



MPLS Command Reference for Cisco NCS 5000 Series Routers

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Preface

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Changes to This Document

This table lists the technical changes made to this document since it was first published.

Date	Change Summary
December 2015	Initial release of this document.
November 2016	Republished with release 6.1.2 command reference updates.
March 2017	Republished with release 6.2.1 command reference updates.
July 2017	Republished for Release 6.2.2
September 2017	Republished for Release 6.3.1
March 2018	Republished for Release 6.4.1
August 2018	Republished for Release 6.5.1
January 2019	Republished for Release 6.5.2
March 2019	Republished for Release 6.5.3
May 2019	Republished for Release 6.6.25
August 2019	Published for the Release 7.0.1
January 2020	Published for the Release 7.1.1
September 2022	Republished for the Release 7.5.3

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MPLS Label Distribution Protocol Commands

This module describes the commands used to configure Label Distribution Protocol (LDP) in a Multiprotocol Label Switching (MPLS) network on the .

LDP provides a standard methodology for hop-by-hop (or dynamic label) distribution in an MPLS network by assigning labels to routes that have been chosen by the underlying Interior Gateway Protocol (IGP) routing protocols. The resulting labeled paths, called *label switch paths* (LSPs), forward labeled traffic across an MPLS backbone.

LDP also provides the means for label switching routers (LSRs) to request, distribute, and release label prefix binding information to peer routers in a network. LDP enables LSRs to discover potential peers and establish LDP sessions with those peers to exchange label binding information.

For detailed information about MPLS concepts, configuration tasks, and examples, see *MPLS Configuration Guide for Cisco NCS 5000 Series Routers*.

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backoff

To configure the parameters for the Label Distribution Protocol (LDP) backoff mechanism, use the **backoff** command in MPLS LDP configuration mode. To return to the default behavior, use the **no** form of this command.

backoff *initial maximum*
no backoff

Syntax Description	<i>initial</i> Initial backoff delay, in seconds. Range is 5 to 2147483 50331.				
	<i>maximum</i> Maximum backoff delay, in seconds. Range is 5 to 2147483 50331.				
Command Default	<i>initial</i> : 15 <i>maximum</i> : 120				
Command Modes	MPLS LDP configuration				
Command History	<table border="1"> <thead> <tr> <th>Release</th> <th>Modification</th> </tr> </thead> <tbody> <tr> <td>Release 6.0</td> <td>This command was introduced.</td> </tr> </tbody> </table>	Release	Modification	Release 6.0	This command was introduced.
Release	Modification				
Release 6.0	This command was introduced.				

Usage Guidelines The LDP backoff mechanism prevents two incompatibly configured label switch routers from engaging in an unthrottled sequence of session setup failures. If a session setup attempt fails (due to incompatibility), each Label Switching Router (LSR) delays the next attempt, increasing the delay exponentially with each successive failure until the maximum backoff delay is reached.

Task ID	Task ID Operations
	mpls-ldp read, write

Examples The following example shows how to configure the initial backoff delay to 30 seconds and the maximum backoff delay to 240 seconds:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# mpls ldp
RP/0/RP0/CPU0:router(config-ldp)# backoff 30 240
```

clear mpls ldp forwarding

To clear (or reset) the MPLS Label Distribution Protocol (LDP) forwarding rewrites, use the **clear mpls ldp forwarding** command in XR EXEC mode.

```
clear mpls ldp [ {ipv4 } ] forwarding [prefix/length ]
```

Syntax Description	ipv4	(Optional) Specifies IP version 4 address family.
	<i>prefix</i>	(Optional) Destination prefix, written in A.B.C.D format.
	<i>length</i>	(Optional) Network mask length, in bits. Range is 0 to 32.
Command Default	No default behavior or values	
Command Modes	XR EXEC mode	
Command History	Release	Modification
	Release 6.0	This command was introduced.
Usage Guidelines	This command resets LDP installed forwarding state for all prefixes or a given prefix. It is useful when installed LDP forwarding state needs to be reprogrammed in LSD and MPLS forwarding.	
Task ID	Task ID	Operations
	mpls-ldp	read, write

Example

This example shows how to clear (or reset) the MPLS LDP forwarding rewrites using the **clear mpls ldp forwarding** command:

```
RP/0/RP0/CPU0:router# clear mpls ldp forwarding
```


clear mpls ldp msg-counters neighbor

To clear the Label Distribution Protocol (LDP) message counters, use the **clear mpls ldp msg-counters neighbor** command in XR EXEC mode.

```
clear mpls ldp msg-counters neighbor [{lsr-id ldp-id}]
```

Syntax Description	<i>lsr-id</i>	LSR ID of neighbor in A.B.C.D format.
	<i>ldp-id</i>	LDP ID of neighbor in A.B.C.D: format.
Command Default	No default behavior or values	
Command Modes	XR EXEC mode	
Command History	Release	Modification
	Release 6.0	This command was introduced.
Usage Guidelines	Use the clear mpls ldp msg-counters neighbor command to clear the statistics on message counters for a specific neighbor (IP address) or for all neighbors. These message counters count the number of LDP protocol messages sent to and received from LDP neighbors.	
Task ID	Task ID	Operations
	mpls-ldp	read, write
Examples	The following example shows how to clear message counters for neighbor 10.20.20.20:	
	RP/0/RP0/CPU0:router# clear mpls ldp msg-counters neighbor 10.20.20.20	

clear mpls ldp neighbor

To force Label Distribution Protocol (LDP) session restart, use the **clear mpls ldp neighbor** command in XR EXEC mode.

```
clear mpls ldp neighbor [{ip-address ldp-id}]
```

Syntax Description		
	<i>ip-address</i>	(Optional) Neighbor IP address.
	<i>ldp-id</i>	(Optional) Neighbor LDP ID in A.B.C.D: format.

Command Default No default behavior or values

Command Modes XR EXEC mode

Command History	Release	Modification
	Release 6.0	This command was introduced.

Usage Guidelines Use the **clear mpls ldp neighbor** command to restart a single LDP session or all LDP sessions (without restarting the LDP process itself).

Task ID	Task ID	Operations
	mpls-ldp	read, write

Examples The following example shows how to force an unconditional LDP session restart:

```
RP/0/RP0/CPU0:router# clear mpls ldp neighbor 10.20.20.20
```

default-route

To enable Multiprotocol Label Switching (MPLS) switching for IP default route by allocating and advertising non-null label, use the **default-route** command in MPLS LDP configuration mode. To return to the default behavior, use the **no** form of this command.

default-route
no default-route

Syntax Description

This command has no arguments or keywords.

Command Default

Allocates null (implicit or explicit) local label for IP default route prefix 0.0.0.0/0.

Command Modes

MPLS LDP configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

When the IP default route 0.0.0.0/0 is configured on an egress router, it is advertised through Interior Gateway Protocol (IGP) to other routers to enable default IP forwarding. When MPLS LDP is configured and establishing label switch paths (LSPs) for other prefixes, you can emulate default forwarding and switching for MPLS in the same way as IP forwarding. To do so, allocate a non-null local label and advertise this label to its peers.

Task ID

Task ID	Operations
mpls-ldp	read, write

Examples

The following example shows how to enable default MPLS switching for default prefix:

```
RP/0/RP0/CPU0:router(config-ldp)# default-route
```

discovery hello

To configure the interval between transmission of consecutive Label Distribution Protocol (LDP) discovery hello messages and the holdtime for a discovered LDP neighbor, use the **discovery hello** command in MPLS LDP configuration mode. To return to the default behavior, use the **no** form of this command.

```
discovery hello {holdtime seconds | interval seconds}
no discovery hello {holdtime | interval}
```

Syntax Description	holdtime Sets the time, in seconds, a discovered LDP neighbor is remembered without receipt of an LDP hello message from the neighbor. Default is 15.
	interval Sets the time, in seconds, between consecutive hello messages. Default is 5.
	<i>seconds</i> Time value, in seconds. Range is 1 to 65535 (65535 means infinite).

Command Default	holdtime: 15
	interval: 5

Command Modes	MPLS LDP configuration
----------------------	------------------------

Command History	Release	Modification
		Release 6.0

Usage Guidelines	No specific guidelines impact the use of this command.
-------------------------	--

Task ID	Task ID	Operations
		mpls-ldp

Examples

The following example shows how to configure the link hello holdtime to 30 seconds:

```
RP/0/RP0/CPU0:router(config-ldp)# discovery hello holdtime 30
```

The following example shows how to configure the link hello interval to 10 seconds:

```
RP/0/RP0/CPU0:router(config-ldp)# discovery hello interval 10
```

discovery instance-tlv disable

To disable transmit and receive processing for Type-Length-Value (TLV), use the **discovery instance-tlv disable** command in MPLS LDP configuration mode. To return to the default behavior, use the **no** form of this command.

```
discovery instance-tlv disable
no discovery instance-tlv disable
```

Syntax Description This command has no arguments or keywords.

Command Default No default behavior or values

Command Modes MPLS LDP configuration

Command History	Release	Modification
	Release 6.0	This command was introduced.

Usage Guidelines No specific guidelines impact the use of this command.

Task ID	Task ID	Operations
	mpls-ldp	read, write

Examples The following example shows how to disable transmit and receive processing for TLV:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# mpls ldp
RP/0/RP0/CPU0:router(config-ldp)# discovery instance-tlv disable
```

discovery targeted-hello

To configure the interval between transmission of consecutive Label Distribution Protocol (LDP) discovery targeted-hello messages, the hold time for a discovered targeted LDP neighbor, and to accept targeted hello from peers, use the **discovery targeted-hello** command in MPLS LDP configuration mode. To return to the default behavior, use the **no** form of this command.

```
discovery targeted-hello {holdtime seconds | interval seconds} {address-family ipv4 discovery
targeted-hello} {accept | [from acl] }
no discovery targeted-hello {accept | holdtime | interval}
```

Syntax Description

accept	Accepts targeted hellos from any source.
ipv4	Specifies IP version 4 address family.
from <i>acl</i>	(Optional) Accepts targeted hellos from LDP peers as permitted by the access-list.
holdtime	Configures the time a discovered LDP neighbor is remembered without receipt of an LDP hello message from a neighbor.
interval	Displays time between consecutive hello messages.
<i>seconds</i>	Time value, in seconds. Range is 1 to 65535.

Command Default

accept : Targeted hello messages are not accepted from any source (neighbor).
holdtime : 90
interval : 10

Command Modes

MPLS LDP configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

LDP supports IPv4 standard access lists only.

Task ID

Task ID	Operations
mpls-ldp	read, write

Examples

The following example shows how to configure the targeted-hello holdtime to 45 seconds:

```
RP/0/RP0/CPU0:router (config-ldp) # discovery targeted-hello holdtime 45
```

The following example shows how to configure the targeted-hello interval to 5 seconds:

```
RP/0/RP0/CPU0:router(config-ldp)# discovery targeted-hello interval 5
```

The following example shows how to configure acceptance of targeted hellos from all peers:

```
RP/0/RP0/CPU0:router(config-ldp)# address-family ipv4  
RP/0/RP0/CPU0:router(config-ldp-af)# discovery targeted-hello accept
```

The following example shows how to configure acceptance of targeted hello from peers 10.1.1.1 and 10.2.2.2 only:

```
RP/0/RP0/CPU0:router(config)# ipv4 access-list peer_acl_10  
RP/0/RP0/CPU0:router(config-ipv4-acl)# permit 10.1.1.1  
RP/0/RP0/CPU0:router(config-ipv4-acl)# permit 10.2.2.2  
RP/0/RP0/CPU0:router(config-ipv4-acl)# mpls ldp  
RP/0/RP0/CPU0:router(config-ldp)# address-family ipv4  
RP/0/RP0/CPU0:router(config-ldp-af)# discovery targeted-hello accept from peer_acl_10
```

discovery transport-address

To provide an alternative address for a TCP connection, use the **discovery transport-address** command in MPLS LDP interface configuration mode. To return to the default behavior, use the **no** form of this command.

```
[interface type interface-path-id] address-family
ipv4
discovery transport-address {ip-address }
no [interface type interface-path-id address-family]{ipv4 } discovery transport-address {ip-address
}
```

Syntax Description		
interface <i>type</i>		(Optional) Interface type. For more information, use the question mark (?) online help function.
<i>interface-path-id</i>		Physical interface or a virtual interface. Note Use the show interfaces command to see a list of all possible interfaces currently configured on the router. For more information about the syntax for the router, use the question mark (?) online help function.
address-family ipv4		Specifies IP version 4 address family.
<i>ip-address</i>		IP address to be advertised as the transport address in discovery hello messages.

Command Default LDP advertises its LDP router ID as the transport address in LDP discovery hello messages.

Command Modes MPLS LDP interface configuration

Command History	Release	Modification
	Release 6.0	This command was introduced.

Usage Guidelines Establishing an LDP session between two routers requires a TCP session connection. To establish the TCP session connection, each router must know the transport address (IP address) of the other router.

The LDP discovery mechanism provides the means for a router to advertise transport addresses. Transport address is implicit or explicit. Implicit addresses do not appear as part of the contents of the discovery hello

messages sent to the peer. If explicit, the advertisement appears as part of the contents of discovery hello messages sent to the peer.

The **discovery transport-address** command modifies the default behavior described above. Using the **interface** keyword, LDP advertises the IP address of the interface in LDP discovery hello messages sent from the interface. Using the *ip-address* argument, LDP advertises the IP address in LDP discovery hello messages sent from the interface.



Note When a router has multiple links connecting it to its peer device, the router must advertise the same transport address in the LDP discovery hello messages it sends on all such interfaces.

Task ID

Task ID Operations

mpls-ldp read,
write

Examples

The following example shows how to specify an exiting address (10.10.3.1) as the transport address on an interface tenGigE 0/1/0/0:

```
RP/0/RP0/CPU0:router(config-ldp)# interface POS 0/1/0/0interface tenGigE 0/0/0/1
RP/0/RP0/CPU0:router(config-ldp-if)# address-family ipv4
RP/0/RP0/CPU0:router(config-ldp-if-af)#discovery transport-address 10.10.3.1

RP/0/RP0/CPU0:router# show mpls ldp neighbor

Peer LDP Identifier: 10.44.44.44:0
TCP connection: 10.44.44.44:65520 - 10.10.3.1:646
Graceful Restart: Yes (Reconnect Timeout: 15 sec, Recovery: 180 sec)
State: Oper; Msgs sent/rcvd: 13/9
Up time: 00:00:11
LDP Discovery Sources:
    tenGigE 0/0/0/1
Addresses bound to this peer:
    10.10.3.2      10.44.44.44
```

downstream-on-demand

To configure MPLS Label Distribution Protocol (LDP) downstream-on-demand mode, use the **downstream-on-demand** command in MPLS LDP configuration mode. To return to the default behavior, use the **no** form of this command.

session

downstream-on-demand with *access-list*

no session downstream-on-demand with *access-list*

Syntax Description		
	session	(Optional) Configures session parameters.
	with	Displays access list of LDP peers.
	<i>access-list</i>	IPv4 access-list name.

Command Default No default behavior or values

Command Modes MPLS LDP configuration

Command History	Release	Modification
	Release 6.0	This command was introduced.

Usage Guidelines No specific guidelines impact the use of this command.

Task ID	Task ID	Operation
	mpls-ldp	read, write

Examples

This is a sample output from the **downstream-on-demand** command:

```
RP/0/RP0/CPU0:router(config-ldp)# downstream-on-demand with acl1
```

explicit-null

To configure a router to advertise explicit null labels instead of implicit null labels, use the **explicit-null** command in MPLS LDP configuration mode. To return to the default behavior, use the **no** form of this command.

address-family {ipv4} **label local advertise**

explicit-null [{to *peer-acl* | for *prefix-acl* [to *peer-acl*]]

no address-family {ipv4} **label local advertise explicit-null** [{to *peer-acl* | for *prefix-acl* [to *peer-acl*]]

Syntax Description		
address-family ipv4		Specifies IP version 4 address family.
label		Configures label control and policies.
local		Configures local label control and policies.
advertise		Configures outbound label advertisement control.
to <i>peer-acl</i>		(Optional) Specifies LDP peers for which explicit-null is advertised instead of implicit-null. Range is 1 to 99.
for <i>prefix-acl</i>		(Optional) Specifies prefixes for which explicit-null is advertised instead of implicit-null. Range is 1 to 99.

Command Default Implicit null is advertised as default null label for routes, such as directly connected routes.

Command Modes MPLS LDP configuration

Command History	Release	Modification
	Release 6.0	This command was introduced.

Usage Guidelines Normally, LDP advertises an implicit null label for directly connected routes. The implicit null label causes the previous hop router to perform next to last router hop popping.

The **explicit-null** command advertises the explicit-null labels in place of implicit null labels for directly connected prefixes.

LDP supports IPv4 standard access lists only.

Task ID	Task ID	Operations
	mpls-ldp	read, write

Examples

The following command shows how to advertise explicit null for all directly connected routes to all LDP peers:

```
RP/0/RP0/CPU0:router(config-ldp-af-lbl-lcl-adv) # explicit-null
```

The following command sequence shows how to advertise explicit-null for directly connected route 192.168.0.0 to all LDP peers and implicit-null for all other directly connected routes:

```
RP/0/RP0/CPU0:router(config)# ipv4 access-list pfx_acl_192_168
RP/0/RP0/CPU0:router(config-ipv4-acl)# permit 192.168.0.0
RP/0/RP0/CPU0:router(config-ldp-af-lbl-lcl-adv)# explicit-null for pfx_acl_192_168
```

The following command sequence shows how to send explicit-null for all directly connected routes to peers 10.1.1.1 and 10.2.2.2 and implicit-null to all other peers:

```
RP/0/RP0/CPU0:router(config)# ipv4 access-list peer_acl_10
RP/0/RP0/CPU0:router(config-ipv4-acl)# permit 10.1.1.1
RP/0/RP0/CPU0:router(config-ipv4-acl)# permit 10.2.2.2
RP/0/RP0/CPU0:router(config-ldp-af-lbl-lcl-adv) # explicit-null to peer_acl_10
```

The following command shows how to advertise explicit-null for prefix 192.168.0.0 to peers 10.1.1.1 and 10.2.2.2 and advertise implicit-null for all other applicable routes to all other peers:

```
RP/0/RP0/CPU0:router(config-ldp-af-lbl-lcl-adv) # explicit-null for pfx_acl_192_168 to peer_acl_10
```

graceful-restart (MPLS LDP)

To configure graceful restart, use the **graceful-restart** command in MPLS LDP configuration mode. To return to the default behavior, use the **no** form of this command.

```
graceful-restart [{reconnect-timeout seconds | forwarding-state-holdtime seconds}]
no graceful-restart [{reconnect-timeout | forwarding-state-holdtime}]
```

Syntax Description	reconnect-timeout <i>seconds</i>	(Optional) Configures the time that the local LDP sends to its graceful restartable peer, indicating how long its neighbor should wait for reconnection in the event of a LDP session failure, in seconds. Range is 60 to 1800.
	forwarding-state-holdtime <i>seconds</i>	(Optional) Configures the time the local forwarding state is preserved (without being reclaimed) after the local LDP control plane restarts, in seconds. Range is 60 to 1800.
Command Default	By default, graceful restart is disabled. reconnect-timeout : 120 forwarding-state-holdtime : 180	
Command Modes	MPLS LDP configuration	
Command History	Release	Modification
	Release 6.0	This command was introduced.

Usage Guidelines Use the LDP graceful restart capability to achieve nonstop forwarding (NSF) during an LDP control plane communication failure or restart. To configure graceful restart (MPLS LDP) between two peers, enable LDP graceful restart on both label switch routers (LSRs).

When an LDP graceful restart session is established and there is control plane failure, the peer LSR starts graceful restart procedures, initially keeps the forwarding state information pertaining to the restarting peer, and marks this state as stale. If the restarting peer does not reconnect within the reconnect timeout, the stale forwarding state is removed. If the restarting peer reconnects within the reconnect time period, it is provided recovery time to resynchronize with its peer. After this time, any unsynchronized state is removed.

The value of the forwarding state hold time keeps the forwarding plane state associated with the LDP control-plane in case of a control-plane restart or failure. If the control plane fails, the forwarding plane retains the LDP forwarding state for twice the forwarding state hold time. The value of the forwarding state hold time is also used to start the local LDP forwarding state hold timer after the LDP control plane restarts. When the LDP graceful restart sessions are renegotiated with its peers, the restarting LSR sends the remaining value

of this timer as the recovery time to its peers. Upon local LDP restart with graceful restart enabled, LDP does not replay forwarding updates to MPLS forwarding until the forwarding state hold timer expires.



Note In the presence of a peer relationship, any change to the LDP graceful restart configuration will restart LDP sessions. If LDP configuration changes from nongraceful restart to graceful restart, all the sessions are restarted. Only graceful restart sessions are restarted upon graceful restart to nongraceful restart configuration changes.

Task ID

Task ID Operations

```
mpls-ldp read,
write
```

Examples

The following example shows how to configure an existing session for graceful restart:

```
RP/0/RP0/CPU0:router(config-ldp)# graceful-restart

RP/0/RP0/CPU0:router:Apr  3 10:56:05.392 : mpls_ldp[336]: %ROUTING-LDP-5-NBR_CHANGE : Nbr
172.168.0.1:0, DOWN
RP/0/RP0/CPU0:router:Apr  3 10:56:05.392 : mpls_ldp[336]: %ROUTING-LDP-5-NBR_CHANGE : Nbr
192.168.0.1:0, DOWN
RP/0/RP0/CPU0:router:Apr  3 10:56:09.525 : mpls_ldp[336]: %ROUTING-LDP-5-NBR_CHANGE : Nbr
192.168.0.1:0, UP
RP/0/RP0/CPU0:router:Apr  3 10:56:11.114 : mpls_ldp[336]: %ROUTING-LDP-5-NBR_CHANGE : Nbr
172.168.0.1:0, UP

RP/0/RP0/CPU0:router# show mpls ldp neighbor brief

Peer                GR Up Time          Discovery Address
-----
192.168.0.1:0       Y 00:01:04           3          8
172.168.0.1:0       N 00:01:02           2          5

RP/0/RP0/CPU0:router# show mpls ldp graceful-restart

Forwarding State Hold timer : Not Running
GR Neighbors                 : 1

Neighbor ID      Up Connect Count  Liveness Timer  Recovery Timer
-----
192.168.0.1     Y          1              -                -
```

session holdtime (MPLS LDP)

To change the time for which an Label Distribution Protocol (LDP) session is maintained in the absence of LDP messages from the session peer, use the **session holdtime** command in MPLS LDP configuration mode. To return to the default behavior, use the **no** form of this command.

session holdtime *seconds*
no session holdtime

Syntax Description	<i>seconds</i> Time, in seconds, that an LDP session is maintained in the absence of LDP messages from the session peer. Range is 15 to 65535.				
Command Default	<i>seconds</i> : 180				
Command Modes	MPLS LDP configuration				
Command History	<table border="1"> <thead> <tr> <th>Release</th> <th>Modification</th> </tr> </thead> <tbody> <tr> <td>Release 6.0</td> <td>This command was introduced.</td> </tr> </tbody> </table>	Release	Modification	Release 6.0	This command was introduced.
Release	Modification				
Release 6.0	This command was introduced.				

Usage Guidelines No specific guidelines impact the use of this command.

Task ID	Task ID	Operations
	mpls-ldp	read, write

Examples

The following example shows how to change the hold time of LDP sessions to 30 seconds:

```
RP/0/RP0/CPU0:router(config-ldp)# session holdtime 30
```

igp auto-config disable

To disable Label Distribution Protocol (LDP) auto-configuration, use the **igp auto-config disable** command in MPLS LDP interface configuration mode. To return to the default behavior, use the **no** form of this command.

igp auto-config disable
no igp auto-config disable

Syntax Description This command has no arguments or keywords.

Command Default No default behavior or values

Command Modes MPLS LDP interface configuration

Command History	Release	Modification
	Release 6.0	This command was introduced.

Usage Guidelines IGP auto-configuration can be enabled on ISIS and OSPF. Configuration details are described in *Routing Configuration Guide for Cisco NCS 5000 Series Routers*.

Task ID	Task ID	Operations
	mpls-ldp	read, write

igp sync delay

To enable Label Distribution Protocol (LDP) Interior Gateway Protocol (IGP) sync delay timer feature, use the **igp sync delay** command in MPLS LDP configuration mode. To return to the default behavior, use the **no** form of this command.

igp sync delay *seconds*
no igp sync delay

Syntax Description	<i>seconds</i> Time, in seconds, that declaration of LDP sync state being up is delayed after session establishment upon link coming up. Range is 5 to 300.				
Command Default	LDP does not delay declaration of sync up and notifies IGP as soon as sync up conditions are met for a link.				
Command Modes	MPLS LDP configuration				
Command History	<table border="1"> <thead> <tr> <th>Release</th> <th>Modification</th> </tr> </thead> <tbody> <tr> <td>Release 6.0</td> <td>This command was introduced.</td> </tr> </tbody> </table>	Release	Modification	Release 6.0	This command was introduced.
Release	Modification				
Release 6.0	This command was introduced.				

Usage Guidelines

- By default, LDP declares LDP sync up as soon as all the requisite conditions are met, namely:
 - LDP session is up.
 - LDP has sent all its label bindings to at least one peer.
 - LDP has received at least one label binding from a peer.

This minimizes traffic loss on link up but can still lead to substantial traffic loss under certain circumstances (for example, when interoperating with an LSR with ordered mode operation). It may be necessary to delay declaration of sync up after the session comes up by configuring a timeout period.

- When the graceful-restart event is configured, the IGP sync delay timer does not take effect.

Task ID	Task ID Operations
	mpls-ldp read, write

Examples

The following example shows how to configure LDP to delay declaration of sync-up to 30 seconds:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# mpls ldp
RP/0/RP0/CPU0:router(config-ldp)# igp sync delay 30
```

igp sync delay on-proc-restart

To delay the declaration of synchronization events to the Interior Gateway Protocol (IGP) when the label distribution protocol (LDP) fails or restarts, use the **igp sync delay on-proc restart** command in MPLS LDP configuration mode. To return to the default behavior, use the **no** form of this command.

igp sync delay on-proc restart *seconds*
no igp sync delay on-proc restart *seconds*

Syntax Description	<i>seconds</i> Time, in seconds, duration of process-level delay for synchronization events when the LDP fails or restarts. Range is from 60 to 600.
---------------------------	--

Command Default	This command is disabled by default.
------------------------	--------------------------------------

Command Modes	MPLS LDP configuration
----------------------	------------------------

Command History	Release	Modification
	Release 6.0	This command was introduced.

Usage Guidelines	The igp sync delay on-proc restart command enables a process-level delay for synchronization events when the LDP fails or restarts. This delay defers the sending of sync-up events to the IGP until most or all the LDP sessions converge and also allows the LDP to stabilize. This allows the LDP process failure to be less stressful because IGP's receive all the sync-up events in bulk. This means that the IGP is required to run the shortest path first (SPF) and link-state advertisements (LSAs) only one time with an overall view of the sync-up events.
-------------------------	--

Task ID	Task ID Operations
	mpls-ldp read, write

Examples

The following example shows how to configure LDP to delay the declaration of synchronization events to IGP by 60 seconds:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# mpls ldp
RP/0/RP0/CPU0:router(config-ldp)# igp sync delay on-proc restart 60
```

The following example shows the status following execution of the command:

```
RP/0/RP0/CPU0:router# show mpls ldp igp sync

Process Restart Sync Delay: 60 sec, Gloal timer running (15 sec remaining)
GigabitEthernet0/3/0/2:
Sync status: Deferred
...
```

When the timer is not running, the output displays the following:

```
Process Restart Sync Delay: 60 sec, Global timer not running
```

implicit-null-override

To configure a router to advertise implicit null labels to a set of prefixes, for which a non-null label is to be advertised by default, use the **implicit-null-override** command in MPLS LDP label configuration mode. To return to the default behavior, use the **no** form of this command.

```
address-family {ipv4} label local
implicit-null-override {for prefix-acl}
no address-family {ipv4} label local implicit-null-override
```

Syntax Description		
	address-family ipv4	Specifies IP version 4 address family.
	label	Configure label control and policies.
	local	Configure local label control and policies.
	for prefix-acl	Specifies the usage of implicit-null label to a set of prefixes. Range is 1 to 99.
		<p>Note This command works with any prefix including static, IGP, and BGP, when specified in the ACL.</p>

Command Default Implicit null is advertised as default null label for routes, such as directly connected routes, whereas a non-null label is advertised for IGP, BGP, and static prefixes.

Command Modes MPLS LDP label configuration

Command History	Release	Modification
	Release 6.0	This command was introduced.

Usage Guidelines No specific guidelines impact the use of this command.

Task ID	Task ID	Operation
	mpls-ldp	read, write

The following command shows how to advertise implicit-null label to a specific LDP peer:


```
RP/0/RP0/CPU0:router (config) #mpls ldp
```

```
RP/0/RP0/CPU0:router(config-ldp)#address-family ipv4
RP/0/RP0/CPU0:router(config-ldp-af)#label
RP/0/RP0/CPU0:router(config-ldp-af-lbl)#loc1
RP/0/RP0/CPU0:router(config-ldp-af-lbl-lcl)#implicit-null-override for 80
```

interface (MPLS LDP)

To configure or enable Multiprotocol Label Switching (MPLS) Label Distribution Protocol (LDP) on an interface, use the **interface** command in MPLS LDP configuration mode. To return to the default behavior, use the **no** form of this command.

```
interface type interface-path-id
no interface type interface-path-id
```

Syntax Description	<i>type</i>	Interface type. For more information, use the question mark (?) online help function.
	<i>interface-path-id</i>	Physical interface or a virtual interface. Note Use the show interfaces command to see a list of all possible interfaces currently configured on the router. For more information about the syntax for the router, use the question mark (?) online help function.
Command Default	No default behavior or values	
Command Modes	MPLS LDP configuration	
Command History	Release	Modification
	Release 6.0	This command was introduced.
Usage Guidelines	When you configure LDP on an interface, the LDP process begins neighbor discovery, sending link hello messages on the interface. This can result in a session setup with discovered neighbors.	
	LDP interface configuration supports forward reference; accordingly, it is possible to configure a nonexistent interface under LDP.	
	Note You cannot enable LDP on loopback and GRE tunnel interfaces.	

Task ID	Task ID	Operations
	mpls-ldp	read, write

Examples

This example shows how to configure MPLS LDP over tenGigE interfaces:

```
RP/0/RP0/CPU0:router#configure
RP/0/RP0/CPU0:router(config)#mpls ldp
RP/0/RP0/CPU0:router(config-ldp)#interface tenGigE 0/0/0/1
RP/0/RP0/CPU0:router(config-ldp-if)#
```

label accept

To control the receipt of labels (remote bindings) for a set of prefixes from a peer, use the **label accept** command in MPLS LDP configuration mode. To return to the default behavior, use the **no** form of this command.

```
address-family ipv4 label {local | remote} {accept from ip-address} { for prefix-acl}
no label accept for prefix-acl from ip-address
```

Syntax Description	for prefix-acl	Accepts and retains remote bindings for prefixes that are permitted by the prefix access list <i>prefix-acl</i> argument.
	from ip-address	Displays the peer IP address.
Command Default	LDP accepts and retains label bindings for all prefixes from all peers.	
Command Modes	MPLS LDP configuration	
Command History	Release	Modification
	Release 6.0	This command was introduced.

Usage Guidelines

By default, LDP accepts labels (as remote bindings) for all prefixes from all its peers. To save resources (such as memory) configure the access list to specify label and binding acceptance for a set of prefixes from a peer. If the inbound label filtering policy changes such that it now allows previously denied prefixes from a peer, you must reset the LDP session with the peer using the **clear mpls ldp neighbor** command.

LDP supports IPv4 standard access lists only.



Note Label acceptance control is also referred to as LDP inbound label filtering.

Task ID	Task ID	Operations
	mpls-ldp	read, write

Examples

The following example shows how to configure inbound label filtering policy. In this example, an LSR is configured to accept and retain label bindings for prefixes 192.168.1.1 (*px_acl_1*) from peer 10.0.0.1, prefix 192.168.2.2 (*px_acl_2*) from peer 172.16.0.1, and prefixes 192.168.1.1, 192.168.2.2, 192.168.3.3 (*px_acl_3*) from peer 209.165.201.1:

```
RP/0/RP0/CPU0:router(config)# mpls ldp
RP/0/RP0/CPU0:router(config-ldp)# address-family ipv4
RP/0/RP0/CPU0:router(config-ldp-af)# label
RP/0/RP0/CPU0:router(config-ldp-af-lbl)# remote
```



```
RP/0/RP0/CPU0:router(config-ldp-af-lbl-rmt)# accept from 13.13.13.13:0 for acl1
```

label advertise

To control the advertisement of local labels, use the **label advertise** command in MPLS LDP configuration mode. To return to the default behavior, use the **no** form of this command.

```
address-family ipv4 label local advertise [disable | explicit-null | for prefix-acl [to prefix-acl]] interface
type interface-path-id ]
no label advertise [{disable | for prefix-acl [to peer-acl]] | interface type interface-path-id}]
```

Syntax Description	Parameter	Description
	disable	(Optional) Disables label advertisement to all peers for all prefixes.
	for <i>prefix-acl</i>	(Optional) Specifies prefix destinations for which labels will be advertised.
	to <i>peer-acl</i>	(Optional) Specifies which LDP neighbors will receive label advertisements.
	interface	(Optional) Specifies an interface for label allocation and advertisement of its interface IP address.
	<i>type</i>	Interface type. For more information, use the question mark (?) online help function.
	<i>interface-path-id</i>	Physical interface or a virtual interface.
	Note	Use the show interfaces command to see a list of all possible interfaces currently configured on the router.
		For more information about the syntax for the router, use the question mark (?) online help function.

Command Default LDP advertises labels for all known prefixes to all peers. LDP does not advertise labels for local interfaces addresses other than Loopback interfaces.

Command Modes MPLS LDP configuration

Command History	Release	Modification
	Release 6.0	This command was introduced.

Usage Guidelines The **label advertise** command determines how the label switch router (LSR) advertises local labels. The following rules describe the effects of running multiple commands:

- Every command has a **prefix-acl** or **peer-acl** pair associated with it, as follows:
 - In the absence of the **for** or **to** keywords, the access list pair is (none, none).
 - When using the **for** keyword without the **to** keyword, the access list is (prefix-acl, none).
- A prefix can have a maximum of one (prefix-acl, peer-acl) pair, as follows:
 - A (prefix-acl, peer-acl) pair applies to a prefix only if the prefix-acl matches the prefix. A match occurs if the prefix-acl permits the prefix.

- If more than one (prefix-acl, peer-acl) pair from multiple **label advertise** commands matches a prefix, the (prefix-acl, peer-acl) pair in the first command applies to the prefix. The order in which the **label advertise** commands are processed is sorted based on the ACL names in a MIB-lexicographical way (shorter ACL name length is processed first, if two ACLs are of equal length, then dictionary ordering is used).
- When an LSR is ready to advertise a label for a prefix, the LSR determines whether a (prefix-acl, peer-acl) pair applies to the prefix.
 - If none applies, and if the **disable** keyword has been configured for the command, the label for the prefix is not advertised to any peer; otherwise, the label is advertised to all peers.
 - If a (prefix-acl, peer-acl) pair applies to the prefix, and if the prefix-acl denies the prefix, the label is not advertised to any peer.
 - If (prefix-acl, peer-acl) pair applies to the prefix and if the prefix-acl denies the prefix, the label is not advertised to peers defined in the peer-acl. Nevertheless, the prefix may be matched in subsequent (prefix-acl, peer-acl) entries and advertised to other peers.
 - If the prefix-acl permits the prefix and there is a peer-acl, the label is advertised to all peers permitted by the peer-acl.

Normally, LDP advertises labels for non-BGP routes present in the routing table. Additionally, LDP advertises labels from /32 IP addresses on Loopback interfaces and does not advertise /32 addresses for other non-Loopback interfaces. To control advertisement of labels for /32 IP addresses on these interfaces, use the **label advertise interface** command.

LDP supports IPv4 standard access lists only.



Note Label advertisement control is also referred to as LDP outbound label filtering.

Task ID

Task ID Operations

mpls-ldp read,
write

Examples

The following example shows how to disable advertisement of all locally assigned labels to all peers:

```
RP/0/RP0/CPU0:router(config)# mpls ldp
RP/0/RP0/CPU0:router(config-ldp)# address-family ipv4
RP/0/RP0/CPU0:router(config-ldp-af)# label
RP/0/RP0/CPU0:router(config-ldp-af-lbl)# local
RP/0/RP0/CPU0:router(config-ldp-af-lbl-lcl)# advertise
RP/0/RP0/CPU0:router(config-ldp-af-lbl-lcl-advt)# disable
```

The following example shows how to send labels only for prefixes 10.1.1.0 and 20.1.1.0 to all peers:

```
RP/0/RP0/CPU0:router(config)# ipv4 access-list pfx_acl_1
RP/0/RP0/CPU0:router(config-ipv4-acl)# permit 10.1.1.0
RP/0/RP0/CPU0:router(config-ipv4-acl)# permit 20.1.1.0
```

```
RP/0/RP0/CPU0:router(config-ldp-af)# label local advertise
RP/0/RP0/CPU0:router(config-ldp-af-lbl-lcl-advt)# disable
RP/0/RP0/CPU0:router(config-ldp-af-lbl-lcl-advt)# for pfx_acl_1
```

The following example shows how to send labels for prefix 10.0.0.0 to peers 10.1.1.1 and 10.2.2.2, labels for prefix 20.0.0.0 to peer 20.1.1.1, and labels for all other prefixes to all other peers:

```
RP/0/RP0/CPU0:router(config)# ipv4 access-list pfx_acl_10
RP/0/RP0/CPU0:router(config-ipv4-acl)# permit 10.0.0.0

RP/0/RP0/CPU0:router(config)# ipv4 access-list pfx_acl_20
RP/0/RP0/CPU0:router(config-ipv4-acl)# permit 20.0.0.0

RP/0/RP0/CPU0:router(config)# ipv4 access-list peer_acl_10
RP/0/RP0/CPU0:router(config-ipv4-acl)# permit 10.1.1.1
RP/0/RP0/CPU0:router(config-ipv4-acl)# permit 10.2.2.2

RP/0/RP0/CPU0:router(config)# ipv4 access-list peer_acl_20
RP/0/RP0/CPU0:router(config-ipv4-acl)# permit 20.1.1.1

RP/0/RP0/CPU0:router(config-ldp-af)# label local advertise
RP/0/RP0/CPU0:router(config-ldp-af-lbl-lcl-advt)# for pfx_acl_10 to peer_acl_10
RP/0/RP0/CPU0:router(config-ldp-af-lbl-lcl-advt)# for pfx_acl_20 to peer_acl_20
```



Note To advertise pfx_acl_10 to peer_acl_10 and pfx_acl_20 to peer_acl_20 and disable all other advertisements to all other peers, include the **disable** keyword with the **label advertise** command.

The following example shows how to use the **interface** keyword to advertise /32 IP address for tenGigE 0/0/0/1:

```
RP/0/RP0/CPU0:router(config-ldp-af)# label local advertise
RP/0/RP0/CPU0:router(config-ldp-af-lbl-lcl-advt)# interface tenGigE 0/0/0/1
```

label allocate

To control allocation of local label only for a set of prefixes, use the **label allocate** command in MPLS LDP configuration mode. To return to the default behavior, use the **no** form of this command.

```
address-family ipv4 label allocate for {prefix-acl | host-routes}
no label allocate
```

Syntax Description

for Specifies set of prefixes for which local label needs to be allocated.

prefix-acl IP access-list name or number. Range is from 1 to 99.

host-routes Allocates the label for host routes only.

Command Default

LDP allocates local label for all learned routes (prefixes).

Command Modes

MPLS LDP configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Local label allocation control lets you override the default label allocation policy and provides many benefits, including reduced memory usage and fewer forwarding and network updates.

By default, LDP allocates local labels for all learned routes. There are times when you may want to limit label allocation for a given set of prefixes; for example, when using LDP in the core network to provide MPLS transport from one edge to another edge. In such cases, it is necessary to set up label switch packets (LSPs) for Loopback /32 addresses for provider edge (PE) routers (rendering it unnecessary to allocate and advertise local labels for other Interior Gateway Protocol (IGP) prefixes).

LDP supports IPv4 standard access lists only.

Task ID

Task ID Operations

mpls-ldp read,
write

Examples

The following example shows how to configure LDP to limit allocation of local labels to prefixes 192.168.1.1, 192.168.2.2, and 192.168.3.3 only:

```
RP/0/RP0/CPU0:router(config)# ipv4 access-list pfx_acl_1
RP/0/RP0/CPU0:router(config-ipv4-acl)# permit 192.168.1.1
RP/0/RP0/CPU0:router(config-ipv4-acl)# permit 192.168.2.2
RP/0/RP0/CPU0:router(config-ipv4-acl)# permit 192.168.3.3

RP/0/RP0/CPU0:router(config-ldp)# address-family ipv4
RP/0/RP0/CPU0:router(config-ldp-af)# label
RP/0/RP0/CPU0:router(config-ldp-af-lbl)# local
```

```
RP/0/RP0/CPU0:router(config-ldp0-af-lbl-lcl)# allocate for pfx_acl_1
```

log graceful-restart

To set up notification describing graceful-restart (GR) session events, use the **log graceful-restart** command in MPLS LDP configuration mode. To return to the default behavior, use the **no** form of this command.

log graceful-restart
no log graceful-restart

Syntax Description This command has no arguments or keywords.

Command Default No default behavior or values

Command Modes MPLS LDP configuration

Command History	Release	Modification
	Release 6.0	This command was introduced.

Usage Guidelines Use the **log graceful-restart** command to receive a syslog/console message when a graceful restart-related session event occurs, including LDP graceful restart session disconnection, reconnection, and timeout.



Note A logging message is issued upon graceful restart session events.

Task ID	Task ID	Operations
	mpls-ldp	read, write

Examples

The following example shows how to enable logging messages for graceful restart session events:

```
RP/0/RP0/CPU0:router(config-ldp)# log graceful-restart
```

The following sample output shows the logging events that can be displayed on the console:

```
RP/0/RP0/CPU0:router: mpls_ldp[340]: %ROUTING-LDP-5-GR : GR session 4.4.4.4:0 (instance 1) disconnected
```

```
RP/0/RP0/CPU0:router: mpls_ldp[340]: %ROUTING-LDP-5-GR : GR session 4.4.4.4:0 (instance 2) reconnected
```

```
RP/0/RP0/CPU0:router: mpls_ldp[340]: %ROUTING-LDP-5-GR : GR session 5.5.5.5:0 (instance 3) timed out
```

```
RP/0/RP0/CPU0:router: mpls_ldp[336]: %ROUTING-LDP-5-GR_RESTART_COMPLETE : GR forwarding state hold timer has expired
```

log neighbor

To enable logging of notices describing session changes, use the **log neighbor** command in MPLS LDP configuration mode. To return to the default behavior, use the **no** form of this command.

log neighbor
no log neighbor

Syntax Description	This command has no arguments or keywords.	
Command Default	No default behavior or values	
Command Modes	MPLS LDP configuration	
Command History	Release	Modification
	Release 6.0	This command was introduced.
Usage Guidelines	Use the log neighbor command to receive a syslog or console message when a neighbor goes up or down.	
Task ID	Task ID	Operations
	mpls-ldp	read, write

Examples

The following example shows how to enable logging messages for neighbor session up and down events:

```
RP/0/RP0/CPU0:router(config-ldp)# log neighbor
```



Note A logging message is issued when an LDP session state changes from up to down (and down to up).

The following shows sample output of logging events that can be displayed on the console:

```
RP/0/RP0/CPU0:router:10 21:11:32.111:mpls_ldp[113]:%LDP-5-NBR_CHANGE: Nbr 10.44.44.44:0, DOWN
```


log session-protection

To enable logging of notices describing LDP session protection events, use the **log session-protection** command in MPLS LDP configuration mode. To return to the default behavior, use the **no** form of this command.

log session-protection
no log session-protection

Syntax Description This command has no arguments or keywords.

Command Default No default behavior or values

Command Modes MPLS LDP configuration

Command History	Release	Modification
	Release 6.0	This command was introduced.

Usage Guidelines Use the **log session-protection** command to receive a syslog or console message when LDP session protection event occurs. These events include LDP session protection initiation, recovery, and timeout.

Task ID	Task ID	Operations
	mpls-ldp	read, write

Examples The following example shows how to enable logging messages for session protection events:

```
RP/0/RP0/CPU0:router(config-ldp)# log session-protection
```



Note Logging messages are issued when session protection events occur.

The following sample output shows the logging events that are displayed on the console:

```
RP/0/RP0/CPU0:router:Apr 21 12:15:01.742: mpls_ldp[315]:%ROUTING-LDP-5-SESSION_PROTECTION:
Session hold up initiated for peer 4.4.4.4:0
```

```
RP/0/RP0/CPU0:router:Apr 21 12:18:04.987: mpls_ldp[315]:%ROUTING-LDP-5-SESSION_PROTECTION:
Session recovery succeeded for peer 4.4.4.4:0
```

mpls ldp

To enter MPLS Label Distribution Protocol (LDP) configuration mode, use the **mpls ldp** command in XR Config mode.

mpls ldp

Syntax Description This command has no arguments or keywords.

Command Default No default behavior or values

Command Modes XR Config mode

Command History	Release	Modification
	Release 6.0	This command was introduced.

Usage Guidelines No specific guidelines impact the use of this command.

Task ID	Task ID	Operations
	mpls-ldp	read, write

Examples

The following example shows how to MPLS LDP configuration mode:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# mpls ldp
RP/0/RP0/CPU0:router(config-ldp)
```

neighbor password

To configure password authentication using the TCP Message Digest 5 (MD5) option for a neighbor, use the **neighbor password** command in MPLS LDP configuration mode. To return to the default behavior, use the **no** form of this command.

```
neighbor ldp-id password {clear | disable | encrypted password }
no neighbor ldp-id password
```

Syntax Description		
	<i>ldp-id</i>	LDP ID of neighbor in A.B.C.D:0 format.
	clear	Clears the password for the encryption parameter to specify that an unencrypted password will follow.
	disable	Disables the global password from the specified neighbor.
	encrypted	Specifies that an encrypted password will follow.
	<i>password</i>	(Clear text) Encrypted or unencrypted password string.

Command Default LDP sessions are negotiated without any password (and MD5).

Command Modes MPLS LDP configuration

Command History	Release	Modification
	Release 6.0	This command was introduced.

Usage Guidelines This security feature is enabled per neighbor, so that a session establishment attempt is allowed only when a password match has been configured. This option must be configured so that both peer passwords match.

To override the default password for a specific neighbor, use the **neighbor *ldp-id* password** command, where the *ldp-id* argument is the LDP ID of the neighbor.



Note The global default password must be configured before being able to override the default password for a specific neighbor.

Task ID	Task ID	Operations
	mpls-ldp	read, write

Examples

The following example shows how to configure the password *abc* for neighbor 10.20.20.20 and how to clear it:

```
RP/0/RP0/CPU0:router(config-ldp)#neighbor 10.20.20.20:0 password encrypted abc
RP/0/RP0/CPU0:router(config-ldp)#neighbor 10.20.20.20:0 password clear abc
```

neighbor targeted

To configure transmission of targeted hellos toward a neighbor for setting up an LDP session, use the **neighbor targeted** command in MPLS LDP configuration mode. To return to the default behavior, use the **no** form of this command.

```
address-family {ipv4} neighbor Ip-address targeted
no address-family {ipv4} neighbor ip-address targeted
```

Syntax Description

ip-address Neighbor IP address.

ipv4 Specifies IP version 4 address family.

Command Default

No default behavior or values

Command Modes

MPLS LDP configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

No specific guidelines impact the use of this command.

Task ID

Task ID Operations

mpls-ldp read,
write

Examples

The following example shows how to set up a targeted discovery session for neighbor 200.1.1.1:

```
RP/0/RP0/CPU0:router (config-ldp)# clear mpls ldp forwarding
RP/0/RP0/CPU0:router (config-ldp-af)# neighbor 200.1.1.1 targeted
```

router-id (MPLS LDP)

To specify an IPv4 address to act as the router ID, use the **router-id** command in MPLS LDP configuration mode. To return to the default behavior, use the **no** form of this command.

```
router-id lsr-id
no router-id
```

Syntax Description	<i>lsr-id</i>	LSR ID in A.B.C.D format.
Command Default	LDP uses router ID as determined by global router ID agent, IP Address Repository Manager (IP ARM).	
Command Modes	MPLS LDP configuration	
Command History	Release	Modification
	Release 6.0	This command was introduced.

Usage Guidelines LDP uses the router ID from different sources in the following order:

1. Configured LDP router ID.
2. Global router ID (if configured).
3. Calculated (computed) using the primary IPv4 address of the highest numbered configured loopback address. We recommend configuring at least one loopback address.



Note We recommend that you configure an IP address for the LDP router-id to avoid unnecessary session flaps.

Task ID	Task ID Operations
	mpls-ldp read, write

Examples The following example shows how to specify an LSR ID as the router ID:

```
RP/0/RP0/CPU0:router (config-ldp) #router-id 10.0.0.1
```

router ospf

To enable Open Shortest Path First (OSPF) LDP IGP synchronization for area interface, use the **router ospf** command in XR Config mode.

```
router ospf process-id [[area {area-id ip-address}] [interface type interface-path-id] mpls ldp sync]
```

Syntax Description		
<i>process-id</i>		Internally used identification parameter for an OSPF routing process. It is locally assigned and can be any positive integer. A unique value is assigned for each OSPF routing process.
area		(Optional) Enters the OSPF area configuration submenu.
<i>area-id</i>		Specifies the OSPF area ID as a decimal value.
<i>ip-address</i>		Specifies the OSPF area ID as an IP address in A.B.C.D format.
interface		(Optional) Enters the OSPF interface configuration submenu.
<i>type</i>		Interface type. For more information, use the question mark (?) online help function.
<i>interface-path-id</i>		Physical interface or a virtual interface. Note Use the show interfaces command to see a list of all possible interfaces currently configured on the router.
sync		For more information about the syntax for the router, use the question mark (?) online help function. Enables LDP IGP synchronization on the specified interface.
Command Default	No default behavior or values	

Command Modes XR Config mode

Command History	Release	Modification
	Release 6.0	This command was introduced.

Usage Guidelines No specific guidelines impact the use of this command.

Task ID	Task ID	Operation
	mpls-ldp	read, write

Example

The following example shows how to enable OSPF LDP IGP synchronization:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router (config)#router ospf 109
RP/0/RP0/CPU0:router (config-ospf)# mpls ldp sync
```


session protection

To enable the LDP session protection feature for keeping LDP peer session up by means of targeted discovery following the loss of link discovery with a peer, use the **session protection** command in MPLS LDP configuration mode. To return to the default behavior, use the **no** form of this command.

```
session protection [{duration seconds}] [for peer-acl]
no session protection
```

Syntax Description	duration <i>seconds</i> (Optional) Specifies the protection duration, that is, the number of seconds that targeted discovery should continue following the loss of link discovery to a neighbor. Range is 30 to 2147483.
	for <i>peer-acl</i> (Optional) Specifies set of LDP peers for which session protection is to be enabled.

Command Default By default, session protection is disabled. When enabled without peer-acl and duration, session protection is provided for all LDP peers and continues for 24 hours after a link discovery loss.

Command Modes MPLS LDP configuration

Command History	Release	Modification
	Release 6.0	This command was introduced.

Usage Guidelines LDP session protection feature allows you to enable the automatic setup of targeted hello adjacencies with all or a set of peers and specify the duration for which session needs to be maintained using targeted hellos after loss of link discovery.

LDP supports only IPv4 standard access lists.

Task ID	Task ID Operations
	mpls-ldp read, write

Examples

The following example shows how to enable session protection for all discovered peers with unlimited duration to maintain the session after link discovery loss:

```
RP/0/RP0/CPU0:router(config-ldp)# session protection
```

The following example shows how to enable session protection for a set of peers (as permitted by a peer ACL) with duration of 30 seconds to maintain the session after link discovery loss:

```
RP/0/RP0/CPU0:router(config-ldp)# session protection for peer_acl duration 30
```

show mpls ldp backoff

To display information about the configured session setup backoff parameters and any potential LDP peers with which session setup attempts are being throttled, use the **show mpls ldp backoff** command in XR EXEC mode.

```
show mpls ldp backoff [{location node-id}]
```

Syntax Description

location node-id (Optional) Displays location information for the specified node ID.

Command Default

No default behavior or values

Command Modes

XR EXEC mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

You must enable the MPLS LDP application to use the **show mpls ldp backoff** command.

Task ID

Task ID Operations

mpls-ldp read

Examples

The following shows a sample output from the **show mpls ldp backoff** command:

```
RP/0/RP0/CPU0:router# show mpls ldp backoff

Backoff Time:
  Initial:15 sec, Maximum:120 sec

Backoff Table: (2 entries)

LDP Id                Backoff (sec)  Waiting (sec)
-----
33.33.33.33:0         15             15
11.11.11.11:0         30             30
```

This table describes the significant fields shown in the display.

Table 1: show mpls ldp backoff Command Field Descriptions

Field	Description
Backoff Time	Initial and maximum backoff time parameters, in seconds.

Field	Description
Backoff Table	<p>List of discovered LDP neighbors for which session setup is being delayed because of previous failures to establish a session due to incompatible configuration. The backoff table incorporates the following information:</p> <p>LDP Id Identifies the LDP neighbors.</p> <p>Backoff (sec) Specifies the time that the session setup is delayed.</p> <p>Waiting (sec) Specifies an approximate time the session setup has been delayed.</p>

show mpls ldp bindings

To display the contents of the Label Information Base (LIB), use the **show mpls ldp bindings** command in XR EXEC mode command.

```
show mpls ldp [afi-all] [{ipv4}] bindings [prefix/length] [advertisement-acls] [brief] [detail]
[local] [local-label label [to label]] [local-only] [neighbor address] [remote-only][remote-label
label [to label]] [summary] [{location node-id}] [all]
```

Syntax Description		
	afi-all	(Optional) Displays all address families.
	ipv4	(Optional) Specifies IP version 4 address family.
	<i>prefix</i>	(Optional) Destination prefix, written in A.B.C.D format.
	<i>length</i>	(Optional) Network mask length, in bits. Range is 0 to 32.
	advertisement-acls	(Optional) Displays the label bindings as applied for (advertisement) outbound label filtering ACLs.
	brief	(Optional) Displays all the prefixes in the LDP database.
	detail	(Optional) Displays the total counts of advertised-to and remote-binding peers in IP address sort order, with remote bindings in tabular format.
	local	(Optional) Displays the local label bindings.
	local-label <i>label</i> [<i>to label</i>]	(Optional) Displays entries matching local label values. Add the <i>label to label</i> argument to indicate the label range.
	local-only	(Optional) Displays binding matches with a local label only.
	neighbor <i>address</i>	(Optional) Displays the label bindings assigned by the selected neighbor.
	remote-only	(Optional) Displays bindings matches with a remote label only.

remote-label <i>label</i> [to <i>label</i>]	(Optional) Displays entries matching the label values assigned by a neighbor router. Add the <i>label to label</i> argument to indicate the label range. Range is from 0 to 2147483647.
summary	(Optional) Displays a summary of the contents of the Label Information Base (LIB).
location <i>node-id</i>	(Optional) Displays location information for the specified node ID.
all	(Optional) Displays the aggregate summary across LDP processes and all VRFs.

Command Default No default behavior or values

Command Modes XR EXEC mode

Command History	Release	Modification
	Release 6.0	This command was introduced.

Usage Guidelines The **show mpls ldp bindings** command displays local and remote label bindings learned from neighbors for non-BGP routes (such as IGP prefixes and static routes).

You can choose to view the entire database or a subset of entries according to the following criteria:

- Prefix
- Input or output label values or ranges
- Neighbor advertising the label



Note The **show mpls ldp bindings summary** command displays summarized information from the LIB and is used when testing scalability or when deployed in a large scale network.

Task ID	Task ID Operations
	mpls-ldp read

Examples The following sample output displays the contents of the LIB for the default routing domain:

```
RP/0/RP0/CPU0:router# show mpls ldp bindings
5.41.0.0/16 , rev 4
```

show mpls ldp bindings

```

    local binding: label:IMP-NULL
    No remote bindings
5.43.9.98/32 , rev 6
    local binding: label:IMP-NULL
    No remote bindings
10.10.2.0/24 , rev 12
    local binding: label:IMP-NULL
    remote bindings :
        lsr:10.255.255.255:0, label:16
        lsr:10.256.256.256:0, label:IMP-NULL
10.10.3.0/24 , rev 10
    local binding: label:IMP-NULL
    remote bindings :
        lsr:10.255.255.255:0, label:IMP-NULL
        lsr:10.256.256.256:0, label:22
22.22.22.22/32 , rev 14
    local binding: label:16
    remote bindings :
        lsr:10.255.255.255:0, label:17
        lsr:10.256.256.256:0, label:IMP-NULL
33.33.33.33/32 , rev 2
    local binding: label:IMP-NULL
    remote bindings :
        lsr:10.255.255.255:0, label:18
        lsr:10.256.256.256:0, label:23

```

The following sample output shows detailed information for the total counts of advertised-to and remote-binding peers in IP address sort order, with remote bindings for 150.150.150.150/32:

```

RP/0/RP0/CPU0:router# show mpls ldp bindings 150.150.150.150/32 detail

150.150.150.150/32, rev 2
  Local binding: label: IMP-NULL
  Advertised to: (6 peers)
    120.120.120.120:0  130.130.130.130:0  150.150.150.1:0  150.150.150.2:0
    150.150.150.3:0   150.150.150.4:0
  Remote bindings:   (3 peers)
    Peer             Label
  -----
    120.120.120.120:0  27018
    130.130.130.130:0  26017
    160.160.160.160:0  27274

```

The following sample output specifies a network number and displays labels learned from label switched router (LSR) 10.255.255.255 for all networks. The **neighbor** keyword is used to suppress the output of remote labels learned from other neighbors:

```

RP/0/RP0/CPU0:router# show mpls ldp bindings neighbor 10.255.255.255

10.10.2.0/24 , rev 12
  local binding: label:IMP-NULL
  remote bindings :
    lsr:10.255.255.255, label:16
10.10.3.0/24 , rev 10
  local binding: label:IMP-NULL
  remote bindings :
    lsr:10.255.255.255:0, label:IMP-NULL
22.22.22.22/32 , rev 14
  local binding: label:16
  remote bindings :

```

```

        lsr:10.255.255.255:0, label:17
33.33.33.33/32 , rev 2
    local binding: label:IMP-NULL
    remote bindings :
        lsr:10.255.255.255:0, label:18
44.44.44.44/32 , rev 16
    local binding: label:17
    remote bindings :
        lsr:10.255.255.255:0, label:IMP-NULL

```

This table describes the significant fields shown in the display.

Table 2: show mpls ldp bindings and show mpls ldp bindings neighbor Command Field Descriptions

Field	Description
a.b.c.d/n	IP prefix and mask for a particular destination (network/mask).
rev	Revision number (rev) that is used internally to manage label distribution for this destination.
local binding	Locally assigned label for a prefix.
remote bindings	Outgoing labels for this destination learned from other LSRs. ¹ Each item in this list identifies the LSR from which the outgoing label was learned and reflects the label associated with that LSR. Each LSR in the transmission path is identified by its LDP identifier.
(rewrite)	Binding has been written into MPLS forwarding and is in use.
(no route)	Route is not valid. LDP times it out before the local binding is deleted.

¹ Label switched routers.

The following sample output summarizes the content by using the **summary** keyword:

```
RP/0/RP0/CPU0:router# show mpls ldp bindings summary
```

```

LIB Summary:
  Total Prefix   : 20
  Revision No    : Current:34, Advertised:34
  Local Bindings : 14
    NULL        : 10 (implicit:10, explicit:0)
    Non-NULL: 4 (lowest:48, highest:51)
  Remote Bindings: 24

```

This table describes the significant fields shown in the display.

Table 3: show mpls ldp bindings summary Command Field Descriptions

Field	Description
Total Prefix	Number of prefixes (routes) known to LDP LIB. All invalid and timed-out routes display as no-routes.
Revision No	Current revision number of LIB entries as well as the minimum revision number that has been advertised to all peers.
Local Bindings	Total number of local bindings, with information on how many of them are Null, non-null, and lowest/highest label assigned or allocated by LDP.
Remote Bindings	Number of remote bindings.

The following sample output shows the access-list advertisement:

```
RP/0/RP0/CPU0:router# show mpls ldp bindings advertisement-acls

Advertisement Spec:
  Prefix ACL = 'pfx_11'
  Prefix ACL = 'pfx_22'
  Prefix ACL = 'pfx_40_1'; Peer ACL = 'peer_11'

5.41.0.0/16 , rev 82
11.11.11.11/32 , rev 69
  Advert ACL(s): Prefix ACL 'pfx_11'
20.20.20.20/32 , rev 83
22.22.22.22/32 , rev 78
  Advert ACL(s): Prefix ACL 'pfx_22'
40.1.1.0/24 , rev 79
  Advert ACL(s): Prefix ACL 'pfx_40_1'; Peer ACL 'peer_11'
```

This table describes the significant fields shown in the display.

Table 4: show mpls ldp bindings advertisement-acls Command Field Descriptions

Field	Description
Advertisement Spec	Lists all prefix and peer access-lists used as outbound label advertisement control.
Advert ACL(s)	Lists the first matching rule (if any) for the prefix entry for outbound label advertisement control (for prefix-acl).

The following sample output shows all the prefixes in the LDP database using the **brief** keyword:

```
RP/0/RP0/CPU0:router# show mpls ldp bindings brief

Prefix                Local Advertised Remote Bindings
                    Label (peers)      (peers)
-----
1.1.2.2/32            -              0              1
1.2.3.4/32           16010          396             0
4.4.4.4/32           16004          396             3
```



```
10.0.0.0/24          19226      396        395
```

The following sample output shows that the binding matches with a local label:

```
RP/0/RP0/CPU0:router# show mpls ldp bindings local-only

10.12.32.2/32, rev 4
  Local binding: label: IMP-NULL
  No remote bindings
```

The following sample output shows that the binding matches with a remote label:

```
RP/0/RP0/CPU0:router# show mpls ldp bindings remote-only

10.26.4.0/24, rev 0
  No local binding
  Remote bindings: (1 peers)
    Peer          Label
    -----
    10.6.6.6:0    IMP-NULL
10.43.4.0/24, rev 0
  No local binding
  Remote bindings: (1 peers)
    Peer          Label
    -----
    10.4.4.4:0    IMP-NULL
10.46.4.0/24, rev 0
  No local binding
  Remote bindings: (2 peers)
    Peer          Label
    -----
    10.4.4.4:0    IMP-NULL
    10.6.6.6:0    IMP-NULL
```

show mpls ldp capabilities

To display the database capability information for an LDP session, use the **show mpls ldp capabilities** command in XR EXEC mode.

show mpls ldp capabilities [**detail**] **location***node-id*

Syntax Description	detail	(Optional) Displays detailed database capability information for an LDP session.
	location <i>node-id</i>	(Optional) Displays location information for the specified node ID.
Command Default	No default behavior or values	
Command Modes	XR EXEC mode	
Command History	Release	Modification
	Release 6.0	This command was introduced.
Usage Guidelines	No specific guidelines impact the use of this command.	
Task ID	Task ID	Operation
	mpls-ldp	read

Example

The following shows a sample output from the **show mpls ldp capabilities** command:

```
RP/0/RP0/CPU0:router# show mpls ldp capabilities
```

```

Type      Description                                     Owner
-----
0x50b     Typed Wildcard FEC                               LDP
0x3eff    Cisco IOS-XR                                    LDP
0x508     MP: Point-to-Multipoint (P2MP)                  mLDP
0x509     MP: Multipoint-to-Multipoint (MP2MP)            mLDP
                                L2VPN-AToM

```

show mpls ldp discovery

To display the status of the LDP discovery process, use the **show mpls ldp discovery** command in XR EXEC mode.

```
show mpls ldp [afi-all] [{ipv4}] discovery [{lsr-id ldp-id}] [{type interface-path-id} | brief | link |
targeted | summary [all]] [detail] [{location node-id}]
```

Syntax	Description
afi-all	(Optional) Displays all address families.
ipv4	(Optional) Specifies IP version 4 address family.
<i>lsr-id</i>	(Optional) Neighbor LSR ID in A.B.C.D format.
<i>ldp-id</i>	(Optional) Neighbor LDP ID in A.B.C.D: format.
<i>type</i>	(Optional) Interface type. For more information, use the question mark (?) online help function.
<i>interface-path-id</i>	Physical interface or a virtual interface. Note Use the show interfaces command to see a list of all possible interfaces currently configured on the router. For more information about the syntax for the router, use the question mark (?) online help function.
brief	(Optional) Displays concise information about a specified LDP-enabled interface.
link	(Optional) Displays link information for LDP discovery.
targeted	(Optional) Displays targeted information for LDP discovery.
summary	(Optional) Displays summarized information for LDP discovery.

show mpls ldp discovery

all	(Optional) Displays the aggregate summary across LDP processes and all VRFs.
detail	(Optional) Displays detailed information (including, inbound label filtering, session KAs, and session protection state) for an LDP session.
location <i>node-id</i>	(Optional) Displays location information for the specified node ID.

Command Default No default behavior or values

Command Modes XR EXEC mode

Command History	Release	Modification
	Release 6.0	This command was introduced.

Usage Guidelines The **show mpls ldp discovery** command shows both link discovery and targeted discovery. When no interface filter is specified, this command generates a list of interfaces running the LDP discovery process. This command also displays neighbor discovery information for the default routing domain.

Task ID	Task ID	Operations
	mpls-ldp	read

Examples The following sample output is from the **show mpls ldp discovery** command:

```
RP/0/RP0/CPU0:router# show mpls ldp discovery

Local LDP Identifier: 10.44.44.44:0
Discovery Sources:
  Interfaces:
    tenGigE 0/0/0/1 : xmit/recv
      LDP Id: 10.33.33.33:0, Transport address: 10.33.33.33
      Hold time: 15 sec (local:15 sec, peer:15 sec)
```

This table describes the significant fields shown in the display.

Table 5: show mpls ldp discovery Command Field Descriptions

Field	Description
Local LDP Identifier	LDP identifier for the local router. An LDP identifier is a 6-byte construct displayed in the form IP address:number. By convention, the first 4 bytes of the LDP identifier constitute the router ID; integers, starting with 0, constitute the final two bytes of the IP address:number construct.

Field	Description
Interfaces	Interfaces engaged in LDP discovery activity, as follows: xmit field Indicates that the interface is transmitting LDP discovery hello packets. recv field indicates that the interface is receiving LDP discovery hello packets. The LDP identifiers indicate the LDP neighbors discovered on the interface.
Transport Address	Address associated with this LDP peer (advertised in hello messages).
LDP Id	LDP identifier of the LDP peer.
Hold time	State of the forwarding hold timer and its current value.

The following sample output summarizes information for LDP discovery by using the **summary** keyword:

```
RP/0/RP0/CPU0:router# show mpls ldp discovery summary

LDP Identifier: 139.0.0.1:0
Interfaces:
  Configured: 2
  Enabled   : 1
Discovery:
  Hello xmit: 1 (1 link)
  Hello recv: 1 (1 link)
```

This table describes the significant fields shown in the display.

Table 6: show mpls ldp discovery summary Command Field Descriptions

Field	Description
LDP Identifier	The LDP identifier for the local router.
Interfaces	Summary of interfaces engaged in LDP activity. Configured Number of interfaces configured for LDP. Enabled Number of interfaces on which LDP is actively enabled and is thus sending LDP hellos. An interface configured for LDP is enabled only if running IP and not in the down state.

Field	Description
Discovery	Summary of LDP discovery process. Hello xmit Number of local LDP discovery sources (including link and targeted hellos) emitting LDP hellos. Hello recv Number of discovered hello sources via link or targeted hello mechanics.

The following sample output shows the MPLS LDP discovery hello information in brief form:

```
RP/0/RP0/CPU0:router# show mpls ldp discovery brief
```

```
Local LDP Identifier: 1.2.34:0
```

Discovery Source	VRF Name	Peer LDP Id	Holdtime	Session
Te0/0/0/0	default	13.13.13.13:0	15	Y

The following sample shows the MPLS LDP afi-all discovery brief command output:

```
RP/0/0/CPU0:router#show mpls ldp afi-all discovery brief
```

```
Local LDP Identifier: 1.2.3.4:0
```

Discovery Source	AFI	VRF Name	Peer LDP Id	Holdtime	Session
Te0/0/0/0	IPv4	default	13.13.13.13:0	15	Y
Te0/0/0/0.1	IPv4	default	13.13.13.13:0	15	Y
Te0/0/0/4	IPv4	default	8.8.8.8:0	15	Y

show mpls ldp forwarding

To display the Label Distribution Protocol (LDP) forwarding state installed in MPLS forwarding, use the **show mpls ldp forwarding** command in XR EXEC mode.

```
show mpls ldp [afi-all] [{ipv4}] forwarding [prefix/length] [fast-reroute] [detail] [next-hop
{address ip-address | interface interface-path-id | label label-value | neighbor ldp-id | unlabelled}]
[local-label label-value] [{location node-id | summary | standby}] [all]
```

Syntax Description		
afi-all		(Optional) Displays all address families.
ipv4		(Optional) Specifies IP version 4 address family.
<i>prefix</i>		(Optional) Destination prefix, written in A.B.C.D format.
<i>length</i>		(Optional) Network mask length, in bits. Range is 0 to 32.
detail		(Optional) Displays detailed information for the LDP timestamp that is used for the routing and forwarding update.
fast-reroute		(Optional) Displays the prefix that is LFA FRR protected in nature.
next-hop		Matches prefixes by next-hop IP address.
local-label <i>label-value</i>		(Optional) Displays the prefix with the specified local label. Range is from 0 to 1048575.
neighbor		Matches prefixes with a path through specified LDP neighbor.
unlabelled		Matches prefixes containing unlabelled paths.
location <i>node-id</i>		(Optional) Displays location information for the specified node ID.
summary		(Optional) Displays the summary information for the LDP forwarding information base (LFIB).
standby		(Optional) Displays standby-node specific information.
all		(Optional) Displays the aggregate summary across LDP processes and all VRFs.

Command Default No default behavior or values

Command Modes XR EXEC mode

Command History	Release	Modification
	Release 6.0	This command was introduced.

Usage Guidelines The **show mpls ldp forwarding** command displays the LDP forwarding entries and provides LDP view of its installed forwarding entries.

