	Subsequent fields describe the processes for which hello is enabled. Choices include Fast Reroute, reroute (hello for state timer), and graceful restart for a neighbor with restart capability.
Statistics	Status of hello statistics. Valid values are as follows: <ul style="list-style-type: none"> • Enabled—Statistics are configured. Hello packets are time-stamped when they arrive in the hello input queue for the purpose of recording the time it takes 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).

Related Commands

Command	Description
show ip rsvp hello statistics	Shows 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 privileged EXEC mode.

show ip rsvp hello client lsp detail

Syntax Description This command has no arguments or keywords.

Defaults No default behavior or values

Command Modes Privileged EXEC

Command History	Release	Modification
	12.0(29)S	This command was introduced.

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:   88.1.1.1  Tun ID: 14  Ext Tun ID: 55.1.1.1
  Tun Sender: 55.1.1.1  LSP ID: 31
  Lsp flags: 0x32
  Lsp GR DN nbr: 99.1.1.1
  Lsp RR DN nbr: 15.0.0.3 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	Subsequent fields provide information that uniquely identifies the LSP. 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.

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

Field	Description
Ext Tun ID	Extended identification number of the tunnel. Usually, this is the same as the source address.
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 privileged EXEC mode.

show ip rsvp hello client lsp summary

Syntax Description This command has no arguments or keywords.

Defaults No default behavior or values

Command Modes Privileged EXEC

Release	Modification
12.0(29)S	This command was introduced.

Usage Guidelines Use the **show ip rsvp hello client lsp summary** command to display information about the 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
55.1.1.1       88.1.1.1       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.

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 privileged EXEC mode.

show ip rsvp hello client neighbor detail

Syntax Description This command has no arguments or keywords.

Defaults No default behavior or values

Command Modes Privileged EXEC

Command History	Release	Modification
	12.0(29)S	This command was introduced.

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 15.0.0.1, Local addr 15.0.0.3
    Nbr State: Normal      Type: Reroute
    Nbr Hello State: Up
    LSPs protecting: 1
    I/F: Et1/3

  Remote addr 55.1.1.1, Local addr 99.1.1.1
    Nbr State: Normal      Type: Graceful Restart
    Nbr Hello State: Lost
    LSPs protecting: 1
```

[Table 6](#) describes the significant fields shown in the display.

Table 6 *show ip rsvp hello client neighbor detail Field Descriptions*

Field	Description
Hello Client Neighbors	Subsequent fields provide information that uniquely identifies the neighbors. Clients can include graceful restart, reroute (hello state timer), and Fast Reroute.
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: <ul style="list-style-type: none"> • 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 GR (graceful restart) 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 privileged EXEC mode.

show ip rsvp hello client neighbor summary

Syntax Description This command has no arguments or keywords.

Defaults No default behavior or values

Command Modes Privileged EXEC

Command History	Release	Modification
	12.0(29)S	This command was introduced.

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

Local          Remote          Type   NBR_STATE  HI_STATE  LSPs
15.0.0.1       15.0.0.3       RR     Normal     Up        1
55.1.1.1       99.1.1.1       GR     Normal     Lost     1
```

[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: <ul style="list-style-type: none"> • 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 GR (graceful restart) 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 privileged EXEC mode.

show ip rsvp hello graceful-restart

Syntax Description This command has no arguments or keywords.

Defaults No default behavior or values

Command Modes Privileged EXEC

Command History	Release	Modification
	12.0(29)S	This command was introduced.

Usage Guidelines Use the **show ip rsvp hello graceful-restart** command to display the status of graceful restart and related statistics for a neighbor node with restart capability.