Task ID**Task ID Operations**

mpls-ldp read

Examples

This is a sample output from the **show mpls ldp forwarding** command:

```
RP/0/RP0/CPU0:router# show mpls ldp forwarding
```

Codes:

- = GR label recovering, (!) = LFA FRR pure backup path
 {} = Label stack with multi-line output for a routing path
 G = GR, S = Stale, R = Remote LFA FRR backup

Prefix	Label In	Label Out	Outgoing Interface	Next Hop	GR Stale
1.0.0.2/32	24001	ExpNull	Te0/0/0/2	5.0.0.1	
1.2.3.4/32	24000	ImpNull	Te0/0/0/1	12.1.1.1	
4.4.4.0/24	24052	24040	Te0/0/0/1	12.1.1.1	
5.5.5.5/32	24011	ImpNull	Te0/0/0/0	22.1.1.1	
10.1.2.0/24	24010	24039	Te0/0/0/4	12.2.2.2	
		24038	Te0/0/0/6.2	16.2.1.1	
		24037	Te0/0/0/6.3	16.3.1.1	
		24036	Te0/0/0/6.4	16.4.1.1	

```
RP/0/RP0/CPU0:router# show mpls ldp forwarding
```

Codes:

- = GR label recovering, (!) = LFA FRR pure backup path
 {} = Label stack with multi-line output for a routing path
 G = GR, S = Stale, R = Remote LFA FRR backup

Prefix	Label In	Label Out	Outgoing Interface	Next Hop	GR Stale
1.0.0.2/32	24001	ExpNull	Te0/0/0/2	5.0.0.1	
1.2.3.4/32	24000	ImpNull	Te0/0/0/1	12.1.1.1	
4.4.4.0/24	24052	24040	Te0/0/0/1	12.1.1.1	
5.5.5.5/32	24011	ImpNull	Te0/0/0/0	22.1.1.1	
10.1.2.0/24	24010	24039	Te0/0/0/4	12.2.2.2	
		24038	Te0/0/0/6.2	16.2.1.1	
		24037	Te0/0/0/6.3	16.3.1.1	
		24036	Te0/0/0/6.4	16.4.1.1	



Note The (!) symbol refers to a non-primary LFA backup path.

This sample output shows detailed information for the LDP timestamp that is used for routing and forwarding update from the **detail** keyword:

```
RP/0/RP0/CPU0:router# show mpls ldp forwarding 12.12.12.12/32 detail
```

Codes:

- = GR label recovering, (!) = LFA FRR pure backup path
 {} = Label stack with multi-line output for a routing path
 G = GR, S = Stale, R = Remote LFA FRR backup


```

Prefix          Label   Label   Outgoing   Next Hop   GR Stale
                In     Out     Interface
-----
12.12.12.12/32  24000  24007   Te0/0/0/0  10.1.0.2
                [ table-id 0xe0000000, RIB flags 0x0000, load-metric 0,
                path-id 7;
                label from: peer 13.13.13.13:0 ]
                24007   Te0/0/0/0.1  10.1.1.2
                [ table-id 0xe0000000, RIB flags 0x0000, load-metric 0,
                path-id 4;
                label from: peer 13.13.13.13:0 ]
                24007   Te0/0/0/0.2  10.1.2.2
                [ table-id 0xe0000000, RIB flags 0x0000, load-metric 0,
                path-id 1;
                label from: peer 13.13.13.13:0 ]

```

```

RIB route: table-id 0xe0000000, version 15, priority 7, metric 10
source 3, type 0x80, flags 0x0
Updates:
Routing : Total 1, Last at Nov 23 15:54:25.679 (01:44:53 ago)
Forwarding: Total 3, Last at Nov 23 15:54:47.937 (01:44:31 ago)

```



Note The (!) symbol refers to a non-primary LFA backup path.

This sample output shows only LDP prefixes with protection (ECMP or secondary LFA backups) update from the **fast-reroute** keyword:

This sample output shows the statistics of protected prefixes and protected paths from the **summary** keyword:

```

RP/0/RP0/CPU0:router# show mpls ldp forwarding summary
Forwarding Server (LSD):
  Connected: Yes
  Forwarding State Holdtime: 360 sec
Forwarding States:
  Interfaces: 10
  Local labels: 8
  Rewrites:
  Prefix:
    Total: 8 (0 with ECMP, 8 FRR protected)
  Labelled:
    Primary pathset : 8 labelled (0 partial), 0 unlabelled
    Backup pathset  : 8 labelled (0 partial), 0 unlabelled
    Complete pathset: 8 labelled (0 partial), 0 unlabelled
  Paths:
    Total: 16 (8 backup, 8 FRR protected)
    Labelled: 16 (8 backup)

```

This table describes the significant fields shown in the display.

Table 7: show mpls ldp forwarding Command Field Descriptions

Field	Description
Prefix/mask	Prefix on the FEC ² for an MPLS forwarding entry.

Field	Description
Label In	Local label assigned to the prefix/mask.
Label Out	Outgoing label for the prefix/mask.
Outgoing Interface	Outgoing physical interface.
Next Hop	Next Hop address.
GR	Graceful restart status (Y or N).
Stale	Status of the entry, stale or not stale. An entry is marked stale when the next-hop graceful restart neighbor disconnects and is unmarked when neighbor reconnects and refreshes the label.
Chkpt	Status of the entry, checkpointed or not checkpointed.
path-id	Primary Path-id.
Backup-path-id	The backup path-id is the path-id of the path protecting a given primary path. A protecting path can be primary path or a non-primary path.
Peer	Displays next-hop LDP peer's LDP identifier.
Connected	Displays LDP connection state with LSD forwarding server.
Forwarding State Holdtime	Displays time that LDP has registered with LSD server to keep LDP forwarding state intact upon LDP disconnect event.
Interfaces	Number of LDP enabled MPLS interfaces.
Local Labels	Number of LDP allocated local labels from LSD.
Rewrites	<p>Counts of Forwarding rewrites. Displays total number of known IPv4 prefixes alongwith information on number of prefixes with more than one ECMP path. This also displays number of prefixes with LFA-FRR protection. The labelled set prints the counts related to prefixes with none, all, partial labelled paths as shown by unlabeled, labelled, and partial keywords. This information is available for primary, backup, and complete path set.</p> <p>Note backup path and FRR are not supported in 6.0</p>
Paths	<p>Forwarding path counts. Displays count of total number of known forwarding paths, along with number of backup paths and number of FRR protected paths. It also displays the count of labelled paths indicating how many of non-primary paths are labelled.</p> <p>Note backup path and FRR are not supported in 6.0</p>

² Forwarding Equivalence Class.

show mpls ldp graceful-restart

To display the status of the Label Distribution Protocol (LDP) graceful restart, use the **show mpls ldp graceful-restart** command in XR EXEC mode.

```
show mpls ldp graceful-restart [{location node-id}] [detail]
```

Syntax Description	location <i>node-id</i>	(Optional) Displays location information for the specified node ID.
	detail	(Optional) Displays detailed information about the specified VRF.

Command Default No default behavior or values

Command Modes XR EXEC mode

Command History	Release	Modification
	Release 6.0	This command was introduced.

Usage Guidelines The **show mpls ldp graceful-restart** command displays LDP graceful-restart-related information when the **graceful-restart** command is enabled.

Task ID	Task ID	Operations
	mpls-ldp	read

Examples

The following shows a sample output from the **show mpls ldp graceful-restart** command:

```
RP/0/RP0/CPU0:router# show mpls ldp graceful-restart

Forwarding State Hold timer : Not Running
GR Neighbors                : 1

Neighbor ID      Up    Connect Count  Liveness Timer  Recovery Timer
-----
10.0.0.2        Y      1              -                -
```

This table describes the significant fields shown in the display.

Table 8: show mpls ldp graceful-restart Command Field Descriptions

Field	Description
Forwarding State Hold timer	State of the hold timer—running or not running.

Field	Description
GR Neighbors	Number of graceful restartable neighbors.
Neighbor ID	Router ID of each neighbor.
Up	Neighbor up or down.
Connect Count	Number of times the same neighbor has reconnected.
Liveness Timer	State of the liveness timer (running or not running) and its expiration time, if running.
Recovery Timer	State of the recovery timer (running or not running) and its expiration time, if running.

show mpls ldp igp sync

To display Label Distribution Protocol (LDP) Interior Gateway Protocol (IGP) synchronization information on interface(s), use the **show mpls ldp igp sync** command in XR EXEC mode mode.

```
show mpls ldp [afi-all] [{ipv4}] igp sync [interface type interface-path-id] [brief] [{location node-id}]
```

Syntax Description		
afi-all		(Optional) Displays all address families.
ipv4		(Optional) Specifies IP version 4 address family.
brief		(Optional) Displays brief information about a specified LDP-enabled interface.
interface		(Optional) Displays the interface type.
<i>type</i>		(Optional) Interface type. For more information, use the question mark (?) online help function.
<i>interface-path-id</i>		(Optional) Physical interface or a virtual interface.
	Note	Use the show interfaces command to see a list of all possible interfaces currently configured on the router.
		For more information about the syntax for the router, use the question mark (?) online help function.
location node-id		(Optional) Displays location information for the specified node ID.
Command Default	No default behavior or values	
Command Modes	XR EXEC mode	

show mpls ldp igp sync

Command History	Release	Modification
	Release 6.0	This command was introduced.

Usage Guidelines LDP IGP synchronization addresses traffic loss issues as a result of synchronization between MPLS LDP and IP (IGP). For instance, upon a link up, IGP can advertise a link before MPLS converges on the link. Also, the IGP link is still used even when MPLS session goes down and MPLS LSP is broken on this link. The use of IGP link is determined based on MPLS LDP convergence synchronization status on the link.

Use the **show mpls ldp igp sync** command to display MPLS convergence status. The configuration for LDP IGP synchronization resides in IGP (OSPF, ISIS); accordingly, LDP displays and advertises this information for all LDP-enabled interfaces (regardless if the interface is configured for LDP IGP).

Task ID	Task ID	Operations
	mpls-ldp	read

Examples

The following shows a sample output from the **show mpls ldp igp sync** command:

```
RP/0/RP0/CPU0:router# show mpls ldp igp sync

TenGigE0/0/0/0:
  VRF: 'default' (0x60000000)
  Sync delay: Disabled
  Sync status: Ready
    Peers:
      13.13.13.13:0
```

This table describes the significant fields shown in the display.

Table 9: show mpls ldp igp sync Command Field Descriptions

Field	Description
VRF	VRF of the interface.
Sync status	MPLS LDP convergence status on a given link. Ready indicates that the link is converged and is ready to be used by IGP. Not Ready with Deferred means that the link fulfills LDP IGP synchronization requirements but is deferred by LDP IGP synchronization delay timeout configuration setting. Not Ready means that the link is not ready to be used by IGP.

Field	Description
Peers	List of peers converged on the given link. If the peer session is GR ³ -enabled, output is tagged as GR. If GR-only reachability is indicated due to a GR neighbor record recovered from checkpoint after local start, then Chkpt-created flag is also set.

³ Graceful Restart.

show mpls ldp interface

To display information about LDP-enabled interfaces, use the **show mpls ldp interfaces** command in XR EXEC mode.

show mpls ldp [**afi-all**] [{**ipv4**}] **interface** [{*type interface-path-id* | **summary**}] [**brief**] [{**location node-id**}]

Syntax Description		
afi-all	(Optional)	Displays all address families.
ipv4	(Optional)	Specifies IP version 4 address family.
<i>type</i>	(Optional)	Interface type. For more information, use the question mark (?) online help function.
<i>interface-path-id</i>		Physical interface or a virtual interface.
	Note	Use the show interfaces command to see a list of all possible interfaces currently configured on the router.
		For more information about the syntax for the router, use the question mark (?) online help function.
summary	(Optional)	Displays summary information about a specified LDP-enabled interface.
brief	(Optional)	Displays concise information about a specified LDP-enabled interface.
detail	(Optional)	Displays detailed information about a specified LDP-enabled interface.
location <i>node-id</i>	(Optional)	Displays location information for the specified node ID.
Command Default	No default behavior or values	
Command Modes	XR EXEC mode	
Command History	Release	Modification
	Release 6.0	This command was introduced.
Usage Guidelines	No specific guidelines impact the use of this command.	
Task ID	Task ID	Operations
	mpls-ldp	read

Examples

The following shows a sample output from the **show mpls ldp interface** command:

```
RP/0/RP0/CPU0:router# show mpls ldp interface
```

```
Interface TenGigE0/0/0/1 (0x8000040)
VRF: 'default' (0x60000000)
Enabled via config: LDP interface
Interface TenGigE0/0/0/1.10 (0x80009b8)
VRF: 'default' (0x60000000)
Enabled via config: LDP interface
Interface TenGigE0/0/0/1.11 (0x80009c0)
VRF: 'default' (0x60000000)
Enabled via config: LDP interface
Interface TenGigE0/0/0/1.12 (0x80009c8)
VRF: 'default' (0x60000000)
```

```
RP/0/RP0/CPU0:router# show mpls ldp interface
```

```
Interface TenGigE0/0/0/0 (0x8000038)
VRF: 'default' (0x60000000)
Enabled via config: LDP interface
Interface TenGigE0/0/0/0.1 (0x80001c8)
VRF: 'default' (0x60000000)
Enabled via config: LDP interface
Interface TenGigE0/0/0/4 (0x8000058)
VRF: 'default' (0x60000000)
Enabled via config: LDP interface
```

This table describes the significant fields shown in the display.

Table 10: show mpls ldp interface Command Field Descriptions

Field	Description
Auto-config items	Lists IGPs that specify an interface for MPLS LDP auto-configuration: OSPF <i>ospf instance area</i> ISIS <i>isis instance</i>

The following shows a sample output from the **show mpls ldp interface detail** command for the mesh groups:

```
RP/0/RP0/CPU0:router# show mpls ldp interface detail
```

```
Interface TenGigE0/0/0/1 (0x8000040)
VRF: 'default' (0x60000000)
Enabled via config: LDP interface
Interface TenGigE0/0/0/1.10 (0x80009b8)
VRF: 'default' (0x60000000)
Enabled via config: LDP interface
Interface TenGigE0/0/0/1.11 (0x80009c0)
VRF: 'default' (0x60000000)
Enabled via config: LDP interface
```

show mpls ldp interface

```
Interface TenGigE0/0/0/1.12 (0x80009c8)
VRF: 'default' (0x60000000)
Enabled via config: LDP interface
```

show mpls ldp neighbor

To display the status of Label Distribution Protocol (LDP) sessions, use the **show mpls ldp neighbor** command in XR EXEC mode mode.

```
show mpls ldp neighbor [{ip-address ldp-id}] [type interface-path-id] [brief] [capabilities] [detail]
[gr] [location node-id] [non-gr] [sp]
```

Syntax Description		
	<i>ip-address</i>	(Optional) Neighbor IP address.
	<i>ldp-id</i>	(Optional) Neighbor LDP ID in A.B.C.D: format.
	<i>type</i>	(Optional) Interface type. For more information, use the question mark (?) online help function.
	<i>interface-path-id</i>	Physical interface or a virtual interface. Note Use the show interfaces command to see a list of all possible interfaces currently configured on the router. For more information about the syntax for the router, use the question mark (?) online help function.
	brief	(Optional) Displays the existing LDP sessions in brief format.
	capabilities	(Optional) Displays the neighbor capabilities information.
	detail	(Optional) Displays detailed information (including, inbound label filtering, session KAs, and session protection state) for an LDP session.
	gr	(Optional) Displays graceful restartable neighbors.
	location <i>node-id</i>	(Optional) Displays location information for the specified node ID.

show mpls ldp neighbor

non-gr	(Optional) Displays non-graceful restartable neighbors.
sp	(Optional) Displays neighbors with session protection.

Command Default No default behavior or values

Command Modes XR EXEC mode

Command History	Release	Modification
	Release 6.0	This command was introduced.

Usage Guidelines The **show mpls ldp neighbor** command provides information about all LDP neighbors in the entire routing domain—conversely, the show output is filtered to display:

- LDP neighbors with specific IP addresses
- LDP neighbors on a specific interface
- LDP neighbors that are graceful restartable
- LDP neighbors that are nongraceful restartable
- LDP neighbors enabled with session protection

Task ID	Task ID	Operations
	mpls-ldp	read

Examples

The following shows a sample output from the **show mpls ldp neighbor** command using an IP address:

```
RP/0/RP0/CPU0:router# show mpls ldp neighbor

Peer LDP Identifier: 12.12.12.12:0
TCP connection: 12.12.12.12:33432 - 5.5.5.5:646
Graceful Restart: No
Session Holdtime: 180 sec
State: Oper; Msgs sent/rcvd: 1464/1479; Downstream-Unsolicited
Up time: 14:08:40
LDP Discovery Sources:
IPv4: (16)
TenGigE0/0/0/1.15
TenGigE0/0/0/1.11
TenGigE0/0/0/1
TenGigE0/0/0/1.13
TenGigE0/0/0/1.3
TenGigE0/0/0/1.7
TenGigE0/0/0/1.14
TenGigE0/0/0/1.6
TenGigE0/0/0/1.2
TenGigE0/0/0/1.10
TenGigE0/0/0/1.4
TenGigE0/0/0/1.5
TenGigE0/0/0/1.16
```

```

TenGigE0/0/0/1.8
TenGigE0/0/0/1.9
TenGigE0/0/0/1.12
IPv6: (0)
Addresses bound to this peer:
IPv4: (73)
4.4.4.1 10.64.98.26 12.12.12.12 20.20.20.1
21.21.21.2 27.27.27.27 43.43.43.1 53.53.53.1
55.55.55.1 59.1.0.2 63.63.63.1 66.66.66.1
69.1.0.2 73.73.73.1 77.77.77.77 79.1.0.2
81.81.81.1 83.83.83.1 89.1.0.2 90.1.0.2
91.1.0.2 92.1.0.2 93.1.0.2 93.93.93.1
94.1.0.2 95.1.0.2 96.1.0.2 97.1.0.2
98.1.0.2 99.1.0.2 100.1.0.2 101.1.0.2
102.1.0.2 103.1.0.2 103.103.103.1 104.1.0.2
105.1.0.2 106.1.0.2 107.1.0.2 108.1.0.2
109.1.0.2 110.1.0.2 111.1.0.2 112.1.0.2
113.1.0.2 113.113.113.1 114.1.0.2 115.1.0.2
116.1.0.2 123.123.123.1 133.133.133.1 143.143.143.1
153.153.153.1 163.163.163.1 173.173.173.1 181.181.181.1
183.183.183.1 184.184.184.1 185.185.185.1 186.186.186.1
187.187.187.1 188.188.188.1 189.189.189.1 190.190.190.1
191.191.191.1 193.193.193.1 194.194.194.1 195.195.195.1
196.196.196.1 197.197.197.1 198.198.198.1 199.199.199.1
203.203.203.1
IPv6: (0)

```

```
RP/0/RP0/CPU0:router# show mpls ldp neighbor non-gr
```

```

Peer LDP Identifier: 12.12.12.12:0
TCP connection: 12.12.12.12:33432 - 5.5.5.5:646
Graceful Restart: No
Session Holdtime: 180 sec
State: Oper; Msgs sent/rcvd: 1464/1479; Downstream-Unsolicited
Up time: 14:08:49
LDP Discovery Sources:
IPv4: (16)
TenGigE0/0/0/1.15
TenGigE0/0/0/1.11
TenGigE0/0/0/1
TenGigE0/0/0/1.13
TenGigE0/0/0/1.3
TenGigE0/0/0/1.7
TenGigE0/0/0/1.14
TenGigE0/0/0/1.6
TenGigE0/0/0/1.2
TenGigE0/0/0/1.10
TenGigE0/0/0/1.4
TenGigE0/0/0/1.5
TenGigE0/0/0/1.16
TenGigE0/0/0/1.8
TenGigE0/0/0/1.9
TenGigE0/0/0/1.12
IPv6: (0)
Addresses bound to this peer:
IPv4: (73)
4.4.4.1 10.64.98.26 12.12.12.12 20.20.20.1
21.21.21.2 27.27.27.27 43.43.43.1 53.53.53.1
55.55.55.1 59.1.0.2 63.63.63.1 66.66.66.1
69.1.0.2 73.73.73.1 77.77.77.77 79.1.0.2
81.81.81.1 83.83.83.1 89.1.0.2 90.1.0.2
91.1.0.2 92.1.0.2 93.1.0.2 93.93.93.1
94.1.0.2 95.1.0.2 96.1.0.2 97.1.0.2
98.1.0.2 99.1.0.2 100.1.0.2 101.1.0.2

```

show mpls ldp neighbor

```

102.1.0.2 103.1.0.2 103.103.103.1 104.1.0.2
105.1.0.2 106.1.0.2 107.1.0.2 108.1.0.2
109.1.0.2 110.1.0.2 111.1.0.2 112.1.0.2
113.1.0.2 113.113.113.1 114.1.0.2 115.1.0.2
116.1.0.2 123.123.123.1 133.133.133.1 143.143.143.1
153.153.153.1 163.163.163.1 173.173.173.1 181.181.181.1
183.183.183.1 184.184.184.1 185.185.185.1 186.186.186.1
187.187.187.1 188.188.188.1 189.189.189.1 190.190.190.1
191.191.191.1 193.193.193.1 194.194.194.1 195.195.195.1
196.196.196.1 197.197.197.1 198.198.198.1 199.199.199.1
203.203.203.1
IPv6: (0)

```

```
RP/0/RP0/CPU0:router# show mpls ldp neighbor 8.8.8.8
```

```

Peer LDP Identifier: 8.8.8.8:0
TCP connection: 8.8.8.8:42784 - 1.2.3.4:646
Graceful Restart: No
Session Holdtime: 180 sec
State: Oper; Msgs sent/rcvd: 1276/1250; Downstream-Unsolicited
Up time: 15:37:39
LDP Discovery Sources:
IPv4: (1)
TenGigE0/0/0/4
IPv6: (0)
Addresses bound to this peer:
IPv4: (9)
5.0.0.2 8.8.8.8 10.1.0.1 10.64.98.28
12.1.1.2 41.41.41.41 77.77.77.77 167.167.167.167
202.202.202.202
IPv6: (0)

```

The following shows a sample output from the **show mpls ldp neighbor** command using the **non-gr** keyword:

```
RP/0/RP0/CPU0:router# show mpls ldp neighbor non-gr
```

```

Peer LDP Identifier: 13.13.13.13:0
TCP connection: 13.13.13.13:63262 - 1.2.3.4:646
Graceful Restart: No
Session Holdtime: 180 sec
State: Oper; Msgs sent/rcvd: 1322/1361; Downstream-Unsolicited
Up time: 15:38:02
LDP Discovery Sources:
IPv4: (1)
TenGigE0/0/0/0
IPv6: (0)
Addresses bound to this peer:
IPv4: (24)
10.0.0.1 4.4.4.4 10.1.0.2 10.1.1.2
10.1.2.2 10.1.3.2 10.1.4.2 10.1.5.2
10.1.6.2 10.1.7.2 10.64.98.27 11.10.9.8
13.13.13.13 18.0.0.1 33.33.33.33 79.0.0.2
79.1.0.2 79.2.0.2 79.3.0.2 79.4.0.2
79.5.0.2 100.100.100.100 178.0.0.2 201.201.201.201
IPv6: (0)

```

This table describes the significant fields shown in the display.

Table 11: show mpls ldp neighbor Command Field Descriptions

Field	Description
Peer LDP Identifier	LDP identifier of the neighbor (peer) for this session.
TCP connection	TCP connection used to support the LDP session, shown in the following format: neighbor IP address peer port local IP address local port
Graceful Restart	Graceful-restart status (Y or N).
State	State of the LDP session. Generally this is Oper (operational), but transient is another possible state.
Msgs sent/rcvd	Number of LDP messages sent to and received from the session peer. The count includes the transmission and receipt of periodic keepalive messages, which are required for maintenance of the LDP session.
Up time	The length of time that this session has been up for (in <i>hh:mm:ss</i> format).
LDP Discovery Sources	The source(s) of LDP discovery activity leading to the establishment of the LDP session.
Addresses bound to this peer	The known interface addresses of the LDP session peer. These are addresses that might appear as “next hop” addresses in the local routing table. They are used to maintain the LFIB ⁴ .

⁴ LFIB = Label Forwarding Information Base.

The following shows a sample output from the **show mpls ldp neighbor** command using the **brief** keyword:

```
RP/0/RP0/CPU0:router# show mpls ldp neighbor brief
```

```
Peer                GR  NSR  Up Time      Discovery  Addresses  Labels
                   --  ---  -----      ipv4  ipv6      ipv4  ipv6  ipv4  ipv6
-----
4.4.4.4:0           Y  N    1d00h        1     0         3     0     5     0
46.46.46.2:0       N  N    1d00h        1     1         3     3     5     5
46.46.46.46:0     Y  N    1d00h        2     2         4     4     5     5
6.6.6.1:0          Y  N    23:25:50    0     1         0     2     0     5
```

This table describes the significant fields shown in the display.

Table 12: show mpls ldp neighbor brief Command Field Descriptions

Field	Description
Peer	LDP identifier of the neighbor (peer) for this session.
GR	Graceful-restart status (Y or N).
Up Time	Time the session has been up (in hh:mm:ss format).
Discovery	Number of LDP discovery sources corresponding to the neighbor.
Address	Number of addresses bound to this peer.

The following shows a sample output from the **show mpls ldp neighbor** command using the **detail** keyword:

```
RP/0/RP0/CPU0:router# show mpls ldp neighbor detail

eer LDP Identifier: 12.12.12.12:0
TCP connection: 12.12.12.12:33432 - 5.5.5.5:646
Graceful Restart: No
Session Holdtime: 180 sec
State: Oper; Msgs sent/rcvd: 1465/1481; Downstream-Unsolicited
Up time: 14:10:17
LDP Discovery Sources:
IPv4: (16)
TenGigE0/0/0/1.15
TenGigE0/0/0/1.11
TenGigE0/0/0/1
TenGigE0/0/0/1.13
TenGigE0/0/0/1.3
TenGigE0/0/0/1.7
TenGigE0/0/0/1.14
TenGigE0/0/0/1.6
TenGigE0/0/0/1.2
TenGigE0/0/0/1.10
TenGigE0/0/0/1.4
TenGigE0/0/0/1.5
TenGigE0/0/0/1.16
TenGigE0/0/0/1.8
TenGigE0/0/0/1.9
TenGigE0/0/0/1.12
IPv6: (0)
Addresses bound to this peer:
IPv4: (73)
4.4.4.1 10.64.98.26 12.12.12.12 20.20.20.1
21.21.21.2 27.27.27.27 43.43.43.1 53.53.53.1
55.55.55.1 59.1.0.2 63.63.63.1 66.66.66.1
69.1.0.2 73.73.73.1 77.77.77.77 79.1.0.2
81.81.81.1 83.83.83.1 89.1.0.2 90.1.0.2
91.1.0.2 92.1.0.2 93.1.0.2 93.93.93.1
94.1.0.2 95.1.0.2 96.1.0.2 97.1.0.2
98.1.0.2 99.1.0.2 100.1.0.2 101.1.0.2
102.1.0.2 103.1.0.2 103.103.103.1 104.1.0.2
105.1.0.2 106.1.0.2 107.1.0.2 108.1.0.2
109.1.0.2 110.1.0.2 111.1.0.2 112.1.0.2
113.1.0.2 113.113.113.1 114.1.0.2 115.1.0.2
116.1.0.2 123.123.123.1 133.133.133.1 143.143.143.1
```



```

153.153.153.1 163.163.163.1 173.173.173.1 181.181.181.1
183.183.183.1 184.184.184.1 185.185.185.1 186.186.186.1
187.187.187.1 188.188.188.1 189.189.189.1 190.190.190.1
191.191.191.1 193.193.193.1 194.194.194.1 195.195.195.1
196.196.196.1 197.197.197.1 198.198.198.1 199.199.199.1
203.203.203.1
IPv6: (0)
Peer holdtime: 180 sec; KA interval: 60 sec; Peer state: Estab
NSR: Disabled
Capabilities:
Sent:
0x508 (MP: Point-to-Multipoint (P2MP))
0x509 (MP: Multipoint-to-Multipoint (MP2MP))
0x50b (Typed Wildcard FEC)
Received:
0x508 (MP: Point-to-Multipoint (P2MP))
0x509 (MP: Multipoint-to-Multipoint (MP2MP))
0x50b (Typed Wildcard FEC)

```

RP/0/RP0/CPU0:router# **show mpls ldp neighbor detail**

```

Peer LDP Identifier: 8.8.8.8:0
TCP connection: 8.8.8.8:42784 - 1.2.3.4:646
Graceful Restart: No
Session Holdtime: 180 sec
State: Oper; Msgs sent/rcvd: 1280/1254; Downstream-Unsolicited
Up time: 15:41:06
LDP Discovery Sources:
IPv4: (1)
TenGigE0/0/0/4
IPv6: (0)
Addresses bound to this peer:
IPv4: (9)
5.0.0.2 8.8.8.8 10.1.0.1 10.64.98.28
12.1.1.2 41.41.41.41 77.77.77.77 167.167.167.167
202.202.202.202
IPv6: (0)
Peer holdtime: 180 sec; KA interval: 60 sec; Peer state: Estab
NSR: Disabled
Capabilities:
Sent:
0x508 (MP: Point-to-Multipoint (P2MP))
0x509 (MP: Multipoint-to-Multipoint (MP2MP))
0x50b (Typed Wildcard FEC)
Received:
0x508 (MP: Point-to-Multipoint (P2MP))
0x509 (MP: Multipoint-to-Multipoint (MP2MP))
0x50b (Typed Wildcard FEC)

```

This table describes the significant fields shown in the display.

Table 13: show mpls ldp neighbor detail Command Field Descriptions

Field	Description
Peer LDP Identifier	LDP identifier of the neighbor (peer) for this session.

Field	Description
TCP connection	TCP connection used to support the LDP session, shown in the following format: neighbor IP address peer port local IP address local port
Graceful Restart	Graceful-restart status (Y or N).
Session Holdtime	Session hold time, in seconds.
State	State of the LDP session (operational or transient).
Msgs sent/rcvd	Number of LDP messages sent to and received from the session peer. The count includes the transmission and receipt of periodic keepalive messages, which are required for maintenance of the LDP session.
Up time	Time the session has been up for (in <i>hh:mm:ss</i> format).
Peer holdtime	Time to keep LDP peer session up without receipt of LDP protocol message from a peer.
Peer state	Peer session state.
Peer holdtime	Time to keep LDP peer session up without receipt of LDP protocol message from a peer.
Clients	LDP (internal) clients requesting session with a neighbor.
Inbound label filtering	LDP neighbor inbound filtering policy.
Session Protection	State of the session protection: Incomplete Targeted discovery requested but not yet up. Ready Targeted discovery and at least one link hello adjacency to the peer are up. Protecting Targeted discovery is up and there is no link hello adjacency to the peer. Targeted discovery is protecting and backing up link discoveries.
Duration	Maximum time to maintain session through targeted discovery upon loss of primary link discovery.
Holdtimer	When in “protecting” state, time to keep LDP peer session up without receipt of LDP protocol message from a peer.

show mpls ldp parameters

To display current LDP parameters, use the **show mpls ldp parameters** command in XR EXEC mode mode.

```
show mpls ldp parameters [{location node-id }]
```

Syntax Description	location node-id	(Optional) Displays location information for the specified node ID.
Command Default	No default behavior or values	
Command Modes	XR EXEC mode	
Command History	Release	Modification
	Release 6.0	This command was introduced.
Usage Guidelines	The show mpls ldp parameters command displays all LDP operational and configuration parameters.	
Task ID	Task ID	Operations
	mpls-ldp	read
	network	read

Examples

The following shows a sample output from the **show mpls ldp parameters** command:

```
RP/0/RP0/CPU0:router# show mpls ldp parameters

LDP Parameters:
  Protocol Version: 1
  Router ID: 10.11.11.11
  Null Label: Implicit
  Session:
    Hold time: 180 sec
    Keepalive interval: 60 sec
    Backoff: Initial:15 sec, Maximum:120 sec
  Discovery:
    Link Hellos:      Holdtime:15 sec, Interval:5 sec
    Targeted Hellos: Holdtime:90 sec, Interval:10 sec
                    (Accepting peer ACL 'peer_acl_10')
  Graceful Restart:
    Enabled (Configured)
    Reconnect Timeout:120 sec, Forwarding State Holdtime:180 sec
  Timeouts:
    Binding with no-route: 300 sec
    LDP application recovery (with LSD): 360 sec
  OOR state
    Memory: Normal
```

This table describes the significant fields shown in the display.

Table 14: show mpls ldp parameters Command Field Descriptions

Field	Description
Protocol Version	Version of LDP running on the platform.
Router ID	Currently used router ID.
Null Label	LDP use of implicit-null or explicit-null as label for prefixes where it has to use a null label.
Session Hold time	Time LDP session is to be maintained with an LDP peer without receiving LDP traffic or an LDP keepalive message from the peer.
Session Keepalive interval	Time interval between consecutive transmissions of LDP keepalive messages to an LDP peer.
Session Backoff	Initial maximum backoff time for sessions.
Discovery Link Hellos	Time to remember that a neighbor platform wants an LDP session without receiving an LDP hello message from the neighbor (hold time), and the time interval between the transmission of consecutive LDP hello messages to neighbors (interval).
Discovery Targeted Hellos	Indicates the time: <ul style="list-style-type: none"> To remember that a neighbor platform wants an LDP session when the neighbor platform is not directly connected to the router or the neighbor platform has not sent an LDP hello message. This intervening interval is known as <i>hold time</i>. Interval between the transmission of consecutive hello messages to a neighbor not directly connected to the router and if targeted hellos are being accepted, displaying peer-acl (if any).
Graceful Restart	Status of graceful-restart status (Y or N).
Timeouts	Various timeouts (of interest) that the LDP is using. One timeout is <i>binding no route</i> , which indicates how long the LDP waits for an invalid route before deleting it. It also shows restart recovery time for LSD and LDP.
OOR state	Out of resource memory state: Normal, Major, or Critical.

show mpls ldp statistics fwd-setup

To display the statistics of the forwarding setup counters related to RIB/LSD, use the **show mpls ldp statistics fwd-setup** command in XR EXEC mode.

```
show mpls ldp statistics fwd-setup [{location node-id }]
```

Syntax Description	location <i>node-id</i>	(Optional) Displays location information for the specified node ID.
Command Default	No default behavior or values	
Command Modes	XR EXEC mode	
Command History	Release	Modification
	Release 6.0	This command was introduced.
Usage Guidelines	No specific guidelines impact the use of this command.	
Task ID	Task ID	Operation
	mpls-ldp	read

Example

The following shows a sample output from the **show mpls ldp statistics fwd-setup** command:

```
RP/0/RP0/CPU0:router# show mpls ldp statistics fwd-setup

RIB
===

Thread counters:
  Events In           : 10
  Events Out          : 39
  RIB fetch throttled : 0 (0 during last throttle)

TC Thread counters:
  Events In           : 39 (3 skipped)
  Events Out          : 12 (0 failed, 2 skipped)

Address Family: IPv4
  RIB server connects: 1
  RIB converged: Yes
  Op counters:
    Fetch              : 4 (2 buffers per fetch)
                       no-data: 0
                       callbacks: 33 routes, 3 convg, 0 rcmd
    Route Up           : 33 (0 protected; Paths: 29/0/0 total/backup/protected)
```

show mpls ldp statistics fwd-setup

```

Route Down      : 0
Route Filtered : 5 (0 intern, 5 misc, 0 alloc, 0 admin,
                   0 unSUPP-intf 0, unSUPP-protection,
                   0 bgp, 0 bgp-unlabelled, 0 ibgp-no-lbl-ucast)

MFI
===

Thread counters:
Events In       : 9
Events Out      : 8
LSD Rsrc-Complete : 1
LSD server connects : 1

Op counters:

```

	Successful	Failed
	-----	-----
Control :	3	0
RCMD Markers :	0	0
State cleanup :	0	0
Interface Enable :	5	0
Interface Disable :	0	0
Label alloc :	4	0
Label alloc - mldp :	0	0
Label free :	0	0
Label free - mldp :	0	0
Rewrite create :	6	0
Rewrite delete :	0	0
Label/Rewrite create :	0	0
Label/Rewrite delete :	0	0
Label OOR cleared :	3	0
Total LSD Reqs/Msgs :	7	0

```

LSD flow control status:
Flow control      : 0
Flow control cnt  : 0
Evt queue item cnt : 0
Last flow control : N/A

```

show mpls ldp statistics msg-counters

To display statistics of the messages exchanged between neighbors, use the **show mpls ldp statistics msg-counters** command in XR EXEC mode mode.

```
show mpls ldp statistics msg-counters [{lsr-id ldp-id}] [{location node-id }]
```

Syntax Description	<i>lsr-id</i>	(Optional) LSR ID of neighbor in A.B.C.D format.
	<i>ldp-id</i>	(Optional) LDP ID of neighbor in A.B.C.D: format.
	location <i>node-id</i>	(Optional) Displays location information for the specified node ID.
Command Default	No default behavior or values	
Command Modes	XR EXEC mode	
Command History	Release	Modification
	Release 6.0	This command was introduced.
Usage Guidelines	The show mpls ldp statistics msg-counters command can provide counter information about different types of messages sent and received between neighbors.	
Task ID	Task ID	Operations
	mpls-ldp	read
Examples	The following shows a sample output from the show mpls ldp statistics msg-counters command:	

```
RP/0/RP0/CPU0:router# show mpls ldp statistics msg-counters
```

```
Peer LDP Identifier: 13.13.13.13:0
```

```
Sent Rcvd
-----
Initialization 1 1
Address 15 46
Address-Withdraw 14 25
Label-Mapping 28 498
Label-Withdraw 14 439
Label-Release 439 14
Label-Request 0 0
Label-Abort-Request 0 0
Notification 0 0
```

show mpls ldp statistics msg-counters

```
KeepAlive 4862 4874
```

```
Total 5373 5897
```

The below table describes the significant fields shown in the display.

Table 15: show mpls ldp statistics msg-counters Command Field Descriptions

Field	Description
Peer LDP Identifier	LDP identifier of the neighbor (peer).
Msg Sent	Summary of messages sent to the LDP peer.
Msg Rcvd	Summary of messages received from the LDP peer.

show mpls ldp summary

To display a summary of LDP information, use the **show mpls ldp summary** command in System Admin EXEC mode mode.

```
show mpls ldp summary [{location node-id}] [all]
```

Syntax Description		
	location <i>node-id</i>	(Optional) Displays location information for the specified node ID.
	all	(Optional) Displays the aggregate summary across LDP processes and all VRFs.

Command Default No default behavior or values

Command Modes XR EXEC mode

Command History	Release	Modification
	Release 6.0	This command was introduced.

Usage Guidelines The **show mpls ldp summary** command can provide information about the number of LDP neighbors, interfaces, forwarding state (rewrites), servers connection/registration, and graceful-restart information.

Task ID	Task ID	Operations
	mpls-ldp	read

Examples

The following example shows a sample output from the **show mpls ldp summary** command:

```
RP/0/RP0/CPU0:router# show mpls ldp summary

AFIs      : IPv4
Routes    : 4
Neighbors : 1 (1 GR)
Hello Adj : 1
Addresses : 3
Interfaces: 4 LDP configured
```

The following example shows a sample output from the **show mpls ldp summary all** command:

```
RP/0/RP0/CPU0:router# show mpls ldp summary all

VRFs      : 1 (1 oper)
AFIs      : IPv4
Routes    : 4
Neighbors : 1 (1 GR)
```

show mpls ldp summary

```

Hello Adj      : 1
Addresses      : 3
Interfaces     : 4 (1 forward reference, 2 LDP configured)
Collaborators:

```

	Connected	Registered
	-----	-----
SysDB	Y	Y
IM	Y	Y
RSI	Y	-
IP-ARM	Y	-
IPv4-RIB	Y	Y (1/1 tables)
LSD	Y	Y
LDP-NSR-Partner	Y	-
L2VPN-AToM	Y	-
mLDP	-	N

This table describes the significant fields shown in the display.

Table 16: show mpls ldp summary Command Field Descriptions

Field	Description
Routes	Number of known IP routes (prefixes).
Neighbors	Number of LDP neighbors, including targeted and graceful restartable neighbors.
Hello Adj	Number of discovered LDP discovery sources.
Interfaces	Number of known IP interfaces and number of LDP configured interfaces. LDP is configured on a forward-referenced interface which may not exist or for which no IP address is configured.
Addresses	Number of known local IP addresses.

show mpls ldp trace

To display the Label Distribution Protocol (LDP) VRF event traces, use the **show mpls ldp trace** command in XR EXEC mode.

show mpls ldp trace

[binding] [capabilities] [config] [dev] [discovery] [error] [file *file-name*]
 [forwarding] [gr] [hexdump] [iccp] [igp-sync] [interface] [last]
 [location {*node-id name all mgmt-nodes*}] [misc] [mldp] [nsr] [peer] [process]
 [reverse] [route] [since] [stats] [tailf] [unique] [usec]
 [verbose] [wide] [wrapping]

Syntax Description		
binding		(Optional) Displays the binding event traces.
capabilities		(Optional) Displays the capabilities event traces.
config		(Optional) Displays the configuration event traces.
dev		(Optional) Displays the development private traces.
discovery		(Optional) Displays Hello or discovery and adj event traces.
error		(Optional) Displays error traces.
file <i>file-name</i>		(Optional) Displays trace of a specific file.
forwarding		(Optional) Displays forwarding event traces.
gr		(Optional) Displays graceful-restart event traces.
hexdump		(Optional) Displays traces in hexadecimal.
iccp		(Optional) Displays ICCP signaling event traces.
igp-sync		(Optional) Displays IGP sync event traces.
interface		(Optional) Displays interface event traces.
last		(Optional) Displays last number of entries.

location	(Optional) Identifies the location of the card whose CPU controller trace information you want to display.
<i>node-id</i>	The node-id argument is expressed in the rack/slot/module notation.
<i>name</i>	Specifies the name of the card.
<i>all</i>	Specifies all locations.
<i>mgmt-nodes</i>	Specifies all managements nodes.
misc	(Optional) Displays miscellaneous event traces.
mldp	(Optional) Displays MLDP event traces.
nsr	(Optional) Displays non-stop routing event traces.
peer	(Optional) Displays peer session event traces.
process	(Optional) Displays process-level event traces.
pw	(Optional) Displays L2VPN pseudo-wire event traces.
reverse	(Optional) Displays latest traces first.
route	(Optional) Displays route event traces.
since last-start	(Optional) Displays traces since the last start time.
stats	(Optional) Displays statistics.
tailf	(Optional) Displays new traces as they are added.
unique	(Optional) Displays unique entries with count.
usec	(Optional) Displays timestamp w/usec detail.
verbose	(Optional) Displays internal debugging information.

wide	(Optional) Do not display buffer name, node name and tid.
wrapping	(Optional) Displays wrapping entries.

Command Default No default behavior or values

Command Modes XR EXEC mode

Command History	Release	Modification
	Release 6.0	This command was introduced.

Usage Guidelines No specific guidelines impact the use of this command.

Task ID	Task ID	Operation
	mpls-ldp	read

Example

The following example shows how to display the LDP event traces:

```
RP/0/RP0/CPU0:router# show mpls ldp trace
```

```
Dec 12 17:14:58.193 mpls/ldp/proc 0/RP0/CPU0 t7049 [PROC]:117: **** PROCESS MPLS-LDP STARTED
****
Dec 12 17:14:58.193 mpls/ldp/proc 0/RP0/CPU0 t7049 [PROC]:1061: Thread 'ldp_main' started
Dec 12 17:14:58.194 mpls/ldp/proc 0/RP0/CPU0 t7049 [PROC]:368: Init done for module 'OS'
Dec 12 17:14:58.206 mpls/ldp/proc 0/RP0/CPU0 t7049 [PROC]:368: Init done for module 'Dbg'
Dec 12 17:14:58.212 mpls/ldp/proc 0/RP0/CPU0 t7049 [PROC]:368: Init done for module 'Global'
Dec 12 17:14:58.212 mpls/ldp/proc 0/RP0/CPU0 t7049 [PROC]:368: Init done for module 'TDP'
Dec 12 17:14:58.213 mpls/ldp/misc 0/RP0/CPU0 t7049 [MISC]:293: s_ldp_chkpt_lib_init=0
Dec 12 17:14:58.213 mpls/ldp/proc 0/RP0/CPU0 t7049 [PROC]:368: Init done for module 'Hello-Tx'
Dec 12 17:14:58.213 mpls/ldp/proc 0/RP0/CPU0 t7263 [PROC]:46: Thread 'ldp_hello_tx' started
Dec 12 17:14:58.244 mpls/ldp/proc 0/RP0/CPU0 t7049 [PROC]:368: Init done for module 'Chkpt'
Dec 12 17:14:58.245 mpls/ldp/proc 0/RP0/CPU0 t7049 [PROC]:368: Init done for module 'GS'
Dec 12 17:14:58.245 mpls/ldp/proc 0/RP0/CPU0 t7049 [PROC]:368: Init done for module 'IO
EVM'
Dec 12 17:14:58.248 mpls/ldp/cfg 0/RP0/CPU0 t7049 [CFG]:151: sr_cfg_pre_init DONE
Dec 12 17:14:58.248 mpls/ldp/proc 0/RP0/CPU0 t7049 [PROC]:368: Init done for module 'Cfg
Pre-Init'
Dec 12 17:14:58.253 mpls/ldp/intf 0/RP0/CPU0 t7049 [INTF]:685: im_attr_owner_init: DONE
Dec 12 17:14:58.253 mpls/ldp/proc 0/RP0/CPU0 t7049 [PROC]:368: Init done for module 'IM
Attr Pre-Init'
Dec 12 17:14:58.253 mpls/ldp/proc 0/RP0/CPU0 t7049 [PROC]:368: Init done for module 'UDP-xport
Pre-Init'
Dec 12 17:14:58.253 mpls/ldp/proc 0/RP0/CPU0 t7271 [PROC]:227: Thread 'ldp_im_attr_nfy'
started
Dec 12 17:14:58.254 mpls/ldp/proc 0/RP0/CPU0 t7049 [PROC]:368: Init done for module 'TCP-xport
Pre-Init'
Dec 12 17:14:58.256 mpls/ldp/proc 0/RP0/CPU0 t7049 [PROC]:3792: TAGCON started
Dec 12 17:14:58.256 mpls/ldp/proc 0/RP0/CPU0 t7049 [PROC]:368: Init done for module 'TC
Init'
```

```
show mpls ldp trace
```

```
Dec 12 17:14:58.277 mpls/ldp/proc 0/RP0/CPU0 t7049 [PROC]:368: Init done for module 'LDP  
mLDP Pre-Init'
```

show lcc

To display label consistency checker (LCC) information, use the **show lcc** command in XR EXEC mode.

```
show lcc {ipv4} unicast {all | label | tunnel-interface} [statistics | [{summary | scan-id scan-id}]]
```

Syntax Description		
ipv4		Specifies IP version 4 address prefixes.
unicast		Specifies unicast address prefixes.
all		Scans all routes.
label		Scans all labels.
tunnel-interface		Specifies the interface of a tunnel.
statistics		Displays route consistency check statistics information.
scan-id		Specifies the value of scan-id. Range is from 0 to 100000.
summary		Displays background route consistency check statistics summary information.

Command Default None

Command Modes IPv4 address family configuration

Command History	Release	Modification
	Release 6.0	This command was introduced.

Usage Guidelines No specific guidelines impact the use of this command.

Task ID	Task ID	Operations
	IPv4	read

Examples

The following example shows an outcome of the label consistency checker information:

```
RP/0/RP0/CPU0:router# show lcc ipv4 unicast all

Sending scan initiation request to IPv4 LSD ... done
Waiting for scan to complete (max time 600 seconds).....
Scan Completed
Collecting scan results from FIBs (max time 30 seconds)... done
Number of nodes involved in the scan: 1
Number of nodes replying to the scan: 1
```

Legend:

? - Currently Inactive Node, ! - Non-standard SVD Role
* - Node did not reply

Node Checks Performed Errors

signalling dscp (LDP)

To assign label distribution protocol (LDP) signaling packets a differentiated service code point (DSCP) to assign higher priority to the control packets while traversing the network, use the **signalling dscp** command in MPLS LDP configuration mode. To return to the default behavior, use the **no** form of this command.

signalling dscp *dscp*
no signalling dscp

Syntax Description	<i>dscp</i> DSCP priority value. Range is 0 to 63.				
Command Default	LDP control packets are sent with precedence 6 (<i>dscp</i> : 48)				
Command Modes	MPLS LDP configuration				
Command History	<table border="1"> <thead> <tr> <th>Release</th> <th>Modification</th> </tr> </thead> <tbody> <tr> <td>Release 6.0</td> <td>This command was introduced.</td> </tr> </tbody> </table>	Release	Modification	Release 6.0	This command was introduced.
Release	Modification				
Release 6.0	This command was introduced.				

Usage Guidelines DSCP marking improves signaling setup and teardown times.

Ordinarily, when LDP sends hello discovery or protocol control messages, these are marked using the default control packet precedence value (6, or *dscp* 48). You can use the **signalling dscp** command to override that DSCP value to ensure that all control messages sent are marked with a specified DSCP.



Note While the **signalling dscp** command controls LDP signaling packets (Discovery hellos and protocol messages), it has no effect on ordinary IP or MPLS data packets.

Task ID	Task ID	Operations
	mpls-ldp	read, write

Examples The following example shows how to assign LDP packets a DSCP value of 56:

```
RP/0/RP0/CPU0:router(config-ldp)# signalling dscp 56
```

snmp-server traps mpls ldp

To inform a network management system of session and threshold cross changes, use the **snmp-server traps mpls ldp** command in global configuration mode.

```
snmp-server traps mpls ldp {up | down | threshold}
```

Syntax Description	
up	Displays the session-up notification.
down	Displays the session-down notification.
threshold	Displays the session-backoff-threshold crossed notification.

Command Default LDP does not send SNMP traps.

Command Modes XR Config mode

Command History	Release	Modification
	Release 6.0	This command was introduced.

Usage Guidelines The **snmp-server traps mpls ldp** command sends notifications to the SNMP server. There are three types of traps sent by LDP:

Session up

Generated when sessions go up.

Session down

Generated when sessions go down.

Threshold

Generated when attempts to establish a session fails. The predefined value is 8.

Task ID	Task ID	Operations
	mpls-ldp	read, write
	snmp	read, write

Examples

The following example shows how to enable LDP SNMP trap notifications for Session up:

```
RP/0/RP0/CPU0:router(config)# snmp-server traps mpls ldp up
```

address-family ipv4 label

To configure label control and policies on a specific IPv4 destination, use the address-family ipv4 label command in the MPLS LDP configuration mode.

```
address-family {ipv4 }
label [remote accept from ldp-id for prefix-acl]
local [default-route] [allocate for {prefix-acl | host-routes}]
[advertise [to ldp-id for prefix-acl]
[interface type interface-path-id ]]
```

Syntax Description		
address-family		Configure address-family and its parameters.
ipv4		Specifies IP version 4 address family.
label		(Optional) Configure label control and policies.
remote		(Optional) Configure remote/peer label control and policies.
accept		(Optional) Configure inbound label acceptance control.
from <i>ldp-id</i>		Specifies which LDP neighbors will receive label advertisements. LDP ID is written in A.B.C.D: format.
for <i>prefix-acl</i>		Specifies prefix destinations for which labels will be advertised.
local		(Optional) Configure local label control and policies.
default-route		(Optional) Enable MPLS forwarding for default route.
allocate		(Optional) Configure label allocation control.
for <i>prefix-acl</i>		Specifies prefix destinations for which labels will be allocated.
host-routes		Allocates labels for host routes only.
advertise		(Optional) Configure outbound label advertisement control.

to <i>ldp-id</i>	(Optional) Specifies which LDP neighbors will receive label advertisements. LDP ID is written in A.B.C.D: format.
for <i>prefix-acl</i>	(Optional) Specifies prefix destinations for which labels will be advertised.
interface	(Optional) Advertise interface host address.
<i>type</i>	Interface type. For more information, use the question mark (?) online help function.
<i>interface-path-id</i>	Physical interface or a virtual interface. Note Use the show interfaces command to see a list of all possible interfaces currently configured on the router. For more information about the syntax for the router, use the question mark (?) online help function.

Command Default No default behavior or values

Command Modes MPLS LDP configuration

Command History	Release	Modification
	Release 6.0	This command was introduced.

Usage Guidelines No specific guidelines impact the use of this command.

Task ID	Task ID	Operation
	mpls-ldp	read, write

Example

The following example shows how to configure label control and policies on a specific IPv4 destination:

```
RP/0/RP0/CPU0:router(config-ldp)# address-family ipv4 label
```

address-family ipv4 label



MPLS Static Commands

This module describes the commands used to configure static MPLS labels in a Multiprotocol Label Switching (MPLS) network on the .

For detailed information about MPLS concepts, configuration tasks, and examples, see *MPLS Configuration Guide for Cisco NCS 5000 Series Routers*.

- [address family ipv4 unicast \(mpls-static\), on page 100](#)
- [clear mpls static local-label discrepancy, on page 102](#)
- [interface \(mpls-static\), on page 103](#)
- [show mpls static local-label, on page 104](#)
- [show mpls static summary, on page 105](#)

address family ipv4 unicast (mpls-static)

To enable static MPLS label binding on a specific IPv4 unicast destination address prefix and on the forwarding next-hop address, use the **address-family ipv4 unicast** command in MPLS static configuration mode. To remove MPLS static binding, use the **no** form of this command.

```
address-family ipv4 unicast local-label label_value allocate [per-prefix ipv4_prefix_value] forward
path path_value nexthop nexthop_information interface-type interface-path-id out-label {label_value
| pop | exp-null}
no address-family ipv4 unicast
```

Syntax Description

local-label <i>label_value</i>	Specifies MPLS local-label value for static binding and forwarding. The range is from 16 to 1048575.
allocate	Displays local-label allocation options.
per-prefix <i>ipv4_prefix_value</i>	Specifies IPv4 prefix value to which the specified MPLS label will be statically bound.
forward	Configure forwarding for traffic with static MPLS label.
path <i>path-value</i>	Specifies path-ID for MPLS cross-connect path.
nexthop <i>nexthop_information</i>	Specifies the next-hop information that is either an IP address or interface.
<i>interface-type</i> <i>interface-id</i>	Interface type. For more information, use the question mark (?) online help function.
out-label <i>label_value</i>	Specifies mpls local-label value for static binding on the egress packet.
pop	Removes label from egress packet.
exp-null	Applies explicit null label on the egress packet.

Command Default

None

Command Modes

MPLS static configuration

Command History

Release	Modification
Release 5.1.1	This command was introduced.

Usage Guidelines

No specific guidelines impact the use of this command.

Task ID

Task ID	Operation
mpls-static	read

Example

The following command sequence shows how to specify local label for an ip-prefix and define LSP.

```
RP/0/RP0/CPU0:router#configure
RP/0/RP0/CPU0:router(config)#mpls static
RP/0/RP0/CPU0:router(config-mpls-static)#address-family ipv4 unicast
RP/0/RP0/CPU0:router(config-mpls-static-af)#local-label 30500 allocate per-prefix 10.1.1.1/24
forward path 1 nexthop 12.2.2.2 out-label 30600
```

clear mpls static local-label discrepancy

To clear any discrepancy between statically allocated and dynamically allocated local labels, use the **clear mpls static local-label discrepancy** command in XR EXEC mode. A label discrepancy is generated when:

- A static label is configured for an IP prefix (per VRF) that already has a binding with a dynamic label.
- A static label is configured for an IP prefix, when the same label value is dynamically allocated to another IP prefix.

clear mpls static local-label discrepancy *{label-value | all}*

Syntax Description	<i>label-value</i> A value that denotes the label for which the discrepancies need to be cleared.
	all Specifies that all discrepancies need to be cleared.

Command Default None

Command Modes XR EXEC mode

Command History	Release	Modification
	Release 6.0	This command was introduced.

Usage Guidelines No specific guidelines impact the use of this command.

Task ID	Task ID	Operation
	mpls-static	read

```
RP/0/RP0/CPU0:router#clear mpls static local-label discrepancy all
```

interface (mpls-static)

To enable MPLS encapsulation on specified interfaces, use the **interface** command in MPLS static configuration mode. To disable MPLS encapsulation on specified interfaces, use the **no** form of the command.

interface *interface-type* *interface-id*
no interface *interface-type* *interface-id*

Syntax Description	<i>interface-type</i> Interface type. For more information, use the question mark (?) online help function.
	<i>interface-path-id</i> Physical interface instance.
Command Default	None
Command Modes	MPLS static configuration
Command History	Release Modification
	Release 6.0 This command was introduced.
Usage Guidelines	No specific guidelines impact the use of this command.
Task ID	Task ID Operation
	mpls-static read and write

Example

The following command sequence shows how to enable MPLS encapsulation on a TenGigE port.

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# mpls static
RP/0/RP0/CPU0:router(config-mpls-static)# interface TenGigE 0/0/0/1
```

show mpls static local-label

To display information about local labels allocated using **mpls static** command, use the **show mpls static local-label** command in XR EXEC mode.

```
show mpls static local-label {label-value | all [detail] | discrepancy [detail] | error [detail]}
```

Syntax Description	local-label label-value	Specifies local label value to display MPLS static information for only that label.
	all	Displays MPLS static information about all local labels.
	discrepancy	Displays label discrepancy between static labels and dynamic labels.
	error	Displays MPLS static labeling errors.
	detail	(Optional) Detailed information is displayed.

Command Default None

Command Modes XR EXEC mode

Command History	Release	Modification
	Release 6.0	This command was introduced.

Usage Guidelines No specific guidelines impact the use of this command.

Task ID	Task ID	Operation
	mpls-static	read

The following command sequence shows how to view label discrepancy information:

```
RP/0/RP0/CPU0:router#show mpls static local-label discrepancy detail
Tue Apr 22 18:20:47.183 UTC
Label  VRF          Type          Prefix          RW Configured  Status
-----
16003  default        Per-Prefix    172.16.0.1/32   No              Discrepancy
STATUS : Label has discrepancy
```

The following command sequence shows how to view MPLS static information for all local labels:

```
RP/0/RP0/CPU0:router#show mpls static local-label all
Tue Apr 22 18:21:41.813 UTC
Label  VRF          Type          Prefix          RW Configured  Status
-----
200    default        Per-Prefix    10.10.10.10/32  Yes            Created
16003  default        Per-Prefix    172.16.0.1/32   No              Discrepancy
```

show mpls static summary

To display MPLS static summary information, use the **show mpls static summary** command in XR EXEC mode.

show mpls static summary

Syntax Description	summary Displays MPLS static binding information.
---------------------------	--

Command Default	None
------------------------	------

Command Modes	XR EXEC mode
----------------------	--------------

Command History	Release	Modification
	Release 6.0	This command was introduced.

Usage Guidelines	No specific guidelines impact the use of this command.
-------------------------	--

Task ID	Task ID	Operation
	mpls-static	read

This is the sample output for **show mpls static summary** command:

```
RP/0/RP0/CPU0:router#show mpls static summary
Tue Apr 22 18:22:17.931 UTC

Label      : Total      2   Errored      0   Discrepancies      1
VRF        : Total      1   Active        1
Interface  : Total      7   Enabled       1   Forward-Reference  0

LSD        : CONNECTED
IM         : CONNECTED
RSI        : CONNECTED
```

show mpls static summary



MPLS Forwarding Commands

This module describes the commands used to configure and use Multiprotocol Label Switching (MPLS) forwarding.

For detailed information about MPLS concepts, configuration tasks, and examples, see *MPLS Configuration Guide for Cisco NCS 5000 Series Routers*.

- [clear mpls forwarding counters, on page 108](#)
- [mpls label range, on page 109](#)
- [show mpls ea interfaces, on page 111](#)
- [show mpls forwarding, on page 112](#)
- [show mpls forwarding exact-route, on page 117](#)
- [show mpls forwarding labels, on page 121](#)
- [show mpls forwarding summary, on page 123](#)
- [show mpls interfaces, on page 126](#)
- [show mpls label range, on page 129](#)
- [show mpls label table, on page 130](#)
- [show mpls lsd applications, on page 132](#)
- [show mpls lsd clients, on page 134](#)
- [show mpls lsd forwarding labels, on page 136](#)
- [show mpls lsd forwarding summary, on page 137](#)

clear mpls forwarding counters

To clear (set to zero) the MPLS forwarding counters, use the **clear mpls forwarding counters** command in XR EXEC mode.

clear mpls forwarding counters

Syntax Description This command has no arguments or keywords.

Command Default No default behavior or values

Command Modes XR EXEC mode

Command History	Release	Modification
	Release 6.0	This command was introduced.

Usage Guidelines Use the **clear mpls forwarding counters** command to set all MPLS forwarding counters to zero so that you can easily see the future changes.

Task ID	Task ID	Operations
	mpls-ldp	read, write
	mpls-static	read, write

Example:

This a test.

Examples

The following example shows sample output before and after clearing all counters:

```
RP/0/RP0/CPU0:router# show mpls forwarding
```

Local Label	Outgoing Label	Prefix or ID	Outgoing Interface	Next Hop	Bytes Switched	T
18	Exp-Null-v4	33.33.33.33/32	PO0/2/0/0	10.20.2.3	17000	O

```
RP/0/RP0/CPU0:router# show mpls forwarding
```

Local Label	Outgoing Label	Prefix or ID	Outgoing Interface	Next Hop	Bytes Switched	T
18	Exp-Null-v4	33.33.33.33/32	PO0/2/0/0	10.20.2.3	16762	O

```
RP/0/RP0/CPU0:router# clear mpls forwarding counters
```


mpls label range

To configure the dynamic range of local labels available for use on packet interfaces, use the **mpls label range** command in XR Config mode. To return to the default behavior, use the **no** form of this command.

mpls label range table *table-id* *minimum* *maximum*
no mpls label range table *table-id* *minimum* *maximum*

Syntax Description	
table <i>table-id</i>	Identifies a specific label table; the global label table has <i>table-id</i> = 0. If no table is specified, the global table is assumed. Currently, you can specify table 0 only.
<i>minimum</i>	Smallest allowed label in the label space. Default is 16000.
<i>maximum</i>	Largest allowed label in the label space. Default is 1048575.

Command Default

table-id: 0
minimum: 16000
maximum: 1048575

Command Modes XR Config mode

Command History	Release	Modification
	Release 6.0	This command was introduced.

Usage Guidelines

After configuring the **mpls label range** command, restart the router for the configuration to take effect.

The label range defined by the **mpls label range** command is used by all MPLS applications that allocate local labels (for dynamic label switching Label Distribution Protocol [LDP], MPLS traffic engineering, and so on).

Labels 0 through 15 are reserved by the Internet Engineering Task Force (IETF) (see the draft-ietf-mpls-label-encaps-07.txt for details) and cannot be included in the range using the **mpls label range** command.

The maximum allowed label limit is 1000000 when ASR 9000 Enhanced Ethernet Line Card is used.



- Note**
- Labels outside the current range and which are allocated by MPLS applications remain in circulation until released.
 - The maximum labels that are available are 144K.
 - You must understand the maximum labels that are supported for each platform versus the labels that are supported for the CLI.

Task ID	Task ID	Operations
	mpls-ldp	read, write

Examples

The following example shows how to configure the size of the local label space using a *minimum* of 16200 and a *maximum* of 120000:

```
RP/0/RP0/CPU0:router# configure  
RP/0/RP0/CPU0:router(config)# mpls label range 16200 120000
```

show mpls ea interfaces

To display the interface label security information, use the **show mpls ea interfaces** command in XR EXEC mode.

show mpls ea interface [**location** *node-id*]

Syntax Description	location <i>node-id</i>	Displays the interfaces on which MPLS is enabled.
Command Modes	XR EXEC mode	
Command History	Release	Modification
	Release 6.0	This command was introduced.
Usage Guidelines	The keywords and arguments described allow display of the interface label security information.	
Task ID	Task ID	Operations
	mpls-ldp	read
	mpls-static	read

Examples

The following sample output is from the **show mpls ea interfaces** command and specific interface and location:

```
RP/0/RP0/CPU0:router# show mpls ea interfaces location 0/1/CPU0
Interface      IFH          MTU  Flags      Type
-----
Interface      IFH          MTU
-----
Te0/0/0/1      0x08000040   1500
Te0/0/0/1.2    0x08001d90   1500
Te0/0/0/1.3    0x08001d98   1500
Te0/0/0/1.4    0x08001da0   1500
Te0/0/0/1.5    0x08001da8   1500
Te0/0/0/1.6    0x08001db0   1500
Te0/0/0/1.7    0x08001db8   1500
Te0/0/0/1.8    0x08001dc0   1500
Te0/0/0/1.9    0x08001dc8   1500
Te0/0/0/1.10   0x08001dd0   1500
Te0/0/0/1.11   0x08001dd8   1500
Te0/0/0/1.12   0x08001de0   1500
Te0/0/0/1.13   0x08001de8   1500
Te0/0/0/1.14   0x08001df0   1500
Te0/0/0/1.15   0x08001df8   1500
Te0/0/0/1.16   0x08001e00   1500
```

show mpls forwarding

To display the contents of the MPLS Label Forwarding Information Base (LFIB), use the **show mpls forwarding** command in XR EXEC mode.

```
show mpls forwarding [detail] [hardware{ingress | egress}] [interface type interface-path-id]
[location node-id] [labels low-value [high-value] ] [prefix{network/mask | ipv4 unicast
network/mask} ] [private] [summary] [tunnels tunnel-id][vrf vrf-name]
```

Syntax Description	
detail	(Optional) Displays information in long form (includes length of encapsulation, length of Media Access Control [MAC] string, maximum transmission unit [MTU], Packet switched, and label stack).
hardware	(Optional) Displays the hardware location entry.
ingress	(Optional) Reads information from the ingress PSE.
egress	(Optional) Reads information from the egress PSE.
interface	(Optional) Displays information for the specified interface.
<i>type</i>	Interface type. For more information, use the question mark (?) online help function.
<i>interface-path-id</i>	Physical interface or a virtual interface. Note Use the show interfaces command to see a list of all possible interfaces currently configured on the router. For more information about the syntax for the router, use the question mark (?) online help function.
labels <i>low-value</i> [<i>high-value</i>]	(Optional) Entries with a local labels range. Ranges for both <i>low-value</i> and <i>high-value</i> are 0 to 1048575.
location <i>node-id</i>	(Optional) Displays hardware resource counters on the designated node.
p2mp	(Optional) Displays only P2MP LSPs. Note This will be supported in a future release of Cisco IOS XR software.
local	(Optional) Displays only P2MP LSP MPLS output paths that are local to a line card.
unresolved	(Optional) Displays P2MP LSPs that have failures. For example, one or more MPLS output paths are unresolved or have platform failures.
leafs	(Optional) Displays P2MP LSPs that have failures on the leaf such as platform failures.

prefix <i>network / mask / length</i>	(Optional) Displays the destination address and mask/prefix length. Note The forward slash (/) between <i>network</i> and <i>mask</i> is required.
ipv4 unicast	(Optional) Displays the IPv4 unicast address.
private	(Optional) Displays private information.
summary	(Optional) Displays summarized information.
tunnels <i>tunnel-id</i>	(Optional) Displays entries either for a specified label switch path (LSP) tunnel or all LSP tunnel entries. Note This will be supported in a future release of Cisco IOS XR software.
vrf <i>vrf-name</i>	(Optional) Displays entries for VPN routing and forwarding (VRF). Note This will be supported in a future release of Cisco IOS XR software.

Command Modes XR EXEC mode

Command History	Release	Modification
	Release 6.0	This command was introduced.

Usage Guidelines The optional keywords and arguments described allow specification of a subset of the entire MPLS forwarding table.



Note This router does not support label accounting for vrf labels. Instead, it supports accounting for the IGP and LDP labels. As a result, the Bytes Switched counter is 0 for the **show mpls forwarding vrf** command.



Note Even if there are multiple outgoing paths the **show mpls forwarding detail** command shows the stats in the first path only as Cisco NCS 5000 Series Router supports only one stat per local label. The statistics are counted at the ingress when a labeled packet enters.

The *node-id* argument is entered in the *rack/slot/module* notation.

Task ID	Task ID	Operations
	mpls-ldp	read, write
	mpls-static	read, write

Examples

The following sample output is from the **show mpls forwarding** command:

```
RP/0/RP0/CPU0:router# show mpls forwarding
```

Local Label	Outgoing Label	Prefix or ID	Outgoing Interface	Next Hop	Bytes Switched
24034	Unlabelled	10.3.0.6/32	Te0/0/0/3	191.4.2.34	0
	Unlabelled	10.3.0.6/32	BE247	191.4.1.194	0
	Unlabelled	10.3.0.6/32	BE248	191.4.1.218	0
	Unlabelled	10.3.0.6/32	BE249	191.4.1.242	0
	Unlabelled	10.3.0.6/32	BE2410	191.4.2.10	0
	Unlabelled	10.3.0.6/32	Te0/0/0/43	191.4.2.58	0
	Unlabelled	10.3.0.6/32	BE247.1	191.4.1.198	0
	Unlabelled	10.3.0.6/32	BE248.1	191.4.1.222	0
	Unlabelled	10.3.0.6/32	BE249.1	191.4.1.246	0
	Unlabelled	10.3.0.6/32	BE2410.1	191.4.2.14	0
	Unlabelled	10.3.0.6/32	Te0/0/0/3.1	191.4.2.38	0
	Unlabelled	10.3.0.6/32	Te0/0/0/43.1	191.4.2.62	0
24035	24027	10.3.0.1/32	BE241	191.4.1.2	370984
	24027	10.3.0.1/32	BE242	191.4.1.26	0
	24027	10.3.0.1/32	BE243	191.4.1.50	0
	24027	10.3.0.1/32	BE241.1	191.4.1.6	0
	24027	10.3.0.1/32	BE242.1	191.4.1.30	0
	24027	10.3.0.1/32	BE243.1	191.4.1.54	0
	24027	10.3.0.1/32	Te0/0/0/79	191.4.1.74	0
	24027	10.3.0.1/32	Te0/0/0/79.1	191.4.1.78	0

The following sample output shows detailed information for the LSP:

```
RP/0/RP0/CPU0:router# show mpls forwarding prefix 10.3.0.1/32 detail
```

Local Label	Outgoing Label	Prefix or ID	Outgoing Interface	Next Hop	Bytes Switched
24035	24027	10.3.0.1/32	BE241	191.4.1.2	371356
		Updated: Nov 29 12:30:14.671			
		Version: 42, Priority: 3			
		Label Stack (Top -> Bottom): { 24027 }			
		NHID: 0x0, Encap-ID: N/A, Path idx: 0, Backup path idx: 0, Weight: 0			
		MAC/Encaps: 14/18, MTU: 8986			
		Packets Switched: 4883			
	24027	10.3.0.1/32	BE242	191.4.1.26	0
		Updated: Nov 29 12:30:14.671			
		Version: 42, Priority: 3			
		Label Stack (Top -> Bottom): { 24027 }			
		NHID: 0x0, Encap-ID: N/A, Path idx: 1, Backup path idx: 0, Weight: 0			
		MAC/Encaps: 14/18, MTU: 9086			
		Packets Switched: 0			
	24027	10.3.0.1/32	BE243	191.4.1.50	0
		Updated: Nov 29 12:30:14.671			
		Version: 42, Priority: 3			
		Label Stack (Top -> Bottom): { 24027 }			
		NHID: 0x0, Encap-ID: N/A, Path idx: 2, Backup path idx: 0, Weight: 0			
		MAC/Encaps: 14/18, MTU: 9086			
		Packets Switched: 0			
	24027	10.3.0.1/32	BE241.1	191.4.1.6	0

```

Updated: Nov 29 12:30:14.671
Version: 42, Priority: 3
Label Stack (Top -> Bottom): { 24027 }
NHID: 0x0, Encap-ID: N/A, Path idx: 3, Backup path idx: 0, Weight: 0
MAC/Encaps: 18/22, MTU: 8986
Packets Switched: 0

    24027      10.3.0.1/32      BE242.1      191.4.1.30      0
Updated: Nov 29 12:30:14.671
Version: 42, Priority: 3
Label Stack (Top -> Bottom): { 24027 }
NHID: 0x0, Encap-ID: N/A, Path idx: 4, Backup path idx: 0, Weight: 0
MAC/Encaps: 18/22, MTU: 9086
Packets Switched: 0

    24027      10.3.0.1/32      BE243.1      191.4.1.54      0
Updated: Nov 29 12:30:14.671
Version: 42, Priority: 3
Label Stack (Top -> Bottom): { 24027 }
NHID: 0x0, Encap-ID: N/A, Path idx: 5, Backup path idx: 0, Weight: 0
MAC/Encaps: 18/22, MTU: 9086
Packets Switched: 0

    24027      10.3.0.1/32      Te0/0/0/79   191.4.1.74      0
Updated: Nov 29 12:30:14.671
Version: 42, Priority: 3
Label Stack (Top -> Bottom): { 24027 }
NHID: 0x0, Encap-ID: N/A, Path idx: 6, Backup path idx: 0, Weight: 0
MAC/Encaps: 14/18, MTU: 9086
Packets Switched: 0

    24027      10.3.0.1/32      Te0/0/0/79.1 191.4.1.78      0
Updated: Nov 29 12:30:14.671
Version: 42, Priority: 3
Label Stack (Top -> Bottom): { 24027 }
NHID: 0x0, Encap-ID: N/A, Path idx: 7, Backup path idx: 0, Weight: 0
MAC/Encaps: 18/22, MTU: 9086
Packets Switched: 0

```

This table describes the significant fields shown in the display.

Table 17: show mpls forwarding Field Descriptions

Field	Description
Local Label	Label assigned by this router.
Outgoing Label	Label assigned by the next hop or downstream peer. Some of the entries that display in this column are: Unlabeled No label for the destination from the next hop, or label switching is not enabled on the outgoing interface. Pop Label Next hop advertised an implicit-null label for the destination.
Prefix or Tunnel ID	Address or tunnel to which packets with this label are going.

Field	Description
Outgoing Interface	Interface through which packets with this label are sent.
Next Hop	IP address of neighbor that assigned the outgoing label.
Bytes Switched	Number of bytes switched with this incoming label.

show mpls forwarding exact-route

To display the exact path for the source and destination address pair, use the **show mpls forwarding exact-route** command in XR EXEC mode.

```
show mpls forwarding exact-route label label-number {bottom-label value | ipv4 source-address destination-address | ipv6source-addressdestination-address} [detail] [protocol protocol source-port source-port destination-port destination-port ingress-interface type interface-path-id] [location node-id] [policy-class value] [hardware {ingress | egress}]
```

Syntax Description		
label <i>label-number</i>	Displays the Label Number. Range is 0 to 1048575.	
bottom-label	Displays the bottom label value. Range is 0 to 1048575.	Note bottom-label is not required for packets with single label.
ipv4 <i>source-address destination-address</i>	Displays the exact path for IPv4 payload. The IPv4 source address in x.x.x.x format. The IPv4 destination address in x.x.x.x format.	
ipv6 <i>source-address destination-address</i>	Displays the exact path for IPv6 payload. The IPv6 source address in x::x::x format. The IPv6 destination address in x::x::x format.	Note This will be supported in a future release of Cisco IOS XR software.
detail	(Optional) Displays detailed information.	
protocol <i>protocol</i>	(Optional) Displays the specified protocol for the route.	Note protocol is not used for load balancing.
source-port <i>source-port</i>	Sets the UDP source port. The range is from 0 to 65535.	
destination-port <i>destination-port</i>	Sets the UDP destination port. The range is from 0 to 65535.	
ingress-interface	Sets the ingress interface.	
<i>type</i>	Interface type. For more information, use the question mark (?) online help function.	
<i>interface-path-id</i>	Physical interface or a virtual interface.	Note Use the show interfaces command to see a list of all possible interfaces currently configured on the router.
	For more information about the syntax for the router, use the question mark (?) online help function.	
location <i>node-id</i>	(Optional) Displays hardware resource counters on the designated node.	

policy-class <i>value</i>	(Optional) Displays the policy-based tunnel selection (PBTS) to direct traffic into specific TE tunnels. The policy-class attribute maps the correct traffic class to this policy. The range for the policy-class value is from 1 to 7. Note This will be supported in a future release of Cisco IOS XR software.
hardware	(Optional) Displays the hardware location entry.
ingress	(Optional) Reads information from the ingress PSE. Note This will be supported in a future release of Cisco IOS XR software.
egress	(Optional) Reads information from the egress PSE.

Command Default No default behavior or values

Command Modes XR EXEC mode

Command History	Release	Modification
	Release 6.0	This command was introduced.

Usage Guidelines The **show mpls forwarding exact-route** command displays information in long form and includes the following information:

- Encapsulation length
- Media Access Control (MAC) string length
- Maximum transmission unit (MTU)
- Packet switching information
- Label stacking information



Note

Task ID	Task ID	Operations
	mpls-ldp	read, write
	mpls-static	read, write

Examples

The following shows a sample output from the **show mpls forwarding exact-route** command:

```
RP/0/RP0/CPU0:router# show mpls forwarding exact-route label 24001
```

```
entropy-label 1234 ingress-interface tenGigE 0/0/0/1/0 location 0/0/CPU0
```

```
Local   Outgoing   Prefix           Outgoing   Next Hop       Bytes
Label   Label      or ID            Interface  Interface      Switched
-----
24001   64002      194.0.0.1/32    Te0/0/0/1/0.1  25.2.11.1     N/A
      Via: Te0/0/0/1/0.1, Next Hop: 25.2.11.1
      Label Stack (Top -> Bottom): { 64002 }
      NHID: 0x4, Encap-ID: N/A, Path idx: 2, Backup path idx: 0, Weight: 0
      Hash idx: 2
      MAC/Encaps: 18/22, MTU: 1500
      Outgoing Interface: TenGigE0/0/0/1/0.1 (ifhandle 0x00000500)
```

This table describes the significant fields shown in the display.

Table 18: show mpls forwarding exact-route Field Descriptions

Field	Description
Local Label	Label assigned by this router.
Outgoing Label	Label assigned by the next hop or downstream peer. Some of the entries that display in this column are: Unlabeled No label for the destination from the next hop, or label switching is not enabled on the outgoing interface. Pop Label Next hop advertised an implicit-null label for the destination.
Prefix or Tunnel ID	Address or tunnel to which packets with this label are going.
Outgoing Interface	Interface through which packets with this label are sent.
Next Hop	IP address of neighbor that assigned the outgoing label.
Bytes Switched	Number of bytes switched with this incoming label.
TO	Timeout: Indicated by an "*" if entry is being timed out in forwarding.
MAC/Encaps	Length in bytes of Layer 2 header, and length in bytes of packet encapsulation, including Layer 2 header and label header.
MTU	MTU ⁵ of labeled packet.
Label Stack	All the outgoing labels on the forwarded packet.
Packets Switched	Number of packets switched with this incoming label.
Label switching	Number of Label switching LFIB ⁶ forwarding entries.
IPv4 label imposition	Number of IPv4 label imposition forwarding entries (installed at ingress LSR).
MPLS TE tunnel head	Number of forwarding entries (installed at ingress LSR) on MPLS TE tunnel head.
MPLS TE fast-reroute	Number of forwarding entries (installed at PLR) for MPLS-TE fast reroute.

Field	Description
Forwarding updates	Number of forwarding updates sent from LSD (RP/DRP) to LFIB/MPLS (RP/DRP/LC) using BCDL mechanism, indicating the total number of updates and total number of BCDL messages.
Labels in use	Local labels in use (installed in LFIB). These usually indicate the lowest and highest label in use (allocated by applications). Furthermore, some reserved labels, such as explicit-nullv4, explicit-nullv6, are installed in the forwarding plane. The label range is 0 to 15.

⁵ MTU = Maximum Transmission Unit.

⁶ LFIB = Label Forwarding Information Base.

show mpls forwarding labels

To display the contents of the MPLS label information, use the **show mpls forwarding labels** command in XR EXEC mode.

show mpls forwarding [*labels low-value high-value*] [*detail*] [*rpf*]

Syntax Description	labels <i>low-value high-value</i>	(Optional) Entries with a local labels range. Ranges for <i>low-value</i> is 0 and <i>high-value</i> is 0 1048575.
	detail	
	rpf	(Optional) Displays label RPF information.
		Note This will be supported in a future release of Cisco IOS XR software.

Command Modes XR EXEC mode

Command History	Release	Modification
	Release 6.0	This command was introduced.

Usage Guidelines The optional keywords and arguments described allow display of MPLS label security and RPF information.

Task ID	Task ID	Operations
	mpls-ldp	read
	mpls-static	read

Examples

The following sample output is from the **show mpls forwarding labels** command using the **rpf**:

```
RP/0/RP0/CPU0:router# show mpls forwarding labels 24035
Local  Outgoing  Prefix          Outgoing  Next Hop      Bytes
Label  Label     or ID           Interface  Interface     Switched
-----
24035  24027     3.3.3.1/32     BE241     191.4.1.2     371896
        24027     3.3.3.1/32     BE242     191.4.1.26    0
        24027     3.3.3.1/32     BE243     191.4.1.50    0
        24027     3.3.3.1/32     BE241.1    191.4.1.6     0
        24027     3.3.3.1/32     BE242.1    191.4.1.30    0
        24027     3.3.3.1/32     BE243.1    191.4.1.54    0
        24027     3.3.3.1/32     Te0/0/0/79  191.4.1.74    0
        24027     3.3.3.1/32     Te0/0/0/79.1 191.4.1.78    0
```

show mpls forwarding labels

show mpls forwarding summary

To display the summary of the MPLS label table, use the **show mpls forwarding summary** command in XR EXEC mode.

show mpls forwarding summary [**debug**] [**location** *node-id*] **no-counters** **private** **rpf**

Syntax Description	Parameter	Description
	debug	(Optional) Displays the information for internal debugging in the command output.
	location <i>node-id</i>	(Optional) Displays the interfaces on which MPLS is enabled.
	no-counters	(Optional) Skips displaying counters.
	private	(Optional) Displays private information.
	rpf	(Optional) Displays label RPF information.

Command Modes XR EXEC mode

Command History	Release	Modification
	Release 6.0	This command was introduced.

Usage Guidelines The optional keywords and arguments described allow display of an MPLS label security information.

Task ID	Task ID	Operations
	mpls-te	read
	mpls-ldp	read
	mpls-static	read

Examples

The following sample output is from the **show mpls forwarding summary** command:

```
RP/0/RP0/CPU0:router# show mpls forwarding summary
Forwarding entries:
  Label switching: 1123, protected: 0
  MPLS TE tunnel head: 0, protected: 0
  MPLS TE midpoint: 0, protected: 0
  MPLS TE internal: 0, protected: 0
  MPLS P2MP TE tunnel head: 0
  MPLS P2MP TE tunnel midpoint/tail: 0
  MPLS P2MP MLDP tunnel head: 0
  MPLS P2MP MLDP tunnel midpoint/tail: 0
Forwarding updates:
  messages: 22
  p2p updates: 50
Labels in use:
  Reserved: 4
```

show mpls forwarding summary

```

Lowest: 0
Highest: 49200
Deleted stale label entries: 0

Pkts dropped: 0
Pkts fragmented: 0
Failed lookups: 0

```

The following sample output is from the **show mpls forwarding summary** command using the **debug** keyword:

```

RP/0/RP0/CPU0:router# show mpls forwarding summary debug
Forwarding entries:
  Label switching: 0, protected: 0
  MPLS TE tunnel head: 0, protected: 0
  MPLS TE midpoint: 0, protected: 0
  MPLS TE internal: 0, protected: 0
  MPLS P2MP TE tunnel head: 0
  MPLS P2MP TE tunnel midpoint/tail: 0
  MPLS P2MP MLDP tunnel head: 0
  MPLS P2MP MLDP tunnel midpoint/tail: 0
Forwarding updates:
  messages: 2
  p2p updates: 4
Labels in use:
  Reserved: 4
  Lowest: 0
  Highest: 13
  Deleted stale label entries: 0

Pkts dropped: 0
Pkts fragmented: 0
Failed lookups: 0

```

The following sample output is from the **show mpls forwarding summary** command using the **no-counters**:

```

RP/0/RP0/CPU0:router# show mpls forwarding summary no-counters
Forwarding entries:
  Label switching: 0, protected: 0
  MPLS TE tunnel head: 0, protected: 0
  MPLS TE midpoint: 0, protected: 0
  MPLS TE internal: 0, protected: 0
  MPLS P2MP TE tunnel head: 0
  MPLS P2MP TE tunnel midpoint/tail: 0
  MPLS P2MP MLDP tunnel head: 0
  MPLS P2MP MLDP tunnel midpoint/tail: 0
Forwarding updates:
  messages: 2
  p2p updates: 4
Labels in use:
  Reserved: 4
  Lowest: 0
  Highest: 13
  Deleted stale label entries: 0

```

The following sample output is from the **show mpls forwarding summary** command using the **private**:


```

RP/0/RP0/CPU0:router# show mpls forwarding summary private
Forwarding entries:
  Label switching: 0, protected: 0
  MPLS TE tunnel head: 0, protected: 0
  MPLS TE midpoint: 0, protected: 0
  MPLS TE internal: 0, protected: 0
  MPLS P2MP TE tunnel head: 0
  MPLS P2MP TE tunnel midpoint/tail: 0
  MPLS P2MP MLDP tunnel head: 0
  MPLS P2MP MLDP tunnel midpoint/tail: 0
Forwarding updates:
  messages: 2
    p2p updates: 4
Labels in use:
  Reserved: 4
  Lowest: 0
  Highest: 13
  Deleted stale label entries: 0
Path count:
  Unicast: 0

Pkts dropped: 0
Pkts fragmented: 0
Failed lookups: 0
fwd-flags: 0x5, ttl-expire-pop-cnt: 0

```

This table describes the significant fields shown in the display.

Table 19: show mpls forwarding summary Field Descriptions

Field	Description
Label switching	Number of Label switching Label Forwarding Information Base (LFIB) forwarding entries.
MPLS TE tunnel head	Number of forwarding entries (installed at ingress LSR) on MPLS TE tunnel head.
Forwarding updates	Number of forwarding updates sent from LSD (RP/DRP) to LFIB/MPLS (RP/DRP/LC) using BCDL mechanism, indicating the total number of updates and total number of BCDL messages.
Labels in use	Local labels in use (installed in LFIB). These usually indicate the lowest and highest label in use (allocated by applications). Furthermore, some reserved labels, such as explicit-nullv4, explicit-nullv6, are installed in the forwarding plane. The label range is 0 to 15.

show mpls interfaces

To display information about one or more interfaces that have been configured for MPLS, use the **show mpls interfaces** command in XR EXEC mode.

show mpls interfaces [*type interface-path-id*] [**location** *node-id*] [**detail**]

Syntax Description	
<i>type</i>	(Optional) Interface type. For more information, use the question mark (?) online help function.
<i>interface-path-id</i>	Physical interface or a virtual interface.
	Note Use the show interfaces command to see a list of all possible interfaces currently configured on the router.
	For more information about the syntax for the router, use the question mark (?) online help function.
location <i>node-id</i>	(Optional) Displays hardware resource counters on the designated node.
detail	(Optional) Displays detailed information for the designated node.

Command Default No default behavior or values

Command Modes XR EXEC mode

Command History	Release	Modification
	Release 6.0	This command was introduced.

Usage Guidelines This command displays MPLS information about a specific interface or about all interfaces where MPLS is configured.

Task ID	Task ID	Operations
	mpls-ldp	read, write
	mpls-static	read, write

Examples

The following shows a sample output from the **show mpls interfaces** command:

```
RP/0/RP0/CPU0:router# show mpls interfaces

  Interface          LDP      Tunnel  Enabled
  Interface          LDP      Tunnel  Static  Enabled
-----
Bundle-Ether241     Yes      No      No      Yes
```

Bundle-Ether242	Yes	No	No	Yes
Bundle-Ether243	Yes	No	No	Yes
TenGigE0/0/0/4	Yes	No	No	Yes
Bundle-Ether341	Yes	No	No	Yes
Bundle-Ether344	Yes	No	No	Yes
Bundle-Ether345	No	No	No	Yes
Bundle-Ether451	Yes	No	No	Yes
Bundle-Ether452	Yes	No	No	Yes
Bundle-Ether461	Yes	No	No	Yes
Bundle-Ether462	Yes	No	No	Yes
Bundle-Ether463	Yes	No	No	Yes
TenGigE0/0/0/27	Yes	No	No	Yes

The following shows a sample output from the **show mpls interfaces** command using the **detail** keyword:

```
RP/0/RP0/CPU0:router# show mpls interfaces detail
```

```

Interface Bundle-Ether241:
  LDP labelling enabled
  LSP labelling not enabled
  MPLS enabled
Interface Bundle-Ether242:
  LDP labelling enabled
  LSP labelling not enabled
  MPLS enabled
Interface Bundle-Ether243:
  LDP labelling enabled
  LSP labelling not enabled
  MPLS enabled
Interface TenGigE0/0/0/4:
  LDP labelling enabled
  LSP labelling not enabled
  MPLS enabled
Interface Bundle-Ether341:
  LDP labelling enabled
  LSP labelling not enabled
  MPLS enabled
Interface Bundle-Ether344:
  LDP labelling enabled
  LSP labelling not enabled
  MPLS enabled
Interface Bundle-Ether345:
  LDP labelling not enabled
  LSP labelling not enabled
  MPLS ISIS enabled
  MPLS enabled
Interface Bundle-Ether451:
  LDP labelling enabled
  LSP labelling not enabled
  MPLS enabled
Interface Bundle-Ether452:
```

This table describes the significant fields in the sample display.

Table 20: show mpls interfaces Command Field Descriptions

Field	Description
LDP	State of LDP labelling.
MTU	MTU ⁷ of labeled packet.
Caps	Capsulation switching chains installed on an interface.
M	MPLS switching capsulation/switching chains are installed on the interface and are ready to switch MPLS traffic.
Static	

⁷ MTU = Maximum Transmission Unit.

show mpls label range

To display the range of local labels available for use on packet interfaces, use the **show mpls label range** command in XR EXEC mode.

show mpls label range

Syntax Description This command has no arguments or keywords.

Command Default No default behavior or values

Command Modes XR EXEC mode

Command History	Release	Modification
	Release 6.0	This command was introduced.

Usage Guidelines You can use the **show mpls label range** command to configure a range for local labels that is different from the default range.

Task ID	Task ID	Operations
	mpls-te	read, write
	mpls-ldp	read, write
	mpls-static	read, write

Examples

The following shows a sample output from the **show mpls label range** command:

```
RP/0/RP0/CPU0:router# show mpls label range
Range for dynamic labels: Min/Max: 16000/144000
```

This table describes the significant fields shown in the display.

Table 21: show mpls label range Command Field Descriptions

Field	Description
Range for dynamic labels	Minimum and maximum allowable range for local labels (which differs from the default range).

show mpls label table

To display the local labels contained in the MPLS label table, use the **show mpls label table** command in XR EXEC mode.

show mpls label table *table-index* [**application** *application*] [**label** *label-value*] [**summary**] [**detail**]

Syntax Description		
table-index	<i>table-index</i>	Index of the label table to display. The global label table is 0. Currently, you can specify table 0 only.
application	<i>application</i>	(Optional) Displays all labels owned by the selected application. Options are: bgp-ipv4 , bgp-spr , bgp-vpn-ipv4 , internal , ldp , none , l2vpn , static , te-control , te-link , and test .
label	<i>label-value</i>	(Optional) Displays a selected label based on the label value. Range is 0 to 1048575.
summary		(Optional) Displays a summary of local labels.
detail		(Optional) Displays detailed information for the MPLS label table.

Command Default No default behavior or values

Command Modes XR EXEC mode

Command History	Release	Modification
	Release 6.0	This command was introduced.

Usage Guidelines Labels 16 to 15999 are reserved for static Layer 2 VPN pseudowires.

Task ID	Task ID	Operations
	mpls-ldp	read, write
	mpls-static	read, write

Examples

The following shows a sample output from the **show mpls label table** command:

```
RP/0/RP0/CPU0:router# show mpls label table 0
```

```
Table  Label  Owner      State  Rewrite
-----  -
0        0      LSD(A)    InUse  Yes
0        1      LSD(A)    InUse  Yes
```

```

0      2      LSD (A)      InUse Yes
0     13     LSD (A)      InUse Yes
0    24000   LDP (A)      InUse Yes
0    24001   LDP (A)      InUse Yes
0    24002   LDP (A)      InUse Yes
0    24003   LDP (A)      InUse Yes

```

This table describes the significant fields shown in the display.

Table 22: show mpls label table Command Field Descriptions

Field	Description
Table	Table ID.
Label	Label index.
Owner	Application that allocated the label. All labels displaying “InUse” state have an owner.
State	<p>InUse</p> <p>Label allocated and in use by an application.</p> <p>Alloc</p> <p>Label allocated but is not yet in use by an application.</p> <p>Pend</p> <p>Label was in use by an application that has terminated unexpectedly, and the application has not reclaimed the label.</p> <p>Pend-S</p> <p>Label was in use by an application, but the MPLS LSD (Label Switching Database) server has recently restarted and the application has not reclaimed the label.</p>
Rewrite	Number of initiated rewrites.

show mpls lsd applications

To display the MPLS applications registered with the MPLS Label Switching Database (LSD) server, use the **show mpls lsd applications** command in XR EXEC mode.

show mpls lsd applications [**application** *application*]

Syntax Description	application <i>application</i> (Optional) Displays all labels owned by the selected application. Options are: bgp-ipv4 , bgp-spkr , bgp-vpn-ipv4 , internal , ldp , none , l2vpn , static , te-control , te-link , and test .						
Command Default	No default behavior or values						
Command Modes	XR EXEC mode						
Command History	<table border="1"> <thead> <tr> <th>Release</th> <th>Modification</th> </tr> </thead> <tbody> <tr> <td>Release 6.0</td> <td>This command was introduced.</td> </tr> </tbody> </table>	Release	Modification	Release 6.0	This command was introduced.		
Release	Modification						
Release 6.0	This command was introduced.						
Usage Guidelines	MPLS applications include Traffic Engineering (TE) control, TE Link Management and label distribution protocol (LDP). The application must be registered with MPLS LSD for its features to operate correctly. All applications are clients (see the show mpls lsd clients, on page 134 command), but not all clients are applications.						
Task ID	<table border="1"> <thead> <tr> <th>Task ID</th> <th>Operations</th> </tr> </thead> <tbody> <tr> <td>mpls-ldp</td> <td>read, write</td> </tr> <tr> <td>mpls-static</td> <td>read, write</td> </tr> </tbody> </table>	Task ID	Operations	mpls-ldp	read, write	mpls-static	read, write
Task ID	Operations						
mpls-ldp	read, write						
mpls-static	read, write						
Examples	The following shows a sample output from the show mpls lsd applications command:						

```
RP/0/RP0/CPU0:router# show mpls lsd applications
```

Application	State	RecoveryTime	Location
LSD (A)	Active 0/0	(0)	0/RP0/CPU0
OSPF (A) :ospf-george	Active 0/0	(30)	0/RP0/CPU0
OSPF (A) :ospf-1	Active 0/0	(30)	0/RP0/CPU0
Static (A)	Active 0/0	(120)	0/RP0/CPU0
LDP (A)	Active 0/0	(15)	0/RP0/CPU0
PIM (A) :pim	Active 0/0	(300)	0/RP0/CPU0
PIM6 (A) :pim6	Active 0/0	(300)	0/RP0/CPU0
L2VPN (A)	Active 0/0	(1800)	0/RP0/CPU0

This table describes the significant fields shown in the display.

Table 23: show mpls lsd applications Command Field Descriptions

Field	Description
Type	LSD application type.
State	Active Application registered with MPLS LSD and is functioning correctly. Recover Application registered with MPLS LSD and is recovering after recently restarting. In this state, the RecoveryTime value indicates how many seconds are left before the application becomes active. Zombie Application not re-registered after an unexpected termination. In this case, RecoveryTime indicates how many seconds are left before MPLS LSD gives up on the application.
RecoveryTime	Seconds remaining before MPLS LSD gives up or resumes the application.
Node	Node expressed in standard <i>rack/slot/module</i> notation.

show mpls lsd clients

To display the MPLS clients connected to the MPLS Label Switching Database (LSD) server, use the **show mpls lsd clients** command in XR EXEC mode.

show mpls lsd clients

Syntax Description This command has no arguments or keywords.

Command Default No default behavior or values

Command Modes XR EXEC mode

Command History	Release	Modification
	Release 6.0	This command was introduced.

Usage Guidelines MPLS clients include Traffic Engineering (TE) Control, TE Link Management, Label Distribution Protocol (LDP), and Bulk Content Downloader (BCDL) Agent. Not all clients are applications (see the **show mpls lsd applications** command), but all applications are clients.

Task ID	Task ID	Operations
	mpls-te	read, write
	mpls-ldp	read, write
	mpls-static	read, write

Examples

The following shows a sample output from the **show mpls lsd clients** command:

```
RP/0/RP0/CPU0:router# show mpls lsd clients
```

ID	Services	Location
0	LSD (A)	0/RP0/CPU0
1	OSPF:ospf-ospf-sr (A)	0/RP0/CPU0
2	OSPF:ospf-ospf-v4 (A)	0/RP0/CPU0
3	OSPF:ospf-core (A)	0/RP0/CPU0
4	ISIS:isis-v4 (A)	0/RP0/CPU0
5	ISIS:core (A)	0/RP0/CPU0
6	ISIS:isis-sr (A)	0/RP0/CPU0
7	Static (A)	0/RP0/CPU0
8	LDP (A)	0/RP0/CPU0
9	L2VPN (A)	0/RP0/CPU0
10	BGP-VPNv4:bgp-default (A)	0/RP0/CPU0

The following table describes the significant fields shown in the display.

Table 24: show mpls lsd clients Command Field Descriptions

Field	Description
Id	Client identification number.
Services	A(xxx) means that this client is an application and xxx is the application name, BA(yyy) means that this client is a BCDL Agent and yyy is expert data. Depending on system conditions, there can be multiple BCDL Agent clients (this is normal).
Location	

show mpls lsd forwarding labels

To display the LSD label RPF information, use the **show mpls lsd forwarding labels** command in XR EXEC mode.

show mpls lsd forwarding [**labels** *low-value high-value*] [**location** *node-id*]

Syntax Description		
labels <i>low-value high-value</i>		(Optional) Entries with a local labels range. Ranges for both <i>low-value</i> and <i>high-value</i> are 0 to 1048575.
location <i>node-id</i>		Displays hardware resource counters on the designated node.

Command Modes XR EXEC mode

Command History	Release	Modification
	Release 6.0	This command was introduced.

Usage Guidelines The optional keywords and arguments described allow display of an MPLS label security information.

Task ID	Task ID	Operations
	mpls-ldp	read
	mpls-static	read

Examples

The following sample output is from the **show mpls lsd forwarding labels** command using a specific location:

```
RP/0/RP0/CPU0:router# show mpls lsd forwarding labels 24035
```

```
In_Label, (ID), Path_Info: <Type>
24035, (IPv4, 'default':4U, 3.3.3.1/32), 8 Paths
  1/8: IPv4, 'default':4U, BE241, nh=191.4.1.2, lbl=24027, flags=0x0, ext_flags=0x0
  2/8: IPv4, 'default':4U, BE242, nh=191.4.1.26, lbl=24027, flags=0x0, ext_flags=0x0
  3/8: IPv4, 'default':4U, BE243, nh=191.4.1.50, lbl=24027, flags=0x0, ext_flags=0x0
  4/8: IPv4, 'default':4U, BE241.1, nh=191.4.1.6, lbl=24027, flags=0x0, ext_flags=0x0
  5/8: IPv4, 'default':4U, BE242.1, nh=191.4.1.30, lbl=24027, flags=0x0, ext_flags=0x0
  6/8: IPv4, 'default':4U, BE243.1, nh=191.4.1.54, lbl=24027, flags=0x0, ext_flags=0x0
  7/8: IPv4, 'default':4U, Te0/0/0/79, nh=191.4.1.74, lbl=24027,
      flags=0x0, ext_flags=0x0
  8/8: IPv4, 'default':4U, Te0/0/0/79.1, nh=191.4.1.78, lbl=24027,
      flags=0x0, ext_flags=0x0
```

show mpls lsd forwarding summary

To display the LSD label information, use the **show mpls lsd forwarding summary** command in XR EXEC mode.

```
show mpls lsd forwarding summary [location node-id]
```

Syntax Description	location <i>node-id</i>	Displays hardware resource counters on the designated node.
Command Modes	XR EXEC mode	
Command History	Release	Modification
	Release 6.0	This command was introduced.
Usage Guidelines	The optional keywords and arguments described allow display of the interface label security information.	
Task ID	Task ID	Operations
	mpls-te	read
	mpls-ldp	read
	mpls-static	read

Examples

The following sample output is from the **show mpls lsd forwarding summary** command:

```
RP/0/RP0/CPU0:router# show mpls lsd forwarding summary
Messages: 813
Forwarding updates: 17889
Rewrites: 322
  FPIs:
    Label: 322
    IPv4: 284
    IPv6: 0
    TE: 0
    PW List: 0
    DMTC Ext_Intf: 0
  MOIs: 1644
    IPv4 paths: 1640 (0 backup, 0 protected)
    IPv6 paths: 0 (0 backup, 0 protected)
    Pop-and_lookup IPv4 paths: 3
    Pop-and_lookup IPv6 paths: 1
    TEv4: 0
    Pseudo-wire: 0
    IP subscriber: 0
    DMTC Ext_Intf: 0
  RPF Nbrs:
    IPv4 Neighbors: 0
    IPv6 Neighbors: 0
    Total RWs with RPF Neighbors: 0
```

`show mpls lsd forwarding summary`



RSVP Infrastructure Commands

This module describes the commands used to configure and use Resource Reservation Protocol (RSVP). RSVP is a signaling protocol used to set up, maintain, and control end-to-end quality-of-service (QoS) reservations over IP. RSVP is specified in Internet Engineering Task Force (IETF) RFC 2205 (<ftp://ftp.isi.edu/in-notes/rfc2205.txt>).

The protocol has been extended to signal Multiprotocol Label Switching traffic engineering (MPLS-TE) tunnels, as specified in the IETF RFC 3209, *RSVP-TE: Extensions to RSVP for LSP Tunnels*. The RSVP implementation supports fault handling as specified in IETF RFC 3473, *Generalized Multiprotocol Label Switching (GMPLS) Signaling RSVP-TE extensions*. The RSVP implementation also supports cryptographic authentication and refresh overhead reduction as specified in the RFC2747, *RSVP Cryptographic Authentication* and RFC2961, *RSVP Refresh Overhead Reduction Extensions* respectively.

For detailed information about MPLS concepts, configuration tasks, and examples, see *MPLS Configuration Guide for Cisco NCS 5000 Series Routers*.

Disable or Enable RSVP Message Checksum

RSVP computes and sets the checksum field on all outgoing RSVP messages, by default. RSVP also verifies the received checksum on all RSVP received messages to ensure its integrity.

A CLI is provided to override this default behavior and revert to the behavior exhibited in prior releases, whereby RSVP neither computes or sets the RSVP checksum field on outgoing RSVP messages, nor does it verify the checksum on received RSVP messages. This CLI is :

```
RP/0/RP0/CPU0:router(config)#rsvp signalling checksum disable
```



Note When the **rsvp signalling checksum disable** command is configured, RSVP sets a zero checksum on all outgoing RSVP messages and ignores the checksum on all received RSVP incoming messages.

- [authentication \(RSVP\), on page 141](#)
- [clear rsvp authentication, on page 143](#)
- [clear rsvp counters all, on page 145](#)
- [clear rsvp counters authentication, on page 146](#)
- [clear rsvp counters chkpt, on page 148](#)
- [clear rsvp counters events, on page 149](#)
- [clear rsvp counters messages, on page 150](#)

- [clear rsvp counters oor](#), on page 151
- [clear rsvp counters prefix-filtering](#), on page 152
- [key-source key-chain \(RSVP\)](#), on page 154
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- [mpls traffic-eng lsp-oor](#), on page 158
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- [show rsvp fast-reroute](#), on page 180
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authentication (RSVP)

To enter RSVP authentication mode, use the **authentication** command in global configuration mode, RSVP interface configuration mode, or RSVP neighbor XR Config mode. To remove authentication parameters in the applicable mode, use the **no** form of this command.

authentication
no authentication

Syntax Description	This command has no arguments or keywords.	
Command Default	The default value is no authentication, which means that the feature is disabled.	
Command Modes	XR Config mode RSVP interface configuration RSVP neighbor configuration	
Command History	Release	Modification
	Release 6.2.1	This command was introduced.
Usage Guidelines	No specific guidelines impact the use of this command.	
Task ID	Task ID	Operations
	mpls-te	read, write

Examples

The following example shows how to enter RSVP authentication configuration mode from global configuration mode:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# rsvp authentication
RP/0/RP0/CPU0:router(config-rsvp-auth)#
```

The following example shows how to activate the RSVP on an interface and enter RSVP authentication configuration mode:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# rsvp interface HundredGigE 0/0/0/3
RP/0/RP0/CPU0:router(config-rsvp-if)# authentication
RP/0/RP0/CPU0:router(config-rsvp-if-auth)#
```

The following example shows how to configure the RSVP neighbor with IP address 10.0.0.1 and enter neighbor authentication configuration mode:

```
RP/0/RP0/CPU0:router# configure  
RP/0/RP0/CPU0:router(config)# rsvp neighbor 10.0.0.1 authentication  
RP/0/RP0/CPU0:router(config-rsvp-nbor-auth)#
```

clear rsvp authentication

To eliminate RSVP security association (SA) before the lifetime expires, use the **clear rsvp authentication** command in XR EXEC mode.

clear rsvp authentication [*type interface-path-id*] [**destination** *IP address*] [**source** *IP address*]

Syntax Description	
<i>type</i>	(Optional) Interface type. For more information, use the question mark (?) online help function.
<i>interface-path-id</i>	Physical interface or a virtual interface. Note Use the show interfaces command to see a list of all possible interfaces currently configured on the router. For more information about the syntax for the router, use the question mark (?) online help function.
destination <i>IP address</i>	(Optional) Eliminates the RSVP security associations (SA) before their lifetimes expire. All SAs with this destination IP address are cleared.
source <i>IP address</i>	(Optional) Eliminates the RSVP security associations (SA) before their lifetimes expire. All SAs with this source IP address are cleared.

Command Default No default behavior or values

Command Modes XR EXEC mode

Command History	Release	Modification
	Release 6.2.1	This command was introduced.

Usage Guidelines Use the **clear rsvp authentication** command for the following reasons:

- To eliminate security associations before their lifetimes expire
- To free up memory
- To resolve a problem with a security association being in an indeterminate state

You can delete all RSVP security associations if you do not enter an optional filter (interface, source, or destination IP address).

If you delete a security association, it is recreated as needed.

Task ID	Task ID	Operations
	mpls-te	execute

Examples The following example shows how to clear each SA:

```
RP/0/RP0/CPU0:router# clear rsvp authentication
```

The following example shows how to clear each SA with the destination address 10.0.0.1:

```
RP/0/RP0/CPU0:router# clear rsvp authentication destination 10.0.0.1
```

The following example shows how to clear each SA with the source address 172.16.0.1:

```
RP/0/RP0/CPU0:router# clear rsvp authentication source 172.16.0.1
```

The following example shows how to clear each SA with the interface:

```
RP/0/RP0/CPU0:router# clear rsvp authentication HundredGigE 0/0/0/3
```

The following example shows how to clear each SA on the interface, destination address 10.0.0.1, and source address 172.16.0.1:

```
RP/0/RP0/CPU0:router# clear rsvp authentication HundredGigE 0/0/0/3 destination 10.0.0.1  
source 172.16.0.1
```

clear rsvp counters all

To clear (set to zero) all RSVP message and event counters that are being maintained by the router, use the **clear rsvp counters all** command in XR EXEC mode.

clear rsvp counters all [*type interface-path-id*]

Syntax Description	<i>type</i>	(Optional) Interface type. For more information, use the question mark (?) online help function.
	<i>interface-path-id</i>	Physical interface or a virtual interface.
	Note	Use the show interfaces command to see a list of all possible interfaces currently configured on the router.
		For more information about the syntax for the router, use the question mark (?) online help function.

Command Modes XR EXEC mode

Command History	Release	Modification
	Release 6.2.1	This command was introduced.

Usage Guidelines No specific guidelines impact the use of this command.

Task ID	Task ID	Operations
	mpls-te	read, write

Examples The following example shows how to clear all message and event counters:

```
RP/0/RP0/CPU0:router# clear rsvp counters all
```

clear rsvp counters authentication

To eliminate RSVP counters for each security association (SA), use the **clear rsvp counters authentication** command in XR EXEC mode.

clear rsvp counters authentication [*type interface-path-id*] [**destination** *IP address*] [**source** *IP address*]

Syntax Description		
<i>type</i>	(Optional) Interface type. For more information, use the question mark (?) online help function.	
<i>interface-path-id</i>	Physical interface or a virtual interface.	
	Note	Use the show interfaces command to see a list of all possible interfaces currently configured on the router.
		For more information about the syntax for the router, use the question mark (?) online help function.
destination <i>IP address</i>	(Optional) Eliminates authentication-related statistics for each security association (SA) with this destination IP address.	
source <i>IP address</i>	(Optional) Eliminates authentication-related statistics for each security association (SA) with this source IP address.	

Command Default No default behavior or values

Command Modes XR EXEC mode

Command History	Release	Modification
	Release 6.2.1	This command was introduced.

Usage Guidelines No specific guidelines impact the use of this command.

Task ID	Task ID	Operations
	mpls-te	execute

Examples The following example shows how to clear authentication counters for each SA:

```
RP/0/RP0/CPU0:router# clear rsvp counters authentication
```

The following example shows how to clear authentication counters for each SA with the destination address 10.0.0.1:

```
RP/0/RP0/CPU0:router# clear rsvp counters authentication destination 10.0.0.1
```

The following example shows how to clear authentication counters for each SA with the source address 172.16.0.1:

```
RP/0/RP0/CPU0:router# clear rsvp counters authentication source 172.16.0.1
```

The following example shows how to clear authentication counters for each SA with an interface.

```
RP/0/RP0/CPU0:router# clear rsvp counters authentication HundredGigE 0/0/0/3
```

The following example shows how to clear authentication counters for each SA on an interface, destination address 10.0.0.1, and source address 172.16.0.1:

```
RP/0/RP0/CPU0:router# clear rsvp counters authentication HundredGigE 0/0/0/3 destination 10.0.0.1 source 172.16.0.1
```

clear rsvp counters chkpt

To clear RSVP checkpoint counters, use the **clear rsvp counters chkpt** command in XR EXEC mode.

clear rsvp counters chkpt

Syntax Description This command has no arguments or keywords.

Command Default No default behavior or values

Command Modes XR EXEC mode

Command History	Release	Modification
	Release 6.2.1	This command was introduced.

Usage Guidelines No specific guidelines impact the use of this command.

Task ID	Task ID	Operations
	mpls-te	read, write

Examples The following example shows how to clear all message and event counters:

```
RP/0/RP0/CPU0:router# clear rsvp counters chkpt
```


clear rsvp counters events

To clear (set to zero) all RSVP event counters that are being maintained by the router, use the **clear rsvp counters events** command in XR EXEC mode.

clear rsvp counters events [*type interface-path-id*]

Syntax Description	<i>type</i>	(Optional) Interface type. For more information, use the question mark (?) online help function.
	<i>interface-path-id</i>	Physical interface or a virtual interface.
	Note	Use the show interfaces command to see a list of all possible interfaces currently configured on the router.
		For more information about the syntax for the router, use the question mark (?) online help function.

Command Default No default behavior or values

Command Modes XR EXEC mode

Command History	Release	Modification
	Release 6.2.1	This command was introduced.

Usage Guidelines Use the **clear rsvp counters events** command to set all RSVP event counters to zero.

Task ID	Task ID	Operations
	mpls-te	read, write

Examples The following example shows how to clear all event counters:

```
RP/0/RP0/CPU0:router# clear rsvp counters events
```

clear rsvp counters messages

To clear (set to zero) all RSVP message counters that are being maintained by the router, use the **clear rsvp counters messages** command in XR EXEC mode.

clear rsvp counters messages [*type interface-path-id*]

Syntax Description	<p><i>type</i> (Optional) Interface type. For more information, use the question mark (?) online help function.</p> <hr/> <p><i>interface-path-id</i> Physical interface or a virtual interface.</p> <p>Note Use the show interfaces command to see a list of all possible interfaces currently configured on the router.</p> <p>For more information about the syntax for the router, use the question mark (?) online help function.</p>
---------------------------	--

Command Default No default behavior or values

Command Modes XR EXEC mode

Command History	<table border="1"> <thead> <tr> <th>Release</th> <th>Modification</th> </tr> </thead> <tbody> <tr> <td>Release 6.2.1</td> <td>This command was introduced.</td> </tr> </tbody> </table>	Release	Modification	Release 6.2.1	This command was introduced.
Release	Modification				
Release 6.2.1	This command was introduced.				

Usage Guidelines Use the **clear rsvp counters messages** command to set all RSVP message counters to zero.

Task ID	<table border="1"> <thead> <tr> <th>Task ID</th> <th>Operations</th> </tr> </thead> <tbody> <tr> <td>mpls-te</td> <td>read, write</td> </tr> </tbody> </table>	Task ID	Operations	mpls-te	read, write
Task ID	Operations				
mpls-te	read, write				

Examples The following example shows how to set all RSVP message counters for an interface to zero:

```
RP/0/RP0/CPU0:router# clear rsvp counters messages HundredGigE0/0/0/3
```

clear rsvp counters oor

To clear internal RSVP counters on out of resources (OOR) events, use the **clear rsvp counters oor** command in XR EXEC mode.

clear rsvp counters oor [*type interface-path-id*]

Syntax Description	<i>type</i>	(Optional) Interface type. For more information, use the question mark (?) online help function.
	<i>interface-path-id</i>	Physical interface or a virtual interface.
	Note	Use the show interfaces command to see a list of all possible interfaces currently configured on the router.
		For more information about the syntax for the router, use the question mark (?) online help function.

Command Default No default behavior or values

Command Modes XR EXEC mode

Command History	Release	Modification
	Release 6.2.1	This command was introduced.

Usage Guidelines Use the **clear rsvp counters oor** command to set RSVP OOR counters to zero.

Task ID	Task ID	Operations
	mpls-te	read, write

Examples The following example show how to clear all RSVP message counters for HundredGigE interface 0/0/0/3 to zero:

```
RP/0/RP0/CPU0:router# clear rsvp counters oor HundredGigE0/0/0/3
```

clear rsvp counters prefix-filtering

To clear internal prefix-filtering related RSVP counters, use the **clear rsvp counters prefix-filtering** command in XR EXEC mode.

clear rsvp counters prefix-filtering {**interface** [*type interface-path-id*] | **access-list** [*aclname*]}

Syntax Description	Parameter	Description
	interface	Clears RSVP prefix-filtering counters for all interfaces.
	<i>type</i>	(Optional) Interface type. For more information, use the question mark (?) online help function.
	<i>interface-path-id</i>	Physical interface or a virtual interface.
	Note	Use the show interfaces command to see a list of all possible interfaces currently configured on the router.
		For more information about the syntax for the router, use the question mark (?) online help function.
	access-list	Clears RSVP prefix-filtering counters for access control list.
	<i>aclname</i>	(Optional) Name of the access list.

Command Default No default behavior or values

Command Modes XR EXEC mode

Command History	Release	Modification
	Release 6.2.1	This command was introduced.

Usage Guidelines Use the **clear rsvp counters prefix-filtering** command to set RSVP prefix-filtering related RSVP counters to zero.

Task ID	Task ID	Operations
	mpls-te	read, write

Examples

The following example shows how to set all RSVP message counters for HundredGigE interface 0/0/0/3 to zero:

```
RP/0/RP0/CPU0:router# clear rsvp counters prefix-filtering interface HundredGigE0/0/0/3
```

The following example shows how to set all RSVP prefix-filtering counters for access-list banks to zero:

```
RP/0/RP0/CPU0:router# clear rsvp counters prefix-filtering access-list banks
```

key-source key-chain (RSVP)

To specify the source of the key information to authenticate RSVP messages, use the **key-source key-chain** command in the appropriate RSVP authentication configuration mode. To remove the key source from the appropriate RSVP authentication configuration mode, use the **no** form of this command.

key-source key-chain *key-chain-name*

no key-source key-chain *key-chain-name*

Syntax Description	<i>key-chain-name</i> Name of the keychain. The maximum number of characters is 32.
---------------------------	---

Command Default	The default value is none, which means that the key source is not specified.
------------------------	--

Command Modes	RSVP authentication configuration RSVP interface authentication configuration RSVP neighbor authentication configuration
----------------------	--

Command History	<table border="1"> <thead> <tr> <th>Release</th> <th>Modification</th> </tr> </thead> <tbody> <tr> <td>Release 6.2.1</td> <td>This command was introduced.</td> </tr> </tbody> </table>	Release	Modification	Release 6.2.1	This command was introduced.
Release	Modification				
Release 6.2.1	This command was introduced.				

Usage Guidelines	<ul style="list-style-type: none"> • RSVP authentication is enabled regardless of whether or not the specified keychain exists or has no available keys to use. If the specified keychain does not exist or there are no available keys in the keychain, RSVP authentication processing fails. • The key-source key-chain command does not create a keychain but just specifies which keychain to use. You must configure a keychain first. • The no key-source key-chain command does not necessarily disable the authentication. • RSVP authentication supports only keyed-hash message authentication code (HMAC)-type algorithms.
-------------------------	---

Task ID	<table border="1"> <thead> <tr> <th>Task ID</th> <th>Operations</th> </tr> </thead> <tbody> <tr> <td>mpls-te</td> <td>read, write</td> </tr> </tbody> </table>	Task ID	Operations	mpls-te	read, write
Task ID	Operations				
mpls-te	read, write				

Examples	The following example shows that the source of the key information is specified for the keychain mpls-keys in RSVP authentication configuration mode:
-----------------	---

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# rsvp authentication
RP/0/RP0/CPU0:router(config-rsvp-auth)# key-source key-chain mpls-keys
```

The following example shows that the source of the key information is specified for the keychain mpls-keys for a HundredGigE interface in RSVP authentication configuration mode:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# rsvp interface HundredGigE 0/0/0/3
RP/0/RP0/CPU0:router(config-rsvp-if)# authentication
RP/0/RP0/CPU0:router(config-rsvp-if-auth)# key-source key-chain mpls-keys
```

The following example shows that the source of the key information is specified for the keychain mpls-keys in RSVP neighbor authentication configuration mode:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# rsvp neighbor 10.0.0.1 authentication
RP/0/RP0/CPU0:router(config-rsvp-nbor-auth)# key-source key-chain mpls-keys
```

life-time (RSVP)

To control how long RSVP maintains idle security associations with other trusted RSVP neighbors, use the **life-time** command in the appropriate RSVP authentication configuration mode. To disable the lifetime setting, use the **no** form of this command.

life-time *seconds*

no life-time *seconds*

Syntax Description	<i>seconds</i> Length of time, in seconds, that RSVP maintains security associations with other trusted RSVP neighbors. Range is 30 to 86400.
---------------------------	---

Command Default	<i>seconds</i> : 1800 (30 minutes)
------------------------	------------------------------------

Command Modes	RSVP authentication configuration RSVP interface authentication configuration RSVP neighbor authentication configuration
----------------------	--

Command History	Release	Modification
	Release 6.2.1	This command was introduced.

Usage Guidelines	Use the life-time (RSVP) command to indicate when to end idle security associations with RSVP trusted neighbors.
-------------------------	---

By setting a larger lifetime, the router remembers the state for a long period time which provides better protection against a replay attack.

Use the **clear rsvp authentication** command to free security associations before their lifetimes expire.

Task ID	Task ID	Operations
	mpls-te	read, write

Examples

The following example shows how to configure a lifetime of 2000 seconds for each SA in RSVP authentication configuration mode:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# rsvp authentication
RP/0/RP0/CPU0:router(config-rsvp-auth)# life-time 2000
```

The following example shows how to configure a lifetime of 2000 seconds for each SA in RSVP neighbor authentication configuration mode:


```
RP/0/RP0/CPU0:router# configure  
RP/0/RP0/CPU0:router(config)# rsvp neighbor 10.0.0.1 authentication  
RP/0/RP0/CPU0:router(config-rsvp-nbor-auth)# life-time 2000
```

The following example shows how to configure a lifetime of 2000 seconds for each SA in RSVP interface authentication configuration mode:

```
RP/0/RP0/CPU0:router# configure  
RP/0/RP0/CPU0:router(config)# rsvp interface HundredGigE 0/0/0/3  
RP/0/RP0/CPU0:router(config-rsvp-if)# authentication  
RP/0/RP0/CPU0:router(config-rsvp-if-auth)# life-time 2000
```

mpls traffic-eng lsp-oor

To set LSP out-of-resource (OOR) parameters, use the **mpls traffic-eng lsp-oor** command in XR Config mode. To remove LSP OOR parameter settings, use the **no** form of this command.

```
mpls traffic-eng lsp-oor [{ { green | red | yellow } action { accept reopt-lsp | admit lsp-min-bw value
| flood { available-bw value | te-metric penalty value } } | { yellow | red } { transit-all |
transit-unprotected } threshold value | green recovery-duration minutes }]
```

```
no mpls traffic-eng lsp-oor [{ { green | red | yellow } action { accept reopt-lsp | admit lsp-min-bw
value | flood { available-bw value | te-metric penalty } } | { yellow | red } { transit-all |
transit-unprotected } threshold | green recovery-duration }]
```

Syntax Description

{green|red|yellow}

(Optional) Specifies a color option for identifying specific actions noted with the **action** keyword.

Here, *green* signifies *normal* state, *red* signifies *major* state, and *yellow* signifies *minor* state.

action {accept reopt-lsp|admit lsp-min-bw value|flood {available-bw value|te-metric penalty value}}

(Optional) Specifies one of the three actions for the selected state:

- **accept reopt-lsp** – Accepts a reoptimized LSP sharing the same link in the selected state as the current LSP. If not enabled, reoptimized LSPs are rejected.
- **admit lsp-min-bw value** – Accept LSPs with a bandwidth that is at least equal to the specified bandwidth. The default value is 0.
- **flood te-metric penalty value** – Adds a penalty value to the TE metric of the links in the specified state. This metric is flooded for all links on the router. The default value is 0.
- **flood available-bw value** – Specifies the percentage of available bandwidth for all links. The default value is 100%.

{yellow red} {transit-all transit-protected} threshold <i>value</i>	(Optional) Specifies a threshold value for mid-point (or transit) LSRs, for the yellow and red color options. <ul style="list-style-type: none"> • transit-all – Specifies that the threshold value be applied for all mid-point routers. • transit-unprotected – Specifies that the threshold value be applied for unprotected mid-point routers. • threshold <i>value</i> – Specifies the threshold value.
green recovery-duration <i>minutes</i>	(Optional) Specifies the time duration for an LSP action in the <i>green</i> state, after recovery. The default value is 0 minutes.

Command Default LSP OOR parameters are disabled.

Command Modes Global Configuration

Command History	Release	Modification
	Release 7.3.2	This command was introduced.

Usage Guidelines

Use the **mpls traffic-eng lsp-oor .. action flood available-bw *value*** command form to lower the available bandwidth on the link, potentially reducing the number of states that would be possible to set up over the link.

Use the **mpls traffic-eng lsp-oor .. action flood te-metric penalty *value*** command form to add to the flooded TE metric (in the MPLS-TE topology). This serves as a deterrent for LERs to set up LSPs over this link.

Use the **mpls traffic-eng lsp-oor .. action admit lsp-min-bw *value*** command form to admit only new LSPs with signaled bandwidth that exceeds the bandwidth value. This restricts the number of new transit LSPs to only a few high bandwidth LSPs.

Use the **mpls traffic-eng lsp-oor .. action accept reopt-lsp** command form to recover the condition when LSPs run into *Yellow* or *Red* states, by allowing existing LSPs to re-optimize.

Use the **mpls traffic-eng lsp-oor .. green recovery-duration *minutes*** command form to determine how long the actions are taken in the LSP OOR *Green* state after recovery. In other words, moving from yellow state to green state or red state to green state.

The following example shows how to configure the time duration for an LSP action in the *green* state, after recovery

```
Router# configure
Router(config)# mpls traffic-eng lsp-oor green recovery-duration 10
Router(config)# commit
Router(config)# end
```

The following example shows the output for the **show mpls traffic-eng lsp-oor summary** command. The main counters track the current OOR state, OOR thresholds, transitions, and the number of LSPs rejected due to OOR.

```
Router# show mpls traffic-eng lsp-oor summary

Total Transit LSPs: 5001
Total Transit Unprotected LSPs: 0
LSP OOR Status: Yellow; Changed last at: Wed May 15 17:05:48 2019
LSP OOR Green State Parameters:
  Available Bandwidth percentage: 100%
  TE Metric Penalty: 0
  Minimum LSP Size: 0 kbps
  Accept Reopt: FALSE
  Transition duration: 0 minutes
  Statistics:
    Transitions 0; LSPs accepted 5001, rejected 0
    Reopt accepted 0, rejected 0
LSP OOR Yellow State Parameters:
  Available Bandwidth percentage: 0%
  TE Metric Penalty: 0
  Minimum LSP Size: 10000 kbps
  Accept Reopt: TRUE
  Transit LSP Threshold: 5000
  Transit Unprotected LSP Threshold: No limit
  Statistics:
    Transitions 1; LSPs accepted 0, rejected 999
    Reopt accepted 0, rejected 0
LSP OOR Red State Parameters:
  Available Bandwidth percentage: 0%
  TE Metric Penalty: 0
  Minimum LSP Size: 10000 kbps
  Accept Reopt: FALSE
  Transit LSP Threshold: 10000
  Transit Unprotected LSP Threshold: No limit
  Statistics:
    Transitions 0; LSPs accepted 0, rejected 0
    Reopt accepted 0, rejected 0
```

rsvp

To enable functionality for Resource Reservation Protocol (RSVP) and enter RSVP configuration commands, use the **rsvp** command in XR Config mode. To return to the default behavior, use the **no** form of this command.

rsvp
no rsvp

Syntax Description This command has no keywords or arguments.

Command Default No default behavior or values

Command Modes XR Config mode

Command History	Release	Modification
	Release 6.2.1	This command was introduced.

Usage Guidelines No specific guidelines impact the use of this command.

Task ID	Task ID	Operations
	mpls-te	read, write

Examples

The following example shows how to enable RSVP functionality and enter the sub-mode for RSVP configuration commands:

```
RP/0/RP0/CPU0:router(config)# rsvp
RP/0/RP0/CPU0:router(config-rsvp)#
```

rsvp interface

To configure RSVP on an interface, use the **rsvp interface** command in XR Config mode. To disable RSVP on that interface, use the **no** form of this command.

rsvp interface *type interface-path-id*
no rsvp interface *type interface-path-id*

Syntax Description

type Interface type. For more information, use the question mark (?) online help function.

interface-path-id Physical interface or a virtual interface.

Note Use the **show interfaces** command to see a list of all possible interfaces currently configured on the router.

For more information about the syntax for the router, use the question mark (?) online help function.

Command Default

RSVP is enabled by default on an interface under the following conditions. (Enabling RSVP on an interface means that interface can be used by RSVP to send and receive RSVP messages).

- RSVP is configured on that interface using the **rsvp interface** command.
- MPLS is configured on that interface.

Command Modes

XR Config mode

Command History

Release	Modification
Release 6.2.1	This command was introduced.

Usage Guidelines

When RSVP is enabled on an interface by any of the three methods mentioned in the above section, the default bandwidth is 0. Use the bandwidth command in RSVP interface configuration mode to configure the bandwidth on an interface.

If the interface bandwidth is 0, RSVP can be used only to signal flows that do not require bandwidth on this interface.

The **rsvp interface** command enables the RSVP interface configuration mode.

Task ID

Task ID	Operations
mpls-te read, write	

Examples

The following example shows how to enable the RSVP interface configuration mode and to enable RSVP on this interface with 0 bandwidth:

```
RP/0/RP0/CPU0:router# configure  
RP/0/RP0/CPU0:router(config)# rsvp interface HundredGigE 0/0/0/3
```

rsvp neighbor

To specify an RSVP neighbor, use the **rsvp neighbor** command in XR Config mode. To deactivate authentication for a neighbor, use the **no** form of this command.

rsvp neighbor *IP-address* **authentication**
no rsvp neighbor *IP-address* **authentication**

Syntax Description	<i>IP-address</i> IP address of the neighbor. A single IP address of a specific neighbor; usually one of the neighbor's physical or logical (loopback) interfaces.
---------------------------	--

authentication Configures RSVP authentication parameters.
--

Command Default	No default values or behaviors
------------------------	--------------------------------

Command Modes	XR Config mode
----------------------	----------------

Command History	<table border="1"> <thead> <tr> <th>Release</th> <th>Modification</th> </tr> </thead> <tbody> <tr> <td>Release 6.2.1</td> <td>This command was introduced.</td> </tr> </tbody> </table>	Release	Modification	Release 6.2.1	This command was introduced.
Release	Modification				
Release 6.2.1	This command was introduced.				

Usage Guidelines	RSVP neighbor configuration mode can be used only if you want to configure authentication for a particular neighbor.
-------------------------	--

Task ID	<table border="1"> <thead> <tr> <th>Task ID</th> <th>Operations</th> </tr> </thead> <tbody> <tr> <td>mpls-te</td> <td>read, write</td> </tr> </tbody> </table>	Task ID	Operations	mpls-te	read, write
Task ID	Operations				
mpls-te	read, write				

Examples	The following example shows how to enter RSVP neighbor authentication configuration mode for IP address 10.0.0.1:
-----------------	---

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# rsvp neighbor 10.0.0.1 authentication
RP/0/RP0/CPU0:router(config-rsvp-nbor-auth)#
```


show rsvp request

To list all the requests that RSVP knows about on a router, use the **show rsvp request** command in XR EXEC mode.

```
show rsvp request [destination IP-address] [detail] [dst-port port-num] [session-type { lsp-p2p }]
[source IP-address] [src-port port-num]
```

Syntax Description	Parameter	Description
	detail	(Optional) Displays multiline status for each path. If this keyword is not specified, only a single-line table entry is displayed.
	destination <i>IP-address</i>	(Optional) Displays the entries that match the specified address.
	dst-port <i>port-num</i>	(Optional) Displays destination port and tunnel information.
	session-type	(Optional) Displays the entries that match the specified session type.
	lsp-p2p	Displays the entries that are used for P2P sessions.
	source <i>IP-address</i>	(Optional) Displays source address information.
	src-port <i>port-num</i>	(Optional) Displays port and LSP ID information.

Command Default No default behavior or values

Command Modes XR EXEC mode

Command History	Release	Modification
	Release 6.2.1	This command was introduced.

Usage Guidelines This command displays information about upstream reservations only; that is, reservations being sent to upstream hops. Information about downstream reservations (that is, incoming or locally created reservations) is available using the **show rsvp reservation** command.

Reservations are displayed in ascending order of destination IP address, destination port, source IP address, and source port.

Task ID	Task	Operations
	mpls-te	read, write

Examples

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

```
RP/0/RP0/CPU0:router# show rsvp request
```

show rsvp request

```

          Dest Addr DPort      Source Addr SPort Pro  OutputIF          Sty Serv Rate Burst
-----
1K      192.168.40.40 2001      192.168.67.68    2   0  HundredGigE 0/0/0/3  SE LOAD    0

```

The following is sample output from the **show rsvp request detail** command, which displays detailed information about all requests in the router. Requests are reservation states for the reservation messages sent upstream:

```
RP/0/RP0/CPU0:router# show rsvp request detail
```

```

REQ: IPv4-LSP Session addr: 192.168.40.40. TunID: 2001. LSPID: 2.
Source addr: 192.168.67.68. ExtID: 192.168.67.68.
Output interface: HundredGigE 0/0/0/3. Next hop: 192.168.67.68 (lih: 0x19700001).
Flags: Local Receiver.
Style: Shared-Explicit. Service: Controlled-Load.
Rate: 0 bits/sec. Burst: 1K bytes. Peak: 0 bits/sec.
MTU min: 0, max: 500 bytes.
Policy: Forwarding. Policy source(s): MPLS/TE.
Number of supporting PSBs: 1
Destination Add DPort      Source Add SPort Pro  Input IF          Rate Burst Prot
-----
192.168.40.40 2001      192.168.67.68 2   0  HundredGigE 0/0/0/3  0  1K  Off
Number of supporting RSBs: 1
Destination Add DPort      Source Add SPort Pro  Input IF Sty Serv Rate Burst
-----
192.168.40.40 2001      10.66.67.68 2   0  None SE LOAD    0  1K

```

This table describes the significant fields shown in the display.

Table 25: show rsvp request detail Command Field Descriptions

Field	Description
Number of supporting PSBs	Number of senders for this session (typically, 1).
Number of supporting RSBs	Number of reservations per session (typically, 1).
Policy	Admission control status.
Policy source	Entity performing the admission control.

show rsvp authentication

To display the database for the security association that RSVP has established with other RSVP neighbors, use the **show rsvp authentication** command in XR EXEC mode.

show rsvp authentication [*type interface-path-id*] [**destination** *IP-address*] [**detail**] [**mode** {**receive** | **send**}] [**neighbor** *IP-address*] [**source** *IP-address*]

Syntax Description

<i>type</i>	(Optional) Interface type. For more information, use the question mark (?) online help function.
<i>interface-path-id</i>	Physical interface or a virtual interface. Note Use the show interfaces command to see a list of all possible interfaces currently configured on the router. For more information about the syntax for the router, use the question mark (?) online help function.
destination <i>IP-address</i>	(Optional) Displays the database for the security association (SA) for the destination IP address. The <i>IP address</i> argument is the IP address of the destination address.
detail	(Optional) Displays additional information about RSVP security SAs.
mode	(Optional) Specifies the SA type. An SA is used to authenticate either incoming (receive) or outgoing (send) messages.
receive	Displays SAs for incoming messages.
send	Displays SAs for outgoing messages.
neighbor <i>IP-address</i>	(Optional) Displays the RSVP authentication information for the neighbor IP address. The <i>IP-address</i> argument is the IP address of the neighbor. For the send SA, the neighbor address is the destination address. For receive, the neighbor address is the source address.
source <i>IP-address</i>	(Optional) Displays the database for the SA for the source IP address. The <i>IP-address</i> argument is the IP address of the source address.

Command Default

No default behavior or values

Command Modes

XR EXEC mode

Command History

Release	Modification
Release 6.2.1	This command was introduced.

Usage Guidelines

No specific guidelines impact the use of this command.

show rsvp authentication

Task ID

Task Operations
ID

mpls-te read

Examples

The following sample output displays information for RSVP authentication:

```
RP/0/RP0/CPU0:router# show rsvp authentication

Codes: S - static, G - global, N - neighbor, I -interface, C - chain

Source Address  Dest Address  Interface          Mode Key-Source Key-ID Code
10.0.0.1        10.0.0.2     HundredGigE 0/0/0/3   Send mpls-keys  1   SGC
10.0.0.2        10.0.0.1     HundredGigE 0/0/0/3   Recv mpls-keys  1   SGC
```

This table describes the significant fields shown in the display.

Table 26: show rsvp authentication Command Field Descriptions

Field	Description
Source Address	IP address of the sender. For Send mode, this is the local address (either the address of the Interface field or the local router ID). For Recv mode, this is the address of the RSVP neighbor.
Dest Address	IP address of the receiver. For Send mode, this is the address of the RSVP neighbor. For Recv mode, this is the local address (either the address of the Interface field or the local router ID).
Interface	Name of the interface over which the security association is being maintained.
Mode	Direction of the association for the following mode types: Send Authenticates messages that you forward. Recv Authenticates messages that you receive.
Key-Source	Key source identification string that is currently set to the configured keychain name.
Key-ID	The last successful key ID that is used for authentication and maps to the keychain ID configuration. If the value is too large to fit into the column, it is truncated and a (..) suffix is appended. Use the detail mode to see the non-truncated key ID.

Field	Description
Code	<p>Code field has the following terms:</p> <p>Static Key is static and configured.</p> <p>Global Key is global-based.</p> <p>Neighbor Key is neighbor-based.</p> <p>Interface Key is interface-based.</p> <p>Chain Key is part of a keychain.</p>

The following sample output shows detailed information about a Send mode SA that is followed by a Receive mode SA:

```
RP/0/RP0/CPU0:router# show rsvp authentication detail
```

```

RSVP Authentication Information:
  Source Address:      10.0.0.1
  Destination Address: 10.0.0.2
  Neighbour Address:  10.0.0.2
  Interface:          HundredGigE 0/0/0/3
  Direction:          Send
  LifeTime:           1800 (sec)
  LifeTime left:      1305 (sec)
  KeyType:             Static Global KeyChain
  Key Source:          name1
  Key Status:          No error
  KeyID:               1
  Digest:              HMAC MD5 (16)
  Challenge:           Not supported
  TX Sequence:         5023969459702858020 (0x45b8b99b00000124)
  Messages successfully authenticated: 245
  Messages failed authentication:      0

Receive Errors:
  Incomplete security association:      0
  Missing INTEGRITY object:             0
  Incorrect digest:                     0
  Digest type mismatch:                 0
  Duplicate sequence number:            0
  Out-of-range sequence number:         0
  Invalid message format:               0

```

This table describes the significant fields shown in the display.

Table 27: show rsvp authentication detail Command Field Descriptions

Field	Description
Source Address	IP address of the sender. For Send mode, this is the local address (either the address of the Interface field or the local router ID). For Recv mode, this is the address of the RSVP neighbor.
Destination Address	IP address of the receiver. For Send mode, this is the address of the RSVP neighbor. For Recv mode, this is the local address (either the address of the Interface field or the local router ID).
Neighbor Address	IP address of the RSVP neighbor with which the security association is being maintained.
Interface	Name of the interface over which the security association is being maintained.
Direction	Direction of the association for the following mode types: Send Authenticates messages that you forward. Recv Authenticates messages that you receive.
LifeTime	Configured expiration timer value.
LifeTime left	Number of seconds until the expiration timer expires.
KeyType	Keys that are used: Static Key is static and configured. Global Key is global-based. Neighbor Key is neighbor-based. Interface Key is interface-based. Chain Key is part of a keychain.
Key-Source	Key source identification string that is currently set to the configured keychain name.
Key Status	Last status reported from the key source.

Field	Description
Key-ID	Last successful key ID that is used for authentication and that maps to the keychain ID configuration. If the value is too large to fit into the column, it is truncated and a (..) suffix is appended. (Use the detail mode to see the non-truncated key ID.)
Digest	Digest algorithm that is used. The algorithms are either HMAC-MD5 or HMAC-SHA1.
Challenge	Current challenge status reported.
Tx Sequence	Last sequence number that was sent.
Messages successfully authenticated	Number of messages authenticated by using this SA.
Messages failed authentication	Number of messages that failed authentication using this SA.
Sequence Window Size	Maximum configured RX sequence number window.
Sequence Window Count	Currently used size of the RX sequence number window.
Incomplete security association	Number of messages that are dropped due to a key failure.
Incorrect digest	Number of messages that are dropped due to an incorrect digest.
Digest type mismatch	Number of messages that are dropped due to an incorrect digest length, which implies an algorithm mismatch.
Duplicate sequence number	Number of messages that are dropped due to a duplicate sequence number.
Out-of-range sequence number	Number of messages that are dropped due to a sequence number range (window-size) checking.
Invalid message format	Number of messages that are dropped due to formatting errors, such as incorrect objects.

show rsvp counters

To display internal RSVP counters, use the **show rsvp counters** command in XR EXEC mode.

show rsvp counters {**messages** [{*type interface-path-id* | **summary** }]| **events** | **database**}

Syntax Description

messages	Displays a historical count of the number of messages RSVP has received and sent on each interface along with a summation.
<i>type</i>	(Optional) Interface type. For more information, use the question mark (?) online help function.
<i>interface-path-id</i>	Physical interface or a virtual interface. Note Use the show interfaces command to see a list of all possible interfaces currently configured on the router. For more information about the syntax for the router, use the question mark (?) online help function.
summary	(Optional) Displays the aggregate counts of all interfaces.
events	Displays the number of states expired for lack of refresh and a count of received No Acknowledgements (NACKs).
database	Displays counters on RSVP database, including number of paths, session, and so on.

Command Default

No default behavior or values

Command Modes

XR EXEC mode

Command History

Release	Modification
Release 6.2.1	This command was introduced.

Usage Guidelines

In message counters, bundle messages are counted as single bundle messages. The component messages are not counted separately.

The **messages** keyword shows the counters for all the interfaces. In addition, the aggregate summary is shown by using both the **messages** and **summary** keywords.

Task ID

Task ID	Operations
mpls-te	read, write

Examples

The following is sample output from the **show rsvp counters messages** command for HundredGigE 0/0/0/3:

```
RP/0/RP0/CPU0:router# show rsvp counters messages HundredGigE 0/0/0/3
```

```

HundredGigE0/0/0/3      Recv      Xmit      Recv      Xmit
  Path                   24         1      Resv           0         0
  PathError              0         0      ResvError       0         0
  PathTear               5         1      ResvTear        0         0
  ResvConfirm            0         0      Ack             34         0
  Bundle                 0         0      Hello           0         0
  SRefresh              10118      0      OutOfOrder      0
  Retransmit            0         0      Rate Limited    0

```

This table describes the significant fields shown in the display.

Table 28: show rsvp counters messages Command Field Descriptions

Field	Description
Path	Number of Path messages sent downstream or received from an upstream node.
PathError	Number of PathError messages received from a downstream neighbor or sent to an upstream neighbor.
PathTear	Number of PathTear messages sent downstream, or messages received, from upstream neighbors.
ResvConfirm	Number of ResvConfirm messages received from an upstream neighbor or sent to a downstream neighbor.
Bundle	Number of Bundle messages containing RSVP messages sent and received by the neighbor.
SRefresh	Number of Summary Refresh messages sent to and received by a neighbor to refresh the path and reservation states.
Retransmit	Number of messages retransmitted to ensure reliable messaging (related to refresh reduction).
Resv	Number of Reservation messages received from a downstream neighbor or sent to an upstream neighbor to reserve resources.
ResvError	Number of Reservation Error messages received from a upstream neighbor or sent to a downstream neighbor.
ResvTear	Number of Reservation Tear messages received from a downstream neighbor or sent to an upstream neighbor to tear down RSVP flows.
Ack	Number of Acknowledgement messages sent and received by a neighbor acknowledging receipt of a message.
Hello	Number of Hello messages sent to and received by a neighbor.
OutOfOrder	Number of messages received that are out of order.
Rate Limited	Number of RSVP packets affected by rate limiting.