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 (help-neighbor only)
  Refresh interval: 10000 msec
  Refresh misses: 4
  DSCP: 0x30
  Advertised restart time: 5 msec
  Advertised recovery time: 0 msec
  Maximum wait for recovery: 3600000 msec
```

[Table 8](#) describes the significant fields shown in the display.

Table 8 *show ip rsvp hello graceful-restart Field Descriptions*

Field	Description
Graceful Restart	Enabled = on for a neighboring router that is restart capable. Disabled = off.
Refresh interval	Frequency in milliseconds (msec) with which a node sends a hello message to its neighbor.
Refresh misses	Number of sequential acknowledgments that a node did not receive.
DSCP	The differentiated services code point (DSCP) value in hello messages.

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

Field	Description
Advertised restart time	The time, in milliseconds (msec) that it takes the sender to restart the RSVP_TE component and exchange hello messages after a failure.
Advertised recovery time	The desired time, in milliseconds (msec), that the sender wants the receiver to synchronize the RSVP/MPLS databases after a failure.
Maximum wait for recovery	The maximum amount of time, in milliseconds (msec), that the router waits for a neighbor to recover.

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 instance detail

To display detailed information about a Resource Reservation Protocol (RSVP) Traffic Engineering (TE) hello instance, use the **show ip rsvp hello instance detail** command in privileged EXEC mode.

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

Syntax Description	filter destination <i>ip-address</i>	(Optional) IP address of the neighbor node.
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Defaults	No default behavior or values
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Command Modes	Privileged EXEC
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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.

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 12.0.0.3 Source 12.0.0.2
  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 rcv 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 14.0.0.1 Source 14.0.0.2
Type: Passive (responding to requests)
I/F: Serial2/1
Last sent Src_instance: 0xF7A80A52
Last rcv 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 Up (node is communicating with its neighbor and for how long) and Lost (communication has been lost or never was established).
Clients	Client(s) 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 ACKs.
IP DSCP	IP 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).
Min	Minimum refresh interval.
Max	Maximum refresh interval.
Average	Average refresh interval.
Waverage	Weighted average refresh interval.
Current	Current refresh interval.

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

Field	Description
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.
Communication with neighbor lost	Subsequent fields designate the number of times that communication with a neighbor was lost and why.
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
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 Resource Reservation Protocol (RSVP) Traffic Engineering (TE) hello instance, use the **show ip rsvp hello instance summary** command in privileged EXEC mode.

show ip rsvp hello instance summary

Syntax Description This command has no arguments or keywords.

Defaults No default behavior or values

Command Modes 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.

Usage Guidelines Use the **show ip rsvp hello instance summary** command to see which nodes are sending hellos (active instances) and which nodes are responding to hellos (passive instances).

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      12.0.0.3      Se2/0    Up          0        1    6000
  GR      55.1.1.1      Any      Up          13       1    10000
  GR      99.1.1.1      Any      Lost        0        1    10000

Passive Instances:
  Neighbor      I/F
  14.0.0.1      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 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 Up (node is communicating with its neighbor) and Lost (communication has been lost or never was 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
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	Shows detailed information about a hello instance.

Glossary

- AS**—autonomous system. A collection of networks that share the same routing protocol and that are under the same system administration.
- ASBR**—autonomous system boundary router. A router that connects and exchanges information between two or more autonomous systems.
- backup tunnel**—An MPLS Traffic Engineering tunnel used to protect other (primary) tunnels' traffic when a link or node failure occurs.
- 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 a neighboring route processor 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.
- 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.
- 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.
- label**—A short, fixed-length data identifier that tells switching nodes how to forward data (packets or cells).
- LDP**—Label Distribution Protocol. The protocol that supports MPLS hop-by-hop forwarding by distributing bindings between labels and network prefixes. The Cisco proprietary version of this protocol is the Tag Distribution Protocol (TDP).
- LSP**—label-switched path. A configured connection between two routers, in which MPLS is used to carry packets. A path created by the concatenation of one or more label switched hops, allowing a packet to be forwarded by swapping labels from an MPLS node to another MPLS node.
- merge point**—The tail of the backup tunnel.
- 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.
- PLR**—point of local repair. The headend of the backup tunnel.
- 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.

topology—The physical arrangement of network nodes and media within an enterprise networking structure.

tunnel—Secure communications path between two peers, such as two routers.

**Note**

Refer to [Internetworking Terms and Acronyms](#) for terms not included in this glossary.

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