The following is sample output from the **show rsvp counters database** command:

```
RP/0/RP0/CPU0:router# show rsvp counters database

Sessions: 0
Locally created and incoming paths: 0
Outgoing paths: 0
Locally created and incoming Reservations: 0
Outgoing Reservations: 0
Interfaces: 4
```

This table describes the significant fields shown in the display.

Table 29: show rsvp counters database Command Field Descriptions

Field	Description
Sessions	RSVP sessions.
Locally created and incoming paths	Path states created by : <ul style="list-style-type: none"> • A local application on the node. • Path message received from the network.
Outgoing paths	Outgoing path states.
Locally created and incoming Reservations	Reservations created by : <ul style="list-style-type: none"> • A local application on the node. • Path message received from the network.
Outgoing Reservations	Outgoing reservation (request) states.
Interfaces	Known RSVP interfaces.

show rsvp counters oor

To display internal RSVP counters on out of resources (OOR) events, use the **show rsvp counters oor** command in XR EXEC mode.

```
show rsvp counters oor [{type interface-path-id | summary}]
```

Syntax Description	
<i>type</i>	(Optional) Interface type. For more information, use the question mark (?) online help function.
<i>interface-path-id</i>	Physical interface or a virtual interface. Note Use the show interfaces command to see a list of all possible interfaces currently configured on the router. For more information about the syntax for the router, use the question mark (?) online help function.
summary	(Optional) Displays a summary of OOR events.

Command Default No default behavior or values

Command Modes XR EXEC mode

Command History	Release	Modification
	Release 6.2.1	This command was introduced.

Usage Guidelines No specific guidelines impact the use of this command.

Task ID	Task ID	Operations
	mpls-te	read, write

Examples

The following is sample output from the **show rsvp counters oor** command:

```
RP/0/RP0/CPU0:router# show rsvp counters oor

HundredGigE 0/0/0/3    Rejected
  Path                24
HundredGigE 0/0/0/4    Rejected
  Path                31
All RSVP Interfaces    Rejected
  Path                55
```

This table describes the significant fields shown in the display.

Table 30: show rsvp counters oor Command Field Descriptions

Field	Description
Path	Number of Path messages received on the interface that were rejected due to oor conditions.

show rsvp counters prefix-filtering

To display internal prefix-filtering related RSVP counters, use the **show rsvp counters prefix-filtering** command in XR EXEC mode.

show rsvp counters prefix-filtering interface [{*type interface-path-id*|**summary**}] **access-list** [*aclname*]

Syntax Description	interface	Displays RSVP prefix-filtering counters for all interfaces.
	<i>type</i>	(Optional) Interface type. For more information, use the question mark (?) online help function.
	<i>interface-path-id</i>	Physical interface or a virtual interface.
	Note	Use the show interfaces command to see a list of all possible interfaces currently configured on the router.
		For more information about the syntax for the router, use the question mark (?) online help function.
	summary	(Optional) Displays a summary of RSVP prefix-filtering counters on all interfaces.
	access-list	Displays RSVP prefix-filtering counters for the access control list.
	<i>aclname</i>	(Optional) Name of the access control list.

Command Default No default behavior or values

Command Modes XR EXEC mode

Command History	Release	Modification
	Release 6.2.1	This command was introduced.

Usage Guidelines Counters do not increment if you have not configured an access control list for prefix-filtering.

Task ID	Task ID	Operations
	mpls-te	read, write

Examples The following is sample output from the **show rsvp counters prefix-filtering** command:

```
RP/0/RP0/CPU0:router# show rsvp counters prefix-filtering interface
Routed      Fwd      Local      Drop      Def-Drop   Def-Proc   Total
Path        4
4
```

show rsvp counters prefix-filtering

```

PathTear          0
ResvConfirm       0
Total             4

```

```

HundredGigE0/0/0/3  Fwd      Local      Drop      Def-Drop    Def-Proc    Total
Path                1         0         0         219        2          222
PathTear            0         0         0         31         0          31
ResvConfirm         0         0         0         0         0           0
Total               1         0         0         219        2          253

```

```

HundredGigE0/0/0/3  Fwd      Local      Drop      Def-Drop    Def-Proc    Total
Path                0         0         0         0         1           1
PathTear            0         0         0         0         0           0
ResvConfirm         0         0         0         0         0           0
Total               0         0         0         0         1           1

```

```

ALL RSVP
Interfaces  Fwd      Local      Drop      Def-Drop    Def-Proc    Total
Path        4         1         0         219        3          227
PathTear    0         0         0         31         0          31
ResvConfirm 0         0         0         0         0           0
Total       4         1         0         250        3          258

```

The following is sample output from the **show rsvp counters prefix-filtering interface type interface-path-id** command:

```
RP/0/RP0/CPU0:router# show rsvp counters prefix-filtering interface HundredGigE 0/0/0/3
```

```

HundredGigE0/0/0/3  Fwd      Local      Drop      Def-Drop    Def-Proc    Total
Path                1         0         0         219        2          222
PathTear            0         0         0         31         0          31
ResvConfirm         0         0         0         0         0           0
Total               1         0         0         250        2          253

```

The following is sample output from the **show rsvp counters prefix-filtering interface summary** command:

```
RP/0/RP0/CPU0:router# show rsvp counters prefix-filtering interface summary
```

```

ALL RSVP
Interfaces  Fwd      Local      Drop      Def-Drop    Def-Proc    Total
Path        4         1         0         219        3          227
PathTear    0         0         0         31         0          31
ResvConfirm 0         0         0         0         0           0
Total       4         1         0         250        3          258

```

The following is sample output from the **show rsvp counters prefix-filtering access-list banks** command:

```
RP/0/RP0/CPU0:router# show rsvp counters prefix-filtering access-list banks
```

```

ACL: banks          Forward      Local      Drop      Total
Path                0           0         0         0

```

```

PathTear          0          0          0          0
ResvConfirm       0          0          0          0
Total             0          0          0          0

```

This table describes the significant fields shown in the display.

Table 31: show rsvp counters prefix-filtering interface and summary CommandField Descriptions

Field	Description
Fwd	Number of messages forwarded to the next router. Note The messages are counted against the <i>routed</i> interface only because RSVP has no record of what interface the messages will be forwarded to.
Local	Number of messages not forwarded (because they are locally destined).
Drop	Number of messages dropped.
Def-Drop	Number of messages dropped when an access control list match returns an implicit deny. (Results when RSVP is configured to drop implicit deny messages.)
Def-Proc	Number of messages processed by RSVP when an access control list match returns an implicit deny.
Path	Number of Path messages.
PathTear	Number of Path Tear messages.
ResvConfirm	Number of ResvConfirm messages.

show rsvp fast-reroute

To display RSVP Fast-Reroute (FRR) information, use the **show rsvp fast-reroute** command in EXEC mode.

show rsvp fast-reroute [**destination** *IP-address*] [**dst-port** *port*] [**session-type** { **lsp-p2p**}] [**source** *IP-address*] [**src-port** *source-port*] [**summary**]

Syntax Description	
destination <i>IP-address</i>	(Optional) Displays the entries that match the specified address.
dst-port <i>port</i>	(Optional) Displays the port address of the destination router.
session-type	(Optional) Displays the entries that match the specified session type.
lsp-p2p	Displays the entries that are used for P2P sessions.
source <i>IP-address</i>	(Optional) Displays the IP address of the source network.
src-port <i>source-port</i>	(Optional) Displays the port number of the source router.
summary	(Optional) Displays summarized information about the FRR database.

Command Default None

Command Modes EXEC

Command History	Release	Modification
	Release 6.2.1	This command was introduced.

Usage Guidelines No specific guidelines impact the use of this command.

Task ID	Task ID	Operations
	mpls-te	read, write

Examples

This is sample output from the **show rsvp fast-reroute** command:

```
RP/0/RP0/CPU0:router# show rsvp fast-reroute
```

Type	Destination	TunID	Source	PSBs	RSBs
LSP4	10.10.10.10	1	10.20.20.20	Ready	Ready

This table describes the significant fields shown in the display.

Table 32: show rsvp fast-reroute Command Field Descriptions

Field	Description
Type	Type of session.
Destination	Destination address of session.
TunID	Tunnel ID number.
Source	Source address of session.
PSBs	PSB FRR ⁸ state.
RSBs	RSB FRR state.

⁸ Fast reroute.

This is sample output from the **show rsvp fast-reroute summary** command:

```
RP/0/RP0/CPU0:router# show rsvp fast-reroute summary

States          Total          Ready          Act-Wait          Active
PSBs            1              1              0                 0
RSBs            1              1              0                 0
```

This table describes the significant fields shown in the display.

Table 33: show rsvp fast-reroute summary Command Field Descriptions

Field	Description
States	FRR ⁹ state.
Total	Total number of path and reservation states.
Ready	Number of states in FRR ready state. No FRR processing has been done on these states.
Act-Wait	Number of states in “Active Wait” FRR state. <ul style="list-style-type: none"> • For PSBs, this indicates that after FRR the path message has not yet been sent. • For RSBs, this indicates that after FRR, the reservation message has not yet been received.
Active	Number of states in “Active” FRR state. <ul style="list-style-type: none"> • For PSBs, this indicates that after FRR the path message has been sent. • For RSBs, this indicates that after FRR, the reservation message has been received.

⁹ Fast reroute.

show rsvp graceful-restart

To display the local graceful-restart information for RSVP, use the **show rsvp graceful-restart** command in XR EXEC mode.

show rsvp graceful-restart [**neighbors**] [*IP-address*] [**detail**]

Syntax Description	neighbors (Optional) Displays single-line status for each neighbor. If this keyword is not specified, only a multiline table entry is displayed showing local graceful-restart information.
	<i>IP-address</i> (Optional) Address of the neighbor you are displaying. Displays a specific neighbor with that destination address only. If this keyword is not specified, all neighbors are displayed.
	detail (Optional) Displays multiline status for each neighbor. If this keyword is not specified, only a single-line table entry is displayed.

Command Default No default behavior or values

Command Modes XR EXEC mode

Command History	Release	Modification
	Release 6.2.1	This command was introduced.

Usage Guidelines Graceful-restart neighbors are displayed in ascending order of neighbor IP address.

Task ID	Task ID	Operations
	mpls-te	read, write

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

```
RP/0/RP0/CPU0:router# show rsvp graceful-restart

Graceful restart: enabled Number of global neighbors: 1
Local MPLS router id: 192.168.55.55
Restart time: 60 seconds Recovery time: 120 seconds
Recovery timer: Not running
Hello interval: 5000 milliseconds Maximum Hello miss-count: 4
```

This table describes the significant fields shown in the display.

Table 34: show rsvp graceful-restart Command Field Descriptions

Field	Description
Graceful restart	Indicates whether graceful restart is configured locally.
Number of global neighbors	Number of neighbors identified by a unique router ID.
Local MPLS router id	Local router ID used for the MPLS applications.
Restart time	Amount of time after a loss in hello messages within which RSVP hello session is reestablished. This setting is manually configurable.
Recovery time	Local recovery time advertised to neighbors. This is dynamically computed based on the number of LSPs established and is the time used by neighbors to refresh states in the event of a failure.
Recovery timer	Countdown timer which, upon expiry, causes un-refreshed data forwarding states to be deleted (usually beginning with a value that is equivalent to the sum of the restart and recovery times).
Hello interval	Interval at which hello messages are sent to neighbors.
Maximum hello miss-count	Number of hellos from a neighbor that can be missed before declaring hellos down.

The following is sample output from the **show rsvp graceful-restart neighbors** command, which displays information about graceful restart neighbors in the router:

```
RP/0/RP0/CPU0:router# show rsvp graceful-restart neighbors
Neighbor          App  State Recovery          Reason          Since          LostCnt
-----
192.168.77.77 MPLS  UP    DONE                N/A  19/12/2016 17:02:25          0
```

This table describes the significant fields shown in the display.

Table 35: show rsvp graceful-restart neighbors Command Field Descriptions

Field	Description
Neighbor	Router ID of a global neighbor.
App	Application type of a global neighbor (MPLS).
State	State of the hello session to a global neighbor (up, down, INIT).
Recovery	State at which the local node is recovering a global neighbor.
Reason	Last reason for which communication has been lost for a global neighbor. If none has occurred, this field is marked as N/A.
Since	Time at which the current hello state for a global neighbor has been established.

Field	Description
LostCnt	Number of times hello communication has been lost with a global neighbor.

The following is sample output from the **show rsvp graceful-restart neighbors detail** command, which displays detailed information about all graceful restart neighbors:

```
RP/0/RP0/CPU0:router# show rsvp graceful-restart neighbors detail

Neighbor: 192.168.77.77 Source: 192.168.55.55 (MPLS)
  Hello instance for application MPLS
    Hello State: UP          (for 00:20:52)
    Number of times communications with neighbor lost: 0
    Reason: N/A
  Recovery State: DONE
  Number of Interface neighbors: 1
    address: 192.168.55.0
  Restart time: 120 seconds  Recovery time: 120 seconds
  Restart timer: Not running
  Recovery timer: Not running
  Hello interval: 5000 milliseconds  Maximum allowed missed Hello messages: 4
```

This table describes the significant fields shown in the display.

Table 36: show rsvp graceful-restart neighbors detail Command Field Descriptions

Field	Description
Neighbor	Router ID of a global neighbor.
Source	Local router ID and application type.
Hello State	State of the hello instance for the global neighbor (up, down, or init) and duration of the current state.
Number of times communications with neighbor lost	Number of times hello communication has been lost with a global neighbor.
Reason	Last reason indicating why communication was lost for a global neighbor. If none has occurred, this field is marked as N/A.
Recovery State	State at which the local node is recovering a global neighbor.
Number of Interface neighbors	Number of interfaces belonging to a global neighbor.
Address	IP address of the interface neighbor.
Recovery timer	Remote recovery time for a global neighbor.
Hello interval	Interval at which hello messages are sent by the remote global neighbor.
Maximum allowed missed Hello messages	Number of hellos that can be missed by the remote global neighbor before declaring hellos down.

show rsvp hello instance

To display the RSVP hello instances, use the **show rsvp hello instance** command in XR EXEC mode.

show rsvp hello instance [*Hostname* or *IP-address*] [**detail**]

Syntax Description

<i>Hostname</i> or <i>IP-address</i>	(Optional) Address of the neighbor you are displaying. If this argument is not specified, all neighbors are displayed.
detail	(Optional) Displays multiline status for each hello instance. If this keyword is not specified, only a single-line table entry is displayed.

Command Default

No default behavior or values

Command Modes

XR EXEC mode

Command History

Release	Modification
Release 6.2.1	This command was introduced.

Usage Guidelines

Hello instances are displayed in ascending order of neighbor IP address.

Task ID

Task ID	Operations
mpls-te	read, write

Examples

The following is sample output from the **show rsvp hello instance** command, which displays brief information about all hello instances in the router:

```
RP/0/RP0/CPU0:router# show rsvp hello instance

Neighbor      Type      State      Interface      LostCnt
-----
192.168.77.77  ACTIVE    UP          None            0
```

This table describes the significant fields shown in the display.

Table 37: show rsvp hello instance Command Field Descriptions

Field	Description
Neighbor	Router ID of a global neighbor hosting the hello instance.
Type	Hello instance type (active or passive). Active type indicates that a node is sending hello requests and passive indicates that a node is sending hello acknowledgements.

show rsvp hello instance

Field	Description
State	State of the hello session to a global neighbor (up, down, or init).
Interface	Interface for interface bound hello's used for FRR ¹⁰ . Hello instances bound to a global neighbor show Interface as None. Hellos used for FRR are currently not supported.
LostCnt	Number of times hello communication has been lost with a global neighbor.

¹⁰ Fast reroute.

The following is sample output from the **show rsvp hello instance** command, which displays detailed information about all hello instances in the router:

```
RP/0/RP0/CPU0:router# show rsvp hello instance detail

Neighbor: 192.168.77.77 Source: 192.168.55.55 (MPLS)
State: UP (for 00:07:14)
Type: ACTIVE (sending requests)
I/F: None
Hello interval (msec) (used when ACTIVE)
Configured: 5000
Src_instance 0x484b01, Dst_instance 0x4d4247
Counters:
Communication with neighbor lost:
  Num of times: 0 Reasons:
    Missed acks: 0
    New Src_Inst received: 0
    New Dst_Inst received: 0
    I/f went down: 0
    Neighbor disabled Hello: 0
Msgs Received: 93
Sent: 92
Suppressed: 87
```

This table describes the significant fields shown in the display.

Table 38: show rsvp hello instance detail Command Field Descriptions

Field	Description
Neighbor	Router ID of a global neighbor.
Source	Local router ID and application type.
State	State of the hello instance for the global neighbor (up, down or init) and duration of the current state.
Type	Hello instance type (active or passive). Active type indicates that a node is sending hello requests and passive indicates that a node is sending hello acks.
I/F	Interface for interface bound hellos. Hello instances for Graceful restart show interface as None.

show rsvp hello instance interface-based

To display the RSVP hello instances on a specific interface, use the **show rsvp hello instance interface-based** command in XR EXEC mode.

show rsvp hello instance interface-based [*IP-address*] [**detail**]

Syntax Description *IP-address* (Optional) Address of the neighboring interface. you are displaying. If this argument is not specified, all neighbors are displayed.

detail (Optional) Displays detailed information for the specified interface.

Command Default No default behavior or values

Command Modes XR EXEC mode

Command History

Release	Modification
Release 6.2.1	This command was introduced.

Usage Guidelines Hello instances are displayed in ascending order of neighbor IP address.

Task ID

Task ID	Operations
mpls-te	read, write

Examples

The following is sample output from the **show rsvp hello instance interface-based** command, which displays detailed information about hello instances on a specific interface:

```
RP/0/RP0/CPU0:router# show rsvp hello instance interface-based 10.10.10.10
```

Neighbor	Type	State	Interface	LostCnt
10.10.10.10	ACTIVE	UP	None	0

This table describes the significant fields shown in the display.

Table 39: show rsvp hello instance interface-based Command Field Descriptions

Field	Description
Neighbor	Router ID of a global neighbor hosting the hello instance.
Type	Hello instance type (active or passive). Active type indicates that a node is sending hello requests and passive indicates that a node is sending hello acknowledgements.

Field	Description
State	State of the hello session to a global neighbor (up, down, or init).
Interface	Interface for interface bound hellos used for FRR ¹¹ . For hello instances bound to a global neighbor, interface will be displayed as none.
LostCnt	Number of times hello communication has been lost with a global neighbor.

¹¹ Fast reroute.

show rsvp interface

To display information about all interfaces with RSVP enabled, use the **show rsvp interface** command in System Admin EXEC mode.

show rsvp interface [*type interface-path-id*] [**detail**]

Syntax Description	<i>type</i>	(Optional) Interface type. For more information, use the question mark (?) online help function.
	<i>interface-path-id</i>	Physical interface or a virtual interface.
	Note	Use the show interfaces command to see a list of all possible interfaces currently configured on the router.
		For more information about the syntax for the router, use the question mark (?) online help function.
	detail	(Optional) Displays multiline status for each interface. If this keyword is not specified, only a single-line table entry is displayed.

Command Default No default behavior or values

Command Modes XR EXEC mode

Usage Guidelines Use the **show rsvp interface** command to display various configuration settings such as the list of neighbors and their refresh reduction capabilities.

Task ID	Task ID	Operations
	mpls-te	read, write

Examples

The following is sample output from the **show rsvp interface** command, which displays brief information about the RSVP-configured interfaces for the GigabitEthernet interface type:

```
RP/0/RP0/CPU0:router# show rsvp interface HundredGigE 0/0/0/3

Thu Oct 22 20:35:42.323 UTC
Interface           MaxBW (bps) MaxFlow (bps) Allocated (bps)      MaxSub (bps)
-----
HundredGigE 0/0/0/3      750M          750M          0 ( 0%)              0
```

show rsvp neighbor

To display information about RSVP neighbors, use the **show rsvp neighbor** command in XR EXEC mode.

show rsvp neighbor [**detail**]

Syntax Description	detail (Optional) Displays detailed information about RSVP neighbors.
---------------------------	--

Command Default	No default behavior or values
------------------------	-------------------------------

Command Modes	XR EXEC mode
----------------------	--------------

Command History	Release	Modification
	Release 6.2.1	This command was introduced.

Usage Guidelines	Use the show rsvp interface command to display various configuration settings such as the list of neighbors and their refresh reduction capabilities.
-------------------------	--

Task ID	Task ID	Operations
	mpls-te read, write	

Examples	The following is sample output from the show rsvp neighbor command using the detail keyword:
-----------------	--

```
RP/0/RP0/CPU0:router# show rsvp neighbor detail
```

```
Global Neighbor: 10.10.10.10
Interface Neighbor: 10.0.0.1
Interface: HundredGigE0/0/0/3
Refresh Reduction: "Enabled" or "Disabled".
Remote epoch: 0XXXXXXXXX
Out of order messages: 0
Retransmitted messages: 0
Interface Neighbor: 172.16.0.1
Interface: HundredGigE0/0/0/3
Refresh Reduction: "Enabled" or "Disabled".
Remote epoch: 0XXXXXXXXX
Out of order messages: 0
Retransmitted messages: 0
```

show rsvp reservation

To display all reservations that RSVP knows about on a router, use the **show rsvp reservation** command in XR EXEC mode.

```
show rsvp reservation [destination IP address] [detail] [dst-port port-num] [session-type { lsp-p2p
}] [source IP-address] [src-port port-num]
```

Syntax Description	detail	(Optional) Displays multiline status for each reservation. If the detail keyword is not specified, only a single-line table entry is displayed.
	destination <i>IP-address</i>	(Optional) Displays the entries that match the specified address.
	dst-port <i>port-num</i>	(Optional) Displays destination port and tunnel ID information.
	session-type	(Optional) Displays the entries that match the specified session type.
	lsp-p2p	Displays the entries that are used for P2P sessions.
	source <i>IP-address</i>	(Optional) Displays source address information.
	src-port <i>port-num</i>	(Optional) Displays source port and LSP ID information.

Command Default No default behavior or values

Command Modes XR EXEC mode

Command History	Release	Modification
	Release 6.2.1	This command was introduced.

Usage Guidelines The **show rsvp reservation** command displays information about downstream reservations only (that is, reservations received on this device or created by application program interface (API) calls). Upstream reservations or requests are displayed using the **show rsvp request** command.

Task ID	Task ID	Operations
	mpls-te	read, write

Examples

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

```
RP/0/RP0/CPU0:router# show rsvp reservation
```

```
-----
      Dest Addr DPort      Source Addr SPort Pro   Input IF Sty Serv Rate Burst
-----
      192.168.40.40  2001    192.168.67.68    2   0      None  SE LOAD    0   1K
```

show rsvp reservation

```

1K      192.168.67.68 2000      10.40.40.40   15   0   HundredGigE 0/0/0/3  SE LOAD      0

```

The following example displays detailed information about all reservations in the router:

```
RP/0/RP0/CPU0:router# show rsvp reservation detail
```

```

RESV: IPv4-LSP Session addr: 192.168.40.40. TunID: 2001. LSPId: 2.
Source addr: 192.168.67.68. ExtID: 192.168.67.68.
Input adjusted interface: None. Input physical interface: None.
Next hop: 0.0.0.0 (lih: 0x0).
Style: Shared-Explicit. Service: Controlled-Load.
Rate: 0 bits/sec. Burst: 1K bytes. Peak: 0 bits/sec.
MTU min: 40, max: 500 bytes.
Flags: Local Receiver.
State expires in 0.000 sec.
Policy: Accepted. Policy source(s): MPLS/TE.
Header info: RSVP TTL=255. IP TTL=255. Flags: 0x0. TOS=0xff.
Resource:
  Labels: Local downstream: 3.

RESV: IPv4-LSP Session addr: 192.168.67.68. TunID: 2000. LSPId: 15.
Source addr: 192.168.40.40. ExtID: 10.10.40.40.
Input adjusted interface: HundredGigE 0/0/0/3. Input physical interface: HundredGigE
0/0/0/3.
Next hop: 10.66.67.68 (lih: 0x8DE00002).
Style: Shared-Explicit. Service: Controlled-Load.
Rate: 0 bits/sec. Burst: 1K bytes. Peak: 0 bits/sec.
MTU min: 0, max: 500 bytes.
Flags: None.
State expires in 361.184 sec.
Policy: Accepted. Policy source(s): MPLS/TE.
Header info: RSVP TTL=254. IP TTL=254. Flags: 0x1. TOS=0xff.
Resource:
  Labels: Outgoing downstream: 3.

```

This table describes the significant fields shown in the display.

Table 40: show rsvp reservation detail Command Field Descriptions

Field	Description
Input adjusted interface	Interface to reflect the path's outgoing interface.
Input physical interface	Interface where the reservation was received.
Next hop	Address of the downstream node that sent the reservation to this node.
Lih	Logical interface handle sent in the hop object of path returned to us in the reservation to figure out what interface the path was sent on.
Flags	Indicates path state, including as Local Repair, Local Sender (LSP ¹² ingress node), and others.
Policy	Admission control status.
Policy source	Entity performing the admission control on the LSP.
Header info	RSVP header information as described in RFC 2205.

¹² Link-state packet

show rsvp sender

To display all path states that RSVP knows about on this router, use the **show rsvp sender** command in XR EXEC mode mode.

```
show rsvp sender [destination IP-address] [detail] [dst-port port-num] [session-type { lsp-p2p }]
[source IP-address] [src-port port-num]
```

Syntax Description	detail	(Optional) Displays multiline status for each path. If the detail keyword is not specified, only a single-line table entry is displayed.
	destination <i>IP-address</i>	(Optional) Displays the entries that match the specified address.
	dst-port <i>port-num</i>	(Optional) Displays destination port and tunnel ID information.
	session-type	(Optional) Displays the entries that match the specified session type.
	lsp-p2p	Displays the entries that are used for P2P sessions.
	source <i>IP-address</i>	(Optional) Displays source address information.
	src-port <i>port-num</i>	(Optional) Displays source port and LSP ID information.

Command Default No default behavior or values

Command Modes XR EXEC mode

Command History	Release	Modification
	Release 6.2.1	This command was introduced.

Usage Guidelines The **show rsvp sender** command displays information about path states.

Task ID	Task ID	Operations
	mpls-te read, write	

Examples

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

```
RP/0/RP0/CPU0:router# show rsvp sender

Dest Addr          DPort    Source Addr SPort  Pro  Input IF          Rate Burst Prot
-----
10.40.40.40        2001     10.66.67.68  2    0    HundredGigE0/0/0/3  0    1K  Off
10.66.67.68        2000     10.40.40.40  15   0    None                0    1K  Off
```

This table describes the significant fields shown in the display.

Table 41: show rsvp sender Command Field Descriptions

Field	Description
DProt	Destination port number and tunnel-id.
Dest Address	Destination and session address of LSP ¹³ .
SPort	Source port and LSP ID.
Source Addr	Address of the ingress node of the LSP.
Input IF	Interface on which the Path message was received.

¹³ Link-state packet

The following example displays detailed information about all paths in the system:

```
RP/0/RP0/CPU0:router# show rsvp sender detail

PATH: IPv4-LSP Session addr: 10.66.67.68. TunID: 1. LSPId: 25.
Source addr: 10.40.40.40. ExtID: 10.40.40.40.
Prot: Off. Backup tunnel: None.
Setup Priority: 7, Reservation Priority: 0
Rate: 0 bits/sec. Burst: 1K bytes. Peak: 0 bits/sec.
Min unit: 40 bytes, Max unit: 500 bytes
Flags: Bidirectional.
State expires in 370.154 sec.
Policy: Accepted. Policy source(s): Default.
Header info: RSVP TTL=254. IP TTL=254. Flags: 0x1. TOS=0xc0.
Input interface: HundredGigE 0/0/0/3. Previous hop: 10.40.40.40 (lih: 0x40600001).
Resource:
  Labels: Outgoing upstream: 3.
  Class-Type: None.
  Explicit Route (Incoming):
    Strict, 10.66.67.68(interface-path-id 5)
    Strict, 10.66.67.68/32
```

This table describes the significant fields shown in the display.

Table 42: show rsvp sender detail Command Field Descriptions

Field	Description
Prot	LSP configured as a protected tunnel.
Backup tunnel	Name of the backup tunnel assigned to protect this LSP ¹⁴ .
Flags	Path state, including as local repair, local sender (LSP ingress node), and others.
Policy	Admission control status for Path message in the incoming direction.
Policy source	Entity doing the admission control, such as COPS or MPLS-TE ¹⁵ .
Header info	RSVP header information as described in RFC 2205.

Field	Description
Input interface	Interface on which the path was received. At ingress mode, it is None.
Previous hop	Address of the upstream peer who sent us the Path message. May be the interface address or node-id depending on LSP (packet or optical).
Lih	Logical interface handle received in the hop object of the path.
Output interface	Interface on which the path was forwarded to the downstream neighbor
Policy	Admission control status for the path in the outgoing direction.
Explicit route	Explicit route specified in the explicit-route object of the Path message.

¹⁴ Link-state packet

¹⁵ MPLS-Traffic Engineering

show rsvp session

To list all sessions that RSVP knows about on this router, use the **show rsvp session** command in XR EXEC mode.

```
show rsvp session [destination IP-address] [detail] [dst-port port-num] [session-type { lsp-p2p }]
[tunnel-name tunnel-name]
```

Syntax Description	detail	(Optional) Displays multiline status for each path. If the detail keyword is not specified, only a single-line table entry is displayed.
	destination <i>IP-address</i>	(Optional) Displays the entries that match the specified address.
	dst-port <i>port-num</i>	(Optional) Displays destination port and tunnel ID information.
	session-type	(Optional) Displays the entries that match the specified session type.
	lsp-p2p	Displays the entries that are used for P2P sessions.
	tunnel-name <i>tunnel-name</i>	(Optional) Displays status for the session matching the specified tunnel-name.

Command Modes XR EXEC mode

Command History	Release	Modification
	Release 6.2.1	This command was introduced.

Usage Guidelines Sessions are displayed in ascending order of destination IP address, destination port, and source IP address.

Task ID	Task ID	Operations
	mpls-te	read, write

Examples

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

```
RP/0/RP0/CPU0:router# show rsvp session
```

Type	Session Addr	Port	Proto/ExtTunID	PSBs	RSBs	Reqs
LSP4	10.40.40.40	2001	10.66.67.68	1	1	1
LSP4	10.66.67.68	2000	10.40.40.40	1	1	0

This table describes the significant fields shown in the display.

Table 43: show rsvp session Command Field Descriptions

Field	Description
Type	Type of data flow (Traffic-Engineering LSP (LSP4 or IPV4 session).
Session Addr	Destination address of the data packets and also tail of the LSP.
Port	Destination port or tunnel ID in case of TE tunnels.
Proto/ExtTunID	Source address of TE tunnels or protocol as in the case of IPV4 sessions.
PSBs	Number of path state blocks for this session.
RSBs	Number of reservation state blocks pertaining to incoming or local reservations for this session.
Reqs	Number of requests. State data structure representing reservations sent up-stream.

The following is sample output for the **show rsvp session detail** command:

```
RP/0/RP0/CPU0:router# show rsvp session detail

SESSION: IPv4-LSP Addr: 10.66.67.68, TunID: 1, ExtID: 10.40.40.40
PSBs: 1, RSBs: 1, Requests: 0
LSPId: 1
Tunnel Name: newhead_t1
RSVP Path Info:
  InLabel: No intf, No label
  Incoming Address: Unknown
  Explicit Route:
    Strict, 10.66.67.68(interface-path-id 5)
    Strict, 10.66.67.68/32
  Record Route: None
  Tspec: avg rate=0, burst=1K, peak rate=0
RSVP Resv Info:
  OutLabel: HundredGigE0/0/0/3, 5
  FRR OutLabel: No intf, No label
  Record Route:
    Node-id 10.66.67.68, interface index 5
  Espec: avg rate=0, burst=1K, peak rate=0
```

This table describes the significant fields shown in the display.

Table 44: show rsvp session detail Command Field Descriptions

Field	Description
TunID	Tunnel identifier and the destination port of the LSP ¹⁶ .
ExtID	Ingress node address of LSP.
Tunnel Instance	Source port of the LSP (with the ExtId forming the source parameters).
Tunnel Name	Name of the tunnel and LSP.

Field	Description
InLabel	Incoming interface and label info for the LSP in the upstream direction. At the egress node, using penultimate hop popping at the egress node, (implicit-null) appears as <i>No Label</i> .
Incoming Address	Address of the ingress interface.
Explicit Route	Explicit route specified in the explicit-route object of the Path message.
Record Route	Record route object in either the path or reservation message.
Tspec	Traffic parameters.
OutLabel	Outgoing interface and label sent downstream.
FRR OutLabel	For FRR ¹⁷ , displays the backup tunnel and Merge-point label.
Fspec	Flow spec parameters for specified QoS.

¹⁶ Link-state packet.

¹⁷ Fast reroute.

signalling dscp (RSVP)

To give all RSVP signaling packets sent out on a specific interface higher priority in the network by marking them with a particular Differentiated Service Code Point (DSCP), use the **signalling dscp** command in RSVP interface configuration submenu. To return to the default behavior, use the **no** form of this command.

signalling dscp *dscp*
no signalling *dscp*

Syntax Description	<i>dscp</i> DSCP priority number. Range is 0 to 63.				
Command Default	No default behavior or values				
Command Modes	RSVP interface configuration				
Command History	<table border="1"> <thead> <tr> <th>Release</th> <th>Modification</th> </tr> </thead> <tbody> <tr> <td>Release 6.2.1</td> <td>This command was introduced.</td> </tr> </tbody> </table>	Release	Modification	Release 6.2.1	This command was introduced.
Release	Modification				
Release 6.2.1	This command was introduced.				

Usage Guidelines	<p>DSCP marking improves signaling setup and teardown times.</p> <p>Usually, when a router receives Path messages for a particular state marked with a DSCP value, it sends out Path messages for that state marked with the same DSCP value. This command overrides that DSCP persistence and ensures that all messages sent out a particular interface are marked with a specified DSCP.</p> <p>Though this command controls RSVP signaling packets, it has no effect on ordinary IP or MPLS data packets traveling along the path created or reserved by this RSVP session.</p> <p>DSCP persistence operates on a per-state basis, but this command operates on a per-interface basis. So, if some incoming message (for example, multicast Path) with DSCP 10 causes two outgoing messages on interfaces A and B, usually both are sent with DSCP 10. If signalling dscp 5 is configured for RSVP on interface A, the Path messages being sent out interface A is marked with DSCP 5, but the Path messages being sent out of interface B are marked with DSCP 10.</p> <p>There is a difference between signalling dscp 0 and no signalling dscp commands. The first command instructs RSVP to explicitly set the DSCP value to 0 on all packets sent out of this interface. The second command removes any override on the packets being sent out of this interface, and allows the DSCP of received packets that created this state to persist on packets forwarded out of this interface.</p> <p>The RFC specifies a standard mapping from the eight IP precedence values to eight values in the 64-value DSCP space. You can use those special DSCP values to specify IP precedence bits only.</p>
-------------------------	---

Task ID	<table border="1"> <thead> <tr> <th>Task ID</th> <th>Operations</th> </tr> </thead> <tbody> <tr> <td>mpls-te</td> <td>read, write</td> </tr> </tbody> </table>	Task ID	Operations	mpls-te	read, write
Task ID	Operations				
mpls-te	read, write				

Examples

The following example shows how to mark all RSVP packets going out on a HundredGigE interface with DSCP value 20.

```
RP/0/RP0/CPU0:router# configure  
RP/0/RP0/CPU0:router(config)# rsvp interface HundredGigE 0/0/0/3  
RP/0/RP0/CPU0:router(config-rsvp-if)# signalling dscp 20
```

The following example shows how to disable DSCP marking of signaling packets going out on a HundredGigE interface.

```
RP/0/RP0/CPU0:router# configure  
RP/0/RP0/CPU0:router(config)# rsvp interface HundredGigE 0/0/0/3  
RP/0/RP0/CPU0:router(config-rsvp-if)# no signalling dscp
```

signalling graceful-restart

To enable or disable RSVP signaling graceful restart, use the **signalling graceful-restart** command in RSVP configuration mode. To return to the default behavior, use the **no** form of this command.

signalling graceful-restart [{**recovery-time** *time* | **restart-time** *time*}]
no signalling graceful-restart

Syntax Description

recovery-time	(Optional) Configures the recovery time that is advertised in the Restart Cap object in the Hello messages.
<i>time</i>	Time, in seconds, for the neighbor to wait for the node to recover (replay) existing states after the Hello session is reestablished before initiating TEARs. Range is 0 to 3600.
restart-time	(Optional) Configures the restart time that is advertised in the Restart Cap object in hello messages.
<i>time</i>	Time, in seconds, after a control-plane restart that RSVP can start exchanging hello messages. Range is 60 to 3600. Default is 120.

Command Default

RSVP signaling graceful restart is disabled.

Command Modes

RSVP configuration

Command History

Release	Modification
Release 6.2.1	This command was introduced.

Usage Guidelines

The **signalling graceful-restart** command provides a mechanism that helps minimize the negative effects on MPLS and Optical User Network Interface (O-UNI) traffic for the following types of faults. This is an implementation of the fault handling section of the IETF standard RFC 3473:

Control-channel-failure

Disruption of communication channels between 2 nodes when the communication channels are separated from the data channels.

Node-failure

Control plane of a node fails, but the node preserves its data forwarding states.

The **signalling graceful-restart** command instigates the exchange of RSVP hello messages between the router and its neighbor nodes. After the hello messages are established with a given neighbor, RSVP can detect these types of faults when they occur.

If no hello messages are received from a neighbor within a certain number of hello intervals, a node assumes that communication with the neighbor has been lost. The node waits the amount of time advertised by the last restart time communicated by the neighbor, before invoking procedures for recovery from communication loss.

The configured restart time is important in case of recovery from failure. The configured value should accurately reflect the amount of time within which, after a control-plane restart, RSVP can start exchanging hello messages.

Task ID	Task ID	Operations
	mpls-te	read, write

Examples

The following example shows how to enable RSVP signalling graceful restart:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# rsvp
RP/0/RP0/CPU0:router(config-rsvp)# signalling graceful-restart
```

The following example shows how to set the restart time:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# rsvp
RP/0/RP0/CPU0:router(config-rsvp)# signalling graceful-restart restart-time 200
```

The following example shows how to reset the restart time to the default of 120 seconds:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# rsvp
RP/0/RP0/CPU0:router(config-rsvp)# no signalling graceful-restart restart-time
```

signalling hello graceful-restart interface-based

To enable RSVP to accept interface-based hello requests from the neighbor on an interface and send a Hello Acknowledgment to it, use the **signalling hello graceful-restart interface-based** command in RSVP configuration mode. To return to the default behavior, use the **no** form of this command.

signalling hello graceful-restart interface-based
no signalling hello graceful-restart interface-based

Syntax Description This command has no arguments or keywords.

Command Default No default behavior or values

Command Modes RSVP interface configuration

Command History	Release	Modification
	Release 6.2.1	This command was introduced.

Usage Guidelines No specific guidelines impact the use of this command.

Task ID	Task ID	Operations
	mpls-te	read, write

Examples

The following example shows how to enable interface-based graceful restart:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# rsvp interface tunnel-te 66
RP/0/RP0/CPU0:router(config-rsvp-if)# signalling hello graceful-restart interface based
```


signalling hello graceful-restart refresh interval

To configure the interval at which RSVP graceful-restart hello messages are sent to each neighbor, use the **signalling hello graceful-restart refresh interval** command in RSVP configuration mode. To return to the default behavior, use the **no** form of this command.

signalling hello graceful-restart refresh interval *refresh-interval*
no signalling hello graceful-restart refresh interval

Syntax Description	<i>refresh-interval</i> Interval, in milliseconds, at which RSVP graceful-restart hello messages are sent to each neighbor. Range is 3000 to 30000.				
Command Default	<i>refresh interval: 5000</i>				
Command Modes	RSVP configuration				
Command History	<table border="1"> <thead> <tr> <th>Release</th> <th>Modification</th> </tr> </thead> <tbody> <tr> <td>Release 6.2.1</td> <td>This command was introduced.</td> </tr> </tbody> </table>	Release	Modification	Release 6.2.1	This command was introduced.
Release	Modification				
Release 6.2.1	This command was introduced.				

Usage Guidelines

The **signalling hello graceful-restart refresh interval** command determines how often hello messages are sent to each neighbor. If the interval is made short, the hello messages are sent more frequently. Although a short interval may help detect failures quickly, it also results in increased network traffic. Optimizations in the RSVP hello mechanism exist to reduce the number of hello messages traveling over the network.

When an RSVP hello message is received, the receiving node acknowledges the hello and restarts its hello timer to the neighbor. By doing this, a hello is transmitted to the neighbor only if a hello is not received before the hello refresh interval has expired.

If two neighboring nodes do not have the same hello interval, the node with the larger hello interval has to acknowledge its neighbor's (more frequent) hellos. For instance, if node A has a hello interval of 5 seconds, and node B has a hello interval of 10 seconds, node B still has to send hello messages every 5 seconds.

The hello backoff mechanism is an optimization that is tailored to minimize the number of hello messages from a neighbor that either does not have graceful restart enabled, or that fails to come back up during the restart interval. The restart interval is provided by the neighbor in the restart cap object.

Task ID	Task ID	Operations
	mpls-te	read, write

Examples

The following example sets the hello graceful-restart refresh interval to 4000 msec:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# rsvp
```

signalling hello graceful-restart refresh interval

```
RP/0/RP0/CPU0:router(config-rsvp)# signalling hello graceful-restart refresh interval 4000
```

signalling prefix-filtering access-list

To specify the extended access control list to use for prefix filtering of RSVP Router Alert messages, use the **signalling prefix-filtering access-list** command in RSVP configuration mode. To return to the default behavior, use the **no** form of this command.

signalling prefix-filtering access-list *access list name*
no signalling prefix-filtering access-list *access list name*

Syntax Description	<i>access list name</i> Extended access-list name as a string (maximum 32 characters).				
Command Default	No default behavior or values				
Command Modes	RSVP configuration				
Command History	<table border="1"> <thead> <tr> <th>Release</th> <th>Modification</th> </tr> </thead> <tbody> <tr> <td>Release 6.2.1</td> <td>This command was introduced.</td> </tr> </tbody> </table>	Release	Modification	Release 6.2.1	This command was introduced.
Release	Modification				
Release 6.2.1	This command was introduced.				
Usage Guidelines	The extended access control list containing the source and destination prefixes used for packet filtering is configured separately.				
Task ID	<table border="1"> <thead> <tr> <th>Task ID</th> <th>Operations</th> </tr> </thead> <tbody> <tr> <td>mpls-te</td> <td>read, write</td> </tr> </tbody> </table>	Task ID	Operations	mpls-te	read, write
Task ID	Operations				
mpls-te	read, write				

Examples

The following example shows how to configure the access control list name banks for prefix-filtering of RSVP Router Alert messages:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# rsvp
RP/0/RP0/CPU0:router(config-rsvp)# signalling prefix-filtering access-list banks
```

The following example shows how to disable RSVP prefix-filtering of RSVP Router Alert messages:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# rsvp
RP/0/RP0/CPU0:router(config-rsvp)# no signalling prefix-filtering access-list banks
```

signalling prefix-filtering default-deny-action

To configure RSVP to drop RSVP Router Alert messages when an access control list match returns an implicit deny, use the **signalling prefix-filtering default-deny-action** command in RSVP configuration mode. To return to the default behavior, use the **no** form of this command.

```
signalling prefix-filtering default-deny-action drop
no signalling prefix-filtering default-deny-action drop
```

Syntax Description	drop Specifies when RSVP router alert messages are dropped.				
Command Default	Performs normal RSVP processing of Path, Path Tear, and ResvConfirm message packets.				
Command Modes	RSVP configuration				
Command History	<table border="1"> <thead> <tr> <th>Release</th> <th>Modification</th> </tr> </thead> <tbody> <tr> <td>Release 6.2.1</td> <td>This command was introduced.</td> </tr> </tbody> </table>	Release	Modification	Release 6.2.1	This command was introduced.
Release	Modification				
Release 6.2.1	This command was introduced.				
Usage Guidelines	No specific guidelines impact the use of this command.				
Task ID	<table border="1"> <thead> <tr> <th>Task ID</th> <th>Operations</th> </tr> </thead> <tbody> <tr> <td>mpls-te</td> <td>read, write</td> </tr> </tbody> </table>	Task ID	Operations	mpls-te	read, write
Task ID	Operations				
mpls-te	read, write				

Examples

The following example shows how to configure RSVP Router Alert messages when an access control list match returns an implicit deny:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# rsvp
RP/0/RP0/CPU0:router(config-rsvp)# signalling prefix-filtering default-deny-action drop
```

signalling rate-limit

To limit the rate of RSVP signaling messages being sent out a particular interface, use the **signalling rate-limit** command in RSVP interface configuration mode. To return to the default behavior, use the **no** form of this command.

signalling rate-limit[rate *messages*] [**interval** *interval-length*]
no signalling rate-limit [rate *messages*] [**interval** *interval-length*]

Syntax Description	rate <i>messages</i>	(Optional) Configures the number of messages sent per scheduling interval. Range is 1 to 500 messages.
	interval <i>interval-length</i>	(Optional) Specifies the length, in milliseconds, between scheduling intervals. Range is 250 to 2000.

Command Default	<i>messages</i> : 100 <i>interval-length</i> : 1,000 (1 second)
-----------------	--

Command Modes	RSVP interface configuration
---------------	------------------------------

Command History	Release	Modification
	Release 6.2.1	This command was introduced.

Usage Guidelines Use the rate-limiting feature with caution. Limiting the rate of RSVP signaling has the advantage of avoiding an overload of the next hop router's input queue, because such overloads would cause the next hop router to drop RSVP messages. However, reliable messaging and rapid retransmit usually enable the router to recover very rapidly from message drops; so rate limiting might not be necessary.

If the rate is set too low, it causes slower convergence times. This command limits all RSVP messages except acknowledgments (ACK) and SRefresh messages. The command does not let you make a router generate messages faster than its inherent limit. (That limit differs among router models.)

Task ID	Task ID	Operations
	mpls-te	read, write

Examples

The following example shows how to enable rate-limiting:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# rsvp interface HundredGigE 0/0/0/3
RP/0/RP0/CPU0:router(config-rsvp-if)# signalling rate-limit
```

The following example shows how to limit the rate to 50 messages per second:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# rsvp interface HundredGigE 0/0/0/3
RP/0/RP0/CPU0:router(config-rsvp-if)# signalling rate-limit rate 50
```

The following example shows how to set a limit at 40 messages for every 250 milliseconds:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# rsvp interface HundredGigE 0/0/0/3
RP/0/RP0/CPU0:router(config-rsvp-if)# signalling rate-limit rate 40 interval 250
```

The following example shows how to restore the rate to the default of 100 messages per second:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# rsvp interface HundredGigE 0/0/0/3
RP/0/RP0/CPU0:router(config-rsvp-if)# no signalling rate-limit rate
```

The following example shows how to disable rate-limiting:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# rsvp interface HundredGigE 0/0/0/3
RP/0/RP0/CPU0:router(config-rsvp-if)# no signalling rate-limit
```

signalling refresh interval

To change the frequency with which a router updates the network about the RSVP state of a particular interface, use the **signalling refresh interval** command in RSVP interface configuration mode. To return to the default behavior, use the **no** form of this command.

signalling refresh interval *seconds*
no signalling refresh interval

Syntax Description	<i>seconds</i> Number of seconds the router waits to update the network about the RSVP state of an interface, in seconds. Range is 10 to 180. Default is 45.				
Command Default	<i>seconds</i> : 45				
Command Modes	RSVP interface configuration				
Command History	<table border="1"> <thead> <tr> <th>Release</th> <th>Modification</th> </tr> </thead> <tbody> <tr> <td>Release 6.2.1</td> <td>This command was introduced.</td> </tr> </tbody> </table>	Release	Modification	Release 6.2.1	This command was introduced.
Release	Modification				
Release 6.2.1	This command was introduced.				
Usage Guidelines	<p>RSVP relies on a soft-state mechanism to maintain state consistency in the face of network losses. That mechanism is based on continuous refresh messages to keep a state current. Each RSVP router is responsible for sending periodic refresh messages to its neighbors.</p> <p>The router attempts to randomize network traffic and reduce metronomic burstiness by jittering the actual interval between refreshes by as much as 50 percent. As a result, refreshes may not be sent at exactly the interval specified. However, the average rate of refreshes are within the specified refresh interval.</p> <p>Lengthening the interval reduces the refresh load of RSVP on the network but causes downstream nodes to hold state longer. This reduces the responsiveness of the network to failure scenarios. Shortening the interval improves network responsiveness but expands the messaging load on the network.</p> <p>The reliable messaging extension, implemented through the signalling refresh reduction reliable command, may cause new or changed messages to be temporarily refreshed at a more rapid rate than specified to improve network responsiveness.</p> <p>The use of reliable messaging with rapid retransmit substantially improves network responsiveness in case of transient message loss; if the refresh interval is changed when using the reliable messaging feature, it is more useful to lengthen the interval than to shorten it.</p> <p>The summary refresh extension, implemented through the signalling refresh reduction summary command, provides a lower-cost mechanism to refresh RSVP state. The router uses the same refresh interval between successive refreshes of a single state when using summary refresh and when using ordinary message-based refresh.</p>				
Task ID	<table border="1"> <thead> <tr> <th>Task ID</th> <th>Operations</th> </tr> </thead> <tbody> <tr> <td>mpls-te</td> <td>read, write</td> </tr> </tbody> </table>	Task ID	Operations	mpls-te	read, write
Task ID	Operations				
mpls-te	read, write				

Examples

The following example shows how to specify a refresh interval of 30 seconds:

```
RP/0/RP0/CPU0:router# configure  
RP/0/RP0/CPU0:router(config)# rsvp interface tunnel-te 2  
RP/0/RP0/CPU0:router(config-rsvp-if)# signalling refresh interval 30
```

The following example shows how to restore the refresh interval to the default value of 45 seconds:

```
RP/0/RP0/CPU0:router# configure  
RP/0/RP0/CPU0:router(config)# rsvp interface tunnel-te 2  
RP/0/RP0/CPU0:router(config-rsvp-if)# no signalling refresh interval
```


signalling refresh missed

To specify the number of successive refresh messages that can be missed before the RSVP deems a state to be expired (resulting in the state to be torn down), use the **signalling refresh missed** command in RSVP interface configuration mode. To return to the default behavior, use the **no** form of this command.

signalling refresh missed *number*
no signalling refresh missed

Syntax Description	<i>number</i> Number of successive missed refresh messages. Range is 1 to 8. Default is 4.	
Command Default	<i>number</i> : 4	
Command Modes	RSVP interface configuration	
Command History	Release	Modification
	Release 6.2.1	This command was introduced.
Usage Guidelines	<p>Decreasing the missed-message number improves RSVP responsiveness to major failures like router failure or link faults, but decreases the resilience of RSVP resulting in packet drops or temporary network congestion. The latter condition makes RSVP too sensitive.</p> <p>Increasing the missed-message number increases the resilience of RSVP to such transient packet loss, but decreases the RSVP responsiveness to more intransient network failures such as router failure or link fault.</p> <p>The default value of 4 provides a balance of resilience and responsiveness factors.</p>	
Task ID	Task ID	Operations
	mpls-te	read, write

Examples

The following example shows how to specify a missed refresh limit of six (6) messages:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# rsvp interface tunnel-te 2
RP/0/RP0/CPU0:router(config-rsvp-if)# signalling refresh missed 6
```

The following example shows how to return the missed refresh limit to the default value of four (4):

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# rsvp interface tunnel-te 2
RP/0/RP0/CPU0:router(config-rsvp-if)# no signalling refresh missed
```

window-size (RSVP)

To specify the maximum number of RSVP authenticated messages that can be received out of sequence, use the **window-size** command in RSVP authentication configuration mode, RSVP interface authentication configuration mode, or RSVP neighbor authentication configuration mode. To disable the window size, use the **no** form of this command.

window-size *N*
no window-size

Syntax Description	<i>N</i> Size of the window to restrict out-of-sequence messages. Range is 1 to 64. Default is 1. All out-of-sequence messages are dropped.
---------------------------	---

Command Default	<i>N</i> : 1
------------------------	--------------

Command Modes	RSVP authentication configuration RSVP interface authentication configuration RSVP neighbor authentication configuration
----------------------	--

Command History	Release	Modification
	Release 6.2.1	This command was introduced.

Usage Guidelines	Use the window-size command to specify the maximum number of authenticated messages that are received out of sequence. All RSVP authenticated messages include a sequence number that is used to prevent replays of RSVP messages.
-------------------------	---

With a default window size of one message, RSVP rejects any out-of-order or out-of-sequence authenticated messages because they are assumed to be replay attacks. However, sometimes bursts of RSVP messages become reordered between RSVP neighbors. If this occurs on a regular basis, and you can verify that the node sending the burst of messages is trusted, you can use the window-size option to adjust the burst size such that RSVP does not discard such reordered bursts. RSVP checks for duplicate messages within these bursts.

Task ID	Task ID	Operations
	mpls-te read, write	

Examples	The following example shows how to configure the size of the window to 33 in RSVP neighbor authentication configuration mode:
-----------------	---

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# rsvp neighbor 10.0.0.1 authentication
RP/0/RP0/CPU0:router(config-rsvp-nbor-auth)# window-size 33
```

The following example shows how to configure the size of the window to 33 in RSVP authentication configuration mode:

```
RP/0/RP0/CPU0:router# configure  
RP/0/RP0/CPU0:router(config)# rsvp authentication  
RP/0/RP0/CPU0:router(config-rsvp-auth)# window-size 33
```

The following example shows how to configure the size of the window to 33 in RSVP interface authentication configuration mode by using the **rsvp interface** command:

```
RP/0/RP0/CPU0:router# configure  
RP/0/RP0/CPU0:router(config)# rsvp interface HundredGigE 0/0/0/3  
RP/0/RP0/CPU0:router(config-rsvp-if)# authentication  
RP/0/RP0/CPU0:router(config-rsvp-if-auth)# window-size 33
```

signalling refresh reduction summary

To configure RSVP summary refresh message size on an interface, use the **signalling refresh reduction summary** command in RSVP interface configuration mode. To return to the default behavior, use the **no** form of this command.

signalling refresh reduction summary *max-size bytes*
no signalling refresh reduction summary *max-size bytes*

Syntax Description	max-size bytes Specifies the maximum size, in bytes, of a single RSVP summary refresh message. Range is 20 to 65000.				
Command Default	<i>bytes: 4096</i>				
Command Modes	RSVP interface configuration				
Command History	<table border="1"> <thead> <tr> <th>Release</th> <th>Modification</th> </tr> </thead> <tbody> <tr> <td>Release 6.2.1</td> <td>This command was introduced.</td> </tr> </tbody> </table>	Release	Modification	Release 6.2.1	This command was introduced.
Release	Modification				
Release 6.2.1	This command was introduced.				

Usage Guidelines Use the **signalling refresh reduction summary** command to specify the maximum size of the summary refresh messages sent. Message size is verified using the **show rsvp interface detail** command.

Task ID	Task ID	Operations
	mpls-te	read, write

Examples

The following example shows how to change the summary message maximum size on an interface:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# rsvp interface tunnel-te 2
RP/0/RP0/CPU0:router(config-rsvp-if)# signalling refresh reduction summary max-size 6000
```

The following example shows how to return the summary message maximum size to the default value on an interface:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# rsvp interface tunnel-te 2
RP/0/RP0/CPU0:router(config-rsvp-if)# no signalling refresh reduction summary max-size 6000
```

signalling refresh reduction reliable

To configure the parameters of reliable messaging, use the **signalling refresh reduction reliable** command in RSVP interface configuration mode. To return to the default behavior, use the **no** form of this command.

signalling refresh reduction reliable {**ack-max-size** *bytes* | **ack-hold-time** *milliseconds* | **retransmit-time** *milliseconds* | **summary-refresh**}

no signalling refresh reduction reliable {**ack-max-size** *bytes* | **ack-hold-time** *milliseconds* | **retransmit-time** *milliseconds* | **summary-refresh**}

Syntax Description		
ack-max-size	Specifies the maximum size of the RSVP component within a single acknowledgment message.	
<i>bytes</i>	Number of bytes that define the maximum size of an RSVP component. Range is 20 to 65000.	
ack-hold-time	Specifies the maximum amount of time a router holds an acknowledgment before sending it, in an attempt to bundle several acknowledgments into a single acknowledgment message.	
<i>milliseconds</i>	Number of milliseconds that define the acknowledgment hold time. Range is 100 to 5000.	
retransmit-time	Specifies the amount of time the router initially waits for an acknowledgment message before resending the RSVP message.	
<i>milliseconds</i>	Number of milliseconds that define the retransmit time. Range is 100 to 10000.	
summary-refresh	Enables the use of reliable transmission for RSVP summary refresh messages.	

Command Default	
ack-max-size	<i>bytes</i> : 4096
ack-hold-time	<i>milliseconds</i> : 400 (0.4 seconds)
retransmit-time	<i>milliseconds</i> : 900 (0.9 seconds)

Command Modes	
	RSVP interface configuration

Command History	Release	Modification
	Release 6.2.1	This command was introduced.

Usage Guidelines	
	For reliable messaging to work properly, configure the retransmit time on the send router (A) and acknowledgment hold time on the peer router (B). (Vice versa for messages in reverse direction.)
	The retransmit time must be greater than the acknowledgment hold time, so that the acknowledgment message has time to get back to the sender before the message retransmits. We recommend that the retransmit-time interval be at least twice the acknowledgment hold-time interval. If the retransmit-time value is smaller than the acknowledgment hold-time value, then router A retransmits the message even though router B may have received the message and is waiting for an acknowledgment hold time to time out to send the acknowledgment. This causes unnecessary network traffic.

Reducing the value of **ack-max-size** causes more acknowledgment messages to be issued, with fewer acknowledgments contained within each acknowledgment message. However, reducing the acknowledgment-max-size does not speed up the rate at which acknowledgment messages are issued because their frequency is still controlled by the time values (acknowledgment hold time and retransmit time).

To use reliable messaging for summary refresh messages, use the **rsvp interface** *interface-name* and **signalling refresh reduction summary** commands.

Task ID	Task ID	Operations
	mpls-te	read, write

Examples

The following example shows how to set the maximum acknowledgment message size to 4096 bytes on a HundredGigE interface.

```
RP/0/RP0/CPU0:router(config)# rsvp interface HundredGigE 0/0/0/3
RP/0/RP0/CPU0:router(config-rsvp-if)# signalling refresh reduction reliable ack-max-size
4096
```

The following example shows how to return the maximum acknowledgment message size to the default of 1000 bytes on a HundredGigE interface.

```
RP/0/RP0/CPU0:router(config)# rsvp interface HundredGigE 0/0/0/3
RP/0/RP0/CPU0:router(config-rsvp-if)# no rsvp signalling refresh reduction reliable
```

The following example shows how to set the acknowledgment hold time to 1 second.

```
RP/0/RP0/CPU0:router(config)# rsvp interface HundredGigE 0/0/0/3
RP/0/RP0/CPU0:router(config-rsvp-if)# signalling refresh reduction reliable ack-hold-time
1000
```

The following example shows how to return the acknowledgment hold time to the default of 0.4 second.

```
RP/0/RP0/CPU0:router(config)# rsvp interface HundredGigE 0/0/0/3
RP/0/RP0/CPU0:router(config-rsvp-if)# no signalling refresh reduction reliable ack-hold-time
```

The following example shows how to set the retransmit timer to 2 seconds.

```
RP/0/RP0/CPU0:router(config)# rsvp interface HundredGigE 0/0/0/3
RP/0/RP0/CPU0:router(config-rsvp-if)# signalling refresh reduction reliable retransmit-time
2000
```

The following example shows how to return the retransmit timer to the default of 0.9 seconds.

```
RP/0/RP0/CPU0:router(config)# rsvp interface HundredGigE 0/0/0/3
```

```
RP/0/RP0/CPU0:router(config-rsvp-if)# no signalling refresh reduction reliable
```

The following example shows how to enable the use of reliable transmission for RSVP summary refresh messages.

```
RP/0/RP0/CPU0:router(config-rsvp-if)# signalling refresh reduction reliable summary-refresh
```

signalling refresh reduction disable

To disable RSVP refresh reduction on an interface, use the **signalling refresh reduction disable** command in RSVP interface configuration mode. To return to the default behavior, use the **no** form of this command.

signalling refresh reduction disable
no signalling refresh reduction disable

Syntax Description This command has no arguments or keywords.

Command Default No default behavior or values

Command Modes RSVP interface configuration

Command History	Release	Modification
	Release 6.2.1	This command was introduced.

Usage Guidelines The following features of the IETF refresh reduction standard RFC 2961 are enabled with this command:

- Setting the refresh-reduction-capable bit in message headers
- Message-ID usage
- Reliable messaging with rapid retransmit, acknowledgment (ACK), and NACK messages
- Summary refresh extension

Because refresh reduction relies on cooperation of the neighbor, the neighbor must also support the standard. If the router detects that a neighbor is not supporting the refresh reduction standard (either through observing the refresh-reduction-enabled bit in messages received from the next hop, or by sending a Message-ID object to the next hop and receiving an error), refresh reduction is not used on this link. That information is obtained through use of the **show rsvp interface detail** command.

Task ID	Task ID	Operations
	mpls-te	read, write

Examples

The following example shows how to disable RSVP refresh reduction on an interface:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# rsvp interface tunnel-te 2
RP/0/RP0/CPU0:router(config-rsvp-if)# signalling refresh reduction disable
```

The following example shows how to enable RSVP refresh reduction on the interface:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# rsvp interface tunnel-te 2
RP/0/RP0/CPU0:router(config-rsvp-if)# no signalling refresh reduction disable
```


signalling refresh reduction bundle-max-size

To configure the maximum size of a single RSVP bundle message, use the **signalling refresh reduction bundle-max-size** command in RSVP interface configuration mode.

signalling refresh reduction bundle-max-size *size*

Syntax Description	<i>size</i> Maximum size, in bytes, of a single RSVP bundle message. Range is 512 to 65000.
---------------------------	---

Command Default	<i>size</i> : 4096
------------------------	--------------------

Command Modes	RSVP interface configuration
----------------------	------------------------------

Command History	Release	Modification
	Release 6.2.1	This command was introduced.

Usage Guidelines	No specific guidelines impact the use of this command.
-------------------------	--

Task ID	Task	Operations
	mpls-te	read, write

Examples

The following example shows how to set the maximum bundle size of a single RSVP bundle message to 4000:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# rsvp interface tunnel-te 2
RP/0/RP0/CPU0:router(config-rsvp-if)# signalling refresh reduction bundle-max-size 4000
```

■ signalling refresh reduction bundle-max-size



MPLS Traffic Engineering Commands

This module describes the commands used to configure Multiprotocol Label Switching (MPLS) Traffic Engineering (TE) on .

Your network must support the following Cisco features before you can enable MPLS-TE:

- MPLS
- IP Cisco Express Forwarding (CEF)
- Intermediate System-to-Intermediate System (IS-IS) or Open Shortest Path First (OSPF) routing protocol
- Resource Reservation Protocol (RSVP)

MPLS Label Distribution Protocol (LDP), Resource Reservation Protocol (RSVP), and Universal Control Plane (UCP) command descriptions are documented separately.

For detailed information about MPLS concepts, configuration tasks, and examples, see *MPLS Configuration Guide for Cisco NCS 5000 Series Routers*.

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adjustment-threshold (MPLS-TE)

To configure the tunnel bandwidth threshold to trigger an adjustment, use the **adjustment-threshold** command in MPLS-TE automatic bandwidth interface configuration mode. To disable this feature, use the **no** form of this command.

```
adjustment-threshold percentage [min minimum bandwidth ]
no adjustment-threshold percentage [min minimum bandwidth ]
```

Syntax Description		
	<i>percentage</i>	Configures the bandwidth percent threshold to trigger an adjustment if the largest sample percentage is higher or lower than the current tunnel bandwidth. The range is from 1 to 100. The default is 5.
	min <i>minimum bandwidth</i>	(Optional) Configures the bandwidth change value to trigger an adjustment. The tunnel bandwidth is changed only if the largest sample is higher or lower than the current tunnel bandwidth, in kbps. The range is from 10 to 4294967295. The default is 10.

Command Default	
	<i>percentage</i> : 5
	<i>minimum bandwidth</i> : 10
	MPLS-TE automatic bandwidth interface configuration

Command History	Release	Modification
	Release 6.2.1	This command was introduced.

Usage Guidelines If you configure or modify the adjustment threshold while the automatic bandwidth is already running, the next bandwidth application is impacted for that tunnel. The new adjustment threshold determines if an actual bandwidth takes place.

Examples The following example configures the tunnel bandwidth threshold to trigger an adjustment:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# interface tunnel-te 1
RP/0/RP0/CPU0:router(config-if)# auto-bw
RP/0/RP0/CPU0:router(config-if-tunte-autobw)# adjustment-threshold 20 min 500
```

admin-weight

To override the Interior Gateway Protocol (IGP) administrative weight (cost) of the link, use the **admin-weight** command in MPLS-TE interface configuration mode. To return to the default behavior, use the **no** form of this command.

admin-weight *weight*
no admin-weight *weight*

Syntax Description

weight Administrative weight (cost) of the link. Range is 0 to 4294967295.

Command Default

weight: IGP Weight (default OSPF 1, IS-IS 10)

Command Modes

MPLS-TE interface configuration

Command History

Release	Modification
Release 6.2.1	This command was introduced.

Usage Guidelines

To use the **admin-weight** command for MPLS LSP path computations, path-selection metric must be configured to TE.

Task ID

Task ID	Operations
mpls-te	read, write

Examples

The following example shows how to override the IGP cost of the link and sets the cost to 20.

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# mpls traffic-eng
RP/0/RP0/CPU0:router(config-mpls-te)# interface HundredGigE 0/0/0/3
RP/0/RP0/CPU0:router(config-mpls-te-if)# admin-weight 20
```


affinity

To configure an affinity (attributes which MPLS-TE tunnel requires in its links) for an MPLS-TE tunnel, use the **affinity** command in interface configuration mode. To disable this behavior, use the **no** form of this command.

```
affinity {affinity-value mask mask-value | exclude name | exclude-all | include name | include-strict
name | flex-algo name}
no affinity {affinity-value mask mask-value | exclude name | exclude-all | include name |
include-strict name}
```

Syntax Description

<i>affinity-value</i>	Attribute values that are required for links to carry this tunnel. A 32-bit decimal number. Range is from 0x0 to 0xFFFFFFFF, representing 32 attributes (bits), where the value of an attribute is 0 or 1.
mask <i>mask-value</i>	Checks the link attribute. A 32-bit decimal number. Range is 0x0 to 0xFFFFFFFF, representing 32 attributes (bits), where the value of an attribute mask is 0 or 1.
exclude <i>name</i>	Configures a particular affinity to exclude.
exclude-all	Excludes all affinities.
include <i>name</i>	Configures the affinity to include in the loose sense.
include-strict <i>name</i>	Configures the affinity to include in the strict sense.

Command Default

affinity-value: 0X00000000
mask-value: 0x0000FFFF

Command Modes

Interface configuration

Command History

Release	Modification
Release 6.2.1	This command was introduced.

Usage Guidelines

Affinity determines the link attributes of the tunnel (that is, the attributes for which the tunnel has an affinity). The attribute mask determines which link attribute the router should check. If a bit in the mask is 0, the attribute value of a link or that bit is irrelevant. If a bit in the mask is 1, the attribute value of that link and the required affinity of the tunnel for that bit must match.

A tunnel can use a link if the tunnel affinity equals the link attributes and the tunnel affinity mask.

If there is an affinity failure, a 5-minute timer is started at the LSP headend. If the tunnel is not able to reoptimize within the timeframe, it is torn down. However, if you execute the **mpls traffic-eng reoptimize disable affinity-failure** command, no timer is started and the tunnel is not torn down. At a subsequent time, other triggers for reoptimization may start the timer for the LSPs with affinity failure.

Any properties set to 1 in the affinity should be 1 in the mask. The affinity and mask should be set as follows:

```
tunnel_affinity=tunnel_affinity and tunnel_affinity_mask
```

You can configure up to 16 affinity constraints under a given tunnel. These constraints are used to configure affinity constraints for the tunnel:

Include constraint

Specifies that a link is considered for CSPF if it contains all affinities associated with the include constraint. An acceptable link contains more affinity attributes than those associated with the include statement. You can have multiple include statements under a tunnel configuration.

Include-strict constraint

Specifies that a link is considered for CSPF if it contains only the colors associated with the include-strict statement. The link cannot have any additional colors. In addition, a link without a color is rejected.

Exclude constraint

Specifies that a link satisfies an exclude constraint if it does not have all the colors associated with the constraint. In addition, a link that does not have any attribute satisfies an exclude constraint.

Exclude-all constraint

Specifies that only the links without any attribute are considered for CSPF. An exclude-all constraint is not associated with any color; whereas, all other constraint types are associated with up to 10 colors.

You set 1 bit for each color; however, the sample output shows multiple bits at the same time. For example, you can configure red and orange colors on HundredGigabitEthernet 0/0/0/3 from the **interface** command. The sample output from the [show mpls traffic-eng link-management interfaces, on page 385](#) command shows that the Attributes field is set to 0x21, which means that there are 0x20 and 0x1 bits on the link.

Task ID

Task ID	Operations
mpls-te	read, write

Examples

This example shows how to configure the tunnel affinity and mask:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# interface tunnel-te 1
RP/0/RP0/CPU0:router(config-if)# affinity 0101 mask 303
```

This example shows that a link is eligible for CSPF if the color is red. The link can have any additional colors.

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# interface tunnel-te 1
RP/0/RP0/CPU0:router(config-if)# affinity include red
```

This example shows that a link is eligible for CSPF if it has at least red and orange colors. The link can have any additional colors.

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# interface tunnel-te 1
RP/0/RP0/CPU0:router(config-if)# affinity include red orange
```

This sample output shows that the include constraint from the **show mpls traffic-eng tunnels** command is 0x20 and 0x1:

```
Name: tunnel-te1 Destination: 0.0.0.0
Status:
  Admin:    up Oper: down Path: not valid Signalling: Down
  G-PID: 0x0800 (internally specified)

Config Parameters:
  Bandwidth:    0 kbps (CT0) Priority: 7 7
  Number of configured name based affinity constraints: 1
  Name based affinity constraints in use:
  Include bit map      : 0x21
  Metric Type: TE (default)
  AutoRoute: disabled LockDown: disabled
  Loadshare:         0 equal loadshares
  Auto-bw: disabled(0/0) 0 Bandwidth Requested:      0
  Direction: unidirectional
  Endpoint switching capability: unknown, encoding type: unassigned
  Transit switching capability: unknown, encoding type: unassigned

Reason for the tunnel being down: No destination is configured
History:
```

This example shows that a tunnel can go over a link that contains red or orange affinity. A link is eligible for CSPF if it has a red color or an orange color. Thus, a link with red and any other colors and a link with orange and other additional colors must meet the constraint.

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# interface tunnel-te 1
RP/0/RP0/CPU0:router(config-if)# affinity include red
RP/0/RP0/CPU0:router(config-if)# affinity include orange
```

This sample output shows that the include constraint from the **show mpls traffic-eng tunnels** command is 0x20 or 0x1:

```
Name: tunnel-te1 Destination: 0.0.0.0
Status:
  Admin:    up Oper: down Path: not valid Signalling: Down
  G-PID: 0x0800 (internally specified)

Config Parameters:
  Bandwidth:    0 kbps (CT0) Priority: 7 7
  Number of configured name based affinity constraints: 2
  Name based affinity constraints in use:
    Include bit map      : 0x1
    Include bit map      : 0x20
  Metric Type: TE (default)
  AutoRoute: disabled LockDown: disabled
  Loadshare:         0 equal loadshares
  Auto-bw: disabled(0/0) 0 Bandwidth Requested:      0
  Direction: unidirectional
```

```
Endpoint switching capability: unknown, encoding type: unassigned
Transit switching capability: unknown, encoding type: unassigned
```

```
Reason for the tunnel being down: No destination is configured
History:
```

This example shows that a link is eligible for CSPF if it has only red color. The link must not have any additional colors.

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router (config)# interface tunnel-te 1
RP/0/RP0/CPU0:router (config-if)# affinity include-strict red
```

This example shows that a link is eligible for CSPF if it does not have the red attribute.

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router (config)# interface tunnel-te 1
RP/0/RP0/CPU0:router (config-if)# affinity exclude red
```

This example shows that a link is eligible for CSPF if it does not have red and blue attributes. Thus, a link that has only a red attribute or only a blue attribute is eligible for CSPF.

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router (config)# interface tunnel-te 1
RP/0/RP0/CPU0:router (config-if)# affinity exclude red blue
```

This example shows that a link is eligible for CSPF if it does not have either a red or a blue attribute.

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router (config)# interface tunnel-te 1
RP/0/RP0/CPU0:router (config-if)# affinity exclude red
RP/0/RP0/CPU0:router (config-if)# affinity exclude blue
```

affinity-map

To assign a numerical value to each affinity name, use the **affinity-map** command in MPLS-TE configuration mode. To return to the default behavior, use the **no** form of this command.

```
affinity-map affinity name {affinity value | bit-position value}
no affinity-map affinity name {affinity value | bit-position value}
```

Syntax Description	
<i>affinity name</i>	Affinity map name-to-value designator (in hexadecimal, <i>0-ffffff</i>).
<i>affinity value</i>	Affinity map value designator. Range is from 1 to 80000000.
bit-position	Configures the value of an affinity map for the bit position of the 32-bit number.
<i>value</i>	Bit position value. Range is from 0 to 31. Range is from 0 to 255.

Command Default No default behavior or values

Command Modes MPLS-TE configuration

Command History	Release	Modification
	Release 6.2.1	This command was introduced.

Usage Guidelines The name-to-value mapping must represent a single bit of a 32-bit value. Repeat the affinity-map command to define multiple colors up to a maximum of 256 colors.

Task ID	Task	Operations
	mpls-te	read, write

Examples The following example shows how to assign a numerical value to each affinity name:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# mpls traffic-eng
RP/0/RP0/CPU0:router(config-mpls-te)# affinity-map red 1
RP/0/RP0/CPU0:router(config-mpls-te)# affinity-map blue 2
```

The following example shows how to configure the value of 15 for an affinity map by bit position:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# mpls traffic-eng
```

```
RP/0/RP0/CPU0:router(config-mpls-te)# affinity-map red2 bit-position 15
```

application (MPLS-TE)

To configure the application frequency, in minutes, for the applicable tunnel, use the **application** command in MPLS-TE automatic bandwidth interface configuration mode. To disable this feature, use the **no** form of this command.

application *minutes*
no application *minutes*

Syntax Description	<i>minutes</i> Frequency, in minutes, for the automatic bandwidth application. The range is from 5 to 10080 (7 days). The default is 1440.				
Command Default	<i>minutes</i> : 1440 (24 hours)				
Command Modes	MPLS-TE automatic bandwidth interface configuration				
Command History	<table border="1"> <thead> <tr> <th>Release</th> <th>Modification</th> </tr> </thead> <tbody> <tr> <td>Release 6.2.1</td> <td>This command was introduced.</td> </tr> </tbody> </table>	Release	Modification	Release 6.2.1	This command was introduced.
Release	Modification				
Release 6.2.1	This command was introduced.				
Usage Guidelines	If you configure and modify the application frequency, the application period can reset and restart for that tunnel. The next bandwidth application for the tunnel happens within the specified minutes.				
Task ID	<table border="1"> <thead> <tr> <th>Task ID</th> <th>Operations</th> </tr> </thead> <tbody> <tr> <td>mpls-te</td> <td>read, write</td> </tr> </tbody> </table>	Task ID	Operations	mpls-te	read, write
Task ID	Operations				
mpls-te	read, write				
Examples	<p>The following example shows how to configure application frequency to 1000 minutes for MPLS-TE interface 1:</p> <pre>RP/0/RP0/CPU0:router# configure RP/0/RP0/CPU0:router(config)# interface tunnel-te 1 RP/0/RP0/CPU0:router(config-if)# auto-bw RP/0/RP0/CPU0:router(config-if-tunte-autobw)# application 1000</pre>				

attribute-flags

To configure attribute flags for an interface, use the **attribute-flags** command in MPLS-TE interface configuration mode. To return to the default behavior, use the **no** form of this command.

attribute-flags *attribute-flags*
no attribute-flags *attribute-flags*

Syntax Description	<i>attribute -flags</i> Links attributes that are compared to the affinity bits of a tunnel during selection of a path. Range is 0x0 to 0xFFFFFFFF, representing 32 attributes (bits) where the value of an attribute is 0 or 1.
---------------------------	--

Command Default	<i>attributes</i> : 0x0
------------------------	-------------------------

Command Modes	MPLS-TE interface configuration
----------------------	---------------------------------

Command History	Release	Modification
	Release 6.2.1	This command was introduced.

Usage Guidelines	The attribute-flags command assigns attributes to a link so that tunnels with matching attributes (represented by their affinity bits) prefer this link instead of others that do not match.
-------------------------	---

The interface attribute is flooded globally so that it can be used as a tunnel headend path selection criterion.

Task ID	Task ID	Operations
	mpls-te read, write	

Examples

The following example shows how to set attribute flags to 0x0101:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# mpls traffic-eng
RP/0/RP0/CPU0:router(config-mpls-te)# interface HundredGigE 0/0/0/3
RP/0/RP0/CPU0:router(config-mpls-te-if)# attribute-flags 0x0101
```


attribute-names

To configure attributes for the interface, use the **attribute-names** command in MPLS-TE interface configuration mode. To return to the default behavior, use the **no** form of this command.

attribute-names *attribute name*
no attribute-names *attribute name*

Syntax Description	<i>attribute name</i> Attribute name expressed using alphanumeric or hexadecimal characters. Up to 32 attribute-names can be assigned.
index	Specifies an entry index for attribute names.
<i>index-number</i>	Specifies the index number. Range is from 1 to 8.

Command Default No default behavior or values

Command Modes MPLS-TE interface configuration

Command History	Release	Modification
	Release 6.2.1	This command was introduced.

Usage Guidelines The name-to-value mapping must represent a single bit of a 32-bit/256-bit value.

Task ID	Task ID	Operations
	mpls-te	read, write

Examples

The following example shows how to assign an attribute name (in this case, red) to a TE link:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# mpls traffic-eng
RP/0/RP0/CPU0:router(config-mpls-te)# interface HundredGigabitEthernet 0/0/0/3

RP/0/RP0/CPU0:router(config-mpls-te-if)# attribute-name red
```

attribute-set

To configure attribute-set for auto-backup tunnels, use the **attribute-set** command in MPLS-TE configuration mode.

```
attribute-set auto-backup attribute-set-name { affinity { affinity-value mask mask-value | exclude name | exclude-all | include name | include-strict name } | logging events lsp-status { reoptimize | state } | policy-class { range | default } | priority setup-range hold-range | record-route | signalled-bandwidth value | soft-preemption }
```

To configure attribute-set for auto-mesh tunnels, use the **attribute-set** command in MPLS-TE configuration mode.

```
attribute-set auto-mesh attribute-set-name { affinity { affinity-value mask mask-value | exclude name | exclude-all | include name | include-strict name } | auto-bw collect-bw-only | autoroute announce | bandwidth bandwidth | fast-reroute [protect { bandwidth node | node bandwidth } ] | logging events lsp-status { insufficient-bandwidth | reoptimize | reroute | state } | policy-class { range | default } | priority setup-range hold-range | record-route | signalled-bandwidth bandwidth [class-type cl] | soft-preemption }
```

To configure attribute-set for a path-option, use the **attribute-set** command in MPLS-TE configuration mode.

```
attribute-set path-option attribute-set-name { affinity { affinity-value mask mask-value | exclude name | exclude-all | include name | include-strict name } | signalled-bandwidth bandwidth [class-type cl] }
```

To disable this behavior, use the **no** form of this command.

```
no attribute-set
```

Syntax Description

auto-backup	Specifies the values of an attribute set for the auto-backup group.
auto-mesh	Specifies the values of an attribute set for the auto-mesh group.
path-option	Specifies the values of an attribute set for the path option.
xro	Specifies that the attribute-set is used to define an XRO.
<i>attribute-set-name</i>	A 32-bit character string, specifies the name of the attribute-set template.
<i>affinity-value</i>	Attribute values that are required for links to carry this tunnel. A 32-bit decimal number, representing 32 attributes (bits), where the value of an attribute is 0 or 1. Range is from 0x0 to 0xFFFF.
mask <i>mask-value</i>	Checks the link attribute. A 32-bit decimal number, representing 32 attributes (bits), where the value of an attribute mask is 0 or 1. Range is from 0x0 to 0xFFFF.

exclude <i>name</i>	Configures a specific affinity that is to be excluded.
exclude-all	Excludes all affinities.
include <i>name</i>	Configures the affinity to include in the loose sense.
include-strict <i>name</i>	Configures the affinity to include in the strict sense.
logging	Per-interface logging configuration.
events	Per-interface logging events.
lsp-status	Enables interface LSP state change alarms.
reoptimize	Enables interface LSP REOPT change alarms.
state	Enables interface LSP UP/DOWN change alarms.
policy-class	Specifies class for policy-based tunnel selection.
<i>range</i>	Tunnel policy class range 1 to 7.
default	Default class for policy-based tunnel selection.
priority	Specifies the tunnel priority.
<i>setup-range</i>	Specifies setup priority. Range is 0 to 7.
<i>hold-range</i>	Specifies hold priority. Range is 0 to 7.
record-route	Records the route used by the tunnel.
signalled-bandwidth	Specifies the tunnel bandwidth requirement to be signaled.
<i>bandwidth</i>	Bandwidth required for an MPLS-TE tunnel, specified in kilobits per second. By default, bandwidth is reserved in the global pool. Range is from 0 to 4294967295.
class-type <i>ct</i>	(Optional) Configures the class type of the tunnel bandwidth request. Range is 0 to 1. Class-type 0 is equivalent to global-pool. Class-type 1 is equivalent to subpool.
soft-preemption	Enables the soft-preemption feature on this tunnel.

Command Default*affinity-value*: 0x0*mask-value*: 0xFFFF**Command Modes**

MPLS TE configuration

Command History	Release	Modification
	Release 6.2.1	This command was introduced.
	Release 7.5.1	The signalled-bandwidth and soft-preemption options were added for auto-backup tunnels.

Usage Guidelines

The values specified for an attribute within a **path-option attribute-set** does not prevent the configuration of the same attribute at the tunnel level. However, only one level is taken into consideration. The configuration at the **path-option** level is considered more specific than the one at the level of the tunnel, and is therefore used.

Attributes that are **not** specified within an **attribute-set** picks their default values, as usual, from the configuration at the tunnel level, the configuration at the global mpls level, or default values.

An XRO attribute-set can be specified as part of the path-option, if required. An empty XRO attribute set results in the GMPLS tunnel being signaled with no exclusions, and therefore no XRO.

This example shows how to configure an attribute-set to a TE interface for an auto-backup tunnel:

```
RP/0/RP0/CPU0:router# config
RP/0/RP0/CPU0:router(config)# mpls traffic-eng
RP/0/RP0/CPU0:router(config-mpls-te)# interface HundredGigabitEthernet 0/0/0/3
RP/0/RP0/CPU0:router(config-mpls-te-if)# auto-tunnel backup
RP/0/RP0/CPU0:router(config-mpls-te-if-auto-backup)# attribute-set ab
RP/0/RP0/CPU0:router(config-mpls-te-if-auto-backup)#
```

This example shows how to configure an attribute-set to a TE interface for an auto-mesh tunnel:

```
RP/0/RP0/CPU0:router# config
RP/0/RP0/CPU0:router(config)# mpls traffic-eng
RP/0/RP0/CPU0:router(config-mpls-te)# auto-tunnel mesh
RP/0/RP0/CPU0:router(config-te-auto-mesh)# group 1
RP/0/RP0/CPU0:router(config-te-mesh-group)# attribute-set aml
RP/0/RP0/CPU0:router(config-te-mesh-group)# destination-list dll
```

This example shows how to configure the attribute-set for auto-backup tunnels:

```
RP/0/RP0/CPU0:router# config
RP/0/RP0/CPU0:router(config)# mpls traffic-eng
RP/0/RP0/CPU0:router(config-mpls-te)# attribute-set auto-backup ab
RP/0/RP0/CPU0:router(config-te-attribute-set)# affinity 0x1 mask 0x1
RP/0/RP0/CPU0:router(config-te-attribute-set)# priority 3 3
RP/0/RP0/CPU0:router(config-te-attribute-set)# policy-class 6
RP/0/RP0/CPU0:router(config-te-attribute-set)# logging events lsp-status reoptimize
RP/0/RP0/CPU0:router(config-te-attribute-set)# logging events lsp-status state
RP/0/RP0/CPU0:router(config-te-attribute-set)# policy-class default
RP/0/RP0/CPU0:router(config-te-attribute-set)# record-route
```

This example shows how to configure the attribute-set for auto-mesh tunnels:

```
RP/0/RP0/CPU0:router# config
RP/0/RP0/CPU0:router(config)# mpls traffic-eng
RP/0/RP0/CPU0:router(config-mpls-te)# attribute-set auto-mesh mesh1
RP/0/RP0/CPU0:router(config-te-attribute-set)# affinity include red blue
RP/0/RP0/CPU0:router(config-te-attribute-set)# affinity include-strict yellow green
RP/0/RP0/CPU0:router(config-te-attribute-set)# affinity exclude orange
RP/0/RP0/CPU0:router(config-te-attribute-set)# affinity exclude-all
RP/0/RP0/CPU0:router(config-te-attribute-set)# policy-class default
```

This example shows how to configure the tunnel affinity and signalled-bandwidth for a path-option:

```
RP/0/RP0/CPU0:router# config
RP/0/RP0/CPU0:router(config)# mpls traffic-eng
RP/0/RP0/CPU0:router(config-mpls-te)# attribute-set path-option myset
RP/0/RP0/CPU0:router(config-te-attribute-set)# affinity 0x3 mask 0x3
RP/0/RP0/CPU0:router(config-te-attribute-set)# signalled-bandwidth 2000
```

The following example shows how to configure attribute set attr01:

```
RP/0/RP0/CPU0:router(config)# mpls traffic-eng
RP/0/RP0/CPU0:router(config-mpls-te)# attribute-set xro attr01
RP/0/RP0/CPU0:router(config-te-attribute-set)#
```

This example shows how to enable signaled bandwidth for a backup auto-tunnel:

```
Router # configure
Router(config)# mpls traffic-eng attribute-set auto-backup MyBackupConfig
Router(config-te-attribute-set)# signalled-bandwidth 700000
Router(config-te-attribute-set)# commit
```

This example shows how to enable soft-preemption for backup auto tunnels' reserved bandwidth:

```
Router# configure
Router(config)# mpls traffic-eng attribute-set auto-backup MyBackupConfig
Router(config-te-attribute-set)# soft-preemption
Router(config-te-attribute-set)# commit
```

auto-bw (MPLS-TE)

To configure automatic bandwidth on a tunnel interface and to enter MPLS-TE automatic bandwidth interface configuration mode, use the **auto-bw** command in MPLS-TE interface configuration mode. To disable the automatic bandwidth on that tunnel, use the **no** form of this command.

```
auto-bw
no auto-bw
```

Syntax Description This command has no arguments or keywords.

Command Default By default, automatic bandwidth is not enabled.

Command Modes MPLS-TE interface configuration

Command History	Release	Modification
	Release 6.2.1	This command was introduced.

Usage Guidelines Use the **auto-bw** command to enter MPLS-TE automatic bandwidth interface configuration mode. The **auto-bw** and **load-share unequal** commands should not be used together.

The **load-share unequal** command determines the load-share for a tunnel based on the bandwidth. However, the MPLS-TE automatic bandwidth feature changes the bandwidth around. If you are configuring both the **load-share unequal** command and the MPLS-TE automatic bandwidth feature, it is recommended that you specify an explicit load-share value configuration under each MPLS-TE automatic bandwidth tunnel.

The following automatic bandwidth scenarios are described:

- If you configure the automatic bandwidth on a tunnel, the automatic bandwidth is enabled on that tunnel. If no other configuration is specified, defaults for the various parameters are used, the operation stops.
- The automatic operation (for example, output rate collection) starts when the automatic bandwidth is enabled on one tunnel. If automatic bandwidth is disabled from all tunnels, the operation stops.
- If the output rate collection is already active when the automatic bandwidth is configured on a tunnel, the statistics collection for that tunnel starts at the next collection configuration.



Note Because the collection timer is already running, the first collection event for that tunnel happens in less than C minutes (for example, on an average of C/2 minutes).

Task ID	Task ID	Operations
	mpls-te	read, write

Examples

The following example shows how to enter MPLS-TE automatic bandwidth interface configuration mode:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router# interface tunnel-te 1
RP/0/RP0/CPU0:router(config-if)# auto-bw
RP/0/RP0/CPU0:router(config-if-tunte-autobw)#
```

auto-bw collect frequency (MPLS-TE)

To configure the automatic bandwidth collection frequency, use the **auto-bw collect frequency** command in MPLS-TE configuration mode. To reset the automatic bandwidth frequency to its default value, use the **no** form of this command.

auto-bw collect frequency *minutes*

no auto-bw collect frequency *minutes*

Syntax Description	<i>minutes</i> Interval between automatic bandwidth adjustments, in minutes. The range is from 1 to 10080. The default is 5.
---------------------------	--

Command Default	<i>minutes</i> : 5 In addition, the no form of this command resets to the default.
------------------------	--

Command Modes	MPLS-TE configuration
----------------------	-----------------------

Command History	Release	Modification
	Release 6.2.1	This command was introduced.

Usage Guidelines	<p>The auto-bw collect frequency command configures the automatic bandwidth collection frequency for all the tunnels.</p> <p>Modifying the global collection frequency does not restart the tunnel for the current application period. The application period continues with the modified collection frequency.</p>
-------------------------	--

Task ID	Task ID	Operations
	mpls-te	read, write

Examples	The following example configures a tunnel for an automatic bandwidth adjustment of 100 minutes:
-----------------	---

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# mpls traffic-eng
RP/0/RP0/CPU0:router(config-mpls-te)# auto-bw collect frequency 100
```


autoroute announce

To specify that the Interior Gateway Protocol (IGP) should use the tunnel (if the tunnel is up) in its enhanced shortest path first (SPF) calculation, use the **autoroute announce** command in interface configuration mode. To return to the default behavior, use the **no** form of this command.

```
autoroute announce [include-ipv6] [metric value]
no autoroute announce
```

Syntax Description	include-ipv6 (Optional) Announces the MPLS-TE tunnel to IS-IS IGP for IPv6 routing.
	metric value (Optional) Specify the MPLS-TE tunnel metric that the Interior Gateway Protocol (IGP) enhanced Shortest Path First (SPF) calculation uses.

Syntax Description This command has no arguments or keywords.

Command Default Announces IPv4 tunnel

Command Modes Interface configuration

Command History	Release	Modification
	Release 6.2.1	This command was introduced.

Usage Guidelines When more than one IGP is configured, the tunnel is announced as autoroute to the IGP that is used to compute the TE tunnel path.

When the **autoroute announce** command is configured, the route metric of the tunnel path to the destination equals the route metric of the shortest IGP path to that destination.

The **autoroute announce metric** configuration overrides the [autoroute metric, on page 248](#) configuration, if present.



Note IS-IS is the only IGP supporting IPv6 MPLS-TE tunnel announcements.

Task ID	Task ID	Operations
	mpls-te	read, write

Examples This example shows how to configure IGP to use the tunnel in its enhanced SPF calculation when the tunnel is up:

```
RP/0/RP0/CPU0:router# configure
```

```
RP/0/RP0/CPU0:router(config)# interface tunnel-te 1  
RP/0/RP0/CPU0:router(config-if)# autoroute announce
```

This example shows how to make IPv6 announcements for MPLS-TE tunnel to the IGP:

```
RP/0/RP0/CPU0:router#configure  
RP/0/RP0/CPU0:router(config)#interface tunnel-te 65534  
RP/0/RP0/CPU0:router(config-if)#autoroute announce  
RP/0/RP0/CPU0:router(config-if-tunte-aa)#include-ipv6
```

autoroute destination

To install multiple static routes in the routing information base (RIB) per MPLS TE tunnel, use the **autoroute destination** command in interface TE tunnel configuration mode. To disable autoroute destination, use the **no** form of this command.

```
autoroute destination ip-address
no autoroute destination ip-address
```

Syntax Description	<i>ip-address</i> Specifies the host address of the route to be installed in the RIB. A maximum of six routes can be specified apart from the default route.				
Command Default	Autoroute destination is disabled.				
Command Modes	Interface Tunnel TE				
Command History	<table border="1"> <thead> <tr> <th>Release</th> <th>Modification</th> </tr> </thead> <tbody> <tr> <td>Release 6.2.1</td> <td>This command was introduced.</td> </tr> </tbody> </table>	Release	Modification	Release 6.2.1	This command was introduced.
Release	Modification				
Release 6.2.1	This command was introduced.				
Usage Guidelines	No specific guidelines impact the use of this command.				
Task ID	<table border="1"> <thead> <tr> <th>Task ID</th> <th>Operation</th> </tr> </thead> <tbody> <tr> <td>mpls-te</td> <td>read, write</td> </tr> </tbody> </table>	Task ID	Operation	mpls-te	read, write
Task ID	Operation				
mpls-te	read, write				

This example shows how to configure installing four routes in RIB for TE tunnel *10*:

```
RP/0/RP0/CPU0:router#configure
RP/0/RP0/CPU0:router(config)#interface tunnel-te 10
RP/0/RP0/CPU0:router(config-if)# autoroute destination 192.168.1.2
RP/0/RP0/CPU0:router(config-if)# autoroute destination 192.168.2.2
RP/0/RP0/CPU0:router(config-if)# autoroute destination 192.168.3.2
RP/0/RP0/CPU0:router(config-if)# autoroute destination 192.168.4.2
```

autoroute metric

To specify the MPLS-TE tunnel metric that the Interior Gateway Protocol (IGP) enhanced Shortest Path First (SPF) calculation uses, use the **autoroute metric** command in interface configuration mode. If no specific metric is to be specified, use the **no** form of this command.

```
autoroute metric {absolute | relative} value
no autoroute metric {absolute | relative} value
```

Syntax Description	absolute	Enables the absolute metric mode; you can enter a positive metric value.
	relative	Enables the relative metric mode; you can enter a positive, negative, or zero value.
	value	Metric that the IGP enhanced SPF calculation uses. Relative value range is from -10 to 10. Absolute value range is from 1 to 2147483647.

Command Default The relative value is 0.

Command Modes Interface configuration

Command History	Release	Modification
	Release 6.2.1	This command was introduced.

Usage Guidelines The **autoroute metric** command overwrites the default tunnel route metric of the shortest IGP path to the destination.



Note The [autoroute announce, on page 245](#) configuration overrides the **autoroute metric** configuration, if present.

Task ID	Task ID	Operations
	mpls-te	read, write

Examples

The following example shows how to configure the IGP enhanced SPF calculation using MPLS-TE tunnel metric as relative negative 1:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# interface tunnel-te 1
RP/0/RP0/CPU0:router(config-if)# autoroute metric relative -1
```

auto-tunnel backup (MPLS-TE)

To automatically build next-hop (NHOP) and next-next-hop (NNHOP) backup tunnels, and to enter auto-tunnel backup configuration mode, use the **auto-tunnel backup** command in MPLS-TE configuration mode. To clear the NHOP and NNHOP backup tunnels, use the **no** form of this command.

auto-tunnel backup
no auto-tunnel backup

Syntax Description This command has no arguments or keywords.

Command Default No default behavior or values

Command Modes MPLS-TE configuration

Command History	Release	Modification
	Release 6.2.1	This command was introduced.

Usage Guidelines The range of *tunnel-ID* is required to be mentioned for the auto-tunnel backup tunnels; otherwise, none of the tunnels are created.

The **no** form of this command deletes both NHOP and NNHOP backup tunnels that are configured using either the **auto-tunnel backup** command or the **nhop-only** command.

Task ID	Task ID	Operation
	mpls-te	read, write

Example

The following example automatically builds NHOP and NNHOP backup tunnels:

```
RP/0/RP0/CPU0:router(config)# mpls traffic-eng
RP/0/RP0/CPU0:router(config-mpls-te)# auto-tunnel backup
```

backup-path tunnel-te

To set an MPLS-TE tunnel to protect a physical interface against failure, use the **backup-path tunnel-te** command in MPLS-TE interface configuration mode. To return to the default behavior, use the **no** form of this command.

backup-path tunnel-te *tunnel-number*
no backup-path tunnel-te *tunnel-number*

Syntax Description	<i>tunnel-number</i> Number of the tunnel protecting the interface. Range is 0 to 65535.
---------------------------	--

Command Default	No default behavior or values
------------------------	-------------------------------

Command Modes	MPLS-TE interface configuration
----------------------	---------------------------------

Command History	Release	Modification
	Release 6.2.1	This command was introduced.

Usage Guidelines	When the protected interface is down (shut down or removed), the traffic it was carrying (for the other label switched paths [LSPs], referred to as the protected LSPs) is rerouted, using fast reroute (FRR) onto the backup tunnels.
-------------------------	--

The following guidelines pertain to the FRR process:

- Multiple (backup) tunnels can protect the same interface by entering this command multiple times for different tunnels. The same (backup) tunnel can protect multiple interfaces by entering this command for each interface.
- The backup tunnel used to protect a physical interface must have a valid IP address configured.
- The backup tunnel cannot pass through the same interface that it is protecting.
- TE tunnels that are configured with the FRR option, cannot be used as backup tunnels.
- For the backup tunnel to provide protection to the protected LSP, the backup tunnel must have a terminating-end node in the path of a protected LSP.
- The source IP address of the backup tunnel and the merge point (MP) address (the terminating-end address of the backup tunnel) must be reachable.



Note	You must configure record-route on TE tunnels that are protected by multiple backup tunnels merging at a single node.
-------------	---

Task ID	Task ID	Operations
	mpls-te	read, write

Examples

The following example shows how to protect the interface using tunnels:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# mpls traffic-eng
RP/0/RP0/CPU0:router(config-mpls-te)# interface HundredGigabitEthernet 0/0/0/3
RP/0/RP0/CPU0:router(config-mpls-te-if)# backup-path tunnel-te 100
RP/0/RP0/CPU0:router(config-mpls-te-if)# backup-path tunnel-te 150
```

bidirectional

To configure a bidirectional LSP for a MPLS TE tunnel and define other parameters for the LSP, use the **bidirectional** command in the MPLS-TE interface configuration mode.

bidirectional association {**id** *value* | **source-address** *IP address* | **global-id** *value* | **type** **co-routed** | **fault-oam**}

Syntax Description	Parameter	Description
	bidirectional	Configures a bidirectional LSP.
	association	Specifies association parameters for the bidirectional LSP.
	id <i>value</i>	Value number that identifies the association. Range is 0 to 65535.
	source-address <i>value</i>	Specifies the source IP address of the LSP from which a reverse path is required.
	global-id <i>value</i>	Value number that identifies the global ID. Range is 0 to 4294967295. The default value is 0.
	co-routed	Configures co-routed LSPs with bidirectional CSPF.
	fault-oam	Configures fault OAM for the bidirectional co-routed LSPs.

Command Default Tunnel interfaces are disabled.

Command Modes Interface configuration mode

Command History	Release	Modification
	Release 6.2.1	This command was introduced.

Usage Guidelines No specific guidelines impact the use of this command.

Task ID	Task ID	Operation
	mpls-te	read, write

Example

This example shows you how to configure an associated bidirectional co-routed MPLS-TE tunnel.

```
RP/0/RSP0/CPU0:router# configure
RRP/0/RSP0/CPU0:router(config)# interface tunnel-te 1
RP/0/RSP0/CPU0:router(config-if)# bidirectional
RP/0/RSP0/CPU0:router(config-if-bidir)# association id 1 source-address 11.0.0.1
RP/0/RSP0/CPU0:router(config-if-bidir)#association type co-routed
```


bandwidth-protection maximum-aggregate

To reserve bandwidth for a backup auto-tunnel, use the **bandwidth-protection maximum-aggregate** command in auto-tunnel backup configuration mode. To remove the bandwidth protection setting, use the **no** form of this command.

```
bandwidth-protection maximum-aggregate value  
no bandwidth-protection [ maximum-aggregate [ value ] ]
```

Syntax Description	<i>value</i> Reserves bandwidth for a backup auto-tunnel. By default, bandwidth is not reserved for a backup auto-tunnel.
Command Default	The command is disabled.
Command Modes	Auto-tunnel backup configuration (config-te-if-auto-backup)
Command History	Release Modification This command was introduced.

Examples

This example shows how to reserve bandwidth for a backup auto-tunnel:

```
Router# configure  
Router(config)# mpls traffic-eng  
Router(config-mpls-te)# interface GigabitEthernet 0/2/0/0 auto-tunnel backup  
Router(config-te-if-auto-backup)# bandwidth-protection maximum-aggregate 100000  
Router(config-te-if-auto-backup)# commit
```

bw-limit (MPLS-TE)

To configure the minimum and maximum automatic bandwidth to be set on a tunnel, use the **bw-limit** command in MPLS-TE automatic bandwidth interface configuration mode. To disable this feature, use the **no** form of this command.

```
bw-limit min bandwidth [max bandwidth]  
no bw-limit
```

Syntax Description	min <i>bandwidth</i>	max <i>bandwidth</i>
	Configures the minimum automatic bandwidth, in kbps, on a tunnel. The range is from 0 to 4294967295. The default is 0.	Configures the maximum automatic bandwidth, in kbps, on a tunnel. The range is from 0 to 4294967295. The default is 4294967295.

Command Default
min: 0 max: 4294967295

Command Modes
MPLS-TE automatic bandwidth interface configuration

Command History	Release	Modification
	Release 6.2.1	This command was introduced.

Usage Guidelines
Both the min and max keywords must be configured.
The bw-limit command automatically sets the minimum bandwidth to the default value of 0, or the bw-limit command automatically sets the maximum to the default value of 4294967295 kbps.
If the value of the min keyword is greater than the max keyword, the bw-limit command is rejected. If you configure and modify the minimum or maximum bandwidth while the automatic bandwidth is already running, the next bandwidth application for that tunnel is impacted. For example, if the current tunnel requested bandwidth is 30 Mbps and the minimum bandwidth is modified to 50 Mbps, the next application sets the tunnel bandwidth to 50 Mbps.

Task ID	Task ID	Operations
	mpls-te	read, write

Examples
The following example shows how to configure the minimum and maximum bandwidth for the tunnel:

```
RP/0/RP0/CPU0:router# configure  
RP/0/RP0/CPU0:router (config)# interface tunnel-te 1  
RP/0/RP0/CPU0:router (config-if)# auto-bw
```

```
RP/0/RP0/CPU0:router(config-if-tunte-autobw)# bw-limit min 30 max 80
```

clear mpls traffic-eng auto-bw (MPLS-TE EXEC)

To clear automatic bandwidth sampled output rates and to restart the application period for the specified tunnel, use the **clear mpls traffic-eng auto-bw** command in XR EXEC mode.

clear mpls traffic-eng auto-bw{all | internal | tunnel-te *tunnel-number*}

Syntax Description	all	Clears the automatic bandwidth sampled output rates for all tunnels.
	internal	Clears all the automatic bandwidth internal data structures.
	tunnel-te <i>tunnel-number</i>	Clears the automatic bandwidth sampled output rates for a specific tunnel. The <i>tunnel-number</i> argument is the tunnel ID used to clear the sampled output rates.

Command Default No default behavior or values

Command Modes XR EXEC mode

Command History	Release	Modification
	Release 6.2.1	This command was introduced.

Usage Guidelines If no tunnel is specified, the **clear mpls traffic-eng auto-bw** command clears all the automatic bandwidth enabled tunnels.

For each tunnel in which the automatic bandwidth adjustment is enabled, information is maintained about the sampled output rates and the time remaining until the next bandwidth adjustment. The application period is restarted and values such as the largest collected bandwidth get reset. The tunnel continues to use the current bandwidth until the next application.

Task ID	Task ID	Operations
	mpls-te	execute

Examples

The following example displays the information for the automatic bandwidth for tunnel number 0 from the **show mpls traffic-eng tunnels auto-bw brief** command:

```
RP/0/RP0/CPU0:router# show mpls traffic-eng tunnels 0 auto-bw brief
```

Tunnel	LSP Name	Last appl ID	Requested BW (kbps)	Signalled BW (kbps)	Highest BW (kbps)	Application BW (kbps)	Application Time Left
tunnel-te0		278	100	100	100	150	12m 38s

The following example shows how to clear the automatic bandwidth sampled output rates for tunnel number 0:

```
RP/0/RP0/CPU0:router# clear mpls traffic-eng auto-bw tunnel-te 0
```

```
RP/0/RP0/CPU0:router# show mpls traffic-eng tunnels 0 auto-bw brief
```

Tunnel	LSP Name	Last appl ID	Requested BW(kbps)	Signalled BW(kbps)	Highest BW(kbps)	Application BW(kbps)	Time Left
tunnel-te0		278	100	100	100	0	24m 0s

clear mpls traffic-eng auto-tunnel backup unused

To remove unused automatic backup tunnels, use the **clear mpls traffic-eng auto-tunnel backup unused** command in XR EXEC mode.

clear mpls traffic-eng auto-tunnel backup unused {all | tunnel-te *tunnel-number*}

Syntax Description		
	all	Clears all the unused automatic backup tunnels.
	tunnel-te <i>tunnel-number</i>	Clears a specific unused automatic backup tunnel.

Command Default No default behavior or values

Command Modes XR EXEC mode

Command History	Release	Modification
	Release 6.2.1	This command was introduced.

Usage Guidelines The **unused** auto-tunnel backup tunnel is the tunnel that is not assigned to protect any FRR tunnel. The behavior of this command is the same as the expiration of the **timers removal unused** command in which, when the timeout value is reached, the automatic backup tunnel is removed.

Task ID	Task ID	Operation
	mpls-te	execute

Example

The following example displays the information for the unused backup automatic tunnels from the **show mpls traffic-eng tunnels unused** command:

```
RP/0/RP0/CPU0:router# show mpls traffic-eng tunnels unused
```

The following example shows how to clear the unused backup automatic tunnels:

```
RP/0/RP0/CPU0:router# clear mpls traffic-eng auto-tunnel backup unused all
RP/0/RP0/CPU0:router# show mpls traffic-eng tunnels unused
```

clear mpls traffic-eng auto-tunnel mesh

To clear all unused auto-tunnel mesh destinations, use the **clear mpls traffic-eng auto-tunnel mesh** command in XR EXEC mode.

```
clear mpls traffic-eng auto-tunnel mesh unused {all | tunnel-te}
```

Syntax Description	all	Clears all applicable unused auto-tunnel destinations.
	tunnel-te <i>id</i>	Clears an unused auto-tunnel destinations identified by a tunnel identifier.

Command Default None

Command Modes XR EXEC mode

Command History	Release	Modification
	Release 6.2.1	This command was introduced.

Usage Guidelines No specific guidelines impact the use of this command.

Task ID	Task ID	Operations
	mpls-te	execute

Examples This is sample output from the **clear mpls traffic-eng auto-tunnel mesh** command:

```
clear mpls traffic-eng auto-tunnel mesh
```

clear mpls traffic-eng counters auto-tunnel mesh

To clear all auto-tunnel mesh counters, use the **clear mpls traffic-eng counters auto-tunnel mesh** command in XR EXEC mode.

clear mpls traffic-eng counters auto-tunnel mesh

This command has no arguments or keywords.

Command Default None

Command Modes XR EXEC mode

Command History	Release	Modification
	Release 6.2.1	This command was introduced.

Usage Guidelines No specific guidelines impact the use of this command.

Task ID	Task ID	Operations
	mpls-te	execute

Examples This is sample output from the **clear mpls traffic-eng counters auto-tunnel mesh** command:

```
RP/0/RP0/CPU0:routerclear mpls traffic-eng counters auto-tunnel mesh
```


clear mpls traffic-eng counters auto-tunnel backup

To clear MPLS-TE automatic tunnel backup counters, use the **clear mpls traffic-eng counters auto-tunnel backup** command in XR EXEC mode.

clear mpls traffic-eng counters auto-tunnel backup

Syntax Description This command has no arguments or keywords.

Command Default No default behavior or values

Command Modes XR EXEC mode

Command History	Release	Modification
	Release 6.2.1	This command was introduced.

Usage Guidelines No specific guidelines impact the use of this command.

Task ID	Task	Operation
	mpls-te	execute

Example

The following example removes all counters for the automatic backup tunnels:

```
RP/0/RP0/CPU0:router# clear mpls traffic-eng counters auto-tunnel backup
```

clear mpls traffic-eng counters global

To clear the internal MPLS-TE tunnel counters, use the **clear mpls traffic-eng counters global** command in XR EXEC mode.

clear mpls traffic-eng counters global

Syntax Description This command has no arguments or keywords.

Command Default No default behavior or values

Command Modes XR EXEC mode

Command History	Release	Modification
	Release 6.2.1	This command was introduced.

Usage Guidelines No specific guidelines impact the use of this command.

Task ID	Task ID	Operations
	mpls-te	execute

Examples The following example shows how to clear the internal MPLS-TE tunnel counters:

```
RP/0/RP0/CPU0:router# clear mpls traffic-eng counters global
```

clear mpls traffic-eng counters signaling

To clear (set to zero) the MPLS tunnel signaling counters, use the **clear mpls traffic-eng counters signaling** command in XR EXEC mode.

```
clear mpls traffic-eng counters signaling {all | [{heads | mids | tails}] | name name | summary}
```

Syntax Description	all	Clears counters for all MPLS-TE tunnels.
	heads	(Optional) Displays tunnels with their heads at this router.
	mids	(Optional) Displays tunnels with their midpoints at this router.
	tails	(Optional) Displays tunnels with their tails at this router.
	name <i>name</i>	Clears counters for an MPLS-TE tunnel with the specified name.
	summary	Clears the counter's summary.

Command Default No default behavior or values

Command Modes XR EXEC mode

Command History	Release	Modification
	Release 6.2.1	This command was introduced.

Usage Guidelines Use the **clear mpls traffic-eng counters signaling** command to set all MPLS counters to zero so that changes can be seen easily.

Task ID	Task ID	Operations
	mpls-te	read, write

Examples

The following example shows how to clear all counters:

```
RP/0/RP0/CPU0:router# clear mpls traffic-eng counters signaling all
```

clear mpls traffic-eng counters soft-preemption

To clear (set to zero) the counters for soft-preemption statistics, use the **clear mpls traffic-eng counters soft-preemption** command in XR EXEC mode.

clear mpls traffic-eng counters {all | soft-preemption}

Syntax Description	
all	Clears counters for all MPLS-TE tunnels.
soft-preemption	Clears the statistics for soft preemption counters.

Command Default None

Command Modes XR EXEC mode

Command History	Release	Modification
	Release 6.2.1	This command was introduced.

Usage Guidelines When all counters are cleared using the **clear mpls traffic-eng counters all** command, the counters for soft-preemption statistics are automatically cleared.

Task ID	Task ID	Operations
	mpls-te	execute

Examples This example shows how to clear all counters:

```
RP/0/RP0/CPU0:router# clear mpls traffic-eng counters signaling all
```

clear mpls traffic-eng fast-reroute log

To clear the log of MPLS fast reroute (FRR) events, use the **clear mpls traffic-eng fast-reroute log** command in XR EXEC mode.

clear mpls traffic-eng fast-reroute log

Syntax Description This command has no arguments or keywords.

Command Default No default behavior or values

Command Modes XR EXEC mode

Command History

Release	Modification
Release 6.2.1	This command was introduced.

Usage Guidelines No specific guidelines impact the use of this command.

Task ID

Task ID	Operations
mpls-te	read, write

Examples

The following example shows sample output before clearing the log of FRR events:

```
RP/0/RP0/CPU0:router# show mpls traffic-eng fast-reroute log
```

Node	Protected LSPs Interface	LSPs	Rewrites	When	Switching Time (usec)
0/0/CPU0	PO0/1/0/1	1	1	Feb 27 19:12:29.064000	147
0/1/CPU0	PO0/1/0/1	1	1	Feb 27 19:12:29.060093	165
0/2/CPU0	PO0/1/0/1	1	1	Feb 27 19:12:29.063814	129
0/3/CPU0	PO0/1/0/1	1	1	Feb 27 19:12:29.062861	128

```
RP/0/RP0/CPU0:router# clear mpls traffic-eng fast-reroute log
```

clear mpls traffic-eng link-management statistics

To clear all the MPLS-TE admission control statistics, use the **clear mpls traffic-eng link-management statistics** command in XR EXEC mode.

clear mpls traffic-eng link-management statistics

Syntax Description This command has no arguments or keywords.

Command Default No default behavior or values

Command Modes XR EXEC mode

Command History	Release	Modification
	Release 6.2.1	This command was introduced.

Usage Guidelines No specific guidelines impact the use of this command.

Task ID	Task ID	Operations
	mpls-te	read, write

Examples The following example shows how to clear all the MPLS-TE statistics for admission control:

```
RP/0/RP0/CPU0:router# clear mpls traffic-eng link-management statistics
```

collect-bw-only (MPLS-TE)

To configure only the bandwidth collection without adjusting the bandwidth automatically, use the **collect-bw-only** command in MPLS-TE automatic bandwidth interface configuration mode. To disable this feature, use the **no** form of this command.

collect-bw-only
no collect-bw-only

Syntax Description	This command has no arguments or keywords.	
Command Default	Bandwidth collection is either enabled or disabled.	
Command Modes	MPLS-TE automatic bandwidth interface configuration	
Command History	Release	Modification
	Release 6.2.1	This command was introduced.

Usage Guidelines

If you enable the **collect-bw-only** command while the automatic bandwidth is already running on a tunnel, the bandwidth application is disabled from that moment. Before you enable the actual bandwidth application, you can get the status of the automatic bandwidth behavior.

If you disable the **collect-bw-only** command on a tunnel from which the automatic bandwidth is already running, the actual bandwidth application takes place on the tunnel at the next application period.

It is also possible to manually activate a bandwidth application regardless of the collect bandwidth only flag that is being specified on a tunnel. To activate the bandwidth application, use the [mpls traffic-eng auto-bw apply \(MPLS-TE\), on page 298](#) command in XR EXEC mode.

Task ID	Task ID	Operations
	mpls-te	read, write

Examples

The following example shows how to enable only the bandwidth collection without adjusting the automatic bandwidth:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# interface tunnel-te 1
RP/0/RP0/CPU0:router(config-if)# auto-bw
RP/0/RP0/CPU0:router(config-if-tunte-autobw)# collect-bw-only
```

destination (MPLS-TE)

To configure the destination address of a TE tunnel, use the **destination** command in interface configuration mode. To return to the default behavior, use the **no** form of this command.

destination *ip-address*
no destination *ip-address*

Syntax Description	<i>ip-address</i> Destination address of the MPLS-TE router ID.
---------------------------	---

Command Default	No default behavior or values
------------------------	-------------------------------

Command Modes	Interface configuration
----------------------	-------------------------

Command History	Release	Modification
	Release 6.2.1	This command was introduced.

Usage Guidelines



Note The tunnel destination address must be a unique MPLS-TE router ID; it cannot be an MPLS-TE link address on a node.

For Point-to-Point (P2P) tunnels, the **destination** command is used as a single-line command.

Task ID	Task ID	Operations
	mpls-te	read, write

Examples

The following example shows how to set the destination address for tunnel-te1 to 10.10.10.10:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# interface tunnel-te1
RP/0/RP0/CPU0:router(config-if)# destination 10.10.10.10
```


disable (explicit-path)

To prevent the path from being used by MPLS-TE tunnels while it is configured, use the **disable** command in explicit path configuration mode. To return to the default behavior, use the **no** form of this command.

disable
no disable

Syntax Description This command has no arguments or keywords.

Command Default Explicit path is enabled.

Command Modes Explicit path configuration

Command History	Release	Modification
	Release 6.2.1	This command was introduced.

Usage Guidelines No specific guidelines impact the use of this command.

Task ID	Task ID	Operations
	mpls-te	read, write

Examples

The following example shows how to disable explicit path 200:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# explicit-path identifier 200
RP/0/RP0/CPU0:router(config-expl-path)# disable
```

exclude srlg (auto-tunnel backup)

To specify that automatic backup tunnels should avoid Shared Risk Link Groups (SRLGs) of protected interface, use the **exclude srlg** command in auto-tunnel backup configuration mode. To disable this feature, use the **no** form of this command.

```
exclude srlg [preferred]
no exclude srlg [preferred]
```

Syntax Description	preferred (Optional) Causes the backup tunnel to avoid SRLGs of its protected interface(s); however, the backup tunnel is created if SRLGs are not avoided.				
Command Default	Strict SRLG				
Command Modes	Auto-tunnel backup configuration				
Command History	<table border="1"> <thead> <tr> <th>Release</th> <th>Modification</th> </tr> </thead> <tbody> <tr> <td>Release 6.2.1</td> <td>This command was introduced.</td> </tr> </tbody> </table>	Release	Modification	Release 6.2.1	This command was introduced.
Release	Modification				
Release 6.2.1	This command was introduced.				
Usage Guidelines	<p>Strict SRLG configuration of this command means that the path computed for the backup tunnel that is automatically created, must not contain any links that are part of the excluded SRLG groups. If such a path cannot be found, the backup tunnel does not come up.</p> <p>Configuration of the preferred option allows the automatic backup tunnel to come up even if a path that excludes SRLGs can not be found.</p>				
Task ID	<table border="1"> <thead> <tr> <th>Task ID</th> <th>Operation</th> </tr> </thead> <tbody> <tr> <td>mpls-te</td> <td>read, write</td> </tr> </tbody> </table>	Task ID	Operation	mpls-te	read, write
Task ID	Operation				
mpls-te	read, write				

Example

In the following example, automatic backup tunnels must avoid SRLGs of the protected interface.

```
RP/0/RP0/CPU0:router(config)# mpls traffic-eng
RP/0/RP0/CPU0:router(config-mpls-te)#
RP/0/RP0/CPU0:router(config-mpls-te-if)# auto-tunnel backup
RP/0/RP0/CPU0:router(config-mpls-te-if-auto-backup)# exclude srlg preferred
```

fast-reroute

To enable fast-reroute (FRR) protection for an MPLS-TE tunnel, use the **fast-reroute** command in interface configuration mode. To return to the default behavior, use the **no** form of this command.

fast-reroute
no fast-reroute

Syntax Description This command has no arguments or keywords.

Command Default FRR is disabled.

Command Modes Interface configuration

Command History	Release	Modification
	Release 6.2.1	This command was introduced.

Usage Guidelines When a protected link used by the fast-reroutable label switched path (LSP) fails, the traffic is rerouted to a previously assigned backup tunnel. Configuring FRR on the tunnel informs all the nodes that the LSP is traversing that this LSP desires link/node/bandwidth protection.

You must allow sufficient time after an RSP RP switchover before triggering FRR on standby RSPs RPs to synchronize with the active RSP RP (verified using the **show redundancy** command). All TE tunnels must be in the recovered state and the database must be in the ready state for all ingress and egress line cards. To verify this information, use the **show mpls traffic-eng tunnels** and **show mpls traffic-eng fast-reroute database** commands.



Note Wait approximately 60 seconds before triggering FRR after verifying the database state.

Task ID	Task ID	Operations
	mpls-te	read, write

Examples

The following example shows how to enable FRR on an MPLS-TE tunnel:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# interface tunnel-te 1
RP/0/RP0/CPU0:router(config-if)# fast-reroute
```

fast-reroute protect

To enable node and bandwidth protection for an MPLS-TE tunnel, use the **fast-reroute protect** command in interface configuration mode. To return to the default behavior, use the **no** form of this command.

```
fast-reroute protect {bandwidth | node}
no fast-reroute protect
```

Syntax Description	
bandwidth	Enables bandwidth protection request.
node	Enables node protection request.

Command Default	
	FRR is disabled.

Command Modes	
	Interface configuration

Command History	Release	Modification
	Release 6.2.1	This command was introduced.

Usage Guidelines	
	No specific guidelines impact the use of this command.

Task ID	Task ID	Operations
	mpls-te read, write	

Examples The following example shows how to enable bandwidth protection for a specified TE tunnel:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router (config)#interface tunnel-te 1
RP/0/RP0/CPU0:router (config-if)# fast-reroute protect bandwidth
```

fast-reroute timers promotion

To configure how often the router considers switching a protected MPLS-TE tunnel to a new backup tunnel if additional backup-bandwidth or a better backup tunnel becomes available, use the **fast-reroute timers promotion** command in MPLS-TE configuration mode. To return to the default behavior, use the **no** form of this command.

```
fast-reroute timers promotion interval
no fast-reroute timers promotion
```

Syntax Description	<i>interval</i> Interval, in seconds, between scans to determine if a label switched path (LSP) should use a new, better backup tunnel. Range is 0 to 604800. A value of 0 disables backup tunnel promotions.				
Command Default	<i>interval</i> : 300				
Command Modes	MPLS-TE configuration				
Command History	<table border="1"> <thead> <tr> <th>Release</th> <th>Modification</th> </tr> </thead> <tbody> <tr> <td>Release 6.2.1</td> <td>This command was introduced.</td> </tr> </tbody> </table>	Release	Modification	Release 6.2.1	This command was introduced.
Release	Modification				
Release 6.2.1	This command was introduced.				

Usage Guidelines Setting the interval to a low value puts more load on the CPU because it has to scan all protected LSPs more frequently. It is not recommended that the timer be configured below the default value of 300 seconds.

Pacing mechanisms have been implemented to distribute the load on the CPU when backup promotion is active. Because of this, when a large number of protected LSPs are promoted, some delay is noticeable in backup promotion. If the promotion timer is configured to a very low value (depending on the number of protected LSPs) some protected LSPs may never get promoted.

To disable the timer, set the value to zero.

Task ID	Task	Operations
	mpls-te	read, write

Examples

The following example shows how to specify that LSPs are scanned every 600 seconds (10 minutes) to determine if they should be promoted to a better backup tunnel:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# mpls traffic-eng
RP/0/RP0/CPU0:router(config-mpls-te)# fast-reroute timers promotion 600
```

flooding thresholds

To set the reserved bandwidth thresholds for a link, use the **flooding thresholds** command in MPLS-TE interface configuration mode. To return to the default behavior, use the **no** form of this command.

```
flooding thresholds {down | up} percent [{percent1 percent2 percent3 ... percent 15}]
no flooding thresholds {down | up}
```

Syntax Description	down	Configures the threshold for decreased resource availability.
	up	Configures the threshold for increased resource availability.
	<i>percent</i> [<i>percent</i>]	Bandwidth threshold level. Range is 0 to 100 for all 16 levels.

Command Default

down: 100, 99, 98, 97, 96, 95, 90, 85, 80, 75, 60, 45, 30, 15

up: 5, 30, 45, 60, 75, 80, 85, 90, 95, 97, 98, 99, 100

Command Modes MPLS-TE interface configuration

Command History	Release	Modification
	Release 6.2.1	This command was introduced.

Usage Guidelines

You can configure up to 16 flooding threshold values. The first value is mandatory; the next 15 are optional. When a threshold is crossed, MPLS-TE link management advertises updated link information. If no thresholds are crossed, changes can be flooded periodically unless periodic flooding was disabled.

Task ID	Task ID	Operations
	mpls-te	read, write

Examples

The following example shows how to set the reserved bandwidth threshold for the link for decreased resource availability (down) and for increased resource availability (up) thresholds:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# mpls traffic-eng
RP/0/RP0/CPU0:router(config-mpls-te)# interface HundredGigabitEthernet
0/0/0/3
RP/0/RP0/CPU0:router(config-mpls-te-if)# flooding thresholds down 100 75 25
RP/0/RP0/CPU0:router(config-mpls-te-if)# flooding thresholds up 25 50 100
```

forward-class

To define the forwarding path in the MPLS-TE interface, use the **forward-class** command in MPLS-TE configuration mode. To remove forward-class configuration, use the **no** form of this command.

forward-class *forward-class*
no forward-class

<i>forward-class</i>	Forward class for the tunnel. Range is 1 to 7.
----------------------	--

Command Default No default behavior or values

Command Modes MPLS-TE configuration

Command History	Release	Modification
	Release 6.2.1	This command was introduced.

Usage Guidelines No specific guidelines impact the use of this command.

Task ID	Task ID	Operations
	mpls-te	read, write

Examples

The following example shows how to define forwarding path in the MPLS-TE interface:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)#interface tunnel-te 1
RP/0/RP0/CPU0:router(config-if)#forward-class 1
```

forwarding-adjacency

To configure an MPLS-TE forwarding adjacency, use the **forwarding-adjacency** command in interface configuration mode. By configuring forwarding adjacency, the MPLS-TE tunnels are considered to be links by the IGP. If no forwarding adjacency is to be defined, use the **no** form of this command.

```
forwarding-adjacency [holdtime time][include-ipv6]
no forwarding-adjacency [holdtime time][include-ipv6]
```

Syntax Description	<p>holdtime time (Optional) Configures the hold time value, in milliseconds, that is associated with each forwarding-adjacency LSP. The hold time is the duration after which the state change of LSP is advertised to IGP. The default value is 0.</p> <p>include-ipv6 (Optional) Announces the MPLS-TE tunnel as an IPv6 forwarding adjacency.</p>
---------------------------	--

Command Default holdtime time: 0

Command Modes Interface configuration

Command History	Release	Modification
	Release 6.2.1	This command was introduced.

Usage Guidelines If you do not specify a **holdtime time** value, a delay is introduced with the following results:

- When forwarding-adjacency is configured on a tunnel that is up, TE notifies IGP without any additional delay.
- When forwarding-adjacency is configured on a tunnel that is down, TE does not notify IGP.
- When a tunnel on which forwarding-adjacency has been configured comes up, TE holds the notification to IGP for the period of holdtime (assuming non-zero holdtime). When the holdtime elapses, TE notifies IGP if the tunnel is still up.

The paths that traffic is taking to the destination can be manipulated by adjusting the forwarding adjacency link metric. To do that, use the **bandwidth** command. The unit of possible bandwidth values is in kbps.

Task ID	Task ID	Operations
	mpls-te	read, write

Examples This example shows how to configure forwarding adjacency with a holdtime value of 60 milliseconds:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# interface tunnel-te 888
RP/0/RP0/CPU0:router(config-if)# forwarding-adjacency holdtime 60
```


This example shows how to announce MPLS-TE tunnel as an IPv6 forwarding adjacency:

```
RP/0/RP0/CPU0:router#configure  
RP/0/RP0/CPU0:router(config)#interface tunnel-te 65534  
RP/0/RP0/CPU0:router(config-if)#forwarding-adjacency  
RP/0/RP0/CPU0:router(config-if-tunte-fwadj)#include-ipv6
```

index exclude-address

To exclude an address from a tunnel path entry at a specific index, use the **index exclude-address** command in explicit path configuration mode. To return to the default behavior, use the **no** form of this command.

```
index index-id exclude-address { ipv4 unicast IP address }
no index index-id
```

Syntax Description	<i>index-id</i>	Index number at which the path entry is inserted or modified. Range is 1 to 65535.
	ipv4 unicast <i>IP address</i>	Excludes the IPv4 unicast address.

Command Default No default behavior or values

Command Modes Explicit path configuration

Command History	Release	Modification
		Release 6.2.1

Usage Guidelines You cannot include or exclude addresses from an IP explicit path unless explicitly configured using the **exclude-address** keyword.

Use the **exclude-address** keyword only after entering the explicit path configuration mode.

If you use the **exclude-address** keyword and specify the IP address of a link, the constraint-based routine does not consider that link when it sets up MPLS-TE paths. If the excluded address is a flooded MPLS-TE router ID, the constraint-based shortest path first (SPF) routine does not consider that entire node.



Note The person who performs the configuration must know the IDs of the routers, as it may not be apparent if the value refers to the link or to the node.

MPLS-TE accepts IP explicit paths composed of all excluded addresses configured using the **exclude-address** keyword.

Task ID	Task ID	Operations
	mpls-te read, write	

Examples

The following example shows how to exclude address 192.168.3.2 at index 3 of the explicit path 200:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router (config)# explicit-path identifier 200
```

```
RP/0/RP0/CPU0:router(config-expl-path)# index 3 exclude-address ipv4 unicast 192.168.3.2
```

index exclude-srlg

To exclude an address to get SRLGs from a tunnel path entry at a specific index, use the **index exclude-srlg** command in explicit path configuration mode. To return to the default behavior, use the **no** form of this command.

index *index-id* **exclude-srlg** **ipv4 unicast** *IP address*

no index *index-id*

Syntax Description		
	<i>index-id</i>	Index number at which the path entry is inserted or modified. Range is 1 to 65535.
	exclude-srlg	Specifies an IP address to get SRLG values from for exclusion.
	ipv4 unicast <i>IP address</i>	Excludes the IPv4 unicast address.

Command Default No default behavior or values

Command Modes Explicit path configuration

Command History	Release	Modification
	Release 6.2.1	This command was introduced.

Usage Guidelines No specific guidelines impact the use of this command.

Task ID	Task ID	Operation
	mpls-te	read, write

Example

The following example shows how to exclude the SRLG values from the IP address 192.168.3.2 at index 1 of the explicit path 100:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# explicit-path identifier 100
RP/0/RP0/CPU0:router(config-expl-path)# index 1 exclude-srlg ipv4 unicast 192.168.3.2
```

index next-address

To include a path entry at a specific index, use the **index next-address** command in explicit path configuration mode. To return to the default behavior, use the **no** form of this command.

```
index index-id next-address [{loose | strict}] ipv4 unicast IP-address
no index index-id
```

Syntax Description		
	<i>index-id</i>	Index number at which the path entry is inserted or modified. Range is 1 to 65535.
	ipv4 unicast <i>IP-address</i>	Includes the IPv4 unicast address (strict address).
	loose ipv4 unicast <i>IP-address</i>	(Optional) Specifies the next unicast address in the path as a loose hop.
	strict ipv4 unicast <i>IP-address</i>	(Optional) Specifies the next unicast address in the path as a strict hop.

Command Default No default behavior or values

Command Modes Explicit path configuration

Command History	Release	Modification
	Release 6.2.1	This command was introduced.

Usage Guidelines You cannot include addresses from an IP explicit path unless explicitly configured using the **next-address** keyword.

Use the **next-address** keyword only after entering the explicit path configuration mode.



Note The person who performs the configuration must know the IDs of the routers, as it may not be apparent if the value refers to the link or to the node.

Task ID	Task ID	Operations
	mpls-te	read, write

Examples

The following example shows how to insert the **next-address** 192.168.3.2 at index 3 of the explicit path 200:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# explicit-path identifier 200
```

```
RP/0/RP0/CPU0:router(config-expl-path)# index 3 next-address ipv4 unicast 192.168.3.2
```

interface (MPLS-TE)

To enable MPLS-TE on an interface and to enter MPLS-TE interface configuration mode, use the **interface** command in XR Config mode. To return to the default behavior, use the **no** form of this command.

```
interface type interface-path-id
no interface type interface-path-id
```

Syntax Description	<i>type</i>	Interface type. For more information, use the question mark (?) online help function.
	<i>interface-path-id</i>	Physical interface or virtual interface.
	Note	Use the show interfaces command to see a list of all possible interfaces currently configured on the router.
		For more information about the syntax for the router, use the question mark (?) online help function.

Command Default No default behavior or values

Command Modes XR Config mode

Command History	Release	Modification
	Release 6.2.1	This command was introduced.

Usage Guidelines You must enter MPLS-TE interface mode to configure specific interface parameters on physical interfaces. Configuring MPLS-TE links or a tunnel TE interface begins the TE-control process on RSP RP.

Task ID	Task ID	Operations
	mpls-te	read, write

Examples

The following example shows how to enter the MPLS-TE interface configuration mode:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# mpls traffic-eng
RP/0/RP0/CPU0:router(config-mpls-te)# interface HundredGigabitEthernet
0/0/0/3
```

The following example shows how to remove an interface from the MPLS-TE domain:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# mpls traffic-eng
```

```
RP/0/RP0/CPU0:router(config-mpls-te)# no interface HundredGigabitEthernet 0/0/0/3
```


interface (SRLG)

To enable Shared Risk Link Groups (SRLGs) on an interface and to enter SRLG interface configuration mode, use the **interface** command in SRLG configuration mode. To return to the previous configuration mode, use the **no** form of this command.

```
interface type interface-path-id
no interface type interface-path-id
```

Syntax Description	<i>type</i> Interface type. For more information, use the question mark (?) online help function.				
	<i>interface-path-id</i> Physical interface or virtual interface.				
	Note Use the show interfaces command to see a list of all possible interfaces currently configured on the router. For more information about the syntax for the router, use the question mark (?) online help function.				
Command Default	No default behavior or values				
Command Modes	SRLG configuration				
Command History	<table border="1"> <thead> <tr> <th>Release</th> <th>Modification</th> </tr> </thead> <tbody> <tr> <td>Release 6.2.1</td> <td>This command was introduced.</td> </tr> </tbody> </table>	Release	Modification	Release 6.2.1	This command was introduced.
Release	Modification				
Release 6.2.1	This command was introduced.				
Usage Guidelines	No specific guidelines impact the use of this command.				
Task ID	<table border="1"> <thead> <tr> <th>Task ID</th> <th>Operation</th> </tr> </thead> <tbody> <tr> <td>mpls-te</td> <td>read, write</td> </tr> </tbody> </table>	Task ID	Operation	mpls-te	read, write
Task ID	Operation				
mpls-te	read, write				

Example

The following example shows how to enter SRLG interface configuration mode:

```
RP/0/RP0/CPU0:router(config)# srlg
RP/0/RP0/CPU0:router(config-srlg)# interface HundredGigabitEthernet
0/0/0/3
RP/0/RP0/CPU0:router(config-srlg-if)# value 10
RP/0/RP0/CPU0:router(config-srlg-if)#value 50
```

interface tunnel-te

To configure an MPLS-TE tunnel interface, use the **interface tunnel-te** command in XR Config mode. To return to the default behavior, use the **no** form of this command.

interface tunnel-te *tunnel-id*
no interface tunnel-te *tunnel-id*

Syntax Description	<i>tunnel-id</i> Tunnel number. Range is 0 to 65535.
---------------------------	--

Command Default	Tunnel interfaces are disabled.
------------------------	---------------------------------

Command Modes	XR Config mode
----------------------	----------------

Command History	Release	Modification
	Release 6.2.1	This command was introduced.

Usage Guidelines	<p>You cannot have two tunnels using the same encapsulation mode with exactly the same source and destination address. The workaround is to create a loopback interface and to use the loopback interface address as the source address of the tunnel.</p> <p>Configuring MPLS-TE links or Tunnel-TE interface begins the TE-control process on RSP RP.</p> <p>The interface tunnel-te command indicates that the tunnel interface is for an MPLS-TE tunnel and enables the various tunnel MPLS configuration options.</p>
-------------------------	---



Note	You must configure record-route on TE tunnels that are protected by multiple backup tunnels merging at a single node.
-------------	---

Task ID	Task ID	Operations
	interface	read, write

Examples	The following example shows how to configure tunnel interface 1:
-----------------	--

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# interface tunnel-te 1
RP/0/RP0/CPU0:router(config-if)# ipv4 unnumbered loopback0
```

The following example shows how to set the tunnel-class attribute to map the correct traffic class to the tunnel:

```
RP/0/RP0/CPU0:router# configure  
RP/0/RP0/CPU0:router(config)# interface tunnel-te 1  
RP/0/RP0/CPU0:router(config-if)# policy-class 1
```

ipv4 unnumbered (MPLS)

To specify the MPLS-TE tunnel Internet Protocol Version 4 (IPv4) address, use the **ipv4 unnumbered** command in interface configuration mode. To return to the default behavior, use the **no** form of this command.

ipv4 unnumbered *type interface-path-id*
no ipv4 unnumbered *type interface-path-id*

Syntax Description	<i>type</i>	Interface type. For more information, use the question mark (?) online help function.
	<i>interface-path-id</i>	Physical interface or virtual interface.
	Note	Use the show interfaces command to see a list of all interfaces currently configured on the router.
		For more information about the syntax for the router, use the question mark (?) online help function.

Command Default No IP address is set.

Command Modes Interface configuration

Command History	Release	Modification
	Release 6.2.1	This command was introduced.

Usage Guidelines Tunnel-te is not signaled until an IP address is configured on the tunnel interface; therefore, the tunnel state stays down without IP address configuration.

Loopback is commonly used as the interface type.

Task ID	Task ID	Operations
	network	read, write

Examples The following example shows how to configure the MPLS-TE tunnel to use the IPv4 address used on loopback interface 0:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# interface tunnel-te 1
RP/0/RP0/CPU0:router(config-if)# ipv4 unnumbered loopback0
```

ipv4 unnumbered mpls traffic-eng

To specify the Internet Protocol Version 4 (IPv4) address, use the **ipv4 unnumbered mpls traffic-eng** command in XR Config mode. To remove the IPv4 address, use the **no** form of this command.

```
ipv4 unnumbered mpls traffic-eng interface-path-id
no ipv4 unnumbered mpls traffic-eng
```

Syntax Description

interface-path-id Physical interface or virtual interface.

Note Use the **show interfaces** command to see a list of all interfaces currently configured on the router.

Command Default

No default behavior or values.

Command Modes

XR Config mode .

Command History

Release	Modification
Release 6.2.1	This command was introduced.

Usage Guidelines

No specific guidelines impact the use of this command.

Task ID

Task ID Operations

network read,
write

Examples

The following example shows how to specify unnumbered IPv4 address for a GigabitEthernet interface:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# ipv4 unnumbered mpls traffic-eng HundredGigabitEthernet
0/0/0/3
```

The following example shows how to specify unnumbered IPv4 address for an MPLS-TE tunnel with tunnel ID 200:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# ipv4 unnumbered mpls traffic-eng tunnel-te 200
```

link-management timers bandwidth-hold

To set the length of time that bandwidth is held for a Resource Reservation Protocol (RSVP) Path (setup) message to wait for the corresponding RSVP Resv message to return, use the **link-management timers bandwidth-hold** command in MPLS-TE configuration mode. To return to the default behavior, use the **no** form of this command.

link-management timers bandwidth-hold *holdtime*
no link-management timers bandwidth-hold *holdtime*

Syntax Description

holdtime Number of seconds that bandwidth can be held. Range is 1 to 300. Default is 15.

Command Default

holdtime: 15

Command Modes

MPLS-TE configuration

Command History

Release	Modification
Release 6.2.1	This command was introduced.

Usage Guidelines

The **link-management timers bandwidth-hold** command determines the time allowed for an RSVP message to return from a neighbor RSVP node.

Task ID

Task ID	Operations
mpls-te	read, write

Examples

The following example shows how to set the bandwidth to be held for 10 seconds:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# mpls traffic-eng
RP/0/RP0/CPU0:router(config-mpls-te)# link-management timers bandwidth-hold 10
```

link-management timers periodic-flooding

To set the length of the interval for periodic flooding, use the **link-management timers periodic-flooding** command in MPLS-TE configuration mode. To return to the default behavior, use the **no** form of this command.

link-management timers periodic-flooding *interval*
no link-management timers periodic-flooding

Syntax Description	<i>interval</i> Length of the interval, in seconds, for periodic flooding. Range is 0 to 3600. A value of 0 turns off periodic flooding. The minimum value is 30.
---------------------------	---

Command Default	<i>interval</i> : 180
------------------------	-----------------------

Command Modes	MPLS-TE configuration
----------------------	-----------------------

Command History	Release	Modification
	Release 6.2.1	This command was introduced.

Usage Guidelines	The link-management timers periodic-flooding command advertises the link state information changes that do not trigger immediate action, such as a change to the allocated bandwidth that does not cross a threshold.
-------------------------	--

Task ID	Task ID	Operations
	mpls-te	read, write

Examples

The following example shows how to set the interval length for periodic flooding to 120 seconds:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# mpls traffic-eng
RP/0/RP0/CPU0:router(config-mpls-te)# link-management timers periodic-flooding 120
```

link-management timers preemption-delay

To set the length of the interval for delaying LSP preemption, use the **link-management timers preemption-delay** command in MPLS-TE configuration mode. To disable this behavior, use the **no** form of this command.

link-management timers preemption-delay bundle-capacity *sec*

Syntax Description	bundle-capacity <i>sec</i> Specifies the bundle-capacity preemption timer value in seconds.
---------------------------	--

Command Default	None
------------------------	------

Command Modes	MPLS-TE configuration
----------------------	-----------------------

Command History	Release	Modification
	Release 6.2.1	This command was introduced.

Usage Guidelines	The value 0 as bundle-capacity value in the link-management timers preemption-delay command disables this timer. This means there is no delay before preemption sets in when the bundle capacity goes down.
-------------------------	--

Task ID	Task ID	Operation
	mpls-te	read, write

This example shows how to set the interval length for preemption-delay:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# mpls traffic-eng
RP/0/RP0/CPU0:router(config-mpls-te)# link-management timers preemption-delay bundle-capacity
180
```


load-share

To determine load-sharing balancing parameters for a specified tunnel interface, use the **load-share** command in interface configuration mode. To return to the default behavior, use the **no** form of this command.

load-share *value*
no load-share

Syntax Description	<i>value</i> Load-share value, equivalent to the bandwidth in kbps (that is, the same value in configuration). Range is 1 to 4294967295. Default is 0.				
Command Default	The default load-share for tunnels with no explicit configuration is the configured signalled bandwidth. The <i>value</i> is 0 if no value is assigned.				
Command Modes	Interface configuration				
Command History	<table border="1"> <thead> <tr> <th>Release</th> <th>Modification</th> </tr> </thead> <tbody> <tr> <td>Release 7.1.1</td> <td>This command was introduced.</td> </tr> </tbody> </table>	Release	Modification	Release 7.1.1	This command was introduced.
Release	Modification				
Release 7.1.1	This command was introduced.				
Usage Guidelines	<p>Configuration schemas are supported for load balancing.</p> <p>To enable the load-share command, you must enable unequal load balancing using the load-share unequal command in the MPLS-TE configuration mode.</p>				
Examples	<p>The following example shows how to configure load-sharing parameters on a specified tunnel interface:</p> <pre>RP/0/RP0/CPU0:router# configure RP/0/RP0/CPU0:router(config)# interface tunnel-te 100 RP/0/RP0/CPU0:router(config-if)# load-share 100 RP/0/RP0/CPU0:router(config-if)# commit</pre>				

load-share unequal

To configure unequal load-sharing for an MPLS-TE tunnel, use the **load-share unequal** command in MPLS-TE configuration mode. To return to the default behavior, use the **no** form of this command.

load-share unequal
no load-share unequal

Syntax Description	This command has no arguments or keywords.	
Command Default	By default, unequal load-balancing is disabled and equal load-balancing occurs.	
Command Modes	MPLS-TE configuration	
Command History	Release	Modification
	Release 7.1.1	This command was introduced.

Usage Guidelines The **auto-bw** and **load-share unequal** commands should not be used together.

The **load-share unequal** command determines the load-share for a tunnel based on the bandwidth. However, the MPLS-TE automatic bandwidth feature changes the bandwidth around. If you are configuring both the **load-share unequal** command and the MPLS-TE automatic bandwidth feature, we recommend that you specify an explicit load-share value configuration under each MPLS-TE automatic bandwidth tunnel.

Examples The following example shows how to enable unequal load-sharing:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# mpls traffic-eng
RP/0/RP0/CPU0:router(config-mpls-te)# load-share unequal
RP/0/RP0/CPU0:router(config-mpls-te)# commit
```

match mpls disposition

To match Tag2IP packets while redirecting MPLS labeled packets to a new destination using PBR policy, use the **match mpls disposition** command in class-map configuration mode. To remove redirection of MPLS labeled packets, use the **no** form of this command.

```
match mpls disposition access-group {ipv4 | ipv6} access-list
no match mpls disposition access-group {ipv4 | ipv6} access-list
```

Syntax Description	
access-group	Specifies an access-group.
ipv4 ipv6	Specifies IPv4 or IPv6 address.
<i>access-list</i>	Specifies an access-list.

Command Default Match is not set.

Command Modes Class-map configuration

Command History	Release	Modification
	Release 6.2.1	This command was introduced.

Usage Guidelines Only Tag2IP packets can be redirected.

Task ID	Task ID	Operation
	qos	read, write

This example shows how to configure match MPLS disposition sequence for an IPv4 address:

```
RP/0/RP0/CPU0:router#configure
RP/0/RP0/CPU0:router(config)#class-map type traffic class_mpls_src_test
RP/0/RP0/CPU0:router(config-cmap)#match mpls disposition access-group ipv4 ACL_MPLS_SRC
RP/0/RP0/CPU0:router(config-cmap)#end-class-map
```

maxabs (MPLS-TE)

To specify the maximum number of MPLS-TE tunnels that can be configured, use the **maxabs** command in MPLS-TE configuration mode. To return to the default behavior, use the **no** form of this command.

maxabs tunnels tunnel-limit destinations dest-limit
no maxabs tunnels tunnel-limit destinations dest-limit

Syntax Description	
tunnels	Configures all tunnels for MPLS-TE.
tunnel-limit	Maximum number of tunnel TE interfaces. Range is 1 to 65536.
destinations	Configures all destinations for MPLS-TE.
dest-limit	Maximum total number of destinations that can be configured. Range is 1 to 65536.

Command Default	
	<i>tunnel-limit</i> : 4096
	<i>dest-limit</i> : 4096

Command Modes	
	MPLS-TE configuration

Command History	Release	Modification
	Release 6.2.1	This command was introduced.

Usage Guidelines	
	No specific guidelines impact the use of this command.

Task ID	Task ID	Operations
	mpls-te	read, write

Examples

The following example shows how to set the tunnel-te configuration limit to 1000:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# mpls traffic-eng
RP/0/RP0/CPU0:router(config-mpls-te)# maxabs tunnels 1000 destinations 1000
```

mpls traffic-eng

To enter MPLS-TE configuration mode, use the **mpls traffic-eng** command in XR Config mode.

mpls traffic-eng

Syntax Description This command has no arguments or keywords.

Command Default No default behavior or values

Command Modes XR Config mode

Command History	Release	Modification
	Release 6.2.1	This command was introduced.

Usage Guidelines No specific guidelines impact the use of this command.

Task ID	Task ID	Operations
	mpls-te	read, write

Examples

The following example shows how to enter MPLS-TE configuration mode:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# mpls traffic-eng
RP/0/RP0/CPU0:router(config-mpls-te)#
```

mpls traffic-eng auto-bw apply (MPLS-TE)

To apply the highest bandwidth collected on a tunnel without waiting for the current application period to end, use the **mpls traffic-eng auto-bw apply** command in XR EXEC mode.

```
mpls traffic-eng auto-bw apply {all | tunnel-te tunnel-number}
```

Syntax Description	all	Applies the highest bandwidth collected instantly on all the automatic bandwidth-enabled tunnels.
	tunnel-te <i>tunnel-number</i>	Applies the highest bandwidth instantly to the specified tunnel. The range is from 0 to 65535.

Command Default No default behavior or values

Command Modes XR EXEC mode

Command History	Release	Modification
	Release 6.2.1	This command was introduced.

Usage Guidelines The **mpls traffic-eng auto-bw apply** command can forcefully expire the current application period on a specified tunnel and immediately apply the highest bandwidth recorded so far instead of waiting for the application period to end on its own.



Note The predefined threshold check still applies on the configuration, and if the delta is not significant enough, the automatic bandwidth functionality overrides this command.

The bandwidth application is performed only if at least one output rate sample has been collected for the current application period.

To guarantee the application of a specific signaled bandwidth value when triggering a manual bandwidth application, follow these steps:

1. Configure the minimum and maximum automatic bandwidth to the bandwidth value that you want to apply by using the command.
2. Trigger a manual bandwidth application by using the **mpls traffic-eng auto-bw apply** command.
3. Revert the minimum and maximum automatic bandwidth value back to their original value.

Task ID	Task ID	Operations
	mpls-te	execute

Examples

The following example applies the highest bandwidth to a specified tunnel:

```
RP/0/RP0/CPU0:router# mpls traffic-eng auto-bw apply tunnel-te 1
```

mpls traffic-eng fast-reroute promote

To configure the router to assign new or more efficient backup MPLS-TE tunnels to protected MPLS-TE tunnels, use the **mpls traffic-eng fast-reroute promote** command in XR EXEC mode. To return to the default behavior, use the **no** form of this command.

mpls traffic-eng fast-reroute promote
no mpls traffic-eng fast-reroute promote

Syntax Description This command has no arguments or keywords.

Command Default No default behavior or values

Command Modes XR EXEC mode

Command History	Release	Modification
	Release 6.2.1	This command was introduced.

Usage Guidelines No specific guidelines impact the use of this command.

Task ID	Task ID	Operations
	mpls-te	read, write

Examples The following example shows how to initiate backup tunnel promote and assignment:

```
RP/0/RP0/CPU0:router# mpls traffic-eng fast-reroute promote
```


mpls traffic-eng level

To configure a router running Intermediate System-to-System (IS-IS) MPLS-TE at IS-IS Level 1 and Level 2, use the **mpls traffic-eng level** command in XR Config mode. To return to the default behavior, use the **no** form of this command.

mpls traffic-eng level *isis-level*
no mpls traffic-eng level *isis-level*

Syntax Description	<i>isis-level</i> IS-IS level (1, 2, or both) where MPLS-TE is enabled.
---------------------------	---

Command Default	No default behavior or values
------------------------	-------------------------------

Command Modes	XR Config mode
----------------------	----------------

Command History	Release	Modification
	Release 6.2.1	This command was introduced.

Usage Guidelines	The mpls traffic-eng level command is supported for IS-IS and affects the operation of MPLS-TE only if MPLS-TE is enabled for that routing protocol instance.
-------------------------	--

Task ID	Task ID	Operations
	isis	read, write

Examples	The following example shows how to configure a router running IS-IS MPLS to flood TE for IS-IS level 1:
-----------------	---

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# router isis 1
RP/0/RP0/CPU0:router(config-isis)# address-family ipv4 unicast
RP/0/RP0/CPU0:router(config-isis-af)# mpls traffic-eng level 1
RP/0/RP0/CPU0:router(config-isis-af)# metric-style wide
```

mpls traffic-eng link-management flood

To enable immediate flooding of all the local MPLS-TE links, use the **mpls traffic-eng link-management flood** command in XR EXEC mode. To return to the default behavior, use the **no** form of this command.

mpls traffic-eng link-management flood
no mpls traffic-eng link-management flood

Syntax Description This command has no arguments or keywords.

Command Default No default behavior or values

Command Modes XR EXEC mode

Command History	Release	Modification
	Release 6.2.1	This command was introduced.

Usage Guidelines If there is no change in the LSA since last flooding, IGP may dampen the advertisement.

Task ID	Task ID	Operations
	mpls-te	read, write

Examples The following example shows how to initiate flooding of the local MPLS-TE links:

```
RP/0/RP0/CPU0:router# mpls traffic-eng link-management flood
```

mpls traffic-eng path-protection switchover tunnel-te

To force a manual switchover for path-protected tunnel, use the **mpls traffic-eng path-protection switchover tunnel-te** command in XR EXEC mode. To disable this feature, use the **no** form of this command.

mpls traffic-eng path-protection switchover tunnel-te *tunnel ID*
no mpls traffic-eng path-protection switchover tunnel-te *tunnel ID*

Syntax Description	<i>tunnel ID</i> Tunnel identifier of the P2P tunnel for the path protection switchover. Range is from 0 to 65535.				
Command Default	No default behavior or values				
Command Modes	XR EXEC mode				
Command History	<table border="1"> <thead> <tr> <th>Release</th> <th>Modification</th> </tr> </thead> <tbody> <tr> <td>Release 6.2.1</td> <td>This command was introduced.</td> </tr> </tbody> </table>	Release	Modification	Release 6.2.1	This command was introduced.
Release	Modification				
Release 6.2.1	This command was introduced.				
Usage Guidelines	No specific guidelines impact the use of this command.				
Task ID	<table border="1"> <thead> <tr> <th>Task ID</th> <th>Operations</th> </tr> </thead> <tbody> <tr> <td>mpls-te</td> <td>execute</td> </tr> </tbody> </table>	Task ID	Operations	mpls-te	execute
Task ID	Operations				
mpls-te	execute				
Examples	<p>The following example configures the switchover for path-protection for tunnel-te:</p> <pre>RP/0/RP0/CPU0:router# mpls traffic-eng path-protection switchover tunnel-te 8</pre>				

mpls traffic-eng reoptimize (EXEC)

To trigger the reoptimization interval of all TE tunnels, use the **mpls traffic-eng reoptimize** command in XR EXEC mode.

mpls traffic-eng reoptimize [*tunnel-id*] [*tunnel-name*] [**all**] [**p2p**{**all** *tunnel-id*}]

Syntax Description	
<i>tunnel-id</i>	(Optional) MPLS-TE tunnel identification expressed as a number. Range is from 0 to 65535.
<i>tunnel-name</i>	(Optional) TE tunnel identification expressed as a name.
all	(Optional) Forces an immediate reoptimization for all tunnels.
p2p	(Optional) Forces an immediate reoptimization of all P2P TE tunnels.
all	(Optional) Forces an immediate reoptimization for all P2P tunnels.
<i>tunnel-id</i>	P2P TE tunnel identification to be reoptimized. Range is from 0 to 65535.

Command Default No default behavior or values

Command Modes XR EXEC mode

Command History	Release	Modification
	Release 6.2.1	This command was introduced.

Usage Guidelines No specific guidelines impact the use of this command.

Task ID	Task ID	Operations
	mpls-te	execute

Examples

The following example shows how to immediately reoptimize all TE tunnels:

```
RP/0/RP0/CPU0:router# mpls traffic-eng reoptimize
```

The following example shows how to immediately reoptimize TE tunnel-te90:

```
RP/0/RP0/CPU0:router# mpls traffic-eng reoptimize tunnel-te90
```

The following example shows how to immediately reoptimize all P2P TE tunnels:

```
RP/0/RP0/CPU0:router# mpls traffic-eng reoptimize p2p all
```

mpls traffic-eng reoptimize events link-up

To turn on automatic reoptimization of Multiprotocol Label Switching (MPLS) traffic engineering when certain events occur, such as, when an interface becomes operational, use the **mpls traffic-eng reoptimize events link-up** command in XR Config mode. To disable automatic reoptimization when link-up event occurs, use the **no** form of this command.

mpls traffic-eng reoptimize events link-up

no mpls traffic-eng reoptimize events link-up

Syntax Description This command has no arguments or keywords.

Command Modes XR Config mode

Command History	Release	Modification
	Release 6.2.1	This command was introduced.

Usage Guidelines No specific guidelines impact the use of this command.

Task ID	Task ID	Operation
	mpls-te	read, write

Example

The following example shows how to turn on automatic reoptimization when an interface becomes operational:

```
RP/0/RP0/CPU0:router# mpls traffic-eng reoptimize events link-up
```

mpls traffic-eng router-id (MPLS-TE router)

To specify that the TE router identifier for the node is the IP address associated with a given interface, use the **mpls traffic-eng router-id** command in the appropriate mode. To return to the default behavior, use the **no** form of this command.

mpls traffic-eng router-id *type interface-path-id*

no mpls traffic-eng router-id *type interface-path-id*

Syntax Description

type Interface type. For more information, use the question mark (?) online help function.

interface-path-id Physical interface or virtual interface.

Note Use the **show interfaces** command to see a list of all interfaces currently configured on the router.

For more information about the syntax for the router, use the question mark (?) online help function.

Command Default

No default behavior or values

Command Modes

OSPF configuration

IS-IS address family configuration

Command History

Release	Modification
Release 6.2.1	This command was introduced.

Usage Guidelines

A routers identifier acts as a stable IP address for the TE configuration. This IP address is flooded to all nodes. You must set the destination on the destination node TE router identifier for all affected tunnels. This router ID is the address that the TE topology database at the tunnel head uses for its path calculation.



Note When the **mpls traffic-eng router-id** command is not configured, global router ID is used by MPLS-TE if there is one configured.

We suggest that you configure the **mpls traffic-eng router-id** command explicitly under the IGP; otherwise, TE uses the default algorithm to pick up the TE router-id, which can be the highest IP address of the loopback interfaces or physical interfaces.

A TE router-id configuration is highly recommended to ensure that the tunnel head-end picks up the correct source address, and the configured static RPF address at the tail-end matches the tunnel source which avoids unexpected traffic drops.

Task ID	Task ID	Operations
	mpls-te	read, write

Examples

The following examples show how to specify the TE router identifier as the IP address associated with loopback interface:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# router ospf CORE_AS
RP/0/RP0/CPU0:router(config-ospf)# mpls traffic-eng router-id 7.7.7.7

RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# router isis 811
RP/0/RP0/CPU0:router(config-isis)# address-family ipv4 unicast
RP/0/RP0/CPU0:router(config-isis-af)# mpls traffic-eng router-id 8.8.8.8
```

mpls traffic-eng reoptimize mesh group

To reoptimize all tunnels of a mesh group, use the **mpls traffic-eng reoptimize mesh group** command in XR EXEC mode.

```
mpls traffic-eng reoptimize auto-tunnel mesh group group_id
```

Syntax Description	<i>group_id</i> Defines auto-tunnel mesh group ID that is to be reoptimized. Range is 0 to 4294967295.
---------------------------	--

Command Default	None
------------------------	------

Command Modes	XR EXEC mode
----------------------	--------------

Command History	Release	Modification
	Release 6.2.1	This command was introduced.

Usage Guidelines	No specific guidelines impact the use of this command.
-------------------------	--

Task ID	Task ID	Operations
	mpls-te	execute

Examples

This is sample out from the **mpls traffic-eng reoptimize mesh group** command:

```
RP/0/RP0/CPU0:router mpls traffic-eng reoptimize mesh group 10
```


mpls traffic-eng srlg

To enter MPLS-TE SRLG configuration mode, use the **mpls traffic-eng srlg** command in XR Config mode. To delete all the SRLG values and mapping configured under traffic engineering, use the **no** form of this command. To enter MPLS-TE SRLG value configuration submode, use the **mpls traffic-eng srlg value srlg value** command in the MPLS TE SRLG configuration mode. To delete all the SRLG values configured, use the **no** form of this command. To specify administrative weight associated with an SRLG value, use the **admin-weight** keyword in the MPLS TE SRLG value configuration submode.

mpls traffic-eng srlg {**admin-weight** *weight* | **value** *srlg value*} **ipv4 address** *ip-address* **next-hop ipv4 address** *next-hop-ip-address*

Syntax Description		
admin-weight <i>weight</i>		Value added to link admin-weight during SRLG-aware path computation. Range is 0 to 4294967295.
value <i>srlg-value</i>		SRLG value. Range is 0 to 4294967295.
static		Assign SRLG to topology link based on IP address.
ipv4 address <i>ip-address</i> next-hop ipv4 address <i>next-hop-ip-address</i>		Assign IP address of the local end-point and next-hop address of the link.

Command Default The default value for **admin-weight** keyword is 1.

Command Modes XR Config mode

Command History	Release	Modification
	Release 6.2.1	This command was introduced.

Usage Guidelines No specific guidelines impact the use of this command.

Task ID	Task ID	Operations
	mpls-te	read, write

Examples

The following example shows how to enter MPLS-TE SRLG configuration mode:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# mpls traffic-eng srlg
RP/0/RP0/CPU0:router(config-mpls-te-srlg)#
```

The following example shows how to enter MPLS-TE SRLG value configuration submode:

```
RP/0/RP0/CPU0:router# configure  
RP/0/RP0/CPU0:router(config)# mpls traffic-eng srlg value 150  
RP/0/RP0/CPU0:router(config-mpls-te-srlg)#
```

The following example shows how to specify admin-weight in the MPLS-TE SRLG value configuration submode:

```
RP/0/RP0/CPU0:router# configure  
RP/0/RP0/CPU0:router(config)# mpls traffic-eng srlg value 150  
RP/0/RP0/CPU0:router(config-mpls-te-srlg)# admin-weight 10
```

mpls traffic-eng teardown (EXEC)

To tear down and reestablish the RSVP-TE tunnels in a router, use the **mpls traffic-eng teardown** command in XR EXEC mode.

mpls traffic-eng teardown { **all** | **head** | **mid** | **tail** }

Syntax Description	all	Tears and set-up all the RSVP-TE tunnels of a network node
	head	Tears and sets up all the RSVP-TE tunnels of the configured headend router
	mid	Tears and sets up all the RSVP-TE tunnels of the configured midend router
	tail	Tears and sets up all the RSVP-TE tunnels of the configured tailend router
Command Default	None	
Command Modes	XR EXEC	
Command History	Release	Modification
	Release 7.11.1	This command was introduced.
Usage Guidelines	You can also use the mpls traffic-eng resetup command to reestablish the tunnels only at the headend router.	
Task ID	Task ID	Operation
	mpls-te	execute

This example shows the tearing down of all the RSVP-TE tunnels in an MPLS network.

```
Router# mpls traffic-eng teardown all
Router# commit
```

mpls traffic-eng tunnel preferred

By default, IS-IS installs multiple ECMPs for a route in the RIB through MPLS TE tunnels and physical interfaces. To limit IS-IS to use only MPLS TE tunnels for ECMP, use the **mpls traffic-eng tunnel preferred** command in XR Config Mode. To return to the default behavior, use the **no** form of this command.

```
mpls traffic-eng tunnel preferred
no mpls traffic-eng tunnel preferred
```

Syntax Description	This command has no arguments or keywords.
---------------------------	--

Command Default	No default behavior or values
------------------------	-------------------------------

Command Modes	XR Config Mode
----------------------	----------------

Command History	Release	Modification
	Release 7.6.1	This command was introduced.

Usage Guidelines	The mpls traffic-eng tunnel preferred command is supported for IS-IS and affects the operation of MPLS-TE only if MPLS-TE is enabled for that routing protocol instance.
-------------------------	---

Task ID	Task ID	Operations
	isis	read, write

Examples	The following example shows how to configure the tunnel preference:
-----------------	---

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# router isis 1
RP/0/RP0/CPU0:router(config-isis)# address-family ipv4 unicast
RP/0/RP0/CPU0:router(config-isis-af)# mpls traffic-eng tunnel preferred
```

mpls traffic-eng tunnel restricted

To specify an autoroute tunnel as a designated path, use the **mpls traffic-eng tunnel restricted** command in IS-IS address family mode config mode. To return to the default behavior, use the **no** form of this command.

mpls traffic-eng tunnel restricted

Syntax Description This command has no arguments or keywords.

Command Default No default behavior or values

Command Modes IS-IS address family mode

Command History	Release	Modification
	Release 7.6.2	This command was introduced.

Usage Guidelines No specific guidelines impact the use of this command.

Task ID	Task ID	Operations
	isis	read, write

Examples

The following example shows how to specify an autoroute tunnel as designated path:

```
Router# configure
Router(config)# router isis 1
Router(config-isis)# address-family ipv4 unicast
Router(config-isis-af)# mpls traffic-eng tunnel restricted
```

named-tunnels tunnel-te

To name the TE (Traffic Engineering) tunnels in the network with unique tunnel IDs (STRING names), use the **named-tunnels tunnel-te** command in MPLS-TE configuration mode. To delete the named tunnels, use the **no** form of this command.

named-tunnels tunnel-te *tunnel-name* [**self-ping** *max-count*]
no named-tunnels

Syntax Description	<i>tunnel-name</i>	Configures the given name to the TE tunnel. Note If the tunnel name contains more than one word, use hyphens to separate the words.
	self-ping <i>max-count</i>	Configures the maximum number of self-ping probes that are to be sent.
Command Default	None	
Command Modes	MPLS-TE configuration	
Command History	Release	Modification
	Release 7.0.12	This command was introduced.
	Release 7.5.3	The self-ping keyword was added.
Usage Guidelines	No specific guidelines impact the use of this command.	
Task ID	Task ID	Operation
	mpls-te	read, write

Example

The following example shows how to name a TE tunnel:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router (config)#mpls traffic-eng
RP/0/RP0/CPU0:router (config-mpls-te)#named-tunnels
RP/0/RP0/CPU0:router (config-mpls-te-named-tunnels)#tunnel-te FROM-NY-TO-LA
```

Self-Ping Probe

The following example shows how to configure self-ping probe:

```
/* Self-ping is supported for named-tunnels. This new keyword self-ping enables self-ping
when tunnel-te ABC is being reoptimized. */
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# mpls traffic-eng
RP/0/RP0/CPU0:router(config-mpls-te)# named-tunnels tunnel-te ABC
RP/0/RP0/CPU0:router(config-te-tun-name)# self-ping
RP/0/RP0/CPU0:router(config-te-tun-name)# commit
```

nhop-only (auto-tunnel backup)

To configure only a next-hop automatic backup tunnel with only link protection, use the **nhop-only** command in MPLS-TE auto-tunnel backup interface configuration mode. To return to the default configuration setting for automatic backup tunnels, use the **no** form of this command.

nhop-only
no nhop-only

Syntax Description This command has no arguments or keywords.

Command Default Both NHOP and NNHOP protection are enabled.

Command Modes Auto-tunnel backup configuration

Command History	Release	Modification
	Release 6.2.1	This command was introduced.

Usage Guidelines If you configure the **nhop-only** command, you destroy any next-next-hop (NNHOP) tunnel created to provide node protection for tunnels running over the specified interface.

If you unconfigure the **nhop-only** command, you trigger a backup assignment on primary tunnels running over that link. The automatic backup tunnel feature attempts to create NNHOP backup tunnels to provide node protection for the specified tunnels.

Task ID	Task ID	Operation
	mpls-te	read, write

Example

In the following example, NNHOP automatic backup tunnels are destroyed and only NHOP tunnels with link protection is configured:

```
RP/0/RP0/CPU0:router (config)# mpls traffic-eng
RP/0/RP0/CPU0:router (config-mpls-te)# interface HundredGigE 0/0/0/3
RP/0/RP0/CPU0:router (config-mpls-te-if)# auto-tunnel backup
RP/0/RP0/CPU0:router (config-mpls-te-if-auto-backup)# nhop-only
```


overflow threshold (MPLS-TE)

To configure the tunnel overflow detection, use the **overflow threshold** command in MPLS-TE automatic bandwidth interface configuration mode. To disable the overflow detection feature, use the **no** form of this command.

overflow threshold *percentage* [**min** *bandwidth*] **limit** *limit*
no overflow threshold

Syntax Description	
<i>percentage</i>	Bandwidth change percent to trigger an overflow. The range is from 1 to 100.
min <i>bandwidth</i>	(Optional) Configures the bandwidth change value, in kbps, to trigger an overflow. The range is from 10 to 4294967295. The default is 10.
limit <i>limit</i>	Configures the number of consecutive collection intervals that exceeds the threshold. The bandwidth overflow triggers an early tunnel bandwidth update. The range is from 1 to 10. The default is none.

Command Default The default value is disabled.

Command Modes MPLS-TE automatic bandwidth interface configuration

Command History	Release	Modification
	Release 6.2.1	This command was introduced.

Usage Guidelines

If you modify the **limit** keyword, the consecutive overflows counter for the tunnel is also reset.

If you enable or modify the minimum value, the current consecutive overflows counter for the tunnel is also reset, which effectively restarts the overflow detection from scratch.

Several number of consecutive bandwidth samples are greater than the overflow threshold (bandwidth percentage) and the minimum bandwidth configured, then a bandwidth application is updated immediately instead of waiting for the end of the application period.

Overflow detection applies only to bandwidth increase. For example, an overflow can not be triggered even if bandwidth decreases by more than the configured overflow threshold.

Task ID	Task ID	Operations
	mpls-te	read, write

Examples The following example shows how to configure the tunnel overflow detection for tunnel-te 1:

```
RP/0/RP0/CPU0:router# configure
```

```
RP/0/RP0/CPU0:router(config)# interface tunnel-te 1  
RP/0/RP0/CPU0:router(config-if)# auto-bw  
RP/0/RP0/CPU0:router(config-if-tunte-autobw)# overflow threshold 50 limit 3
```

path-option (MPLS-TE)

To configure a path option for an MPLS-TE tunnel, use the **path-option** command in tunnel-te interface configuration mode. To return to the default behavior, use the **no** form of this command.

```
path-option preference-priority [protecting number] {dynamic | explicit {name path-name | identifier
path-number}[protected-by path-option-level]} [attribute-set name][isis instance-name level level]
[lockdown] [ospf instance-name area {value address}] [verbatim]
no path-option preference-priority {dynamic | explicit {name path-name | identifier
path-number}[protected-by path-option-level]} [isis instance-name level level] [lockdown] [ospf
instance-name area {value address}] [verbatim]
```

Syntax Description	
<i>preference-priority</i>	Path option number. Range is from 1 to 1000.
protecting <i>number</i>	Specifies a path setup option to protect a path. The range is from 1 to 1000.
dynamic	Specifies that label switched paths (LSP) are dynamically calculated.
explicit	Specifies that LSP paths are IP explicit paths.
name <i>path-name</i>	Specifies the path name of the IP explicit path.
identifier <i>path-number</i>	Specifies a path number of the IP explicit path.
protected-by <i>path-option-level</i>	(Optional) Configures path protection for an explicit path that is protected by another explicit path.
isis <i>instance-name</i>	(Optional) Limits CSPF to a single IS-IS instance and area.
attribute-set <i>name</i>	(Optional) Specifies the attribute set for the LSP.
level <i>level</i>	Configures the level for IS-IS. The range is from 1 to 2.
lockdown	(Optional) Specifies that the LSP cannot be reoptimized.
ospf <i>instance-name</i>	(Optional) Limits CSPF to a single OSPF instance and area.
area	Configures the area for OSPF.
<i>value</i>	Decimal value for the OSPF area ID.
<i>address</i>	IP address for the OSPF area ID.
verbatim	(Optional) Bypasses the Topology/CSPF check for explicit paths.

Command Default No default behavior or values

Command Modes Tunnel-te interface configuration

Command History	Release	Modification
	Release 6.2.1	This command was introduced.

Usage Guidelines

You can configure several path options for a single tunnel. For example, there can be several explicit path options and a dynamic option for one tunnel. The path setup preference is for lower (not higher) numbers, so option 1 is preferred.

When the lower number path option fails, the next path option is used to set up a tunnel automatically (unless using the lockdown option).

The **protecting** keyword specifies that you can configure path-protection for the primary LSP. The **protecting** keyword is available only for tunnel-gte interfaces.

You specify the backup path for the **path-option** command in case of the primary path failure.

CSPF areas are configured on a per-path-option basis.

The **dynamic** keyword is required to configure path-protection.

Any primary explicit path on a path protection enabled tunnel can be configured to be protected by an explicit path option level using **protected-by** keyword. Only one explicit protecting path is supported per path option.

Task ID

Task ID	Task ID	Operations
	mpls-te	read, write

Examples

The following example shows how to configure the tunnel to use a named IPv4 explicit path as verbatim and lockdown options for the tunnel. This tunnel cannot reoptimize when the FRR event goes away, unless you manually reoptimize it:

```
RP/0/RP0/CPU0:router(config)# interface tunnel-te 1
RP/0/RP0/CPU0:router(config-if)# path-option 1 explicit name test verbatim lockdown
```

The following example shows how to enable path protection on a tunnel to configure an explicit path:

```
RP/0/RP0/CPU0:router(config)# interface tunnel-te 1
RP/0/RP0/CPU0:router(config-if)# path-option 1 explicit name po4
RP/0/RP0/CPU0:router(config-if)# path-option protecting 1 explicit name po6
```

The following example shows how to limit CSPF to a single OSPF instance and area:

```
RP/0/RP0/CPU0:router(config)# interface tunnel-te 1
RP/0/RP0/CPU0:router(config-if)# path-option 1 explicit name router1 ospf 3 area 7 verbatim
```

The following example shows how to limit CSPF to a single IS-IS instance and area:

```
RP/0/RP0/CPU0:router(config)# interface tunnel-te 1  
RP/0/RP0/CPU0:router(config-if)# path-option 1 dynamic isis mtbf level 1 lockdown
```

path-protection (MPLS-TE)

To enable path protection for a tunnel interface, use the **path-protection** command in interface configuration mode. To return to the default behavior, use the **no** form of this command.

path-protection
no path-protection

Syntax Description This command has no arguments or keywords.

Command Default No default behavior or values

Command Modes Interface configuration

Command History	Release	Modification
	Release 6.2.1	This command was introduced.

Usage Guidelines Although not as fast as a link or node protection, presignaling a secondary Labeled Switch Path (LSP) is faster than configuring a secondary path option or allowing the tunnel's source router to dynamically recalculate a path. The actual recovery time is topology-dependent, and is affected by delay factors such as propagation delay and switch fabric latency.

Task ID	Task	Operations
		mpls-te

Examples The following example shows how to enable path protection for the tunnel-te interface type:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# interface tunnel-te 1
RP/0/RP0/CPU0:router(config-if)# path-protection
```

path-protection timers reopt-after-switchover

To configure the time to wait after a switchover occurs on a tunnel before a reoptimization is attempted for the tunnel, use the **path-protection timers reopt-after-switchover** command in MPLS-TE configuration mode. To disable this feature, use the **no** form of this command.

path-protection timers reopt-after-switchover *seconds*
no path-protection timers reopt-after-switchover *seconds*

Syntax Description	<i>seconds</i> Time, in seconds, between path-protection event and tunnel reoptimization. Range is from 0 to 604800.				
Command Default	<i>seconds</i> : 180 (3 minutes)				
Command Modes	MPLS-TE configuration				
Command History	<table border="1"> <thead> <tr> <th>Release</th> <th>Modification</th> </tr> </thead> <tbody> <tr> <td>Release 6.2.1</td> <td>This command was introduced.</td> </tr> </tbody> </table>	Release	Modification	Release 6.2.1	This command was introduced.
Release	Modification				
Release 6.2.1	This command was introduced.				
Usage Guidelines	This command is used as a triggered reoptimization, which allows a tunnel to reoptimize to a better path than the standby path after the switchover. This option is used as a one time reoptimization.				
Task ID	<table border="1"> <thead> <tr> <th>Task ID</th> <th>Operations</th> </tr> </thead> <tbody> <tr> <td>mpls-te</td> <td>read, write</td> </tr> </tbody> </table>	Task ID	Operations	mpls-te	read, write
Task ID	Operations				
mpls-te	read, write				

Examples

The following example shows how to adjust the number of seconds between when a path-protection switchover is effected on a tunnel head to when reoptimization is performed on the tunnel:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# mpls traffic-eng
RP/0/RP0/CPU0:router(config-mpls-te)# path-protection timers reopt-after-switchover 180
```

path-selection cost-limit

To set the upper limit on the path aggregate admin-weight when computing paths for MPLS-TE LSPs, use the **path-selection cost-limit** command in an appropriate configuration mode. To remove the upper limit, use the **no** form of this command.

path-selection cost-limit *cost-limit-value*

Syntax Description	<i>cost-limit-value</i> Configures the path-selection cost-limit value. The range is from 1 to 4294967295.
---------------------------	--

Command Default	The cost-limit is ignored.
------------------------	----------------------------

Command Modes	XR Config mode Interface tunnel TE configuration MPLS TE path-option attribute set configuration
----------------------	--

Command History	Release	Modification
	Release 6.2.1	This command was introduced.

Usage Guidelines	Path-selection cost-limit configuration works only on MPLS TE tunnels. The cost-limit configured under path-option attribute-set configuration mode takes priority and will be in effect if the cost-limit is configured under global configuration, interface tunnel TE, and path-option attribute-set configuration modes. The cost-limit is ignored by default.
-------------------------	--

A LSP is created only if its path aggregate admin-weight is less than the specified path cost limit.

Task ID	Task ID	Operation
	mpls-te read, write	

This example shows how to set the path-selection cost-limit for under MPLS TE path-option attribute-set *PO3AttrSet*.

```
RP/0/RP0/CPU0:router#configure
RP/0/RP0/CPU0:router(config)#mpls traffic-eng
RP/0/RP0/CPU0:router(config-mpls-te)#attribute-set path-option PO3AttrSet
RP/0/RP0/CPU0:router(config-te-attribute-set)#path-selection cost-limit 50000
```


path-selection ignore overload (MPLS-TE)

To ignore the Intermediate System-to-Intermediate System (IS-IS) overload bit setting for MPLS-TE, use the **path-selection ignore overload** command in MPLS-TE configuration mode. To return to the default behavior, use the **no** form of this command.

```
path-selection ignore overload {head | mid | tail}
no path-selection ignore overload {head | mid | tail}
```

Syntax Description	This command has no arguments or keywords.	
Syntax Description	head	The tunnel stays up if set-overload-bit is set by ISIS on the head router. Ignores overload node during CSPF for the head node.
	mid	The tunnel stays up if set-overload-bit is set by ISIS on the mid router. Ignores overload node during CSPF for the mid node.
	tail	The tunnel stays up if set-overload-bit is set by ISIS on the tail router. Ignores overload node during CSPF for the tail node.
Command Default	None	
Command Modes	MPLS-TE configuration	
Command History	Release	Modification
	Release 6.2.1	This command was introduced.
Usage Guidelines	<p>Use the path-selection ignore overload command to ensure that label switched paths (LSPs) are not broken because of routers that have IS-IS overload bit as enabled.</p> <p>When the IS-IS overload bit avoidance (OLA) feature is activated, all nodes with the overload bit set, which includes head nodes, mid nodes, and tail nodes, are ignored. This means that they are still available for use with label switched paths (LSPs). This feature allows you to include an overloaded node in constraint-based shortest path first (CSPF).</p>	
Task ID	Task ID	Operations
	mpls-te	read, write
Examples	<p>This example shows how to use the path-selection ignore overload head command:</p> <pre>RP/0/RP0/CPU0:router# configure RP/0/RP0/CPU0:router(config)# mpls traffic-eng RP/0/RP0/CPU0:router(config-mpls-te)# path-selection ignore overload</pre>	

path-selection ignore overload (MPLS-TE)

```
RP/0/RP0/CPU0:router(config-mpls-te)# path-selection ignore overload head
```

path-selection loose-expansion affinity (MPLS-TE)

To specify the affinity value to be used to expand a path to the next loose hop for a tunnel on an area border router, use the **path-selection loose-expansion affinity** command in MPLS-TE configuration mode. To return to the default behavior, use the **no** form of this command.

```
path-selection loose-expansion affinity affinity-value mask affinity-mask [class-type type]
no path-selection loose-expansion affinity affinity-value mask affinity-mask [class-type type]
```

Syntax Description		
<i>affinity-value</i>	Attribute values required for links carrying this tunnel. A 32-bit decimal number. Range is 0x0 to 0xFFFFFFFF, representing 32 attributes (bits), where the value of an attribute is 0 or 1.	
mask <i>affinity-mask</i>	Checks the link attribute, a 32-bit decimal number. Range is 0x0 to 0xFFFFFFFF, representing 32 attributes (bits), where the value of an attribute mask is 0 or 1.	
class-type <i>type</i>	(Optional) Requests the class-type of the tunnel bandwidth. Range is 0 to 1.	

Command Default

```
affinity-value : 0X00000000
mask-value : 0xFFFFFFFF
```

Command Modes MPLS-TE configuration

Command History	Release	Modification
	Release 6.2.1	This command was introduced.

Usage Guidelines The new affinity scheme (based on names) is not supported for loose-hop expansion. New configuration does not affect the already up tunnels.

Task ID	Task	Operations
	mpls-te	read, write

Examples

The following example shows how to configure affinity 0x55 with mask 0xFFFFFFFF:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# mpls traffic-eng
RP/0/RP0/CPU0:router(config-mpls-te)# path-selection loose-expansion affinity 55 mask
FFFFFFF
```

path-selection loose-expansion metric (MPLS-TE)

To configure a metric type to be used to expand a path to the next loose hop for a tunnel on an area border router, use the **path-selection loose-expansion metric** command in MPLS-TE configuration mode. To return to the default behavior, use the **no** form of this command.

```
path-selection loose-expansion metric {igp | te} [class-type type]
no path-selection loose-expansion metric {igp | te} [class-type type]
```

Syntax Description		
	igp	Configures an Interior Gateway Protocol (IGP) metric.
	te	Configures a TE metric. This is the default.
	class-type type	(Optional) Requests the class type of the tunnel bandwidth. Range is 0 to 1.

Command Default The default is TE metric.

Command Modes MPLS-TE configuration

Command History	Release	Modification
	Release 6.2.1	This command was introduced.

Usage Guidelines New configurations do not affect tunnels that are already up.

Task ID	Task ID	Operations
	mpls-te	read, write

Examples

The following example shows how to set the path-selection metric to use the IGP metric overwriting default:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# mpls traffic-eng
RP/0/RP0/CPU0:router(config-mpls-te)# path-selection loose-expansion metric igp
```

path-selection metric (MPLS-TE)

To specify the MPLS-TE tunnel path-selection metric, use the **path-selection metric** command in MPLS-TE configuration mode. To return to the default behavior, use the **no** form of this command.

```
path-selection metric {igp | te}
no path-selection metric {igp | te}
```

Syntax Description

igp Configures an Interior Gateway Protocol (IGP) metric.

te Configures a TE metric.

Command Default

The default is TE metric.

Command Modes

MPLS-TE configuration

Command History

Release	Modification
Release 6.2.1	This command was introduced.

Usage Guidelines

The metric type to be used for path calculation for a given tunnel is determined as follows:

- If the **path-selection metric** command was entered to specify a metric type for the tunnel, use that metric type.
- Otherwise, use the default (TE) metric.

Task ID

Task ID	Operations
mpls-te	read, write

Examples

The following example shows how to set the path-selection metric to use the IGP metric overwriting default:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# mpls traffic-eng
RP/0/RP0/CPU0:router(config-mpls-te)# path-selection metric igp
```

path-selection metric (interface)

To configure an MPLS-TE tunnel path-selection metric type, use the **path-selection metric** command in interface configuration mode. To return to the default behavior, use the **no** form of this command.

```
path-selection metric {igp | te}
no path-selection metric {igp | te}
```

Syntax Description	igp Configures Interior Gateway Protocol (IGP) metrics.
	te Configures TE metrics. This is the default.

Command Default	The default is TE metrics.
------------------------	----------------------------

Command Modes	Interface configuration
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Command History	Release	Modification
	Release 6.2.1	This command was introduced.

Usage Guidelines	<p>The metric type to be used for path calculation for a given tunnel is determined as follows:</p> <ul style="list-style-type: none"> • If the path-selection metric command was entered to either a metric type for the tunnel or only a metric type, use that metric type. • Otherwise, use the default (TE) metric.
-------------------------	--

Task ID	Task ID	Operations
	mpls-te	read, write

Examples

The following example shows how to set the path-selection metric to use the IGP metric overwriting default:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# interface tunnel-te 1
RP/0/RP0/CPU0:router(config-if)# path-selection metric igp
```

policy-class

To configure policy-based tunnel selection (PBTS) to direct traffic into specific TE tunnels, use the **policy-class** command in interface configuration mode. To disable this feature, use the **no** form of this command.

Multiple EXP values can be specified as part of a policy-class, separated by spaces. The EXP values configured to a TE tunnel effectively form a monolithic policy-class, which should not overlap with other policy-classes. Once an EXP value is used in a policy-class configuration, it can only be reused if the subsequent policy-class configurations containing that EXP value are identical. For example, if the configuration **policy-class 1 2 3** is applied to one or more tunnels, configurations such as **policy-class 1**, **policy-class 2 3**, or **policy-class 3 4 5** become invalid.

```
policy-class {1 - 7 | default}
no policy-class
```

Syntax Description

1 - 7 Policy-class attribute to map the correct traffic class to this policy. Multiple EXP values can be specified, separated by spaces.

default Default tunnel policy class.

Command Default

The lowest class tunnels are assigned to carry default traffic only if no default tunnel is available for forwarding.

Command Modes

Interface configuration

Command History

Release	Modification
Release 6.2.1	This command was introduced.

Usage Guidelines

Use the **policy-class** command to enable policy-based tunnel selection (PBTS). See *Cisco IOS XR MPLS Configuration Guide for the Cisco CRS-1 Router* and *Cisco IOS XR MPLS Configuration Guide for the Cisco XR 12000 Series Router* for more information on PBTS.

To display the configured PBTS policy-class value, use the **show mpls traffic-eng tunnels** command.

To display information about PBTS configuration, use the **show cef** and **show cef hardware** commands in *Cisco IOS XR IP Addresses and Services Command Reference for the Cisco XR 12000 Series Router* and *Cisco IOS XR IP Addresses and Services Command Reference for the Cisco CRS-1 Router*.

Task ID

Task ID	Operations
mpls-te	read, write

Examples

The following example shows how to configure a policy class:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# interface tunnel-te 1
```

```
RP/0/RP0/CPU0:router(config-if)# policy-class 7
```

The following example shows how to configure a policy-class that maps to multiple traffic classes:

```
RP/0/RP0/CPU0:router# configure  
RP/0/RP0/CPU0:router(config)# interface tunnel-te 1  
RP/0/RP0/CPU0:router(config-if)# policy-class 1 2 3
```

The following example shows how to configure a default policy-class tunnel:

```
RP/0/RP0/CPU0:router# configure  
RP/0/RP0/CPU0:router(config)# interface tunnel-te 1  
RP/0/RP0/CPU0:router(config-if)# policy-class default  
RP/0/RP0/CPU0:router(config-if)# commit
```


priority (MPLS-TE)

To configure the setup and reservation priority for an MPLS-TE tunnel, use the **priority** command in interface configuration mode. To return to the default behavior, use the **no** form of this command.

priority *setup-priority hold-priority*
no priority *setup-priority hold-priority*

Syntax Description	
<i>setup-priority</i>	Priority used when signaling a label switched path (LSP) for this tunnel to determine which existing tunnels can be preempted. Range is 0 to 7 (in which a lower number indicates a higher priority). Therefore, an LSP with a setup priority of 0 can preempt any LSP with a non-0 priority.
<i>hold-priority</i>	Priority associated with an LSP for this tunnel to determine if it should be preempted by other LSPs that are being signaled. Range is 0 to 7 (in which a lower number indicates a higher priority).

Command Default	
	<i>setup-priority: 7</i> <i>hold-priority: 7</i>

Command Modes	
	Interface configuration

Command History	Release	Modification
	Release 6.2.1	This command was introduced.

Usage Guidelines	
	When an LSP is signaled and an interface does not currently have enough bandwidth available for that LSP, the call admission software (if necessary) preempts lower-priority LSPs to admit the new LSP. Accordingly, the new LSP priority is the setup priority and the existing LSP priority is the hold priority. The two priorities make it possible to signal an LSP with a low setup priority (so that the LSP does not preempt other LSPs on setup) and a high hold priority (so that the LSP is not preempted after it is established). Setup priority and hold priority are typically configured to be equal, and setup priority cannot be numerically smaller than the hold priority.

Task ID	Task ID	Operations
	mpls-te	read, write

Examples	
	The following example shows how to configure a tunnel with a setup and hold priority of 1:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# interface tunnel-te 1
RP/0/RP0/CPU0:router(config-if)# priority 1 1
```

record-route

To record the route used by a tunnel, use the **record-route** command in interface configuration mode. To return to the default behavior, use the **no** form of this command.

record-route
no record-route

Syntax Description This command has no arguments or keywords.

Command Default No default behavior or values

Command Modes Interface configuration

Command History	Release	Modification
	Release 6.2.1	This command was introduced.

Usage Guidelines You must configure record-route on TE tunnels that are protected by multiple backup tunnels merging at a single node.

Task ID	Task ID	Operations
	mpls-te	read, write

Examples

The following example shows how to enable record-route on the TE tunnel:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# interface tunnel-te 1
RP/0/RP0/CPU0:router(config-if)# record-route
```

redirect default-route nexthop

To configure multi nexthop tracking on default-route on a VRF for IPv4 or IPv6 address family, use the **redirect default-route nexthop** command in policy-map class type configuration mode.

```
redirect {ipv4 | ipv6} default-route nexthop
[vrf vrf-name] [{v4v6}] nexthop [vrf vrf-name] [{v4v6}] nexthop [vrf vrf-name] [{v4v6}]
```

Syntax Description		
ipv4 ipv6		Specifies IPv4 or IPv6 address family.
vrf vrf-name		Specifies the VRF name for nexthop.
<i>v4</i>		Specifies IPv4 nexthop address in A.B.C.D format.
<i>v6</i>		Specifies IPv6 nexthop address in X::X::X%zone format.

Command Default No default behavior or values

Command Modes Policy-map class type configuration

Command History	Release	Modification
	Release 6.2.1	This command was introduced.

Usage Guidelines No specific guidelines impact the use of this command.

Task ID	Task ID	Operation
	qos	read, write

Example

The following example shows how to configure multi nexthop tracking on default-route on a VRF for IPv4:

```
RP/0/RSP0/CPU0:Router# config
RP/0/RSP0/CPU0:Router(config)# policy-map type pbr kmd
RP/0/RSP0/CPU0:Router(config-pmap)# class type traffic acl
RP/0/RSP0/CPU0:Router(config-pmap-c)# redirect ipv4 default-route nexthop vrf vpn1 3.2.1.2
nexthop vrf vpn2 3.2.3.2 nexthop vrf vpn3 3.2.4.2
```

redirect nexthop

To configure multi nexthop tracking on a VRF for IPv4 or IPv6 address family, use the **redirect nexthop** command in policy-map class type configuration mode.

redirect {**ipv4** | **ipv6**} **nexthop**
[vrf vrf-name] [{v4 v6}] nexthop [vrf vrf-name] [{v4 v6}] nexthop [vrf vrf-name] [{v4 v6}]

Syntax Description		
	ipv4 ipv6	Specifies IPv4 or IPv6 address family.
	vrf vrf-name	Specifies the VRF name for nexthop.
	v4	Specifies IPv4 nexthop address in A.B.C.D format.
	v6	Specifies IPv6 nexthop address in X:X::X%zone format.

Command Default No default behavior or values

Command Modes Policy-map class type configuration

Command History	Release	Modification
	Release 6.2.1	This command was introduced.

Usage Guidelines A maximum number of three nexthops can be configured. The first nexthop configured has the highest priority as compared to the last nexthop, which has the least priority. The nexthops configured must be either IPv4 or IPv6. Either a VRF name or an IPv4/IPv6 address, or both can be configured for a given nexthop. When VRF is not configured, it is presumed to be ingress interface VRF.

Task ID	Task ID	Operation
	qos	read, write

Example

The following example shows how to configure multi nexthop tracking on a VRF for IPv4:

```
RP/0/RSP0/CPU0:Router# config
RP/0/RSP0/CPU0:Router(config)# policy-map type pbr kmd
RP/0/RSP0/CPU0:Router(config-pmap)# class type traffic acl
RP/0/RSP0/CPU0:Router(config-pmap-c)# redirect ipv4 nexthop vrf vpn1 3.2.1.2 nexthop vrf
vpn2 3.2.3.2 nexthop vrf vpn3 3.2.4.2
```

reoptimize (MPLS-TE)

To force the reoptimization interval for all TE tunnels, use the **reoptimize** command in MPLS-TE configuration mode. To return to the default behavior, use the **no** form of this command.

reoptimize *frequency*
no reoptimize *frequency*

Syntax Description	<p><i>frequency</i> Timer frequency range, in seconds. Range is from 0 to 604800.</p> <p>Note:</p> <ul style="list-style-type: none"> • A value of 0 disables periodic reoptimization. • Any value in the range from 1 to 60 results in periodic reoptimization that occurs every 60 seconds. 				
Command Default	<i>frequency</i> : 3600				
Command Modes	MPLS-TE configuration				
Command History	<table border="1"> <thead> <tr> <th>Release</th> <th>Modification</th> </tr> </thead> <tbody> <tr> <td>Release 6.2.1</td> <td>This command was introduced.</td> </tr> </tbody> </table>	Release	Modification	Release 6.2.1	This command was introduced.
Release	Modification				
Release 6.2.1	This command was introduced.				
Usage Guidelines	No specific guidelines impact the use of this command.				
Task ID	<table border="1"> <thead> <tr> <th>Task ID</th> <th>Operations</th> </tr> </thead> <tbody> <tr> <td>mpls-te</td> <td>read, write</td> </tr> </tbody> </table>	Task ID	Operations	mpls-te	read, write
Task ID	Operations				
mpls-te	read, write				

Examples

The following example shows how to force the reoptimization interval to 60 seconds:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# mpls traffic-eng
RP/0/RP0/CPU0:router(config-mpls-te)# reoptimize 60
```

reoptimize timers delay (MPLS-TE)

To delay removal or relabeling of the old label switched paths (LSPs) (reoptimized LSP from the forwarding plane) after tunnel reoptimization, use the **reoptimize timers delay** command in MPLS-TE configuration mode. To restore the default value, use the **no** form of this command.

```
reoptimize timers delay {after-frr seconds | cleanup delay-time | installation delay-time |
path-protection seconds}
no reoptimize timers delay {after-frr seconds | cleanup delay-time | installation delay-time |
path-protection seconds}
```

Syntax Description		
	after-frr	Delays the LSP reoptimization in the event of the FRR.
	<i>seconds</i>	Reoptimization initiation delay time of the tunnel, in seconds, after an FRR event. Range is from 0 to 120.
	cleanup	Delays removal of the old LSPs after tunnel reoptimization.
	<i>delay-time</i>	Reoptimization delay time, in seconds. A value of 0 disables delay. The valid range is from 0 to 300 for cleanup time.
	installation	Delays installation of a new label after tunnel reoptimization.
	<i>delay-time</i>	Reoptimization delay time, in seconds. A value of 0 disables delay. The valid range is 0 to 3600 for installation time.
	path-protection	Delays the time between path protection switchover event and tunnel reoptimization.
	<i>seconds</i>	Time, in seconds, between path protection switchover event and tunnel reoptimization. A value of 0 disables delay. Range is from 0 to 604800.

Command Default	
	after-frr <i>delay</i> : 0
	cleanup <i>delay</i> : 20
	<i>delay-time</i> : 20
	installation <i>delay</i> : 20

path-protection: 180

Command Modes MPLS-TE configuration

Command History	Release	Modification
	Release 6.2.1	This command was introduced.

Usage Guidelines A device with Multiprotocol Label Switching traffic engineering (MPLS-TE) tunnels periodically examines tunnels with established LSPs to discover whether more efficient LSPs (paths) are available. If a better LSP is available, the device signals the more efficient LSP; if the signaling is successful, the device replaces the older LSP with the new, more efficient LSP.

Sometimes the slower router-point nodes may not yet utilize the new label's forwarding plane. In this case, if the headend node replaces the labels quickly, it can result in brief packet loss. By delaying the cleanup of the old LSP using the **reoptimize timers delay cleanup** command, packet loss is avoided.

Task ID	Task ID	Operations
	mpls-te	read, write

Examples

The following example shows how to set the reoptimization cleanup delay time to 1 minute:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# mpls traffic-eng
RP/0/RP0/CPU0:router(config-mpls-te)# reoptimize timers delay cleanup 60
```

The following example shows how to set the reoptimization installation delay time to 40 seconds:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# mpls traffic-eng
RP/0/RP0/CPU0:router(config-mpls-te)# reoptimize timers delay installation 40
```

The following example shows how to set the reoptimization delay time after the event of the FRR to 50 seconds:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# mpls traffic-eng
RP/0/RP0/CPU0:router(config-mpls-te)# reoptimize timers delay after-frr 50
```

The following example shows how to set the reoptimization delay time between path protection switchover event and tunnel reoptimization to 80:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# mpls traffic-eng
RP/0/RP0/CPU0:router(config-mpls-te)# reoptimize timers delay path-protection 80
```

route-priority

To enable users to adjust the route-priority given to TE labels into the data plane, compared to labels and route updates from other protocols, use the **route-priority** command in MPLS-TE configuration mode. To return to the default behavior, use the **no** form of this command.

```
route-priority role {middle | head {primary | backup}} queue queue
no route-priority role {middle | head {primary | backup}}
```

Syntax Description	role	Defines the role of the tunnel to which the label belongs.
	middle	A tunnel mid-point.
	head backup	A tunnel head which is assigned as a FRR backup to an interface.
	head primary	All other tunnel heads.
	<i>queue</i>	Defines the queue number. Range is from 0 to 12 inclusive; lower values represent higher priority queues.

Command Default

head backup: 9
 head primary: 10
 middle: 10

Command Modes MPLS-TE configuration

Command History	Release	Modification
	Release 6.2.1	This command was introduced.

Usage Guidelines Use this command to change the priority given to TE labels when updates to the forwarding plane are made from the control plane.

The priority values used by other applications are:

- 0 - Unused
- 1 - Unused
- 2 - RIB/LDP (Critical)
- 3 - Unused
- 4 - Unused
- 5 - RIB/LDP (High)

- 6 - Unused
- 7 - Unused
- 8 - RIB/LDP (Medium)
- 9 - TE backup tunnel head
- 10 - Other TE tunnels
- 11 - Unused (future TE use)
- 12 - Unused (future TE use)



Caution The default prioritization of label updates from the control plane to the forwarding plane has been carefully chosen to avoid traffic loss under both normal operation and high system load, and to balance the needs of the various features that employ label switching. Changing these defaults may cause unpredictable behavior including traffic loss, especially when the router is experiencing high load. Use of this command is not recommended without proper understanding of its effects and possible side-effects.

Task ID

Task ID	Operations
mpls-te	read, write

Examples

The following example shows how to enable route-priority:

```
RP/0/RP0/CPU0:router(config)# mpls traffic-eng
RP/0/RP0/CPU0:router(config-mpls-te)# route-priority role middle queue 7
```

router-id secondary (MPLS-TE)

To configure a secondary TE router identifier in MPLS-TE to be used locally (not advertised through IGP), use the **router-id secondary** command in MPLS-TE configuration mode. To return to the default behavior, use the **no** form of this command.

router-id secondary *IP address*
no router-id secondary *IP address*

Syntax Description	<i>IP address</i> IPv4 address to be used as secondary TE router ID.				
Command Default	No default behavior or values				
Command Modes	MPLS-TE configuration				
Command History	<table border="1"> <thead> <tr> <th>Release</th> <th>Modification</th> </tr> </thead> <tbody> <tr> <td>Release 6.2.1</td> <td>This command was introduced.</td> </tr> </tbody> </table>	Release	Modification	Release 6.2.1	This command was introduced.
Release	Modification				
Release 6.2.1	This command was introduced.				
Usage Guidelines	<p>Use the router-id secondary command on tail end nodes to terminate verbatim tunnels to secondary TE RIDs as destinations.</p> <p>You can configure up to 32 IPv4 addresses as TE secondary router IDs.</p>				
Task ID	<table border="1"> <thead> <tr> <th>Task ID</th> <th>Operations</th> </tr> </thead> <tbody> <tr> <td>mpls-te</td> <td>read, write</td> </tr> </tbody> </table>	Task ID	Operations	mpls-te	read, write
Task ID	Operations				
mpls-te	read, write				
Examples	<p>The following example shows how to configure a secondary TE router identifier in MPLS-TE:</p> <pre>RP/0/RP0/CPU0:router# configure RP/0/RP0/CPU0:router(config)# mpls traffic-eng RP/0/RP0/CPU0:router(config-mpls-te)# router-id secondary 10.0.0.1 RP/0/RP0/CPU0:router(config-mpls-te)# router-id secondary 172.16.0.1</pre>				

set destination-address

To set destination address while redirecting Tag2IP MPLS labeled packets using PBR policy, use the **set destination-address** command in policy map class type configuration mode. To remove this configuration, use the **no** form of this command.

```
set destination-address {ipv4 | ipv6} ip-address
no set destination-address {ipv4 | ipv6} ip-address
```

Syntax Description	ipv4 ipv6 Specifies IPv4 or IPv6 address format.
	<i>ip-address</i> Specifies the IPv4 or IPv6 address.

Command Default	Destination IP address is not set.
------------------------	------------------------------------

Command Modes	Policy-map class type Configuration
----------------------	-------------------------------------

Command History	Release	Modification
	Release 6.2.1	This command was introduced.

Usage Guidelines	Only Tag2IP packets redirection is supported.
-------------------------	---

Task ID	Task ID	Operation
	qos	read, write

This example shows how to set an IPv4 address as the redirect destination address:

```
RP/0/0/CPU0:ios#configure
RP/0/0/CPU0:ios(config)#policy-map type pbr pbr_prec_exp
RP/0/0/CPU0:ios(config-pmap)#class type traffic class_prec_exp
RP/0/0/CPU0:ios(config-pmap-c)#set destination-address ipv4 192.168.0.1
```

set ipv4 df

To set or clear the do not fragment (df) bit policy before forwarding the packet in IPv4 traffic, use the `set ipv4 df` command in Policy-map configuration mode. To disable setting or clearing the df bit, use the `no` form of this command.

set ipv4 df *df-value*

Syntax Description	<i>df-value</i> Specifies the df bit value. Range is from 1 to 7.
---------------------------	---

Command Default	Set df bit policy is disabled.
------------------------	--------------------------------

Command Modes	Policy-map configuration
----------------------	--------------------------

Command History	Release	Modification
	Release 6.2.1	This command was introduced.

Usage Guidelines	No specific guidelines impact the use of this command.
-------------------------	--

Task ID	Task ID	Operation
	qos	read, write

This example shows how to set the IPv4 df bit policy value as *1*:

```
RP/0/RP0/CPU0:router (config-pmap-c) #set ipv4 df 1
```

set source-address

To set source address while redirecting Tag2IP MPLS labeled packets using PBR policy, use the **set source-address** command in policy map class type configuration mode. To remove this configuration, use the **no** form of this command.

```
set source-address {ipv4 | ipv6} ip-address
```

Syntax Description	ipv4 ipv6 Specifies IPv4 or IPv6 address format.
	<i>ip-address</i> Specifies the IPv4 or IPv6 address.

Command Default	No default behavior or values
------------------------	-------------------------------

Command Modes	Policy-map class type Configuration
----------------------	-------------------------------------

Command History	Release	Modification
	Release 6.2.1	This command was introduced.

Usage Guidelines	No specific guidelines impact the use of this command.
-------------------------	--

Task ID	Task ID	Operation
	qos	read, write

Example

This example shows how to set an IPv4 address as the source address:

```
RP/0/0/CPU0:ios#configure
RP/0/0/CPU0:ios(config)#policy-map type pbr pbr_prec_exp
RP/0/0/CPU0:ios(config-pmap)#class type traffic class_prec_exp
RP/0/0/CPU0:ios(config-pmap-c)#set source-address ipv4 10.0.0.1
```

show explicit-paths

To display the configured IP explicit paths, use the **show explicit-paths** command in XR EXEC mode.

show explicit-paths [{**name** *path-name* | **identifier** *number*}]

Syntax Description	name <i>path-name</i> (Optional) Displays the name of the explicit path.
	identifier <i>number</i> (Optional) Displays the number of the explicit path. Range is 1 to 65535.

Command Default No default behavior or values

Command Modes XR EXEC mode

Command History	Release	Modification
	Release 6.2.1	This command was introduced.

Usage Guidelines An IP explicit path is a list of IP addresses that represent a node or link in the explicit path.

Task ID	Task ID	Operations
	mpls-te	read

Examples The following shows a sample output from the **show explicit-paths** command:

```
RP/0/RP0/CPU0:router# show explicit-paths

Path ToR2      status enabled
  0x1: next-address 192.168.1.2
  0x2: next-address 10.20.20.20
Path ToR3      status enabled
  0x1: next-address 192.168.1.2
  0x2: next-address 192.168.2.2
  0x3: next-address 10.30.30.30
Path 100       status enabled
  0x1: next-address 192.168.1.2
  0x2: next-address 10.20.20.20
Path 200       status enabled
  0x1: next-address 192.168.1.2
  0x2: next-address 192.168.2.2
  0x3: next-address 10.30.30.30
```

This table describes the significant fields shown in the display.

Table 45: show explicit-paths Command Field Descriptions

Field	Description
Path	Pathname or number, followed by the path status.
1: next-address	First IP address in the path.
2: next-address	Second IP address in the path.

The following shows a sample output from the **show explicit-paths** command using a specific path name:

```
RP/0/RP0/CPU0:router# show explicit-paths name ToR3

Path ToR3      status enabled
 0x1:  next-address 192.168.1.2
 0x2:  next-address 192.168.2.2
 0x3:  next-address 10.30.30.30
```

The following shows a sample output from the **show explicit-paths** command using a specific path number:

```
RP/0/RP0/CPU0:router# show explicit-paths identifier 200

Path 200      status enabled
 0x1:  next-address 192.168.1.2
 0x2:  next-address 192.168.2.2
 0x3:  next-address 10.30.30.30
```

show interfaces tunnel-te accounting

To display IPv4 and IPv6 statistics for MPLS traffic engineering (TE) tunnels, use the **show interfaces tunnel-te accounting** command in XR EXEC mode.

show interfaces tunnel-te *tunnel-number* **accounting** [{**location** *location-id* | **rates**}]

Syntax Description		
	<i>tunnel-number</i>	Specifies TE tunnel number. Range is from 0 to 6553.
	location <i>location-id</i>	Specifies fully qualified location of the TE tunnel.
	rates	Displays interface accounting rates.

Command Default None

Command Modes XR EXEC mode

Command History	Release	Modification
	Release 6.2.1	This command was introduced.

Usage Guidelines No specific guidelines impact the use of this command.

Task ID	Task ID	Operation
	mpls-te	read

This example displays accounting information from tunnel-te interface *I*:

```
RP/0/RP0/CPU0:router#show interface tunnel-te 1 accounting
```

```
tunnel-te1
  Protocol          Pkts In      Chars In      Pkts Out      Chars Out
  IPv4_UNICAST      0             0              5             520
  IPv6_UNICAST      0             0             15            1560
```


show mpls traffic-eng affinity-map

To display the color name-to-value mappings configured on the router, use the **show mpls traffic-eng affinity-map** command in XR EXEC mode.

show mpls traffic-eng affinity-map

Syntax Description This command has no arguments or keywords.

Command Default No default behavior or values

Command Modes XR EXEC mode

Command History	Release	Modification
	Release 6.2.1	This command was introduced.

Usage Guidelines If the affinity value of an affinity associated with an affinity constraint is unknown, the **show mpls traffic-eng affinity-map** command output displays: "(refers to undefined affinity name)"

Task ID	Task ID	Operations
	mpls-te	read

Examples

The following shows a sample output from the **show mpls traffic-eng affinity-map** command:

```
RP/0/RP0/CPU0:router# show mpls traffic-eng affinity-map
```

Affinity Name	Bit-position	Affinity Value
bcdefghabcdefghabcdefghabcdefgha	0	1
red1	1	2
red2	2	4
red3	3	8
red4	4	10
red5	5	20
red6	6	40
red7	7	80
red8	8	100
red9	9	200
red10	10	400
red11	11	800
red12	12	1000
red13	13	2000
red14	14	4000
red15	15	8000
red16	16	10000
cdefghabcdefghabcdefghabcdefghab	17	20000
red18	18	40000
red19	19	80000

show mpls traffic-eng affinity-map

```

red20          20          100000
red21          21          200000
red22          22          400000
red23          23          800000
red24          24          1000000
red25          25          2000000
red26          26          4000000
red27          27          8000000
orange28       28          10000000
red28          29          20000000
red30          30          40000000
abcdefghabcde 31          80000000

```

Table 46: show mpls traffic-eng affinity-map Field Descriptions, on page 350 describes the significant fields shown in the display.

Table 46: show mpls traffic-eng affinity-map Field Descriptions

Field	Description
Affinity Name	Affinity name associated with the tunnel affinity constraints.
Bit-position	Bit position set in the 32-bit affinity value
Affinity Value	Affinity value associated with the affinity name.

show mpls traffic-eng attribute-set

To display the attribute set for MPLS-TE, use the **show mpls traffic-eng attribute-set** command in XR EXEC mode.

```
show mpls traffic-eng attribute-set [{auto-backup | auto-mesh | path-option | xro}[attribute-set-name]]
```

Syntax Description		
	auto-backup	Displays information for the auto-backup attribute type.
	auto-mesh	Displays information for the auto-mesh attribute type.
	path-option	Displays information for the path-option attribute type.
	xro	Displays information for the XRO attribute type.
	<i>attribute-set-name</i>	Specifies the name of the attribute set to be displayed.

Command Default Displays information about all types of attribute sets.

Command Modes XR EXEC mode

Command History	Release	Modification
	Release 6.2.1	This command was introduced.

Usage Guidelines To use this command, first enable the MPLS-TE application.

Task ID	Task ID	Operation
	mpls-te	read

Example

The following command shows the attribute set for auto-backup attribute type.

```
RP/0/RP0/CPU0:router# show mpls traffic-eng attribute-set auto-backup auto1
```

```
Attribute Set Name: auto1 (Type: auto-backup)
  Affinity: 0x0/0xffff (Default)
  Priority: 7 7 (Default)
  Record-route: Enabled
  Policy-class: 0 (Not configured)
  Logging: None
  List of protected interfaces (count 0)
  List of tunnel IDs (count 0)
```

The following command shows the attribute set for auto-mesh attribute type.

```
RP/0/RP0/CPU0:router# show mpls traffic-eng attribute-set auto-mesh mesh1

Attribute Set Name: mesh1 (Type: auto-mesh)
  Bandwidth: 0 kbps (CT0) (Default)
  Affinity: 0x0/0xffff (Default)
  Priority: 7 7 (Default)
  Interface Bandwidth: 0 kbps (Default)
  AutoRoute Announce: Disabled
  Auto-bw: Disabled
  Soft Preemption: Disabled
  Fast Reroute: Disabled, Protection Desired: None
  Record-route: Disabled
  Policy-class: 0 (Not configured)
  Logging: None
  List of Mesh Groups (count 0)
```

The following command shows the attribute set for path-option attribute type.

```
RP/0/RP0/CPU0:router# show mpls traffic-eng attribute-set path-option path1

Attribute Set Name: path1 (Type: path option)
  Bandwidth: 0 kbps (CT0) (Default)
  Affinity: 0x0/0xffff (Default)
  List of tunnel IDs (count 0)
```

The following command shows the attribute set for xro.

```
RP/0/RP0/CPU0:router# show mpls traffic-eng attribute-set xro

Attribute Set Name: foo (Type: XRO)
  Number of XRO constraints : 2
    LSP, best-effort, LSP-id used
      Specified by FEC: tunnel-id 55, LSP-id 88, ext. id 10.10.10.10
                        source 10.10.10.10, destination 20.20.20.20
    LSP, strict, LSP-id ignored
      Specified by FEC: tunnel-id 3, LSP-id 0, ext. id 10.0.0.1
                        source 10.0.0.1, destination 172.16.0.1
```

show mpls traffic-eng autoroute

To display tunnels that are announced to the Interior Gateway Protocol (IGP), including information about next hop and destinations, use the **show mpls traffic-eng autoroute** command in XR EXEC mode.

```
show mpls traffic-eng autoroute [name tunnel-name][IP-address]
```

Syntax Description	<i>IP-address</i> (Optional) Tunnel leading to this address.
	name <i>tunnel-name</i> Specifies a tunnel by name.

Command Default None

Command Modes XR EXEC mode

Command History	Release	Modification
	Release 6.2.1	This command was introduced.

Usage Guidelines The traffic-engineering tunnels are taken into account for the enhanced shortest path first (SPF) calculation of the IGP. The **show mpls traffic-eng autoroute** command displays those tunnels that IGP is currently using in its enhanced SPF calculation (that is, those tunnels that are up and have autoroute configured).

Tunnels are organized by destination. All tunnels to a destination carry a share of the traffic tunneled to that destination.

Task ID	Task ID	Operations
	mpls-te	read

Examples

The following shows a sample output from the **show mpls traffic-eng autoroute** command:

```
RP/0/RP0/CPU0:router# show mpls traffic-eng autoroute

Destination 103.0.0.3 has 2 tunnels in OSPF 0 area 0
tunnel-te1 (traffic share 1, nexthop 103.0.0.3)
tunnel-te2 (traffic share 1, nexthop 103.0.0.3)
```

This table describes the significant fields shown in the display.

Table 47: show mpls traffic-eng autoroute Command Field Descriptions

Field	Description
Destination	Multiprotocol Label Switching (MPLS) TE tail-end router ID.

Field	Description
traffic share	A factor, based on bandwidth, indicating how much traffic this tunnel should carry, relative to other tunnels, to the same destination. If two tunnels go to a single destination, one with a traffic share of 200 and the other with a traffic share of 100, the first tunnel carries two-thirds of the traffic.
Nexthop	Next-hop router ID of the MPLS-TE tunnel.
absolute metric	Metric with mode absolute for the MPLS-TE tunnel.
relative metric	Metric with mode relative for the MPLS-TE tunnel.

This sample output displays *Signalled-Name* information:

```
RP/0/RP0/CPU0:router# show mpls traffic-eng autoroute
Destination 192.168.0.4 has 1 tunnels in OSPF ring area 0
  tunnel-te1 (traffic share 0, nexthop 192.168.0.4)
    Signalled-Name: rtrA_t1
```

This sample output displays IS-IS autoroute information:

```
RP/0/RP0/CPU0:router#show mpls traffic-eng autoroute
Destination 192.168.0.1 has 1 tunnels in IS-IS ring level 1
  tunnel-te1 (traffic share 0, nexthop 192.168.0.1)
    (IS-IS ring level-1, IPV4 Unicast)
    (IS-IS ring level-1, IPV6 Unicast)
```

show mpls traffic-eng auto-tunnel backup

To display information about automatically build MPLS-TE backup tunnels, use the **show mpls traffic-eng auto-tunnel backup** command in XR EXEC mode.

```
show mpls traffic-eng auto-tunnel {backup [{private | summary | unused}]}
```

Syntax Description	backup	Displays information about auto-tunnel backup.
	private	(Optional) Displays private information about the automatically build MPLS-TE backup tunnels.
	summary	(Optional) Displays the automatically build MPLS-TE backup tunnels summary information.
	unused	(Optional) Displays only unused MPLS-TE backup tunnels.

Command Default No default behavior or values

Command Modes XR EXEC mode

Command History	Release	Modification
	Release 6.2.1	This command was introduced.

Usage Guidelines No specific guidelines impact the use of this command.

Task ID	Task ID	Operation
	mpls-te read	

Example

This is sample output from the **show mpls traffic-eng auto-tunnel backup** command:

```
AutoTunnel Backup Configuration:
  Interfaces count: 4
  Unused removal timeout: 1h 0m 0s
  Configured tunnel number range: 2000-2500

AutoTunnel Backup Summary:
  AutoTunnel Backups:
    1 created, 1 up, 0 down, 0 unused
    1 NHOP, 0 NNHOP, 0 SRLG strict, 0 SRLG preferred
  Protected LSPs:
    1 NHOP, 0 NHOP+SRLG
    0 NNHOP, 0 NNHOP+SRLG
  Protected S2L Sharing Families:
```

show mpls traffic-eng auto-tunnel backup

```

    0 NHOP, 0 NHOP+SRLG
    0 NNHOP, 0 NNHOP+SRLG
Protected S2Ls:
    0 NHOP, 0 NHOP+SRLG
    0 NNHOP, 0 NNHOP+SRLG

Cumulative Counters (last cleared 05:17:19 ago):
      Total  NHOP  NNHOP
Created:         1    1    0
Connected:       1    1    0
Removed (down):  0    0    0
Removed (unused): 0    0    0
Removed (in use): 0    0    0
Range exceeded:  0    0    0

AutoTunnel Backups:
      Tunnel  State  Protection  Prot.  Protected  Protected
      Name    State  Offered    Flows* Interface  Node
-----
 tunnel-te2000  up  NHOP                1    Gi0/2/0/2    N/A

*Prot. Flows = Total Protected LSPs, S2Ls and S2L Sharing Families

```

This is sample output from the **show mpls traffic-eng auto-tunnel mesh** command:

```
RP/0/RP0/CPU0:router#show mpls traffic-eng auto-tunnel mesh
```

```

Auto-tunnel Mesh Global Configuration:
  Unused removal timeout: 2h
  Configured tunnel number range: 10000-12000

Auto-tunnel Mesh Groups Summary:
  Mesh Groups count: 5
  Mesh Groups Destinations count: 50

Mesh Group 40 (2 Destinations, 1 Up, 1 Down):
  Destination-list: dl-40
  Attribute-set: ta_name
  Destination: 40.40.40.40, tunnel-id: 10000, State: Up
  Destination: 10.10.10.10, tunnel-id: 10001, State: Down
Mesh Group 41 (3 Destinations, 2 Up, 1 Down):
  Destination-list: dl-40
  Attribute-set: ta_name
  Destination: 203.0.113.1, tunnel-id: 10005, State: Up
  Destination: 209.165.201.1, tunnel-id: 10006, State: Up
  Destination: 10.0.0.1, tunnel-id: 10007, State: Down
Mesh Group 51 (0 Destinations, 0 Up, 0 Down):
  Destination-list: Not configured
  Attribute-set: Not configured
Mesh Group 52 (0 Destinations, 0 Up, 0 Down):
  Destination-list: NAME1 (Not defined)
  Attribute-set: NAME2 (Not defined)
Mesh Group 53 (2 Destinations, 1 Up, 1 Down):
  Destination-list: dl-53
  Attribute-set: Not configured
  Destination: 40.40.40.40, tunnel-id: 10000, State: Up
  Destination: 10.10.10.10, tunnel-id: 10001, State: Down

```

```

Cumulative Counters (last cleared 7h ago):
      Total
Created:         100
Connected:       50
Removed (unused): 50

```



```
Removed (in use):    0
Range exceeded:      0
```

This is sample output from the **show mpls traffic-eng auto-tunnel private** command:

```
Auto-tunnel Mesh Private Information:
ID allocator overall maximum ID: 4096
ID allocator last allocated ID: 50999
ID allocator number IDs allocated: 1000
```

show mpls traffic-eng auto-tunnel mesh

To display information about automatically built MPLS-TE mesh tunnels, use the **show mpls traffic-eng auto-tunnel mesh** command in XR EXEC mode.

show mpls traffic-eng auto-tunnel mesh {*mesh-value* | **unused** | **summary** | **attribute-set** *name* | **destination** *address* | **destination-list** *name* | **down** | **up** | **tunnel** {**created** | **not-created**} | **onehop**}

Syntax Description		
mesh <i>mesh-value</i>		Displays the tunnels that belong to the specified auto-tunnel mesh group. The range of mesh group ID is from 0 to 4294967295.
attribute-set <i>name</i>		Displays mesh-groups configured with a specific attribute set.
destination <i>address</i>		Displays only the destinations with a specified address.
destination-list <i>name</i>		Displays mesh-groups configured with a specified prefix-list.
down		Displays only those tunnels that are down.
up		Displays only those tunnels that are up.
summary		Displays auto-tunnel mesh summary information.
unused		Displays only the down tunnels with no destination in the topology.
tunnel created not-created		Specifies either created destinations with tunnels, or not-created destinations without tunnels.
onehop		Displays onehop enabled mesh groups.

Command Default None

Command Modes XR EXEC mode

Command History	Release	Modification
	Release 6.2.1	This command was introduced.

Usage Guidelines No specific guidelines impact the use of this command.

Task ID	Task ID	Operation
	MPLS-TE	read

This is sample output from the **show mpls traffic-eng auto-tunnel mesh** command:

```
RP/0/RP0/CPU0:router show mpls traffic-eng auto-tunnel mesh
```

```
Auto-tunnel Mesh Global Configuration:
  Unused removal timeout: 1h 0m 0s
```

Configured tunnel number range: 1000-1200

Auto-tunnel Mesh Groups Summary:

Mesh Groups count: 1
 Mesh Groups Destinations count: 3
 Mesh Groups Tunnels count:
 3 created, 0 up, 3 down, 0 FRR enabled

Mesh Group: 65 (3 Destinations)

Status: Enabled
 Attribute-set: am-65
 Destination-list: dl-65 (Not a prefix-list)
 Recreate timer: Not running

Destination	Tunnel ID	State	Unused timer
192.168.0.2	1000	up	Not running
192.168.0.3	1001	up	Not running
192.168.0.4	1002	up	Not running

Displayed 3 tunnels, 0 up, 3 down, 0 FRR enabled

Auto-mesh Cumulative Counters:

Last cleared: Wed Nov 9 12:56:37 2011 (02:39:07 ago)

	Total
Created:	3
Connected:	0
Removed (unused):	0
Removed (in use):	0
Range exceeded:	0

This shows how to configure the **auto-tunnel mesh** command with **destination-list** and **attribute-set** keywords:

```
RP/0/RP0/CPU0:router(config)# mpls traffic-eng
RP/0/RP0/CPU0:router(config-mpls-te)# auto-tunnel mesh
RP/0/RP0/CPU0:router(config-te-auto-mesh)# group 65
RP/0/RP0/CPU0:router(config-te-mesh-group)# disable
RP/0/RP0/CPU0:router(config-te-mesh-group)# destination-list dl-65
RP/0/RP0/CPU0:router(config-te-mesh-group)# attribute-set am-65
```



Note This **attribute-set** is an optional configuration. Without this configuration, all tunnels use default tunnel attribute values. If you configure a non-existent attribute-set, this mesh group does not create any tunnel.



Note This **destination-list** configuration is mandatory. If there is no IPv4 prefix-list by this router, this mesh group create tunnels with all routers in the network.

This sample output displays information about one-hop tunnels:

```
RP/0/RP0/CPU0:router#show mpls traffic-eng auto-tunnel mesh onehop
```

```
Auto-tunnel Mesh Onehop Groups Summary:
Mesh Groups count: 1
Mesh Groups Destinations count: 2
Mesh Groups Tunnels count:
  2 created, 2 up, 0 down, 0 FRR enabled
```

```
Mesh Group: 25 (2 Destinations) Onehop
Status: Enabled
Attribute-set: Not configured
Destination-list: dest_list (Not a prefix-list)
Recreate timer: Not running
  Destination      Tunnel ID      State  Unused timer
  -----
  10.10.10.2       3500          up    Not running
  11.11.11.2       3501          up    Not running
Displayed 2 tunnels, 2 up, 0 down, 0 FRR enabled
```

```
Auto-mesh Onehop Cumulative Counters:
Last cleared: Thu Sep 12 13:39:38 2013 (03:47:21 ago)
  Total
Created:          2
Connected:       2
Removed (unused): 0
Removed (in use): 0
Range exceeded:  0
```

show mpls traffic-eng collaborator-timers

To display the current status of the MPLS-TE collaborator timers, use the **show mpls traffic-eng collaborator-timers** command in XR EXEC mode.

show mpls traffic-eng collaborator-timers

Syntax Description This command has no arguments or keywords.

Command Default No default behavior or values

Command Modes XR EXEC mode

Command History	Release	Modification
	Release 6.2.1	This command was introduced.

Usage Guidelines The MPLS-TE process maintains the timers for all of the collaborators such as RSVP, LSD, and so forth. The **show mpls traffic-eng collaborator-timers** command shows the status of these timers.

Task ID	Task ID	Operations
	mpls-te	read

Examples

The following sample output shows the current status of the collaborator timers:

```
RP/0/RP0/CPU0:router# show mpls traffic-eng collaborator-timers

Collaborator Timers
-----
Timer Name: [LMRIB Restart] Index:[0]
  Duration: [60] Is running: NO
  Last start time: 02/09/2009 11:57:59
  Last stop time: 02/09/2009 11:58:00
  Last expiry time: Never expired
Timer Name: [LMRIB Recovery] Index:[1]
  Duration: [60] Is running: YES
  Last start time: 02/09/2009 11:58:00
  Last stop time: Never Stopped
  Last expiry time: 19/08/2009 17:45:24
Timer Name: [RSVP Restart] Index:[2]
  Duration: [180] Is running: NO
  Last start time: 26/08/2009 18:59:18
  Last stop time: 26/08/2009 18:59:20
  Last expiry time: Never expired
Timer Name: [RSVP Recovery] Index:[3]
  Duration: [1800] Is running: NO
  Last start time: 26/08/2009 18:59:20
  Last stop time: 26/08/2009 19:03:19
  Last expiry time: 19/08/2009 18:12:39
```

```

Timer Name: [LSD Restart] Index:[4]
  Duration: [60] Is running: NO
  Last start time: 19/08/2009 17:44:26
  Last stop time: 19/08/2009 17:44:26
  Last expiry time: Never expired
Timer Name: [LSD Recovery] Index:[5]
  Duration: [600] Is running: NO
  Last start time: 19/08/2009 17:44:26
  Last stop time: Never Stopped
  Last expiry time: 19/08/2009 17:53:44
Timer Name: [Clearing in progress BW for the whole topology] Index:[6]
  Duration: [60] Is running: YES
  Last start time: 02/09/2009 11:57:50
  Last stop time: Never Stopped
  Last expiry time: 02/09/2009 11:57:50

```

This table describes the significant fields shown in the display.

Table 48: show mpls traffic-eng collaborator-timers Command Field Descriptions

Field	Description
Timer Name	Timer name that is associated to a collaborator.
Index	Identification number of the timer.
Duration	Expiry delay of the timer, in seconds. For example, the duration indicates the timer interval.
Is running	Timer is running low or not.
Last start time	Last time that the collaborator process for MPLS LSD was restarted.
Last stop time	Time TE was able to reconnect to the MPLS LSD process.
Last expiry time	Time that timer expired.

show mpls traffic-eng counters signaling

To display tunnel signaling statistics, use the **show mpls traffic-eng counters signaling** command in XR EXEC mode.

```
show mpls traffic-eng counters {signaling | soft-preemption} {tunnel-number | all} [{heads | mids | tails}] | name tunnel-name | summary}
```

Syntax Description		
signaling		Displays signaling counters.
soft-preemption		Displays the statistics for the soft-preemption.
<i>tunnel-number</i>		Statistics for the input tunnel number. The range is from 0 to 65535.
all		Displays statistics for all tunnels.
heads		(Optional) Displays statistics for all tunnel heads.
mids		(Optional) Displays statistics for all tunnel midpoints.
tails		(Optional) Displays statistics for all tunnel tails.
name		Displays statistics for a specified tunnel.
<i>tunnel-name</i>		Name of the specified tunnel.
summary		Displays a summary of signaling statistics.

Command Default None

Command Modes XR EXEC mode

Command History	Release	Modification
	Release 6.2.1	This command was introduced.

Usage Guidelines No specific guidelines impact the use of this command.

show mpls traffic-eng counters signaling

Task ID	Task ID	Operations
	mpls-te	read

Examples

This is a sample output from the **show mpls traffic-eng counters signaling** command, using the **all** keyword, which displays tunnel signaling statistics for all tunnels:

```
RP/0/RP0/CPU0:router# show mpls traffic-eng counters signaling all

Tunnel Head: tunnel-te100
Cumulative Tunnel Counters:
  Signalling Events      Recv      Xmit      ResvCreate      Recv      Xmit
  PathCreate             1         1         ResvCreate       1         0
  PathChange             0         0         ResvChange       0         0
  PathError              0         0         ResvError        0         0
  PathTear               0         18        ResvTear         0         0
  BackupAssign           0         1         BackupError      0         0
  PathQuery              0         0         Unknown          0         0

Destination 100.0.0.4
Cumulative counters
  Signalling Events      Recv      Xmit      ResvCreate      Recv      Xmit
  PathCreate             1         1         ResvCreate       1         0
  PathChange             0         0         ResvChange       0         0
  PathError              0         0         ResvError        0         0
  PathTear               0         18        ResvTear         0         0
  BackupAssign           0         1         BackupError      0         0
  PathQuery              0         0         Unknown          0         0
S2L LSP ID: 2 Sub-Grp ID: 0 Destination: 100.0.0.4
  Signalling Events      Recv      Xmit      ResvCreate      Recv      Xmit
  PathCreate             1         1         ResvCreate       1         0
  PathChange             0         0         ResvChange       0         0
  PathError              0         0         ResvError        0         0
  PathTear               0         0         ResvTear         0         0
  BackupAssign           0         1         BackupError      0         0
  PathQuery              0         0         Unknown          0         0

Signaling Counter Summary:
  Signalling Events      Recv      Xmit      ResvCreate      Recv      Xmit
  PathCreate             11        7         ResvCreate       11        4
  PathChange             0         0         ResvChange       0         0
  PathError              0         0         ResvError        0         0
  PathTear               0         38        ResvTear         0         0
  BackupAssign           0         3         BackupError      0         0
  PathQuery              0         0         Unknown          0         0
```

This is a sample output from the **show mpls traffic-eng counters signaling** command using the **tunnel number** argument, which displays statistics for the input tunnel number:

```
RP/0/RP0/CPU0:router# show mpls traffic-eng counters signaling 200

Tunnel Head: tunnel-te200
Cumulative Tunnel Counters:
  Signalling Events      Recv      Xmit      ResvCreate      Recv      Xmit
  PathCreate             4         4         ResvCreate       4         0
  PathChange             0         0         ResvChange       0         0
  PathError              0         0         ResvError        0         0
```



```

PathTear          0      1      ResvTear          0      0
BackupAssign      0      4      BackupError       0      0
PathQuery         0      0      Unknown           0      0

Destination 192.168.0.1
Cumulative counters
  Signalling Events Recv      Xmit          Recv      Xmit
  PathCreate         4      4      ResvCreate       4      0
  PathChange         0      0      ResvChange       0      0
  PathError          0      0      ResvError        0      0
  PathTear           0      1      ResvTear         0      0
  BackupAssign       0      4      BackupError       0      0
  PathQuery          0      0      Unknown          0      0
S2L LSP ID: 3 Sub-Grp ID: 0 Destination: 192.168.0.1
  Signalling Events Recv      Xmit          Recv      Xmit
  PathCreate         3      3      ResvCreate       3      0
  PathChange         0      0      ResvChange       0      0
  PathError          0      0      ResvError        0      0
  PathTear           0      0      ResvTear         0      0
  BackupAssign       0      3      BackupError       0      0
  PathQuery          0      0      Unknown          0      0

```

This table describes the significant fields shown in the display.

Table 49: show mpls traffic-eng counters signaling Command Field Descriptions

Field	Description
Tunnel Head	Tunnel head identifier.
Match Resv Create	Number of RSVP Reservation create messages received.
Sender Create	Number of Sender Create messages sent by TE to RSVP.
Path Error	Number of RSVP Path Error messages received.
Match Resv Change	Number of RSVP Reservation change messages received.
Sender Modify	Number of Sender Modify messages sent by TE to RSVP.
Path Change	Number of RSVP Path Change messages received.
Match Resv Delete	Number of RSVP Reservation delete messages received.
Sender Delete	Number of Sender Delete messages sent by TE to RSVP.
Path Delete	Number of RSVP Path Delete messages received.
Total	Total signaling messages received from RSVP.
Unknown	Unknown messages include fast reroute events and internal messages related to process restart.

This is sample output from the **show mpls traffic-eng counters soft-preemption** command, which displays statistics for the soft preempted LSPs:

```
RP/0/RP0/CPU0:routershow mpls traffic-eng counters soft-preemption
```

show mpls traffic-eng counters signaling

```

Soft Preemption Global Counters:
Last Cleared: Never
Preemption Node Stats:
  Number of soft preemption events: 1
  Number of soft preempted LSPs: 1
  Number of soft preempted LSPs that timed out: 0
  Number of soft preempted LSPs that were torn down: 0
  Number of soft preempted LSPs that were fast rerouted: 0
  Minimum Time in Soft Preemption Pending State (sec): 0
  Maximum Time in Soft Preemption Pending State (sec): 0
  Average Time in Soft Preemption Pending State (sec): 0
Headend Stats:
  Number of soft preempted LSPs: 1
  Number of reoptimized soft preempted headend-LSPs: 0
  Number of path protected switchover soft preempted headend-LSPs: 0
  Number of torn down soft preempted headend-LSPs: 0

```

This is sample output from the **show mpls traffic-eng counters signaling all** command that displays the *Signalled-Name* information:

```

RP/0/RP0/CPU0:router#show mpls traffic-eng counters signaling all
Tunnel Head: tunnel-tel
Signalled-Name: rtrA_t1
Cumulative Tunnel Counters:
  Signalling Events      Recv      Xmit  Signalling Events      Recv      Xmit
  PathCreate             2         2     ResvCreate             2         0

```

show mpls traffic-eng forwarding

To display forwarding information on tunnels that were admitted locally, use the **show mpls traffic-eng forwarding** command in XR EXEC mode.

```
show mpls traffic-eng forwarding [backup-name tunnel-name] [source source-address][tunnel-id
tunnel-id] [interface {in | inout | out} type interface-path-id][{ p2p}] {p2p} [detail]
```

Syntax Description	
backup-name <i>tunnel-name</i>	(Optional) Restricts tunnels with this backup tunnel name.
source <i>source-address</i>	(Optional) Restricts tunnels for this specified tunnel source IPv4 address.
tunnel-id <i>tunnel-id</i>	(Optional) Restricts tunnels for this tunnel identifier. Range for the <i>tunnel-id</i> argument is from 0 to 65535.
interface	(Optional) Displays information on the specified interface.
<i>type</i>	(Optional) Interface type. For more information, use the question mark (?) online help function.
<i>interface-path-id</i>	Physical interface or a virtual interface. Note Use the show interfaces command to see a list of all possible interfaces currently configured on the router.
	For more information about the syntax for the router, use the question mark (?) online help function.
in	Displays information for the input interface.
inout	Displays information for either the input or output interface.
out	Displays information for the output interface.
p2p	(Optional) Displays only Point-to-Point (P2P) information.
detail	(Optional) Displays detailed forwarding information.
Command Default	No default behavior or values
Command Modes	XR EXEC mode

show mpls traffic-eng forwarding

Command History	Release	Modification
	Release 6.2.1	This command was introduced.

Usage Guidelines No specific guidelines impact the use of this command.

Task ID	Task ID	Operations
	mpls-te	read

Examples

The following shows a sample output from the **show mpls traffic-eng forwarding** command:

```
RP/0/RP0/CPU0:router# show mpls traffic-eng forwarding

Tue Sep 15 14:22:39.609 UTC P2P tunnels

Tunnel ID          Ingress IF          Egress IF          In lbl  Out lbl
-----
Backup tunnel
-----
172.16.0.1 2_2      HundredGigE0/0/0/3  HundredGigE0/0/0/4  16004  16020
unknown
198.51.100.1 1_23      -                  HundredGigE0/0/0/3  16000  3
tt1300
198.51.100.1 1100_9    -                  HundredGigE0/0/0/3  16002
16001 unknown
198.51.100.1 1200_9    -                  HundredGigE0/0/0/3  16001
16000 unknown
198.51.100.1 1300_2    -                  HundredGigE0/0/0/4  16005
16021 unknown
198.51.100.1 1400_9    -                  HundredGigE0/0/0/3  16003
16002 unknown
```

This table describes the significant fields shown in the display.

Table 50: show mpls traffic-eng forwarding Field Descriptions

Field	Description
TUNNEL ID	Tunnel identification.
Ingress IF	Ingress interface of the tunnel.
Egress IF	Egress interface of the tunnel.
In lbl	Incoming label associated with the tunnel.
Out lbl	Outgoing label associated with the tunnel.
Backup tunnel	Fast Reroute backup tunnel

show mpls traffic-eng forwarding-adjacency

To display forwarding-adjacency information for an IPv4 address, use the **show mpls traffic-eng forwarding-adjacency** command in XR EXEC mode.

```
show mpls traffic-eng forwarding-adjacency [IP-address]
```

Syntax Description	<i>IP-address</i> (Optional) Destination IPv4 address for forwarding adjacency.				
Command Default	No default behavior or values				
Command Modes	XR EXEC mode				
Command History	<table border="1"> <thead> <tr> <th>Release</th> <th>Modification</th> </tr> </thead> <tbody> <tr> <td>Release 6.2.1</td> <td>This command was introduced.</td> </tr> </tbody> </table>	Release	Modification	Release 6.2.1	This command was introduced.
Release	Modification				
Release 6.2.1	This command was introduced.				
Usage Guidelines	No specific guidelines impact the use of this command.				
Task ID	<table border="1"> <thead> <tr> <th>Task ID</th> <th>Operations</th> </tr> </thead> <tbody> <tr> <td>mpls-te</td> <td>read</td> </tr> </tbody> </table>	Task ID	Operations	mpls-te	read
Task ID	Operations				
mpls-te	read				

Examples

This is a sample output from the **show mpls traffic-eng forwarding-adjacency** command:

```
RP/0/RP0/CPU0:router# show mpls traffic-eng forwarding-adjacency
destination 192.168.0.1 has 1 tunnels
tunnel-te1 (traffic share 0, next-hop 192.168.0.1)
(Adjacency Announced: yes, holdtime 0)
```

This sample output displays information on IPv6 autoroute forwarding adjacency information for IS-IS IGP:

```
RP/0/RP0/CPU0:router#show mpls traffic-eng forwarding-adjacency
destination 192.168.0.1 has 1 tunnels
tunnel-te10 (traffic share 0, next-hop 192.168.0.1)
(Adjacency Announced: yes, holdtime 0)
(IS-IS 100, IPv4 unicast)
(IS-IS 100, IPv6 unicast)
```

show mpls traffic-eng igp-areas

To display MPLS-TE internal area storage, use the **show mpls traffic-eng igp-areas** command in XR EXEC mode.

show mpls traffic-eng igp-areas [detail]

Syntax Description	detail (Optional) Displays detailed information about the configured MPLS-TE igp-areas and communication statistics with IGPs.
---------------------------	---

Command Default	No default behavior or values
------------------------	-------------------------------

Command Modes	XR EXEC mode
----------------------	--------------

Command History	Release	Modification
	Release 6.2.1	This command was introduced.

Usage Guidelines	No specific guidelines impact the use of this command.
-------------------------	--

Task ID	Task ID	Operations
	mpls-te	read

Examples

The following shows a sample output from the **show mpls traffic-eng igp-areas** command:

```
RP/0/RP0/CPU0:router# show mpls traffic-eng igp-areas
```

```
MPLS-TE IGP Areas
```

```
Global router-id:          10.144.144.144
Global optical router-id:  Not available
```

```
IS-IS 100
```

```
IGP ID:                    0000.0000.0044
TE router ID configured:   10.144.144.144
                           in use:      10.144.144.144
Link connection:          up
Topology/tunnel connection: up
```

```
level 2
```

```
TE index: 1
IGP config for TE: complete
Local links flooded in this IGP level: 1
Flooding beacon sent and received
P2P tunnel heads running over this IGP level: 1
  1 AA, 0 FA
```

```
Tunnel loose-hops expanded over this IGP level: 0
```

```
OSPF 100
```

```
IGP ID: 10.144.144.144
TE router ID configured: 10.144.144.144
      in use: 10.144.144.144
Link connection: up
Topology/tunnel connection: up
```

```
area 0
```

```
TE index: 0
IGP config for TE: complete
Local links flooded in this IGP area: 2
Flooding beacon sent and received
P2P tunnel heads running over this IGP area: 3
      1 AA, 0 FA
Tunnel loose-hops expanded over this IGP area: 0
```

The following shows a sample output from the **show mpls traffic-eng igp-areas** command:

```
RP/0/RP0/CPU0:router# show mpls traffic-eng igp-areas
```

```
MPLS-TE IGP Areas
Global router-id: 0.0.0.0
Global optical router-id: Not available
OSPF 0
IGP ID: 101.0.0.1
TE router ID configured: 101.0.0.1
      in use: 101.0.0.1
Link connection: up
Topology/tunnel connection: up
area 4
TE index: 0
IGP config for TE: complete
Number of links in this IGP area: 1
Number of tunnel heads running over this IGP area: 0
Number of tunnel loose-hops expanded over this IGP area: 0
area 3
TE index: 1
IGP config for TE: complete
Number of links in this IGP area: 1
Number of tunnel heads running over this IGP area: 0
Number of tunnel loose-hops expanded over this IGP area: 0
area 2
TE index: 2
IGP config for TE: complete
Number of links in this IGP area: 1
Number of tunnel heads running over this IGP area: 0
Number of tunnel loose-hops expanded over this IGP area: 0
area 1
TE index: 3
IGP config for TE: complete
Number of links in this IGP area: 1
Number of tunnel heads running over this IGP area: 0
Number of tunnel loose-hops expanded over this IGP area: 0
area 0
TE index: 4
IGP config for TE: complete
Number of links in this IGP area: 2
Number of tunnel heads running over this IGP area: 1
Number of tunnel loose-hops expanded over this IGP area: 0
```

This table describes the significant fields shown in the display.

Table 51: show mpls traffic-eng igp-areas Command Field Descriptions

Field	Description
Global router-id	Global router ID on this node.
IGP ID	IGP System ID.
area	IGP area.
TE index	Internal index in the IGP area table.
IGP config for TE	Whether the IGP configuration is complete or missing.

show mpls traffic-eng link-management admission-control

To display which tunnels were admitted locally and their parameters, use the **show mpls traffic-eng link-management admission-control** command in XR EXEC mode.

show mpls traffic-eng link-management admission-control [*interface type interface-path-id*]

Syntax Description	interface	(Optional) Displays information on the specified interface.
	<i>type</i>	(Optional) Interface type. For more information, use the question mark (?) online help function.
	<i>interface-path-id</i>	Physical interface or virtual interface.
	Note	Use the show interfaces command to see a list of all possible interfaces currently configured on the router.
		For more information about the syntax for the router, use the question mark (?) online help function.

Command Default No default behavior or values

Command Modes XR EXEC mode

Command History	Release	Modification
	Release 6.2.1	This command was introduced.

Usage Guidelines No specific guidelines impact the use of this command.

Task ID	Task ID	Operations
	mpls-te	read

Examples

The following shows a sample output from the **show mpls traffic-eng link-management admission-control** command:

```
RP/0/RP0/CPU0:router# show mpls traffic-eng link-management admission-control

S System Information:
  Tunnels Count      : 2
  Tunnels Selected  : 2
  Bandwidth descriptor legend:
    B0 = bw from pool 0, B1 = bw from pool 1, R = bw locked, H = bw held

TUNNEL ID           UP IF      DOWN IF      PRI STATE      BW (kbits/sec)
-----
```

show mpls traffic-eng link-management admission-control

```

10.10.10.10 1_34      -          HundredGigE0/0/0/3  7/7 Resv Admitted 100      RBO
10.10.10.10 15_2     -          HundredGigE0/0/0/3  7/7 Resv Admitted 0
B0

```

This table describes the significant fields shown in the display.

Table 52: show mpls traffic-eng link-management admission-control Command Field Descriptions

Field	Description
Tunnels Count	Total number of tunnels admitted.
Tunnels Selected	Number of tunnels displayed.
Bandwidth descriptor legend	BW pool type and status displayed with the tunnel entry. Shown as RG (Locked BW in global pool) in the preceding sample output.
TUNNEL ID	Tunnel identification.
UP IF	Upstream interface used by the tunnel.
DOWN IF	Downstream interface used by the tunnel.
PRI	Tunnel setup priority and hold priority.
STATE	Tunnel admission status.
BW (kbps)	Tunnel bandwidth in kilobits per second. If an R follows the bandwidth number, the bandwidth is reserved. If an H follows the bandwidth number, the bandwidth is temporarily being held for a Path message. If a G follows the bandwidth number, the bandwidth is from the global pool. If an S follows the bandwidth number the bandwidth is from the sub-pool.

The following shows a sample output from the **show mpls traffic-eng link-management interface** command:

```

RP/0/RP0/CPU0:router# show mpls traffic-eng link-management interface HundredGigE 0/0/0/3

System Information::
  Links Count          : 1

Link ID:: HundredGigE 0/0/0/3 (35.0.0.5)
Local Intf ID: 7
Link Status:

  Link Label Type      : PSC (inactive)
  Physical BW         : 155520 kbits/sec
  BCID                : RDM
  Max Reservable BW   : 0 kbits/sec (reserved: 100% in, 100% out)
  BC0 (Res. Global BW): 0 kbits/sec (reserved: 100% in, 100% out)
  BC1 (Res. Sub BW)   : 0 kbits/sec (reserved: 100% in, 100% out)
  MPLS-TE Link State  : MPLS-TE on, RSVP on
  Inbound Admission   : allow-all
  Outbound Admission  : allow-if-room
  IGP Neighbor Count   : 0
  Max Res BW (RDM)    : 0 kbits/sec

```

```

BC0 (RDM)                : 0 kbits/sec
BC1 (RDM)                : 0 kbits/sec
Max Res BW (MAM)        : 0 kbits/sec
BC0 (MAM)               : 0 kbits/sec
BC1 (MAM)               : 0 kbits/sec
Admin Weight            : 1 (OSPF), 10 (ISIS)
Attributes               : 0x5 (name-based)
Flooding Status: (1 area)
  IGP Area[1]: ospf 100 area 0, not flooded
                (Reason: Interface has been administratively disabled)

```

This table describes the significant fields shown in the display.

Table 53: show mpls traffic-eng link-management interface Command Field Descriptions

Field	Description
Links Count	Number of links configured for MPLS-TE.
Link ID	Index of the link described.
Local Intf ID	Local interface ID.
Link Label Type	Label type of the link, for instance: PSC ¹⁸ , TDM ¹⁹ , FSC ²⁰ .
Physical BW	Link bandwidth capacity (in kilobits per second).
BCID	Bandwidth constraint model ID (RDM or MAM).
Max Reservable BW	Maximum reservable bandwidth on this link.
BC0 (Res. Global BW)	Bandwidth constraint value for class-type 0.
BC1 (Res. Sub BW)	Bandwidth constraint value for class-type 1.
MPLS-TE Link State	Status of the link MPLS-TE-related functions.
Inbound Admission	Link admission policy for incoming tunnels.
Outbound Admission	Link admission policy for outgoing tunnels.
IGP Neighbor Count	IGP neighbors directly reachable over this link.
Max Res BW (RDM)	Maximum reservable bandwidth on this link for RDM.
BC0 (RDM)	Bandwidth constraint value for RDM.
BC1 (RDM)	Bandwidth constraint value for RDM.
Admin Weight	Administrative weight associated with this link.
Attributes	Interface attributes referring to one or more affinity names.
IGP Area[1]	IGP type and area and level used for TE flooding.

¹⁸ PSC = Packet switch capable.

¹⁹ TDM = Time-division multiplexing.

²⁰ FSC = Fiber switch capable.

show mpls traffic-eng link-management advertisements

To display local link information that MPLS-TE link management is currently flooding into the global TE topology, use the **show mpls traffic-eng link-management advertisements** command in XR EXEC mode.

show mpls traffic-eng link-management advertisements

Syntax Description This command has no arguments or keywords.

Command Default No default behavior or values

Command Modes XR EXEC mode

Command History	Release	Modification
	Release 6.2.1	This command was introduced.

Usage Guidelines The **show mpls traffic-eng link-management advertisements** command has two output formats depending on the Diff-Serv TE Mode: one for prestandard mode and one for IETF mode.

The SRLG values are advertised for the link.

Task ID	Task ID	Operations
	mpls-te	read

Examples

The following shows a sample output from the **show mpls traffic-eng link-management advertisements** command:

```
RP/0/RP0/CPU0:router# show mpls traffic-eng link-management advertisements

Link ID:: 0 (GigabitEthernet0/2/0/1)
  Link IP Address      : 12.9.0.1
  O/G Intf ID         : 28
  Designated Router   : 12.9.0.2
  TE Metric           : 1
  IGP Metric          : 1
  Physical BW         : 1000000 kbits/sec
  BCID                : RDM
  Max Reservable BW   : 10000 kbits/sec
  Res Global BW       : 10000 kbits/sec
  Res Sub BW          : 0 kbits/sec
  SRLGs               : 10, 20

Downstream::
                Global Pool  Sub Pool
                -----
Reservable BW[0]:          10000          0 kbits/sec
Reservable BW[1]:          10000          0 kbits/sec
Reservable BW[2]:           9800          0 kbits/sec
```

show mpls traffic-eng link-management advertisements

```

Reservable BW[3]:          9800          0 kbits/sec
Reservable BW[4]:          9800          0 kbits/sec
Reservable BW[5]:          9800          0 kbits/sec
Reservable BW[6]:          9800          0 kbits/sec
Reservable BW[7]:          9800          0 kbits/sec

Attribute Flags: 0x00000004
Attribute Names: red2

Link ID:: 1 (GigabitEthernet0/2/0/2)
Link IP Address      : 14.9.0.1
O/G Intf ID         : 29
Designated Router   : 14.9.0.4
TE Metric           : 1
IGP Metric          : 1
Physical BW         : 1000000 kbits/sec
BCID                : RDM
Max Reservable BW   : 750000 kbits/sec
Res Global BW       : 750000 kbits/sec
Res Sub BW          : 0 kbits/sec

Downstream::

Global Pool      Sub Pool
-----
Reservable BW[0]: 750000          0 kbits/sec
Reservable BW[1]: 750000          0 kbits/sec
Reservable BW[2]: 750000          0 kbits/sec
Reservable BW[3]: 750000          0 kbits/sec
Reservable BW[4]: 750000          0 kbits/sec
Reservable BW[5]: 750000          0 kbits/sec
Reservable BW[6]: 750000          0 kbits/sec
Reservable BW[7]: 750000          0 kbits/sec

Attribute Flags: 0x00000000
Attribute Names:

```

This table describes the significant fields shown in the display.

Table 54: show mpls traffic-eng link-management advertisements Command Field Descriptions

Field	Description
Link ID	Index of the link described.
Link IP Address	Local IP address of the link.
TE Metric	Metric value for the TE link configured under MPLS-TE.
IGP Metric	Metric value for the TE link configured under IGP.
Physical BW	Link bandwidth capacity (in kilobits per second).
BCID	Bandwidth constraint model ID (RDM or MAM).
Max Reservable BW	Maximum reservable bandwidth on this link.
Res Global BW	Maximum reservable of global pool/BC0 bandwidth on this link.
Res Sub BW	Reservable sub-bandwidth for sub-pool /BC1 bandwidth on this link.

Field	Description
SRLGs ²¹	Links that share a common fiber or a common physical attribute. If one link fails, other links in the group may also fail. Links in the group have a shared risk.
Downstream	Direction of the LSP path message.
Reservable BW[x]	Bandwidth available for reservations in the global TE topology and subpools.
Attribute Flags	Link attribute flags being flooded.
Attribute Names	Name of the affinity attribute of a link.
BC0	Bandwidth constraint value for class-type 0
BC1	Bandwidth constraint value for class-type 1
TE-class [index]	TE-class configured on this router at given index (mapping of class-type and priority), shows available bandwidth in that class.

²¹ SRLGs = Shared Risk Link Groups.

show mpls traffic-eng link-management bandwidth-allocation

To display current local link information, use the **show mpls traffic-eng link-management bandwidth-allocation** command in XR EXEC mode.

show mpls traffic-eng link-management bandwidth-allocation [*interface type interface-path-id*]

Syntax Description	interface	(Optional) Displays information on the specified interface.
	<i>type</i>	(Optional) Interface type. For more information, use the question mark (?) online help function.
	<i>interface-path-id</i>	Physical interface or a virtual interface.
	Note	Use the show interfaces command to see a list of all possible interfaces currently configured on the router.
		For more information about the syntax for the router, use the question mark (?) online help function.

Command Default No default behavior or values

Command Modes XR EXEC mode

Command History	Release	Modification
	Release 6.2.1	This command was introduced.

Usage Guidelines Advertised and current information may differ depending on how flooding is configured.

Task ID	Task ID	Operations
	mpls-te	read

Examples

The following shows a sample output from the **show mpls traffic-eng link-management bandwidth-allocation** command:

```
RP/0/RP0/CPU0:router# show mpls traffic-eng link bandwidth-allocation interface HundredGigE0/0/0/3

System Information::
  Links Count          : 4
  Bandwidth Hold time : 15 seconds

  Link ID: HundredGigE0/0/0/3 (7.2.2.1)
  Local Intf ID: 4
  Link Status:
  Link Label Type     : PSC
```



```

Physical BW      : 155520 kbits/sec
BCID            : MAM
Max Reservable BW : 1000 kbits/sec (reserved: 0% in, 0% out)
BC0            : 600 kbits/sec (reserved: 2% in, 2% out)
BC1            : 400 kbits/sec (reserved: 0% in, 0% out)
MPLS-TE Link State : MPLS-TE on, RSVP on, admin-up, flooded
Inbound Admission : allow-all
Outbound Admission : allow-if-room
IGP Neighbor Count : 2
BW Descriptors   : 1 (including 0 BC1 descriptors)
Admin Weight     : 1 (OSPF), 10 (ISIS)
Up Thresholds    : 15 30 45 60 75 80 85 90 95 96 97 98 99 100 (default)
Down Thresholds  : 100 99 98 97 96 95 90 85 80 75 60 45 30 15 (default)

```

Bandwidth Information::

Downstream BC0 (kbits/sec):

KEEP	PRIORITY	BW HELD	BW TOTAL HELD	BW LOCKED	BW TOTAL LOCKED
0		0	0	0	0
1		0	0	0	0
2		0	0	0	0
3		0	0	0	0
4		0	0	0	0
5		0	0	0	0
6		0	0	0	0
7		0	0	10	10

Downstream BC1 (kbits/sec):

KEEP	PRIORITY	BW HELD	BW TOTAL HELD	BW LOCKED	BW TOTAL LOCKED
0		0	0	0	0
1		0	0	0	0
2		0	0	0	0
3		0	0	0	0
4		0	0	0	0
5		0	0	0	0
6		0	0	0	0

This table describes the significant fields shown in the display.

Table 55: show mpls traffic-eng link-management bandwidth-allocation Command Field Descriptions

Field	Description
Links Count	Number of links configured for MPLS-TE.
Bandwidth Hold Time	Time, in seconds, that bandwidth can be held.
Link ID	Interface name and IP address of the link.
Link Label type	Label type of the link, for example: <ul style="list-style-type: none"> • PSC²² • TDM²³ • FSC²⁴
Physical BW	Link bandwidth capacity (in bits per second).

Field	Description
BCID	Bandwidth constraint model ID (RDM or MAM).
Max Reservable BW	Maximum reservable bandwidth on this link.
BC0	Maximum RSVP bandwidth in BC0.
BC1	Maximum RSVP bandwidth in BC1.
BW Descriptors	Number of bandwidth allocations on this link.
MPLS-TE Link State	Status of the link MPLS-TE-related functions.
Inbound Admission	Link admission policy for incoming tunnels.
Outbound Admission	Link admission policy for outgoing tunnels.
IGP Neighbor Count	IGP neighbors directly reachable over this link.
BW Descriptors	Internal bandwidth descriptors created when tunnels are admitted.
Admin Weight	Administrative weight associated with this link.
Up Thresholds	Threshold values used to determine link advertisement when available bandwidth increases.
Down Thresholds	Threshold values used to determine link advertisement when available bandwidth decreases.

²² PSC = Packet switch capable.

²³ TDM = Time-division multiplexing.

²⁴ FSC = Fiber switch capable.

show mpls traffic-eng link-management igp-neighbors

To display Interior Gateway Protocol (IGP) neighbors, use the **show mpls traffic-eng link-management igp-neighbors** command in XR EXEC mode.

```
show mpls traffic-eng link-management igp-neighbors [igp-id {isis isis-address | ospf ospf-id}
[{interface type interface-path-id IP-address}]]
```

Syntax Description	igp-id	(Optional) Displays the IGP neighbors that are using a specified IGP identification.
	isis <i>isis-address</i>	Displays the specified Intermediate System-to-Intermediate System (IS-IS) neighbor system ID when neighbors are displayed by IGP ID.
	ospf <i>ospf-id</i>	Displays the specified Open Shortest Path first (OSPF) neighbor OSPF router ID when neighbors are displayed by IGP ID.
	interface	(Optional) Displays information on the specified interface.
	<i>type</i>	Interface type. For more information, use the question mark (?) online help function.
	<i>interface-path-id</i>	Physical interface or a virtual interface.
	Note	Use the show interfaces command to see a list of all possible interfaces currently configured on the router.
		For more information about the syntax for the router, use the question mark (?) online help function.
	<i>IP-address</i>	(Optional) IGP neighbors that are using a specified IGP IP address.

Command Modes XR EXEC mode

Command History	Release	Modification
	Release 6.2.1	This command was introduced.

Usage Guidelines No specific guidelines impact the use of this command.

Task ID	Task ID	Operations
	mpls-te	read

Examples

The following shows a sample output from the **show mpls traffic-eng link-management igp-neighbors** command:

```
RP/0/RP0/CPU0:router# show mpls traffic-eng link igp-neighbors
```

show mpls traffic-eng link-management igp-neighbors

```
Link ID: HundredGigE0/0/0/3  
No Neighbors
```

```
Link ID: HundredGigE0/0/0/4  
Neighbor ID: 10.90.90.90 (area: ospf area 0, IP: 10.15.12.2)
```

This table describes the significant fields shown in the display.

Table 56: show mpls traffic-eng link-management igp-neighbors Command Field Descriptions

Field	Description
Link ID	Link by which the neighbor is reached.
Neighbor ID	IGP identification information for the neighbor.

show mpls traffic-eng link-management interfaces

To display interface resources, or a summary of link management information, use the **show mpls traffic-eng link-management interfaces** command in XR EXEC mode.

show mpls traffic-eng link-management interfaces [*type interface-path-id*]

Syntax Description	<p><i>type</i> (Optional) Interface type. For more information, use the question mark (?) online help function.</p> <hr/> <p><i>interface-path-id</i> Physical interface or a virtual interface.</p> <p>Note Use the show interfaces command to see a list of all possible interfaces currently configured on the router.</p> <p>For more information about the syntax for the router, use the question mark (?) online help function.</p>
---------------------------	--

Command Default No default behavior or values

Command Modes XR EXEC mode

Command History	Release	Modification
	Release 6.2.1	This command was introduced.

Usage Guidelines You cannot configure more than 250 links under MPLS-TE. SRLG values can be configured for the link.

Task ID	Task ID	Operations
	mpls-te	read

Examples The following sample output is from the **show mpls traffic-eng link-management interfaces** command:

```
RP/0/RP0/CPU0:router# show mpls traffic-eng link-management interfaces HundredGigE 0/0/0/3

System Information::
  Links Count          : 7 (Maximum Links Supported 250)

Link ID:: HundredGigE0/0/0/3 (12.9.0.1)
  Local Intf ID: 28
  Link Status:

  Link Label Type      : PSC
  Physical BW          : 1000000 kbits/sec
```

show mpls traffic-eng link-management interfaces

```

BCID                : RDM
Max Reservable BW   : 10000 kbits/sec (reserved: 2% in, 2% out)
BC0 (Res. Global BW): 10000 kbits/sec (reserved: 2% in, 2% out)
BC1 (Res. Sub BW)   : 0 kbits/sec (reserved: 100% in, 100% out)
MPLS TE Link State  : MPLS TE on, RSVP on, admin-up
Inbound Admission   : reject-huge
Outbound Admission  : allow-if-room
IGP Neighbor Count  : 1
Max Res BW (RDM)    : 10000 kbits/sec
BC0 (RDM)           : 10000 kbits/sec
BC1 (RDM)           : 0 kbits/sec
Max Res BW (MAM)    : 0 kbits/sec
BC0 (MAM)           : 0 kbits/sec
BC1 (MAM)           : 0 kbits/sec
Attributes           : 0x4
Attribute Names     : red2
Flooding Status: (1 area)
  IGP Area[1]: OSPF 100 area 0, flooded
    Nbr: ID 12.9.0.2, IP 0.0.0.0 (Up)
    Admin weight: not set (TE), 1 (IGP)

```

This table describes the significant fields shown in the display.

Table 57: show mpls traffic-eng link-management interfaces Command Field Descriptions

Field	Description
Links Count	Number of links configured for MPLS-TE. Maximum number of links supported is 100.
Link ID	Link identification index.
Link Label Type	Label type assigned to the link.
Physical Bandwidth	Link bandwidth capacity (in kilobits per second).
BCID	Bandwidth constraint model ID (RDM or MAM).
Max Reservable BW	Maximum reservable bandwidth on this link.
BC0	Reservable bandwidth (in kbps) on this link in BC0.
BC1	Reservable bandwidth (in kbps) on this link in BC1.
Attributes	TE link attribute in hexadecimal.
Attribute Names	Name of the affinity attribute of a link.
SRLGs ²⁵	Links that share a common fiber or a common physical attribute. If one link fails, other links in the group may also fail. Links in the group have a shared risk.
MPLS-TE Link State	Status of the MPLS link.
Inbound Admission	Link admission policy for inbound tunnels.
Outbound Admission	Link admission policy for outbound tunnels.
IGP Neighbor Count	IGP ²⁶ neighbors directly reachable over this link.

Field	Description
Admin. Weight	Administrative weight associated with this link.
Flooding Status	Status for each configured area or Flooding status for the configured area.
IGP Area	IGP type and area and level used for TE flooding.

²⁵ SRLGs = Shared Risk Link Groups.

²⁶ IGP = Interior Gateway Protocol .

show mpls traffic-eng link-management statistics

To display interface resources or a summary of link management information, use the **show mpls traffic-eng link-management statistics** command in XR EXEC mode.

show mpls traffic-eng link-management statistics [{summary | interface *type interface-path-id*}

Syntax Description

summary	(Optional) Displays the statistics summary.
interface	(Optional) Displays the interface for which information is requested.
type	(Optional) Interface type. For more information, use the question mark (?) online help function.
interface-path-id	Physical interface or virtual interface.
Note	Use the show interfaces command to see a list of all possible interfaces currently configured on the router.
	For more information about the syntax for the router, use the question mark (?) online help function.

Command Default

No default behavior or values

Command Modes

XR EXEC mode

Command History

Release	Modification
Release 6.2.1	This command was introduced.

Usage Guidelines

The **show mpls traffic-eng link-management statistics** command displays resource and configuration information for all configured interfaces.

Task ID

Task ID	Operations
mpls-te read	

Examples

The following shows a sample output from the **show mpls traffic-eng link-management statistics** command using the **summary** keyword:

```
RP/0/RP0/CPU0:router# show mpls traffic-eng link-management statistics summary

LSP Admission Statistics:

      Setup      Setup      Setup      Setup      Tear      Tear      Tear
      Requests  Admits   Rejects   Errors   Requests  Preempts  Errors
      -----  -----  -----  -----  -----  -----  -----
```



```

Path      13      12      1      0      10      0      0
Resv      8       8       0      0       5       0      0

```

Table 58: show mpls traffic-eng link-management statistics summary Command Field Descriptions, on page 389 describes the significant fields shown in the display.

Table 58: show mpls traffic-eng link-management statistics summary Command Field Descriptions

Field	Description
Path	Path information.
Resv	Reservation information.
Setup Requests	Number of requests for a setup.
Setup Admits	Number of admitted setups.
Setup Rejects	Number of rejected setups.
Setup Errors	Number of setup errors.
Tear Requests	Number of tear requests.
Tear Preempts	Number of paths torn down due to preemption.
Tear Errors	Number of tear errors.

show mpls traffic-eng link-management summary

To display a summary of link management information, use the **show mpls traffic-eng link-management summary** command in XR EXEC mode.

show mpls traffic-eng link-management summary

Syntax Description This command has no arguments or keywords.

Command Default No default behavior or values

Command Modes XR EXEC mode

Command History	Release	Modification
	Release 6.2.1	This command was introduced.

Usage Guidelines You cannot configure more than 250 links for MPLS-TE/FRR.

Task ID	Task ID	Operations
	mpls-te	read

Examples

The following sample output is from the **show mpls traffic-eng link-management summary** command:

```
RP/0/RP0/CPU0:router# show mpls traffic-eng link-management summary
```

```
System Information::
  Links Count       : 6 (Maximum Links Supported 100)
  Flooding System   : enabled
  IGP Areas Count   : 2

IGP Areas
-----

IGP Area[1]:: isis level-2
  Flooding Protocol : ISIS
  Flooding Status   : flooded
  Periodic Flooding : enabled (every 180 seconds)
  Flooded Links     : 4
  IGP System ID     : 0000.0000.0002.00
  MPLS-TE Router ID : 20.20.20.20
  IGP Neighbors     : 8

IGP Area[2]:: ospf area 0
  Flooding Protocol : OSPF
  Flooding Status   : flooded
  Periodic Flooding : enabled (every 180 seconds)
  Flooded Links     : 4
```

```

IGP System ID       : 20.20.20.20
MPLS-TE Router ID  : 20.20.20.20
IGP Neighbors       : 8

```

This table describes the significant fields shown in the display.

Table 59: show mpls traffic-eng link-management summary Command Field Descriptions

Field	Description
Links Count	Number of links configured for MPLS-TE. Maximum number of links supported is 100.
Flooding System	Enable status of the MPLS-TE flooding system.
IGP Areas Count	Number of IGP ²⁷ areas described.
IGP Area	IGP type and area and level used for TE flooding.
Flooding Protocol	IGP flooding information for this area.
Flooding Status	Status of flooding for this area.
Periodic Flooding	Status of periodic flooding for this area.
Flooded Links	Links that were flooded.
IGP System ID	IGP for the node associated with this area.
MPLS-TE Router ID	MPLS-TE router ID for this node.
IGP Neighbors	Number of reachable IGP neighbors associated with this area.

²⁷ IGP = Interior Gateway Protocol.

show mpls traffic-eng maximum tunnels

To display the maximum number of MPLS-TE tunnels that you can configure, use the **show mpls traffic-eng maximum tunnels** command in XR EXEC mode.

show mpls traffic-eng maximum tunnels

Syntax Description This command has no keywords or arguments.

Command Default None

Command Modes XR EXEC mode

Command History	Release	Modification
	Release 6.2.1	This command was introduced.

Usage Guidelines No specific guidelines impact the use of this command.

Task ID	Task ID	Operations
	mpls-te	read

Examples

This is sample output from the **show mpls traffic-eng maximum tunnels** command:

```
RP/0/RP0/CPU0:router# show mpls traffic-eng maximum tunnels
```

```
Maximum Global Tunnel Count:
```

```
Maximum          Current Count
-----          -
4096              2
```

```
Maximum Global Destination Count:
```

```
Maximum          Current Count
-----          -
4096              2
```

```
Maximum AutoTunnel Backup Count:
```

```
Maximum          Current Count
-----          -
200              122
```

This is sample output of the automatic mesh tunnels from the **show mpls traffic-eng maximum tunnels** command:

```
RP/0/RP0/CPU0:router# show mpls traffic-eng maximum tunnels

Maximum Global Tunnel Count:

Maximum      Current Count
-----      -
4096         12

Maximum Static Tunnel Count:

Maximum      Current Count
-----      -
4096         8

Maximum Auto-tunnel Mesh Count:

Maximum      Current Count
-----      -
201          3

Maximum Global Destination Count:

Maximum      Current Count
-----      -
4096         13

Maximum GMPLS-UNI Tunnel Count:

Maximum      Current Count
-----      -
500          39
```

[Table 60: show mpls traffic-eng maximum tunnels Command Field Descriptions, on page 393](#) describes the significant fields shown in the display.

Table 60: show mpls traffic-eng maximum tunnels Command Field Descriptions

Field	Description
Maximum Global Tunnel Count	Maximum number of tunnel interfaces (all TE tunnel types, tunnel-te, tunnel-mte, and tunnel-gte) that can be configured.
Maximum Global Tunnel Count	Maximum number of tunnel interfaces (all TE tunnel types and tunnel-te) that can be configured.
Maximum Global Destination Count	Maximum number of tunnel destinations that can be configured.
Maximum	Table heading for the maximum number in each category.

Field	Description
Current Count	Table heading for the current count in each category.
Maximum AutoTunnel Backup Count	Maximum number of automatic backup tunnels that can be configured.
Maximum GMPLS UNI Tunnel Count	Maximum number of Generalized Multiprotocol Label Switching (GMPLS) User-Network Interface (UNI) tunnels that can be configured and the current tunnel count.
Maximum AutoTunnel Mesh Count	Maximum number of automatic mesh tunnels that can be configured.

show mpls traffic-eng preemption log

To display the log of preemption events, use the **show mpls traffic-eng preemption log** command in XR EXEC mode mode.

show mpls traffic-eng preemption log

Syntax Description	log Displays a log of preemption events.
---------------------------	---

Command Default	None
------------------------	------

Command Modes	XR EXEC mode
----------------------	--------------

Command History	Release	Modification
	Release 6.2.1	This command was introduced.

Usage Guidelines	No specific guidelines impact the use of this command.
-------------------------	--

Task ID	Task ID	Operation
	mpls-te	read

This is sample output from the **show mpls traffic-eng preemption log** command displaying the log of preemption events:

```
RP/0/RP0/CPU0:router# show mpls traffic-eng preemption log
Bandwidth Change on GigabitEthernet0/0/0/0
Old BW (BC0/BC1): 200000/100000, New BW (BC0/BC1): 1000/500 kbps
BW Overshoot (BC0/BC1): 1000/0 kbps
Preempted BW (BC0/BC1): 350000/0 kbps; Soft 30000/0 kbps; Hard 5000/0 kbps;
Preempted 2 tunnels; Soft 1 tunnel; Hard 1 tunnel
-----
TunID LSP ID          Source      Destination Preempt  Pri  Bandwidth  BW Type
Type                               S/H      (in kbps)
-----
   1  10002      192.168.0.1      1.0.0.0    Hard  7/7      5000      BC0
   1     2      192.168.0.1      192.168.0.4 Soft  7/7      30000     BC0
```

This sample output displays the log of soft-preemption over FRR backup tunnels events:

```
RP/0/RP0/CPU0:router#show mpls traffic-eng preemption log
Thu Apr 25 13:12:04.863 EDT
Bandwidth Change on GigabitEthernet0/0/0/1 at 04/25/2013 12:56:14
Old BW (BC0/BC1): 200000/100000, New BW (BC0/BC1): 100000/0 kbps
BW Overshoot (BC0/BC1): 30000/0 kbps
Preempted BW (BC0/BC1): 130000/0 kbps; Soft 60000/0 kbps; Hard 0/0 kbps; FRRSoft 70000/0
```

show mpls traffic-eng preemption log

```
Preempted 2 tunnel, 2 LSP; Soft 1 tunnel, 1 LSP; Hard 0 tunnels, 0 LSPs; FRRSoft 1
tunnel, 1 LSP
```

TunID	LSP ID	Source	Destination	Preempt Type	Pri S/H	Bandwidth (in kbps)	BW Type
1	13	192.168.0.1	192.168.0.3	FRRSoft	7/7	70000	BC0
2	22	192.168.0.1	192.168.0.3	Soft	7/7	60000	BC0

show mpls traffic-eng self-ping statistics

To display various self-ping counters collected over time, use the **show mpls traffic-eng self-ping statistics** command in XR EXEC mode.

show mpls traffic-eng self-ping statistics

Syntax Description This command has no keywords or arguments.

Command Default No default behavior or values

Command Modes XR EXEC mode

Command History	Release	Modification
	Release 7.5.3	This command was introduced.

Usage Guidelines No specific guidelines impact the use of this command.

Task ID	Task	Operations ID
	mpls-te	read

Examples

The following shows a sample output from the **show mpls traffic-eng self-ping statistics** :

```
Router# show mpls traffic-eng self-ping statistics
Self-Ping Statistics:
  Collected since: Tue Jun 14 09:35:52 2022 (1d04h ago)
  Operations:
    Started 2
    Running 0
    Successful 1
    Timed-out 1
    Terminated 0
  Probes sent 11
  Probes failed 0
  Received responses 1 (Average response time 00:00:00)
  Mismatched responses 0
```

The following table describes the significant fields shown in the display.

Table 61: show mpls traffic-eng self-ping statistics Command Field Descriptions

Field	Description
Started	Number of self-ping operations initiated.
Running	Number of active self-ping sessions (for tunnels under reoptimization) at the moment.
Successful	Number of successful (response received) self-ping operations.

Field	Description
Timed-out	Number of timed-out (response not received) self-ping operations.
Terminated	Number of terminated (intentionally stopped) self-ping operations.
Probes sent	Number of self-ping probe packets.
Probes failed	Number of errors occurred in sending self-ping probes. It is possible in OOR case or when packet sending layer experiences some trouble.
Received responses	Number of response probes received and the average time required to receive a probe since self-ping operation started.
Mismatched responses	Number of self-ping responses which cannot be matched to active self-ping session. It can happen in slower networks when LER send multiple probes out before first response received. First response stops self-ping for tunnel, but additional responses may come later. Those packets do not match active session anymore.

show mpls traffic-eng topology

To display the current MPLS-TE network topology for the node, use the **show mpls traffic-eng topology** command in XR EXEC mode.

```
show mpls traffic-eng topology [IP-address] [affinity] [brief] [{exclude-srlg
exclude-srlg-interface-address|explicit-path{identifier explicit-path-id-number|name explicit-path-name}]
priority level}] [{isis nsap-address | ospf ospf-address | [path {destination IP-address | tunnel
P2P-tunnel-number }]} | {router | network}}}] [srlg][static]
```

Syntax Description		
	<i>IP-address</i>	(Optional) Node IP address (router identifier to interface address).
	destination <i>IP-address</i>	Displays the LSP destination IPv4 address.
	exclude-srlg	Specifies an IP address to get SRLG values from for exclusion.
	explicit-path	Displays the explicit LSP path.
	tunnel	Displays the topology path that is based on the Point-to-Point (P2P) tunnel number.
	<i>P2P -tunnel-number</i>	P2P tunnel number. Range is 0 to 65535.
	affinity	(Optional) Displays the attribute values that are required for links carrying this tunnel. A 32-bit decimal number. Range is 0x0 to 0xFFFFFFFF, representing 32 attributes (bits), where the value of an attribute is 0 or 1.
	priority <i>level</i>	(Optional) Displays the priority used when signaling a LSP for this tunnel, to determine which existing tunnels can be preempted.
	isis <i>nsap-address</i>	(Optional) Displays the node router identification, if Intermediate System-to-Intermediate System (IS-IS) is enabled.
	ospf <i>ospf-address</i>	(Optional) Displays the node router identifier, if Open Shortest Path First (OSPF) is enabled.

path	(Optional) Displays the path to a destination from this router.
router	Displays the given OSPF address type of the router node.
network	Displays the given OSPF address type of the network node.
brief	(Optional) Displays the brief form of the output that provides a less detailed version of the topology.
srlg	(Optional) Displays the SRLG information.
static	(Optional) Displays the statically configured SRLG.

Command Default No default behavior or values

Command Modes XR EXEC mode

Command History	Release	Modification
	Release 6.2.1	This command was introduced.

Usage Guidelines No specific guidelines impact the use of this command.

Task ID	Task ID	Operations
	mpls-te read, write	

Examples

The following shows a sample output from the **show mpls traffic-eng topology** command specifying the tunnel number in brief form:

```
RP/0/RP0/CPU0:router# show mpls traffic-eng topology path tunnel 160

Tunnel160 Path Setup to 10.10.10.10: FULL_PATH
bw 100 (CT0), min_bw 0, metric: 10
setup_pri 7, hold_pri 7
affinity_bits 0x0, affinity_mask 0xffff
Hop0:10.2.2.1
Hop1:10.10.10.10
```

The following shows a sample output from the **show mpls traffic-eng topology** command specifying the destination IP address:

```
RP/0/RP0/CPU0:router# show mpls traffic-eng topology path destination 10.10.10.10
```

```
Path Setup to 10.10.10.10:
bw 0 (CT0), min_bw 999900, metric: 10
setup_pri 7, hold_pri 7
affinity_bits 0x0, affinity_mask 0xffffffff
Hop0:10.2.2.1
Hop1:10.10.10.10
```

The following shows a sample output from the **show mpls traffic-eng topology** command specifying the topology for the SRLG interfaces:

```
RP/0/RP0/CPU0:router# show mpls traffic-eng topology srlg
```

```
Tue Oct 6 13:10:30.342 UTC
My_System_id: 0000.0000.0005.00 (IS-IS 1 level-2)
```

SRLG	Interface Addr	TE Router ID	IGP Area ID
1	10.1.2.1	192.0.2.1	IS-IS 1 level-2
2	10.1.2.1	192.0.2.1	IS-IS 1 level-2
3	10.1.2.1	192.0.2.1	IS-IS 1 level-2
4	10.1.2.1	192.0.2.1	IS-IS 1 level-2
5	10.1.2.1	192.0.2.1	IS-IS 1 level-2
6	10.1.2.1	192.0.2.1	IS-IS 1 level-2
7	10.1.2.1	192.0.2.1	IS-IS 1 level-2
8	10.1.2.1	192.0.2.1	IS-IS 1 level-2
10	10.4.5.5	192.0.2.5	IS-IS 1 level-2
30	10.4.5.5	192.0.2.5	IS-IS 1 level-2
77	10.4.5.5	192.0.2.5	IS-IS 1 level-2
88	10.4.5.5	192.0.2.5	IS-IS 1 level-2
1500	10.4.5.5	192.0.2.5	IS-IS 1 level-2
10000000	10.4.5.5	192.0.2.5	IS-IS 1 level-2
4294967290	10.4.5.5	192.0.2.5	IS-IS 1 level-2
4294967295	10.4.5.5	192.0.2.5	IS-IS 1 level-2

The following shows a sample output from the **show mpls traffic-eng topology path destination** command specifying the topological path with SRLG exclusion:

```
RP/0/RP0/CPU0:router# show mpls traffic-eng topology path destination 100.0.0.2 exclude-srlg
10.4.5.5 isis 1 level 2
```

```
Tue Oct 6 13:13:44.053 UTC
Path Setup to 100.0.0.2:
bw 0 (CT0), min_bw 0, metric: 20
setup_pri 7, hold_pri 7
affinity_bits 0x0, affinity_mask 0xffff
Exclude SRLG Intf Addr : 10.4.5.5
SRLGs Excluded: 10, 30, 77, 88, 1500, 10000000
4294967290, 4294967295

Hop0:10.5.1.5
Hop1:10.5.1.1
Hop2:10.1.2.1
Hop3:10.1.2.2
Hop4:10.0.0.2
```

The following shows a sample output from the **show mpls traffic-eng topology path destination** command specifying the topological path based on a given explicit path:

show mpls traffic-eng topology

```
RP/0/RP0/CPU0:router# show mpls traffic-eng topology path destination 100.0.0.2 explicit-path
name exclude-srlg isis 1 level 2
```

```
Tue Oct 6 13:16:44.233 UTC
Path Setup to 100.0.0.2:
bw 0 (CT0), min_bw 0, metric: 20
setup_pri 7, hold_pri 7
affinity_bits 0x0, affinity_mask 0xffff
SRLGs Excluded: 10, 30, 77, 88, 1500, 10000000
                  4294967290, 4294967295, 1, 2, 3, 4
                  5, 6, 7, 8

Hop0:10.5.1.5
Hop1:10.5.1.1
Hop2:10.1.2.1
Hop3:10.1.2.2
Hop4:10.0.0.2
```

show mpls traffic-eng tunnels

To display information about MPLS-TE tunnels, use the **show mpls traffic-eng tunnels** command in XR EXEC mode.

```
show mpls traffic-eng tunnels [tunnel-number] [affinity] [all] [auto-bw] [attribute-set {all/tunnel-name}]
[auto-tunnel] [backup [{tunnel-number | auto-tunnel [mesh] mesh-value | [name tunnel-name] |
protected-interface type interface-path-id | {static | auto}}]] [brief] [destination destination-address]
[detail] [down] [interface {in | out | inout} type interface-path-id] [name tunnel-name] [p2p]
[property { backup-tunnel | fast-reroute}] [protection [{frr | path | tunnel-id tunnel-id | tabular}}]]
[reoptimized within-last interval][role {all | head | tail | middle}] [soft-preemption {desired |
triggered}}][source source-address] [suboptimal constraints {current | max | none}] [summary]
[tabular] [up] [class-type ct]
```

Syntax Description		
tunnel-number	(Optional) Number of the tunnel. Range is from 0 to 65535.	
attribute-set	(Optional) Restricts the display of tunnels with an attribute set.	
affinity	(Optional) Displays the affinity attributes for all outgoing links. The links, which are used by the tunnel, display color information.	
all	(Optional) Displays all MPLS-TE tunnels.	
auto-bw	(Optional) Restricts the display to tunnels when the automatic bandwidth is enabled.	
auto-tunnel	(Optional) Restricts the display of automatically created tunnels.	
mesh mesh-value	Displays the tunnels that belong to the specified auto-tunnel mesh group.	
backup	(Optional) Displays FRR ²⁸ backup tunnels information. The information includes the physical interface protected by the tunnel, the number of TE LSPs ²⁹ protected, and the bandwidth protected. (Optional) Displays backup information for automatic tunnels and FRR tunnels.	
name tunnel-name	(Optional) Displays the tunnel with given name.	
protected-interface	(Optional) Displays FRR protected interfaces.	
static	(Optional) Displays static backup tunnels.	
auto-tunnel	(Optional) Displays protected automatic backup tunnels.	

brief	(Optional) Displays the brief form of this command.
destination <i>destination-address</i>	(Optional) Restricts the display to tunnels destined for the specified IP address.
detail	(Optional) Displays detail information about headend tunnels.
down	(Optional) Displays tunnels that are down.
interface in	(Optional) Displays tunnels that use the specified input interface.
interface out	(Optional) Displays tunnels that use the specified output interface.
interface inout	(Optional) Displays tunnels that use the specified interface as an input or output interface.
<i>type</i>	(Optional) Interface type. For more information, use the question mark (?) online help function.
<i>interface-path-id</i>	Physical interface or a virtual interface. Note Use the show interfaces command to see a list of all possible interfaces currently configured on the router. For more information about the syntax for the router, use the question mark (?) online help function.
p2p	(Optional) Displays only P2P tunnels.
property backup-tunnel	(Optional) Displays tunnels with property of backup tunnel. Selects MPLS-TE tunnels used to protect physical interfaces on this router. A tunnel configured to protect a link against failure is a backup tunnel and has the backup tunnel property.
property fast-reroute	(Optional) Displays tunnels with property of fast-reroute configured. Selects FRR-protected MPLS-TE tunnels originating on (head), transmitting (router), or terminating (tail) on this router.

protection	(Optional) Displays all protected tunnels (configured as fast-reroutable). Displays information about the protection provided to each tunnel selected by other options specified with this command. The information includes whether protection is configured for the tunnel, the protection (if any) provided to the tunnel by this router, and the tunnel bandwidth protected.
frr	(Optional) Displays all protected tunnels (configured as fast-reroutable).
path	(Optional) Displays information for the path-protection.
tunnel-id	(Optional) Displays information for the path-protection for a particular tunnel.
<i>tunnel-id</i>	(Optional) Tunnel identifier. The range is from 0 to 65535.
tabular	(Optional) Displays information for the path protection tunnel in tabular format.
reoptimized within-last <i>interval</i>	(Optional) Displays tunnels reoptimized within the last given time interval.
role all	(Optional) Displays all tunnels.
role head	(Optional) Displays tunnels with their heads at this router.
role middle	(Optional) Displays tunnels at the middle of this router.
role tail	(Optional) Displays tunnels with their tails at this router.
soft-preemption	Displays tunnels on which the soft-preemption feature is enabled.
source <i>source-address</i>	(Optional) Restricts the display to tunnels with a matching source IP address.
suboptimal constraints current	(Optional) Displays tunnels whose path metric is greater than the current shortest path constrained by the tunnel's configured options.
suboptimal constraints max	(Optional) Displays tunnels whose path metric is greater than the current shortest path, constrained by the configured options for the tunnel, and taking into consideration only the network capacity.

suboptimal constraints none	(Optional) Displays tunnels whose path metric is greater than the shortest unconstrained path.
summary	(Optional) Displays summary of configured tunnels.
tabular	(Optional) Displays a table showing TE LSPs, with one entry per line.
up	(Optional) Displays tunnels when the tunnel interface is up.
class-type <i>ct</i>	(Optional) Displays tunnels using the given class-type value configuration.

²⁸ FRR = Fast Reroute.

²⁹ LSPs = Label Switched Paths.

Command Default None

Command Modes XR EXEC mode

Command History	Release	Modification
	Release 6.2.1	This command was introduced.

Usage Guidelines Use the **brief** form of the **show mpls traffic-eng tunnels** command to display information specific to a tunnel interface. Use the command without the **brief** keyword to display information that includes the destination address, source ID, role, name, suboptimal constraints, and interface.

The **affinity** keyword is available for only the source router.

Selected tunnels would have a shorter path if they were reoptimized immediately.

To display the path-protection summary fields, you must configure the options for the path-protection.

Task ID	Task ID	Operations
	mpls-te	read, write

Examples

This sample output is not changed when no area is specified for the active path-option. If the area is specified, it is added on a line of its own after the existing path-option information.

```
RP/0/RP0/CPU0:router# show mpls traffic-eng tunnels 20 detail
```

```
Signalling Summary:
```

```
    LSP Tunnels Process:  running
    RSVP Process:        running
    Forwarding:          enabled
    Periodic reoptimization: every 3600 seconds, next in 2400 seconds
```

```

        Periodic FRR Promotion: every 300 seconds, next in 16 seconds
        Auto-bw enabled tunnels: 6

Name: tunnel-te20 Destination: 130.130.130.130
Status:
  Admin: up Oper: up Path: valid Signalling: connected

  path option 1, type explicit rlr2r3gig_path (Basis for Setup, path weight 200)
  G-PID: 0x0800 (derived from egress interface properties)
  Bandwidth Requested: 113 kbps CT0

Config Parameters:
  Bandwidth: 100 kbps (CT0) Priority: 7 7 Affinity: 0x0/0xffff
  Metric Type: TE (interface)
  AutoRoute: enabled LockDown: disabled Policy class: not set
  Forwarding-Adjacency: disabled
  Loadshare: 0 equal loadshares
  Auto-bw: enabled
    Last BW Applied: 113 kbps CT0 BW Applications: 1
    Last Application Trigger: Periodic Application
    Bandwidth Min/Max: 0-4294967295 kbps
    Application Frequency: 5 min Jitter: 0s Time Left: 4m 19s
    Collection Frequency: 1 min
    Samples Collected: 0 Next: 14s
    Highest BW: 0 kbps Underflow BW: 0 kbps
    Adjustment Threshold: 10% 10 kbps
    Overflow Detection disabled
    Underflow Detection disabled
  Fast Reroute: Disabled, Protection Desired: None
  Path Protection: Not Enabled
History:
  Tunnel has been up for: 00:18:54
  Current LSP:
    Uptime: 00:05:41
  Prior LSP:
    ID: path option 1 [3]
    Removal Trigger: reoptimization completed
Current LSP Info:
  Instance: 4, Signaling Area: IS-IS 1 level-2
  Uptime: 00:05:41 (since Mon Mar 15 00:01:36 UTC 2010)
  Outgoing Interface: HundredGigE0/0/0/3, Outgoing Label: 16009
  Router-IDs: local 110.110.110.110
               downstream 120.120.120.120
Path Info:
  Outgoing:
  Explicit Route:
    Strict, 61.10.1.2
    Strict, 61.15.1.1
    Strict, 61.15.1.2
    Strict, 130.130.130.130
  Record Route: Disabled
  Tspec: avg rate=113 kbits, burst=1000 bytes, peak rate=113 kbits
  Session Attributes: Local Prot: Not Set, Node Prot: Not Set, BW Prot: Not Set
Resv Info: None
  Record Route: Disabled
  Fspec: avg rate=113 kbits, burst=1000 bytes, peak rate=113 kbits
Displayed 1 (of 6) heads, 0 (of 0) midpoints, 0 (of 0) tails
Displayed 1 up, 0 down, 0 recovering, 0 recovered heads

```

This is a sample output from the **show mpls traffic-eng tunnels** command using the **property** keyword:

```
RP/0/RP0/CPU0:router# show mpls traffic-eng tunnels property backup interface out
HundredGigE0/0/0/3
```

Signalling Summary:

```
    LSP Tunnels Process:  running, not registered with RSVP
    RSVP Process:        not running
    Forwarding:          enabled
    Periodic reoptimization: every 3600 seconds, next in 3595 seconds
    Periodic FRR Promotion: every 300 seconds, next in 295 seconds
    Periodic auto-bw collection: disabled
```

Name: tunnel-te1 Destination: 10.0.0.1

Status:

```
Admin:    up Oper:    up Path:  valid Signalling: connected
```

```
path option 1, type dynamic (Basis for Setup, path weight 1)
```

```
G-PID: 0x0800 (derived from egress interface properties)
```

Config Parameters:

```
Bandwidth:      1000 kbps (CT0) Priority:  7 7 Affinity: 0x0/0xffff
Metric Type:    TE (default)
AutoRoute:     disabled LockDown: disabled
Loadshare:     10000 bandwidth-based
Auto-bw:       disabled(0/0) 0 Bandwidth Requested:      0
Direction:     unidirectional
Endpoint switching capability: unknown, encoding type: unassigned
Transit switching capability: unknown, encoding type: unassigned
Backup FRR EXP Demotion: 1 ' 7, 2 ' 1
Class-Attributes: 1, 2, 7
Bandwidth-Policer: off
```

History:

```
Tunnel has been up for: 00:00:08
```

```
Current LSP:
```

```
Uptime: 00:00:08
```

Path info (ospf 0 area 0):

```
Hop0: 10.0.0.2
```

```
Hop1: 102.0.0.2
```

```
Displayed 1 (of 1) heads, 0 (of 0) midpoints, 0 (of 0) tails
```

```
Displayed 0 up, 1 down, 0 recovering, 0 recovered heads
```

This table describes the significant fields shown in the display.

Table 62: show mpls traffic-eng tunnels Command Field Descriptions

Field	Description
LSP Tunnels Process	Status of the LSP ³⁰ tunnels process.
RSVP Process	Status of the RSVP process.
Forwarding	Status of forwarding (enabled or disabled).
Periodic reoptimization	Time, in seconds, until the next periodic reoptimization.
Periodic FRR Promotion	Time, in seconds, till the next periodic FRR ³¹ promotion.
Periodic auto-bw collection	Time, in seconds, till the next periodic auto-bw collection.

Field	Description
Name	Interface configured at the tunnel head.
Destination	Tail-end router identifier.
Admin/STATUS	Configured up or down.
Oper/STATE	Operationally up or down.
Signalling	Signaling connected or down or proceeding.
Config Parameters	Configuration parameters provided by tunnel mode MPLS traffic-eng, including those specific to unequal load-balancing functionality (bandwidth, load-share, backup FRR EXP demotion, class-attributes, and bandwidth-policer).
History: Current LSP: Uptime	Time LSP has been up.
Path Info	Hop list of current LSP.

³⁰ LSP = Link-State Packet.

³¹ FRR = Fast Reroute.

This sample output shows the link attributes of links that are traversed by the tunnel (color information):

```
RP/0/RP0/CPU0:router# show mpls traffic-eng tunnels 11 affinity
```

Signalling Summary:

```

LSP Tunnels Process: running
RSVP Process: running
Forwarding: enabled
Periodic reoptimization: every 3600 seconds, next in 2710 seconds
Periodic FRR Promotion: every 300 seconds, next in 27 seconds

```

```
Auto-bw enabled tunnels: 0 (disabled)
```

```
Name: tunnel-tell Destination: 209.165.201.30
```

Status:

```
Admin: up Oper: up Path: valid Signalling: connected
```

```

path option 1, type explicit gige_1_2_3 (Basis for Setup, path weight 2)
G-PID: 0x0800 (derived from egress interface properties)
Bandwidth Requested: 200 kbps CT0

```

Config Parameters:

```

Bandwidth: 200 kbps (CT0) Priority: 2 2
Number of affinity constraints: 1
Include bit map : 0x4
Include name : red2

```

Metric Type: TE (default)

```

AutoRoute: disabled LockDown: disabled Policy class: not set
Forwarding-Adjacency: disabled
Loadshare: 0 equal loadshares
Auto-bw: disabled
Fast Reroute: Enabled, Protection Desired: Any

```

show mpls traffic-eng tunnels

```

Path Protection: Not Enabled
History:
Tunnel has been up for: 02:55:27
Current LSP:
  Uptime: 02:02:19
Prior LSP:
  ID: path option 1 [8]
  Removal Trigger: reoptimization completed

Path info (OSPF 100 area 0):
Link0: 12.9.0.1
  Attribute flags: 0x4
  Attribute names: red2
Link1: 23.9.0.2
  Attribute flags: 0x4
  Attribute names: red2

Displayed 1 (of 8) heads, 0 (of 0) midpoints, 0 (of 0) tails
Displayed 1 up, 0 down, 0 recovering, 0 recovered heads

```

This sample output shows the brief summary of the tunnel status and configuration:

```
RP/0/RP0/CPU0:router# show mpls traffic-eng tunnels brief
```

```

Signalling Summary:
  LSP Tunnels Process: running
  RSVP Process: running
  Forwarding: enabled
  Periodic reoptimization: every 3600 seconds, next in 2538 seconds
  Periodic FRR Promotion: every 300 seconds, next in 38 seconds
  Auto-bw enabled tunnels: 0 (disabled)

```

TUNNEL NAME	DESTINATION	STATUS	STATE
tunnel-te1060	10.6.6.6	up	up
PE6_C12406_t607	10.7.7.7	up	up
PE6_C12406_t608	10.8.8.8	up	up
PE6_C12406_t609	10.9.9.9	up	up
PE6_C12406_t610	10.10.10.10	up	up
PE6_C12406_t621	10.21.21.21	up	up
PE7_C12406_t706	10.6.6.6	up	up
PE7_C12406_t721	10.21.21.21	up	up
Tunnel_PE8-PE6	10.6.6.6	up	up
Tunnel_PE8-PE21	10.21.21.21	up	up
Tunnel_PE9-PE6	10.6.6.6	up	up
Tunnel_PE9-PE21	10.21.21.21	up	up
Tunnel_PE10-PE6	10.6.6.6	up	up
Tunnel_PE10-PE21	10.21.21.21	up	up
PE21_C12406_t2106	10.6.6.6	up	up
PE21_C12406_t2107	10.7.7.7	up	up
PE21_C12406_t2108	10.8.8.8	up	up
PE21_C12406_t2109	10.9.9.9	up	up
PE21_C12406_t2110	10.10.10.10	up	up
PE6_C12406_t6070	10.7.7.7	up	up
PE7_C12406_t7060	10.6.6.6	up	up
tunnel-te1	200.0.0.3	up	up
HundredGigE0/0/0/3	100.0.0.1	up	up
HundredGigE0/0/0/4	200.0.0.1	up	up

```

Displayed 1 (of 1) heads, 20 (of 20) midpoints, 0 (of 0) tails
Displayed 1 up, 0 down, 0 recovering, 0 recovered heads

```

This section shows a sample output that results when automatic backup tunnels are created:

```
RP/0/RP0/CPU0:router# show mpls traffic-eng tunnels brief
```

```
.
.
.
TUNNEL NAME          DESTINATION      STATUS  STATE
          tunnel-te0          200.0.0.3      up    up
          tunnel-te1          200.0.0.3      up    up
          tunnel-te2          200.0.0.3      up    up
          *tunnel-te50         200.0.0.3      up    up
          *tunnel-te60         200.0.0.3      up    up
          *tunnel-te70         200.0.0.3      up    up
          *tunnel-te80         200.0.0.3      up    up
.
.
.
```

* = automatically created backup tunnel

This is sample output that shows a summary of configured tunnels by using the **summary** keyword:

```
RP/0/RP0/CPU0:router# show mpls traffic-eng tunnels summary
```

```
LSP Tunnels Process: not running, disabled
                    RSVP Process: running
                    Forwarding: enabled
                    Periodic reoptimization: every 3600 seconds, next in 2706 seconds
                    Periodic FRR Promotion: every 300 seconds, next in 81 seconds
                    Periodic auto-bw collection: disabled
```

```
Signalling Summary:
  Head: 1 interfaces, 1 active signalling attempts, 1 established
        0 explicit, 1 dynamic
        1 activations, 0 deactivations
        0 recovering, 0 recovered
  Mids: 0
  Tails: 0
```

```
Fast ReRoute Summary:
  Head: 0 FRR tunnels, 0 protected, 0 rerouted
  Mid: 0 FRR tunnels, 0 protected, 0 rerouted
  Summary: 0 protected, 0 link protected, 0 node protected, 0 bw protected
```

```
Path Protection Summary:
  20 standby configured tunnels, 15 connected, 10 path protected
  2 link-diverse, 4 node-diverse, 4 node-link-diverse
```

```
AutoTunnel Backup Summary:
  AutoTunnel Backups:
    50 created, 50 up, 0 down, 8 unused
    25 NHOP, 25 NNHOP, 10 SRLG strict, 10 SRLG pref
  Protected LSPs:
    10 NHOP, 20 NHOP+SRLG
    15 NNHOP, 5 NNHOP+SRLG
  Protected S2L Sharing Families:
    10 NHOP, 20 NHOP+SRLG
    15 NNHOP, 5 NNHOP+SRLG
  Protected S2Ls:
    10 NHOP, 20 NHOP+SRLG
    15 NNHOP, 5 NNHOP+SRLG
```

This is a sample output from the **show mpls traffic-eng tunnels** command using the **protection** keyword. This command selects every MPLS-TE tunnel, known to the router, that was signaled as an FRR-protected LSP (property fast-reroute), and displays information about the protection this router provides to each selected tunnel.

```
RP/0/RP0/CPU0:router# show mpls traffic-eng tunnels protection

tunnel160
  LSP Head, Admin: up, Oper: up
  Src: 10.20.20.20, Dest: 10.10.10.10, Instance: 28
  Fast Reroute Protection: None

tunnel170
  LSP Head, Admin: up, Oper: up
  Src: 10.20.20.20, Dest: 10.10.10.10, Instance: 945
  Fast Reroute Protection: Requested
  Outbound: FRR Ready
  Backup tunnel160 to LSP nhop
    tunnel160: out I/f: HundredGigE0/0/0/3
  LSP signalling info:
    Original: out I/f: HundredGigE0/0/0/4, label: 3, nhop: 10.10.10.10
    With FRR: out I/f: tunnel160, label: 3
  LSP bw: 10 kbps, Backup level: any unlimited, type: CT0
```

This table describes the significant fields shown in the display.

Table 63: show mpls traffic-eng tunnels protection Command Field Descriptions

Field	Description
Tunnel#	Number of the MPLS-TE backup tunnel.
LSP Head/router	Node is either head or router for this LSP ³² .
Instance	LSP ID.
Backup tunnel	Backup tunnel protection for NHOP/NNHOP.
out if	Backup tunnel's outgoing interface
Original	Outgoing interface, label, and next-hop of the LSP when not using backup.
With FRR	Outgoing interface and label when using backup tunnel.
LSP BW	Signaled bandwidth of the LSP.
Backup level	Type of bandwidth protection provided—pool type and limited/unlimited bandwidth.
LSP Tunnels Process	Status of the TE process ³³ .

³² LSP = Link-State Packet.

³³ LSP = Label Switched Path

This is sample output from the **show mpls traffic-eng tunnels** command using the **backup** keyword. This command selects every MPLS-TE tunnel known to the router, and displays information about the FRR protection that each selected tunnel provides for interfaces on this route. The command does not generate output for tunnels that do not provide FRR protection of interfaces on this router:


```
RP/0/RP0/CPU0:router# show mpls traffic-eng tunnels backup

tunnel160
  Admin: up, Oper: up
  Src: 10.20.20.20, Dest: 10.10.10.10, Instance: 28
  Fast Reroute Backup Provided:
    Protected I/fs: HundredGigE0/0/0/3
    Protected lsps: 0
    Backup BW: any-class unlimited, Inuse: 0 kbps
```

This table describes the significant fields shown in the display.

Table 64: show mpls traffic-eng tunnels backup Command Field Descriptions

Field	Description
Tunnel#	MPLS-TE backup tunnel number.
Dest	IP address of backup tunnel destination.
State	State of the backup tunnel. Values are up, down, or admin-down.
Instance	LSP ID of the tunnel.
Protected I/fs	List of interfaces protected by the backup tunnel.
Protected lsps	Number of LSPs currently protected by the backup tunnel.
Backup BW	Configured backup bandwidth type and amount. Pool from which bandwidth is acquired. Values are any-class, CT0, and CT1. Amount is either unlimited or a configured limit in kbps.
Inuse	Backup bandwidth currently in use on the backup tunnel.

This shows a sample output from the **show mpls traffic-eng tunnels** command using the **backup** and **protected-interface** keywords:

```
RP/0/RP0/CPU0:router# show mpls traffic-eng tunnels backup protected-interface

Interface: HundredGigE0/0/0/3
  Tunnel100  UNUSED : out I/f:                Admin: down Oper: down

Interface: HundredGigE0/0/0/4
  Tunnel160  NHOP  : out I/f: HundredGigE0/0/0/5  Admin:  up Oper:  up
```

This table describes the significant fields shown in the display.

Table 65: show mpls traffic-eng tunnels backup protected-interface Command Field Descriptions

Field	Description
Interface	MPLS-TE-enabled FRR protected interface.
Tunnel#	FRR protected tunnel on the interface.

Field	Description
NHOP/NNHOP/UNUSED	State of Protected tunnel. Values are unused, next hop, next-next hop.
out I/f	Outgoing interface of the backup tunnel providing the protection.

This shows a sample output from the **show mpls traffic-eng tunnels** command using the **up within-last** keywords:

```
RP/0/RP0/CPU0:router# show mpls traffic-eng tunnels up within-last 200

Signalling Summary:
    LSP Tunnels Process: running
    RSVP Process: running
    Forwarding: enabled
    Periodic reoptimization: every 3600 seconds, next in 3381 seconds
    Periodic FRR Promotion: every 300 seconds, next in 81 seconds
    Periodic auto-bw collection: disabled

Name: tunnel-tell Destination: 30.30.30.30
Status:
  Admin: up Oper: up Path: valid Signalling: connected

  path option 1, type explicit back (Basis for Setup, path weight 1)
  G-PID: 0x0800 (derived from egress interface properties)

Config Parameters:
  Bandwidth: 0 kbps (CT0) Priority: 7 7 Affinity: 0x0/0xffff
  Number of configured name based affinities: 2
  Name based affinity constraints in use:
    Include bit map : 0x4 (refers to undefined affinity name)
    Include-strict bit map: 0x4
Metric Type: TE (default)
  AutoRoute: disabled LockDown: disabled Loadshare: 0 bw-based
  Auto-bw: disabled(0/0) 0 Bandwidth Requested: 0
  Direction: unidirectional
Endpoint switching capability: unknown, encoding type: unassigned
Transit switching capability: unknown, encoding type: unassigned

History:
  Tunnel has been up for: 00:00:21
  Current LSP:
    Uptime: 00:00:21
  Prior LSP:
    ID: path option 1 [4]
    Removal Trigger: tunnel shutdown

Path info (ospf area 0):
  Hop0: 7.4.4.2
  Hop1: 30.30.30.30

Displayed 1 (of 3) heads, 0 (of 0) midpoints, 0 (of 0) tails
Displayed 1 up, 0 down, 0 recovering, 0 recovered heads
```

This shows a sample output from the **show mpls traffic-eng tunnels** command using the **reoptimized within-last** keywords:

```
RP/0/RP0/CPU0:router# show mpls traffic-eng tunnels reoptimized within-last 600

Signalling Summary:
```

```

LSP Tunnels Process: running
  RSVP Process: running
    Forwarding: enabled
  Periodic reoptimization: every 60000 seconds, next in 41137 seconds
  Periodic FRR Promotion: every 300 seconds, next in 37 seconds
  Periodic auto-bw collection: disabled

Name: tunnel-tel Destination: 30.30.30.30
Status:
  Admin: up Oper: up Path: valid Signalling: connected

  path option 1, type explicit prot1 (Basis for Setup, path weight 1)
G-PID: 0x0800 (derived from egress interface properties)

Config Parameters:
  Bandwidth: 66 kbps (CT0) Priority: 7 7 Affinity: 0x0/0xffff
  Metric Type: IGP (global)
  AutoRoute: enabled LockDown: disabled Loadshare: 66 bw-based
  Auto-bw: disabled(0/0) 0 Bandwidth Requested: 66
  Direction: unidirectional
Endpoint switching capability: unknown, encoding type: unassigned
Transit switching capability: unknown, encoding type: unassigned

History:
  Tunnel has been up for: 00:14:04
  Current LSP:
    Uptime: 00:03:52
    Selection: reoptimization
  Prior LSP:
    ID: path option 1 [2017]
    Removal Trigger: reoptimization completed

Path info (ospf area 0):
  Hop0: 7.2.2.2
  Hop1: 7.3.3.2
  Hop2: 30.30.30.30
Displayed 1 (of 1) heads, 0 (of 0) midpoints, 0 (of 0) tails
Displayed 1 up, 0 down, 0 recovering, 0 recovered heads

```

This is a sample output from the **show mpls traffic-eng tunnels** command using the **detail** keyword:

```
RP/0/RP0/CPU0:router# show mpls traffic-eng tunnels 100 detail
```

```

Name: tunnel-tel Destination: 24.24.24.24
Status:
  Admin: up Oper: up

  Working Path: valid Signalling: connected
  Protecting Path: valid Protect Signalling: connected
  Working LSP is carrying traffic

  path option 1, type explicit po4 (Basis for Setup, path weight 1)
  (Basis for Standby, path weight 2)
G-PID: 0x001d (derived from egress interface properties)
Path protect LSP is present.

  path option 1, type explicit po6 (Basis for Setup, path weight 1)

Config Parameters:
  Bandwidth: 10 kbps (CT0) Priority: 7 7 Affinity: 0x0/0xffff
  Metric Type: TE (default)
  AutoRoute: enabled LockDown: disabled Loadshare: 10 bw-based
  Auto-bw: disabled(0/0) 0 Bandwidth Requested: 10

```

show mpls traffic-eng tunnels

```

Direction: unidirectional
Endpoint switching capability: unknown, encoding type: unassigned
Transit switching capability: unknown, encoding type: unassigned

History:
Tunnel has been up for: 00:04:06
Current LSP:
  Uptime: 00:04:06
Prior LSP:
  ID: path option 1 [5452]
  Removal Trigger: path verification failed
Current LSP Info:
  Instance: 71, Signaling Area: ospf optical area 0
  Uptime: 00:10:41
  Incoming Label: explicit-null
  Outgoing Interface: HundredGigE0/0/0/3, Outgoing Label: implicit-null
  Path Info:
    Explicit Route:
      Strict, 100.0.0.3
      Strict, 24.24.24.24
    Record Route: None
    Tspec: avg rate=2488320 kbits, burst=1000 bytes, peak rate=2488320 kbits
Resv Info:
  Record Route:
    IPv4 100.0.0.3, flags 0x0
    Fspec: avg rate=2488320 kbits, burst=1000 bytes, peak rate=2488320 kbits
Protecting LSP Info:
  Instance: 72, Signaling Area: ospf optical area 0
  Incoming Label: explicit-null
  Outgoing Interface: HundredGigE0/0/0/4, Outgoing Label: implicit-null
  Path Info:
    Explicit Route:
      Strict, 101.0.0.3
      Strict, 24.24.24.24
    Record Route: None
    Tspec: avg rate=2488320 kbits, burst=1000 bytes, peak rate=2488320 kbits
Resv Info:
  Record Route:
    IPv4 101.0.0.3, flags 0x0
    Fspec: avg rate=2488320 kbits, burst=1000 bytes, peak rate=2488320 kbits
Reoptimized LSP Info (Install Timer Remaining 11 Seconds):
Cleaned LSP Info (Cleanup Timer Remaining 19 Seconds):

```

This is a sample output that shows the path-protection options for tunnel-te 100 using the **detail** keyword.

```

RP/0/RP0/CPU0:router# show mpls traffic-eng tunnels 100 detail

Signalling Summary:
  LSP Tunnels Process: running
  RSVP Process: running
  Forwarding: enabled
  Periodic reoptimization: every 60 seconds, next in 31 seconds
  Periodic FRR Promotion: every 300 seconds, next in 299 seconds
  Auto-bw enabled tunnels: 0 (disabled)

Name: tunnel-te100 Destination: 33.3.33.3
Status:
  Admin: up Oper: up (Up for 02:06:14)
  Path: valid Signalling: connected

Path options:

```

```

path-option 5 explicit name to-gmpls3 verbatim lockdown OSPF 0 area 0
  PCALC Error [Standby]: Wed Oct 15 15:53:24 2008
  Info: Destination IP address, 1.2.3.4, not found in topology
path-option 10 dynamic
path option 15 explicit name div-wrt-to-gmpls3 verbatim
path option 20 dynamic standby OSPF 0 area 0
  (Basis for Standby, path weight 2)
G-PID: 0x0800 (derived from egress interface properties)
Bandwidth Requested: 0 kbps CT0

Config Parameters:
  Bandwidth:          0 kbps (CT0) Priority:  7 7 Affinity: 0x0/0xffff
  Metric Type: TE (default)
  AutoRoute: disabled LockDown: disabled
  Loadshare:         0 equal loadshares
  Auto-bw: disabled(0/0) 0 Bandwidth Requested:      0
  Direction: unidirectional
  Endpoint switching capability: unknown, encoding type: unassigned
  Transit switching capability: unknown, encoding type: unassigned
  Path Protection: enabled

Reoptimization Info in Inter-area:
  Better Path Queries sent = 13; Preferred Path Exists received = 0
  Last better path query was sent 00:08:22 ago
  Last preferred path exists was received 00:00:00 ago

History:
  Tunnel has been up for: 02:15:56
  Current LSP:
    Uptime: 02:15:56
  Prior LSP:
    ID: path option 10 [22]
    Removal Trigger: path verification failed
  Current LSP Info:

  Bandwidth:          0 kbps (CT0) Priority:  7 7 Affinity: 0x0/0xffff
  Metric Type: TE (default)
  AutoRoute: disabled LockDown: disabled Policy class: not set
  Loadshare:         0 equal loadshares
  Auto-bw: disabled
  Direction: unidirectional
  Endpoint switching capability: unknown, encoding type: unassigned
  Transit switching capability: unknown, encoding type: unassigned
  Fast Reroute: Disabled, Protection Desired: None
Reoptimization Info in Inter-area:
  Better Path Queries sent = 13; Preferred Path Exists received = 0
  Last better path query was sent 00:08:22 ago
  Last preferred path exists was received 00:00:00 ago
Path Protection Info:
  Standby Path: Node and Link diverse Last switchover 00:08:22 ago
  Switchover Reason: Path delete request
  Number of Switchovers 13, Standby Ready 15 times

History:
  Prior LSP:
    ID: path option 10 [188]
    Removal Trigger: path option removed
  Tunnel has been up for: 00:03:58
  Current LSP:
    Uptime: 00:03:58
  Reopt. LSP:
    Setup Time: 272 seconds
  Current LSP Info:
    Instance: 1, Signaling Area: OSPF 0 area 0

```

```

Uptime: 00:03:58
Outgoing Interface: HundredGigE0/0/0/3, Outgoing Label: implicit-null
Router-IDs: local      222.22.2.2
            downstream 33.3.33.3

Path Info:
  Outgoing:
  Explicit Route:
    Strict, 23.0.0.3
    Strict, 33.3.33.3
  Record Route: None
  Tspec: avg rate=0 kbits, burst=1000 bytes, peak rate=0 kbits
  Session Attributes: Local Prot: Not Set, Node Prot: Not Set, BW Prot: Not Set

Resv Info:
  Record Route: None
  Fspec: avg rate=0 kbits, burst=1000 bytes, peak rate=0 kbits

Standby LSP Info:
Instance: 1, Signaling Area: OSPF 0 area 0
Uptime: 00:03:58
Outgoing Interface: HundredGigE0/0/0/3, Outgoing Label: implicit-null
Router-IDs: local      222.22.2.2
            downstream 33.3.33.3

Path Info:
  Outgoing:
  Explicit Route:
    Strict, 23.0.0.3
    Strict, 33.3.33.3
  Record Route: None
  Tspec: avg rate=0 kbits, burst=1000 bytes, peak rate=0 kbits
  Session Attributes: Local Prot: Not Set, Node Prot: Not Set, BW Prot: Not Set

Resv Info:
  Record Route: None
  Fspec: avg rate=0 kbits, burst=1000 bytes, peak rate=0 kbits

Reoptimized LSP Info:
Instance: 5, Signaling Area: OSPF 0 area 0
Outgoing Interface: HundredGigE0/0/0/4, Outgoing Label: 16000
Path Info:
  Outgoing:
  Explicit Route:
    Strict, 26.0.0.6
    Strict, 36.0.0.3
    Strict, 33.3.33.3
  Record Route: None
  Tspec: avg rate=0 kbits, burst=1000 bytes, peak rate=0 kbits
  Session Attributes: Local Prot: Not Set, Node Prot: Not Set, BW Prot: Not Set

Resv Info:
  Record Route: None
  Fspec: avg rate=0 kbits, burst=1000 bytes, peak rate=0 kbits

Delayed Clean Standby LSP Info:
Instance: 1, Signaling Area: OSPF 0 area 0
Uptime: 00:03:58
Outgoing Interface: HundredGigE0/0/0/3, Outgoing Label: implicit-null
Router-IDs: local      222.22.2.2
            downstream 33.3.33.3

Path Info:
  Outgoing:
  Explicit Route:
    Strict, 23.0.0.3
    Strict, 33.3.33.3
  Record Route: None
  Tspec: avg rate=0 kbits, burst=1000 bytes, peak rate=0 kbits
  Session Attributes: Local Prot: Not Set, Node Prot: Not Set, BW Prot: Not Set

Resv Info:
  Record Route: None
  Fspec: avg rate=0 kbits, burst=1000 bytes, peak rate=0 kbits

```

Displayed 0 (of 2) heads, 0 (of 0) midpoints, 0 (of 0) tails
 Displayed 0 up, 0 down, 0 recovering, 0 recovered heads

This is a sample output from the **show mpls traffic-eng tunnels** command using the **role mid** keyword:

```
RP/0/RP0/CPU0:router# show mpls traffic-eng tunnels role mid

Signalling Summary:
  LSP Tunnels Process: running
  RSVP Process: running
  Forwarding: enabled
  Periodic reoptimization: every 3600 seconds, next in 1166 seconds
  Periodic FRR Promotion: every 300 seconds, next in 90 seconds
  Periodic auto-bw collection: disabled
LSP Tunnel 10.10.10.10 1 [5508] is signalled, connection is up
Tunnel Name: FRR1_t1 Tunnel Role: Mid
InLabel: HundredGigE0/0/0/3, 33
OutLabel: HundredGigE0/0/0/4, implicit-null
Signalling Info:
  Src 10.10.10.10 Dst 30.30.30.30, Tunnel ID 1, Tunnel Instance 5508
  Path Info:1
    Incoming Address: 7.3.3.1
Incoming Explicit Route:
  Strict, 7.3.3.1
  Loose, 30.30.30.30
ERO Expansion Info:
  ospf 100 area 0, Metric 1 (TE), Affinity 0x0, Mask 0xffff, Queries 0
Outgoing Explicit Route:
  Strict, 7.2.2.1
  Strict, 30.30.30.30
Record Route: None
Tspec: avg rate=10 kbits, burst=1000 bytes, peak rate=10 kbits
Resv Info:
  Record Route:
    IPv4 30.30.30.30, flags 0x20
    Label 3, flags 0x1
    IPv4 7.3.3.2, flags 0x0
    Label 3, flags 0x1
  Fspec: avg rate=10 kbits, burst=1000 bytes, peak rate=10 kbits
Displayed 0 (of 1) heads, 1 (of 1) midpoints, 0 (of 1) tails
Displayed 0 up, 0 down, 0 recovering, 0 recovered heads
```

This sample output shows a tabular table for TE LSPs by using the **tabular** keyword:

```
RP/0/RP0/CPU0:router# show mpls traffic-eng tunnels tabular
```

Tunnel Name	LSP ID	Destination Address	Source Address	Tun State	FRR State	LSP Role
tunnel-mte100	1	172.16.0.1	60.60.60.60	up	Inact	Head
tunnel-mte300	1	60.60.60.60	172.16.0.1	up	Inact	Tail
tunnel-te1060	2	10.6.6.6	10.1.1.1	up	Inact	Head
PE6_C12406_t607	2	10.7.7.7	10.6.6.6	up	Inact	Mid
PE6_C12406_t608	2	10.8.8.8	10.6.6.6	up	Inact	Mid
PE6_C12406_t609	2	10.9.9.9	10.6.6.6	up	Inact	Mid
PE6_C12406_t610	2	10.10.10.10	10.6.6.6	up	Inact	Mid
PE6_C12406_t621	2	10.21.21.21	10.6.6.6	up	Inact	Mid
PE7_C12406_t706	835	10.6.6.6	10.7.7.7	up	Inact	Mid
PE7_C12406_t721	603	10.21.21.21	10.7.7.7	up	Inact	Mid
Tunnel_PE8-PE6	4062	10.6.6.6	10.8.8.8	up	Inact	Mid

show mpls traffic-eng tunnels

```

Tunnel_PE8-PE21 6798 10.21.21.21 10.8.8.8 up Inact Mid
Tunnel_PE9-PE6 4062 10.6.6.6 10.9.9.9 up Inact Mid
Tunnel_PE9-PE21 6795 10.21.21.21 10.9.9.9 up Inact Mid
Tunnel_PE10-PE6 4091 10.6.6.6 10.10.10.10 up Inact Mid
Tunnel_PE10-PE21 6821 10.21.21.21 10.10.10.10 up Inact Mid
PE21_C12406_t2106 2 10.6.6.6 10.21.21.21 up Ready Mid
PE21_C12406_t2107 2 10.7.7.7 10.21.21.21 up Inact Mid
PE21_C12406_t2108 2 10.8.8.8 10.21.21.21 up Inact Mid
PE21_C12406_t2109 2 10.9.9.9 10.21.21.21 up Inact Mid
PE21_C12406_t2110 2 10.10.10.10 10.21.21.21 up Inact Mid
PE6_C12406_t6070 2 10.7.7.7 10.6.6.6 up Inact Mid
PE7_C12406_t7060 626 10.6.6.6 10.7.7.7 up Inact Mid
tunnel-te1 1 200.0.0.3 200.0.0.1 up Inact Head InAct
tunnel-te100 1 200.0.0.3 200.0.0.1 up Ready Head InAct
HundredGigE0/0/0/3 2 100.0.0.1 200.0.0.1 up Inact Head InAct
HundredGigE0/0/0/4 6 200.0.0.1 100.0.0.1 up Inact Tail InAct

```

This sample output shows a tabular table indicating automatic backup tunnels when using the **tabular** keyword:

```
RP/0/RP0/CPU0:router# show mpls traffic-eng tunnels tabular
```

Tunnel Name	LSP ID	Destination Address	Source Address	State	FRR State	LSP Role	Path Prot
tunnel-te0	549	200.0.0.3	200.0.0.1	up	Inact	Head	InAct
tunnel-te1	546	200.0.0.3	200.0.0.1	up	Inact	Head	InAct
tunnel-te2	6	200.0.0.3	200.0.0.1	up	Inact	Head	InAct
*tunnel-te50	6	200.0.0.3	200.0.0.1	up	Active	Head	InAct
*tunnel-te60	4	200.0.0.3	200.0.0.1	up	Active	Head	InAct
*tunnel-te70	4	200.0.0.3	200.0.0.1	up	Active	Head	InAct
*tunnel-te80	3	200.0.0.3	200.0.0.1	up	Active	Head	InAct

* = automatically created backup tunnel

This table describes the significant fields shown in the display.

Table 66: show mpls traffic-eng tunnels tabular Command Field Descriptions

Field	Description
Tunnel Name	MPLS-TE tunnel name.
LSP ID	LSP ID of the tunnel.
Destination Address	Destination address of the TE tunnel (identified in Tunnel Name).
Source Address	Source address for the filtered tunnels.
Tunnel State	State of the tunnel. Values are up, down, or admin-down.
FRR State	FRR state identifier.
LSP Role	Role identifier. Values are All, Head, or Tail.

This sample output shows a path protection for tunnel ID 10:


```
RP/0/RP0/CPU0:router# show mpls traffic-eng tunnels protection path tunnel-id 10

Tun ID 10, Src 22.2.22.2 Dst 66.6.66.6, Ext ID 22.2.22.2
  Switchover 00:08:22 ago, Standby Path: {Not found | Link diverse | Node diverse | Node
and Link diverse}
  Current LSP: LSP ID 10022, Up time 12:10:24,
    Local lbl: 16001, Out Interface: HundredGigE0/0/0/3, Out lbl: implicit-null
    Path: 10.0.0.1, 172.16.0.1, 209.165.201.30, 8.8.8.8
  Standby LSP: None | LSP ID, Up time 12:00:05,
    Local lbl: 16002, Out Interface: HundredGigE0/0/0/4, Out lbl: implicit-null
    Path 4.4.4.4, 5.5.5.5, 6.6.6.6, 7.7.7.7
```

This sample output shows the path protection in a tabular format:

```
RP/0/RP0/CPU0:router# show mpls traffic-eng tunnels protection path tabular

Tunnel Current Standby      Protected      Standby
   ID   LSP ID   LSP ID         State          Diversity
  155     10     11           Ready        Node and Link Diverse
 1501     11     12           Ready        Node and Link Diverse
 1502     10     11           Ready        Node and Link Diverse
 1504     10     11           Ready        Node and Link Diverse
 1505     10     11           Ready        Node and Link Diverse
```

This table describes the significant fields shown in the display.

Table 67: show mpls traffic-eng tunnels protection path tabular Command Field Descriptions

Field	Description
Tunnel ID	Identifier of the tunnel.
Current LSP ID	Identifier of the LSP that is carrying traffic.
Standby LSP ID	Identifier of the standby LSP that is protecting traffic.
Protected State	Values are Ready and Not Ready.
Standby Diversity	Values are Node and Link Diverse along with Node Diverse and Link Diverse. Values that state that the current and standby LSP do not have nodes or links in common. The current and standby LSP do not have nodes in common (but can share a link), or they have no links in common (but can share nodes).

This sample output shows the MPLS-TE tunnel information only for tunnels in which the automatic bandwidth is enabled using the **auto-bw** keyword:

```
RP/0/RP0/CPU0:router# show mpls traffic-eng tunnels auto-bw

Signalling Summary:
  LSP Tunnels Process:  running
    RSVP Process:      running
    Forwarding:         enabled
  Periodic reoptimization: every 3600 seconds, next in 636 seconds
  Periodic FRR Promotion: every 300 seconds, next in 276 seconds
  Auto-bw enabled tunnels: 1

Name: tunnel-tel Destination: 0.0.0.0
```

show mpls traffic-eng tunnels

```

Status:
  Admin:      up Oper: down Path: not valid Signalling: Down
  G-PID: 0x0800 (internally specified)
  Bandwidth Requested: 0 kbps CT0

Config Parameters:
  Bandwidth:      0 kbps (CT0) Priority: 7 7 Affinity: 0x0/0xffff
  Metric Type: TE (default)
  AutoRoute: disabled LockDown: disabled Policy class: not set
  Loadshare:      0 equal loadshares
Auto-bw: (collect bw only)
  Last BW Applied: 500 kbps (CT0) BW Applications: 25
  Last Application Trigger: Periodic Application
  Bandwidth Min/Max: 10-10900 kbps
  Application Frequency: 10 min (Cfg: 10 min) Time Left: 5m 34s
  Collection Frequency: 2 min
  Samples Collected: 2 Highest BW: 450 kbps Next: 1m 34s
  Adjustment Threshold: 5%
  Overflow Threshold: 15% Limit: 1/4 Early BW Applications: 0
  Direction: unidirectional
  Endpoint switching capability: unknown, encoding type: unassigned
  Transit switching capability: unknown, encoding type: unassigned
  Fast Reroute: Disabled, Protection Desired: None

Reason for the tunnel being down: No destination is configured
History:
Displayed 1 (of 1) heads, 0 (of 0) midpoints, 0 (of 0) tails
Displayed 0 up, 1 down, 0 recovering, 0 recovered heads

```

This table describes the significant fields shown in the display.

Table 68: show mpls traffic-eng tunnels auto-bw Command Field Descriptions

Field	Description
collect bw only	Field is displayed only if the bandwidth collection is configured in the tunnel automatic bandwidth configuration.
Last BW Applied	Last bandwidth change that is requested by the automatic bandwidth for the tunnel. In addition, this field indicates which pool is used for the bandwidth.
BW Applications	Total number of bandwidth applications that is requested by the automatic bandwidth, which includes the applications triggered by an overflow condition.
Last Application Trigger	These last application options are displayed: <ul style="list-style-type: none"> • Periodic Application • Overflow Detected • Manual Application
Bandwidth Min/Max	Bandwidth configured is either minimum or maximum.
Application Frequency	Configured application frequency. The Time Left field indicates the time left before the next application executes.
Collection Frequency	Globally configured collection frequency, which is the same value for all the tunnels.

Field	Description
Samples Collected	Number of samples that are collected during the current application period. This field is replaced by the Collection Disabled field if Collection Frequency is not currently configured.
Highest BW	Highest bandwidth that is collected for the application period.
Next	Time left before the next collection event.
Overflow Threshold	Overflow threshold that is configured. The Overflow field appears only if the overflow detection is configured in the tunnel automatic bandwidth configuration.
Limit	Consecutive overflow detected or configured limit.
Early BW Applications	Number of early bandwidth applications that are triggered by an overflow condition.

This is sample output from the **show mpls traffic-eng tunnels** command after the NNHOP SRLG preferred automatic backup tunnel is configured:

```
RP/0/RP0/CPU0:router# show mpls traffic-eng tunnels 1
```

Signalling Summary:

```

    LSP Tunnels Process:  running
    RSVP Process:        running
    Forwarding:          enabled
    Periodic reoptimization: every 3600 seconds, next in 2524 seconds
    Periodic FRR Promotion: every 300 seconds, next in 49 seconds
    Auto-bw enabled tunnels: 1

```

Name: tunnel-te1 Destination: 200.0.0.3 (auto backup)

Status:

```
Admin: up Oper: up Path: valid Signalling: connected
```

```
path option 10, type explicit (autob_nnhop_srlg_tunnel1) (Basis for Setup, path weight 11)
```

```

path option 20, type explicit (autob_nnhop_tunnel1)
G-PID: 0x0800 (derived from egress interface properties)
Bandwidth Requested: 0 kbps CT0
Creation Time: Fri Jul 10 01:53:25.581 PST (1h 25m 17s ago)

```

Config Parameters:

```

Bandwidth: 0 kbps (CT0) Priority: 7 7 Affinity: 0x0/0xffff
Metric Type: TE (default)
AutoRoute: disabled LockDown: disabled Policy class: not set
Forwarding-Adjacency: disabled

```

Loadshare: 0 equal loadshares

```

Auto-bw: disabled
Fast Reroute: Disabled, Protection Desired: None
Path Protection: Not Enabled

```

Auto Backup:

```

Protected LSPs: 4
Protected S2L Sharing Families: 0
Protected S2Ls: 0
Protected i/f: HundredGigE0/0/0/2 Protected node: 20.0.0.2
Protection: NNHOP+SRLG
Unused removal timeout: not running

```

History:

```
Tunnel has been up for: 00:00:08
```

```

Current LSP:
  Uptime: 00:00:08
Prior LSP:
  ID: path option 1 [545]
  Removal Trigger: configuration changed

```

```

Path info (OSPF 0 area 0):
Hop0: 10.0.0.2
Hop1: 100.0.0.2
Hop2: 100.0.0.3
Hop3: 200.0.0.3

```

This table describes the significant fields shown in the display.

Table 69: show mpls traffic-eng tunnels Command Field Descriptions

Field	Description
Auto Backup	Auto backup section header.
Creation Time	Time when the tunnel was created and for what period was the tunnel created.
Protected LSPs	Number of ready and active LSPs protected by this backup.
Protected S2L Sharing Families	Number of ready and active sharing families protected by this backup.
Protected S2Ls	Number of ready and active primary tunnels protected by this backup.
Protected i/f Protected node	Interface and NNHOP node protected by this backup.
Protection: NNHOP+SRLG	Type of protection provided by this backup. Note Protection can be different when a preferred SRLG is configured and an SRLG path is not found.
Example when backup is in use: Unused removal timeout: not running Example when backup is unused: Unused removal timeout: 1h26m	Amount of time left before the unused removal timeout expires. This timer only runs when the backup is in the unused state. After the timer expires, the automatic backup tunnel is removed.

This is sample output from the **show mpls traffic-eng tunnels** command using the **detail** keyword:

```

RP/0/RP0/CPU0:router# show mpls traffic-eng tunnels 999 detail

Name: tunnel-te999 Destination: 10.0.0.1
Status:
  Admin:    up Oper:    up Path:  valid Signalling: connected

  path option 1, type dynamic (Basis for Setup, path weight 2)
  Path-option attribute: po
  Number of affinity constraints: 2
    Include bit map      : 0x4
    Include name         : blue
    Exclude bit map     : 0x2
    Exclude name        : red

```

```

    Bandwidth: 300 (CT0)
    G-PID: 0x0800 (derived from egress interface properties)
    Bandwidth Requested: 300 kbps CT0
    Creation Time: Fri Jan 14 23:35:58 2017 (00:00:42 ago)
Config Parameters:
    Bandwidth:      100 kbps (CT0) Priority:  7  7 Affinity: 0x0/0xffff
    Metric Type: TE (default)
    Hop-limit: disabled
    AutoRoute: disabled LockDown: disabled Policy class: not set
    Forwarding-Adjacency: disabled
    Loadshare:      0 equal loadshares
    Auto-bw: disabled
    Fast Reroute: Enabled, Protection Desired: Any
    Path Protection: Not Enabled
    Soft Preemption: Disabled
SNMP Index: 42
History:
    Tunnel has been up for: 00:00:30 (since Fri Jan 14 23:36:10 EST 2017)
    Current LSP:
        Uptime: 00:00:30 (since Fri Jan 14 23:36:10 EST 2017)
Current LSP Info:
    Instance: 2, Signaling Area: OSPF 100 area 16909060
    Uptime: 00:00:30 (since Fri Jan 14 23:36:10 EST 2017)
    Outgoing Interface: HundredGigE0/0/0/4, Outgoing Label: 16005
    Router-IDs: local      209.165.201.30
                downstream 172.16.0.1
    Soft Preemption: None
    Path Info:
        Outgoing:
            Explicit Route:
                Strict, 23.9.0.2
                Strict, 12.9.0.2
                Strict, 12.9.0.1
                Strict, 10.0.0.1

    Record Route: Disabled
    Tspec: avg rate=300 kbits, burst=1000 bytes, peak rate=300 kbits
    Session Attributes: Local Prot: Set, Node Prot: Not Set, BW Prot: Not Set
                    Soft Preemption Desired: Not Set
Resv Info:
    Record Route:
        IPv4 172.16.0.1, flags 0x20
        Label 16005, flags 0x1
        IPv4 23.9.0.2, flags 0x0
        Label 16005, flags 0x1
        IPv4 10.0.0.1, flags 0x20
        Label 3, flags 0x1
        IPv4 12.9.0.1, flags 0x0
        Label 3, flags 0x1
    Fspec: avg rate=300 kbits, burst=1000 bytes, peak rate=300 kbits Displayed 1 (of 8)
heads, 0 (of 3) midpoints, 0 (of 0) tails Displayed 1 up, 0 down, 0 recovering, 0 recovered
heads

```

This is sample output from the **show mpls traffic-eng tunnels** command using the **auto-tunnel backup** keywords:

```
RP/0/RP0/CPU0:router# show mpls traffic-eng tunnels auto-tunnel backup
```

```

AutoTunnel Backup Configuration:
  Interfaces count: 30
  Unused removal timeout: 2h
  Configured tunnel number range: 0-100

```

show mpls traffic-eng tunnels

```

AutoTunnel Backup Summary:
    50 created, 50 up, 0 down, 8 unused
    25 NHOP, 25 NNHOP, 10 SRLG strict, 10 SRLG pref
Protected LSPs:
    10 NHOP, 20 NHOP+SRLG
    15 NNHOP, 5 NNHOP+SRLG
Protected S2L Sharing Families:
    10 NHOP, 20 NHOP+SRLG
    15 NNHOP, 5 NNHOP+SRLG
Protected S2Ls:
    10 NHOP, 20 NHOP+SRLG
    15 NNHOP, 5 NNHOP+SRLG

Cumulative Counters (last cleared 1h ago):
          Total      NHOP      NNHOP
Created:         550        300        250
Connected:       500        250        250
Removed (down):    0          0          0
Removed (unused): 200        100        100
Removed (in use):  0          0          0
Range exceeded:   0          0          0

```

This table describes the significant fields shown in the display.

Table 70: show mpls traffic-eng tunnels auto-tunnel backup Command Field Descriptions

Field	Description
AutoTunnel Backup Configuration	Header for the automatic tunnel backup configuration.
Interfaces count	Number of interfaces that have automatic tunnel backup enabled.
Unused removal timeout	Configured value and time left before expiration of the unused removal timeout attribute.
Configured tunnel number range	Configured tunnel number range.
AutoTunnel Backup Summary	Header for the automatic tunnel backup summary information.
50 created	Number of automatic backup tunnels created.
50 up	Number of automatic backup tunnels in the up state.
0 down	Number of automatic backup tunnels in the down state.
8 unused	Number of automatic backup tunnels in the unused state.
25 NHOP	Number of automatic backup tunnels created for NHOP protection.
25 NNHOP	Number of automatic backup tunnels created for NNHOP protection.
10 SRLG strict	Number of automatic backup tunnels created with the SRLG preferred attribute.

Field	Description
10 SRLG pref	Number of automatic backup tunnels created with the SRLG preferred attribute.
Protected LSPs Protected S2L Sharing Families Protected S2Ls	Headings for summary information showing current status of LSPs, S2L Sharing Families, and S2Ls that are protected by the automatic tunnel backups. Numbers include primary tunnels in FRR ready and active state.
10 NHOP	Number of automatic backup tunnels that are link protected.
20 NHOP+SRLG	Number of automatic backup tunnels that are link protected and using an SRLG diverse backup path.
15 NNHOP	Number of automatic backup tunnels that are node protected.
20 NNHOP+SRLG	Number of automatic backup tunnels that are node protected and use an SRLG diverse backup path.
Cumulative Counters (last cleared 1h ago):	Cumulative counters for automatic backup tunnels.
Headers: Total, NHOP, NNHOP	Total number of counters and breakdown of NHOP and NNHOP counters.
Created:	Cumulative number of created automatic backup tunnels since the last counter was cleared.
Connected:	Cumulative number of the connected automatic backup tunnels since the last counter was cleared. Note Counter increments only the first time that a tunnel connects.
Removed (down/unused/in use)	Number of automatic backup tunnels that are removed based on state.
Range exceeded	Number of automatic backup tunnels attempted and later rejected when the total number exceeds the configured range.

This is sample output from the **show mpls traffic-eng tunnels name tunnel-te1 detail** command, which displays the soft preemption information for the tunnel-te1 tunnel:

```
RP/0/RP0/CPU0:router# show mpls traffic-eng tunnels name tunnel-te1 detail
Name: tunnel-te1 Destination: 192.168.0.4
Status:
  Admin:    up Oper:    up Path:  valid Signalling: connected

  path option 1, type explicit ABC1 (Basis for Setup, path weight 2)
  Last PCALC Error [Reopt]: Fri Jan 13 16:40:24 2017
  Info: Can't reach 10.10.10.2 on 192.168.0.2, from node 192.168.0.1 (bw)
```

show mpls traffic-eng tunnels

```

Last Signalled Error: Fri Jan 13 16:38:53 2017
  Info: [2] PathErr(34,1)-(reroute, flow soft-preempted) at 10.10.10.1
G-PID: 0x0800 (derived from egress interface properties)
Bandwidth Requested: 30000 kbps CT0
Creation Time: Thu Jan 13 15:46:45 2017 (00:53:44 ago)
Config Parameters:
  Bandwidth:      30000 kbps (CT0) Priority:  7 7 Affinity: 0x0/0xffff
  Metric Type: TE (default)
  Hop-limit: disabled
  AutoRoute: enabled LockDown: disabled Policy class: not set
  Forwarding-Adjacency: disabled
  Loadshare:      0 equal loadshares
  Auto-bw: disabled
  Fast Reroute: Enabled, Protection Desired: Any
  Path Protection: Not Enabled
  Soft Preemption: Enabled
Soft Preemption:
  Current Status: Preemption pending
  Last Soft Preemption: Fri Jan 13 16:38:53 2017 (00:01:36 ago)
  Addresses of preempting links:
    10.10.10.1: Fri Jan 13 16:38:53 2017 (00:01:36 ago)
  Duration in preemption pending: 96 seconds
  Preemption Resolution: Pending
Stats:
  Number of preemption pending events: 1
  Min duration in preemption pending: 0 seconds
  Max duration in preemption pending: 0 seconds
  Average duration in preemption pending: 0 seconds
  Resolution Counters: 0 reopt complete, 0 torn down
                      0 path protection switchover
SNMP Index: 9
History:
  Tunnel has been up for: 00:52:46 (since Thu Jan 13 15:47:43 EDT 2017)
  Current LSP:
    Uptime: 00:52:46 (since Thu Jan 13 15:47:43 EDT 2017)
  Reopt. LSP:
    Last Failure:
      LSP not signalled, has no S2Ls
      Date/Time: Thu Jan 13 16:40:24 EDT 2017 [00:00:05 ago]
  Prior LSP:
    ID: path option 1 [2]
    Removal Trigger: path error
Current LSP Info:
  Instance: 2, Signaling Area: OSPF ring area 0
  Uptime: 00:52:46 (since Thu Jan 13 15:47:43 EDT 2017)
  Outgoing Interface: HundredGigE0/0/0/3, Outgoing Label: 16002
  Router-IDs: local 192.168.0.1
              downstream 192.168.0.2
  Soft Preemption: Pending
  Preemption Link: HundredGigE0/0/0/3; Address: 10.10.10.1
  Preempted at: Fri Jan 13 16:38:53 2017 (00:01:36 ago)
  Time left before hard preemption: 204 seconds
Path Info:
  Outgoing:
  Explicit Route:
    Strict, 10.10.10.2
    Strict, 14.14.14.2
    Strict, 14.14.14.4
    Strict, 192.168.0.4
  Record Route: Empty
  Tspec: avg rate=30000 kbits, burst=1000 bytes, peak rate=30000 kbits
  Session Attributes: Local Prot: Set, Node Prot: Not Set, BW Prot: Not Set
                    Soft Preemption Desired: Set
Resv Info:

```



```

Record Route:
  IPv4 192.168.0.2, flags 0x20
  Label 16002, flags 0x1
  IPv4 10.10.10.2, flags 0x0
  Label 16002, flags 0x1
  IPv4 192.168.0.4, flags 0x20
  Label 3, flags 0x1
  IPv4 14.14.14.4, flags 0x0
  Label 3, flags 0x1
  Fspec: avg rate=30000 kbits, burst=1000 bytes, peak rate=30000 kbits
Displayed 1 (of 4) heads, 0 (of 0) midpoints, 0 (of 2) tails
Displayed 1 up, 0 down, 0 recovering, 0 recovered heads

```

This is sample output from the **show mpls traffic-eng tunnels** command with the **mesh** keyword:

```

RP/0/RP0/CPU0:router# show mpls traffic-eng tunnels auto-tunnel
Signalling Summary:
    LSP Tunnels Process:  running
        RSVP Process:    running
        Forwarding:      enabled
    Periodic reoptimization: every 3600 seconds, next in 3098 seconds
    Periodic FRR Promotion:  every 300 seconds, next in 238 seconds
    Auto-bw enabled tunnels: 1000

Name: tunnel-te9000  Destination: 20.20.20.20 (auto-tunnel mesh)
Status:
  Admin:  up Oper:  up Path:  valid Signalling: connected
  path option 10, type dynamic (Basis for Setup, path weight 11)
  G-PID: 0x0800 (derived from egress interface properties)
  Bandwidth Requested: 0 kbps CT0
  Creation Time: Fri Jan 14 09:09:31 2010 (01:41:20 ago)
Config Parameters:
  Bandwidth: 0 kbps (CT0) Priority: 7 7 Affinity: 0x0/0xffff
  Metric Type: TE (default)
  AutoRoute: disabled LockDown: disabled Policy class: not set
  Forwarding-Adjacency: disabled
  Loadshare: 0 equal loadshares
  Auto-bw: disabled
  Fast Reroute: Disabled, Protection Desired: None
  Path Protection: Not Enabled
  Attribute-set: TA-NAME (type auto-mesh)
Auto-tunnel Mesh:
  Group 40: Destination-list dl-40
  Unused removal timeout: not running
History:
  Tunnel has been up for: 01:40:53 (since Fri Jan 14 09:09:58 EST 2010)
Current LSP:
  Uptime: 01:41:00 (since Fri Jan 14 09:09:51 EST 2010)
Reopt. LSP:
  Last Failure:
    LSP not signalled, identical to the [CURRENT] LSP
    Date/Time: Fri Jan 14 09:42:30 EST 2010 [01:08:21 ago]

Path info (OSPF 100 area 0):
Hop0: 7.0.15.1
Hop1: 20.20.20.20

```

This shows an auto-tunnel mesh summary sample output from the **show mpls traffic-eng tunnels** command using the **summary** keyword:

```

RP/0/RP0/CPU0:router# show mpls traffic-eng tunnels summary
Fri Jan 14 10:46:34.677 EST

    LSP Tunnels Process:  running
        RSVP Process:    running

```

show mpls traffic-eng tunnels

```

                Forwarding: enabled
                Periodic reoptimization: every 3600 seconds, next in 3354 seconds
                Periodic FRR Promotion: every 300 seconds, next in 193 seconds
                Periodic auto-bw collection: 1000

Signalling Summary:
  Head: 2000 interfaces, 2000 active signalling attempts, 2000 established
        2000 explicit, 0 dynamic
        9250 activations, 7250 deactivations
        0 recovering, 2000 recovered
  Mids: 0
  Tails: 0

Fast ReRoute Summary:
  Head: 1000 FRR tunnels, 1000 protected, 0 rerouted
  Mid: 0 FRR tunnels, 0 protected, 0 rerouted
  Summary: 1000 protected, 500 link protected, 500 node protected, 0 bw protected

<snip>

Auto-tunnel Mesh Summary:
  Auto-mesh Tunnels:
    50 created, 50 up, 0 down, 25 FRR, 20 FRR enabled
  Mesh Groups:
    4 groups, 50 destinations

```

This sample output displays the *Signalled-Name* information:

```

RP/0/RP0/CPU0:router#show mpls traffic-eng tunnels
Name: tunnel-tel Destination: 192.168.0.4
Signalled-Name: rtrA_t1
Status:
  Admin: up Oper: up Path: valid Signalling: connected
.
.
.

```

This sample output displays the cost-limit configuration information:

```

RP/0/RP0/CPU0:router#show mpls traffic-eng tunnels detail
Name: tunnel-tel
Signalled-Name: ios_t1
Status:
  Admin: up Oper: down Path: not valid Signalling: Down
  G-PID: 0x0800 (derived from egress interface properties)
  Bandwidth Requested: 0 kbps CT0
  Creation Time: Fri Jan 15 13:00:29 2014 (5d06h ago)
Config Parameters:
  Bandwidth: 0 kbps (CT0) Priority: 7 7 Affinity: 0x0/0xffff
  Metric Type: TE (default)
  Hop-limit: disabled
  Cost-limit: 2
  AutoRoute: disabled LockDown: disabled Policy class: not set
  Forward class: 0 (default)
  Forwarding-Adjacency: disabled
  Loadshare: 0 equal loadshares
  Auto-bw: disabled
  Fast Reroute: Disabled, Protection Desired: None
  Path Protection: Not Enabled
  BFD Fast Detection: Disabled
  Reoptimization after affinity failure: Enabled
  Soft Preemption: Disabled

```

```
Reason for the tunnel being down: No destination is configured
SNMP Index: 10
Displayed 1 (of 1) heads, 0 (of 0) midpoints, 0 (of 0) tails
Displayed 0 up, 1 down, 0 recovering, 0 recovered heads
```

This sample output displays the 'Traffic switched to FRR backup tunnel' message, when the FRR backup is activated as part of soft-preemption:

```
RP/0/RP0/CPU0:router#show mpls traffic-eng tunnels detail
.
.
.
Soft Preemption: Pending
  Preemption Link: HundredGigE0/0/0/3; Address: 14.14.14.2
  Traffic switched to FRR backup tunnel-te 1000
  Preempted at: Fri Jan 27 12:56:14 2017 (00:00:03 ago)
  Time left before hard preemption: 96 seconds
.
.
.
```

show mpls traffic-eng tunnels auto-bw brief

To display the list of automatic bandwidth enabled tunnels, and to indicate if the current signaled bandwidth of the tunnel is identical to the bandwidth that is applied by the automatic bandwidth, use the **show mpls traffic-eng tunnels auto-bw brief** command in XR EXEC mode.

show mpls traffic-eng tunnels auto-bw brief

Syntax Description This command has no arguments or keywords.

Command Default No default behavior or values

Command Modes XR EXEC mode

Command History	Release	Modification
	Release 6.2.1	This command was introduced.

Usage Guidelines Use the **show mpls traffic-eng tunnels auto-bw brief** command to determine if the automatic bandwidth application has been applied on a specified tunnel. If a single tunnel is specified, only the information for that tunnel is displayed.

Task ID	Task	Operations
	mpls-te read	

Examples

The following sample output shows the list of automatic bandwidth enabled tunnels:

```
RP/0/RP0/CPU0:router# show mpls traffic-eng tunnels auto-bw brief
```

Tunnel Name	LSP ID	Last appl BW (kbps)	Requested BW (kbps)	Signalled BW (kbps)	Highest BW (kbps)	Application Time Left
tunnel-te0	1	10	10	10	50	2h 5m
tunnel-te1	5	500	500	300	420	1h 10m

This table describes the significant fields shown in the display.

Table 71: show mpls traffic-eng tunnels auto-bw brief Field Descriptions

Field	Description
Tunnel Name	Name for the tunnel.
LSP ID	ID of the Label Switched Path that is used by the tunnel.
Last appl BW (kbps)	Last bandwidth applied (for example, requested) by the automatic-bandwidth feature for the tunnel.

Field	Description
Requested BW (kbps)	Bandwidth that is requested for the tunnel.
Signalled BW (kbps)	Bandwidth that is actually signalled for the tunnel.
Highest BW (kbps)	Highest bandwidth measured since the last start of the application interval.
Application Time Left	Time left until the application period ends for this tunnel.

show mpls traffic-eng link-management soft-preemption

To display information about soft-preemption activity on a MPLS TE link, use the **show mpls traffic-eng link-management soft-preemption** command in XR EXEC mode.

show mpls traffic-eng link-management soft-preemption [*interfacetype interface-path-id*]

Syntax Description	interface	Displays information on the specified interface.
	<i>type</i>	Interface type. For more information, use the question mark (?) online help function.
	<i>interface-path-id</i>	Physical interface or a virtual interface.
		<p>Note Use the show interfaces command to see a list of all possible interfaces currently configured on the router.</p> <p>For more information about the syntax for the router, use the question mark (?) online help function.</p>

Command Default None

Command Modes XR EXEC mode

Command History	Release	Modification
	Release 6.2.1	This command was introduced .

Usage Guidelines No specific guidelines impact the use of this command.

Task ID	Task ID	Operations
	mpls-te	read

Examples

This is sample output from the **show mpls traffic-eng link-management soft-preemption** command:

```
RP/0/RP0/CPU0:router# show mpls traffic-eng link-management soft-preemption interface
```

HundredGigE0/0/0/3

Name: HundredGigE0/0/0/3; IPv4 Address: 10.2.1.10
 Total Soft Preempted Bandwidth (BC0/BC1) kbps: 1500/1000
 Currently Soft Preempted Bandwidth (BC0/BC1) kbps: 1200/800
 Released Soft Preempted Bandwidth (BC0/BC1) kbps: 300/200
 Currently Over-subscribed Bandwidth (BC0/BC1) kbps: 1000/600
 Currently Soft Preempted Tunnels: 5 tunnels

TunID	LSPID	Source	Destination	Pri S/H	BW Kbps	Class Type	Time out
50	10	10.4.4.40	10.1.1.10	2/2	400	BC0	100
51	11	10.4.4.40	10.1.1.10	2/2	600	BC0	100
52	12	10.4.4.40	10.1.1.10	3/3	200	BC0	80
53	11	10.4.4.40	10.1.1.10	3/3	500	BC1	90
54	12	10.4.4.40	10.1.1.10	4/4	300	BC1	90

show srlg

To show the SRLG interface and configuration information, use the **show srlg** command in XR EXEC mode.

```
show srlg [group group-name] [inherit-location {location}] [interface type interface-path-id]
[location {name | mgmt-nodes}] [mapping {locationname}] [name name] [optical-interface
{locationinterface-id}] [producers name] [value value-number] [trace{file filename original|hexdump
|last entries |reverse |stats |tailf |unique |verbose |wrapping}]
```

Syntax Description

group <i>group-name</i>	(Optional) Specifies a group.
inherit-location <i>location</i>	(Optional) Specifies a particular location.
interface <i>type</i>	(Optional) Displays information on the specific interface type. For more information, use the question mark (?) online help function.
<i>interface-path-id</i>	Physical interface or virtual interface. Note Use the show interfaces command to see a list of all interfaces currently configured on the router. For more information about the syntax for the router, use the question mark (?) online help function.
location	(Optional) Specifies a node.
<i>node-id</i>	Node ID. The <i>node-id</i> argument is entered in the <i>rack/slot/module</i> notation.
all	Specifies all locations.
mgmt-nodes	Specifies all management nodes.
mapping	(Optional) Specifies a mapping
<i>location</i>	Node location
<i>name</i>	Name of the mapping
name <i>name</i>	(Optional) Specifies an SRLG name.
optical-interface <i>interface-id</i>	(Optional) Specifies an optical interface.
producers <i>name</i>	(Optional) Specifies a SRLG producer.
value <i>value-number</i>	(Optional) Displays SRLG value numbers.
trace	(Optional) Displays trace information for SRLG.
file <i>filename</i>	(Optional) Displays trace information for a specific file name.

original	Displays the original location of the file.
hexdump	(Optional) Displays traces in hexadecimal format.
last	(Optional) Displays trace information for a specific number of entries.
<i>entries</i>	Number of entries. Replace entries with the number of entries you want to display. For example, if you enter 5, the display shows the last 5 entries in the trace data. Range is 1 to 4294967295.
reverse	(Optional) Displays the latest traces first.
stats	(Optional) Displays the statistics in the command output.
tailf	(Optional) Displays the new traces as they are added in the command output.
unique	(Optional) Displays the unique entries with counts in the command output.
verbose	(Optional) Displays the information for internal debugging in the command output.
wrapping	(Optional) Displays the wrapping entries in the command output.

Command Default No default behavior or values

Command Modes XR EXEC mode

Command History	Release	Modification
	Release 6.2.1	This command was introduced.

Usage Guidelines No specific guidelines impact the use of this command.

Task ID	Task ID	Operation
	ip-services	read

Example

The following sample output is from the **show srlg value** command.

```
System Information::
Interface Count   : 2 (Maximum Interfaces Supported 250)
```

```
Interface : HundredGigE0/0/0/3, Value Count : 2  
SRLG Values : 10,20
```

```
Interface : HundredGigE0/0/0/3, Value Count : 2  
SRLG Values : 10,30
```

```
Interface : HundredGigE0/0/0/3, Value Count : 2  
SRLG Values : 10,40
```

```
Interface : HundredGigE0/0/0/3, Value Count : 1  
SRLG Values : 100
```

signalled-name

To configure the name of the tunnel required for an MPLS-TE tunnel, use the **signalled-name** command in interface configuration mode. To return to the default behavior, use the **no** form of this command.

signalled-name *name*
no signalled-bandwidth *name*

Syntax Description

name Name used to signal the tunnel.

Command Default

Default name is the hostname_tID, where ID is the tunnel interface number.

Command Modes

Interface configuration

Command History

Release	Modification
Release 6.2.1	This command was introduced.

Usage Guidelines

No specific guidelines impact the use of this command.

Task ID

Task ID	Operations
mpls-te	read, write

Examples

The following example shows how to set the tunnel name:

```
RP/0/RP0/CPU0:router(config)# interface tunnel-te 1
RP/0/RP0/CPU0:router(config-if)# signalled-name tunnel-from-NY-to-NJ
```

signalling advertise explicit-null (MPLS-TE)

To specify that tunnels terminating on a router use explicit-null labels, use the **signalling advertise explicit-null** command in MPLS-TE configuration mode. To return to the default behavior, use the **no** form of this command.

signalling advertise explicit-null
no signalling advertise explicit-null

Syntax Description This command has no arguments or keywords.

Command Default Implicit-null labels are advertised.

Command Modes MPLS-TE configuration

Command History	Release	Modification
	Release 6.2.1	This command was introduced.

Usage Guidelines Use the **signalling advertise explicit-null** command to specify that tunnels terminating on this router use explicit-null labels. This command applies to tunnel labels advertised to next to last (penultimate) hop.

The explicit label is used to carry quality-of-service (QoS) information up to the terminating-end router of the label switched path (LSP).

Task ID	Task ID	Operations
	mpls-te	read, write

Examples

The following example shows how to configure explicit null tunnel labels:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# mpls traffic-eng
RP/0/RP0/CPU0:router(config-mpls-te)# signalling advertise explicit-null
```

snmp traps mpls traffic-eng

To enable the router to send Multiprotocol Label Switching traffic engineering (MPLS-TE) Simple Network Management Protocol (SNMP) notifications or informs, use the **snmp traps mpls traffic-eng** command in XR Config mode. To disable this behavior, use the **no** form of this command.

snmp traps mpls traffic-eng [*notification-option*] **preempt**
no snmp traps mpls traffic-eng [*notification-option*]

Syntax Description

notification-option (Optional) Notification option to enable the sending of notifications to indicate changes in the status of MPLS-TE tunnels. Use one of these values:

- up
- down
- reoptimize
- reroute
- cisco-ext

preempt Enables MPLS-TE tunnel preempt trap.

Command Default

None

Command Modes

XR Config mode

Command History

Release	Modification
Release 6.2.1	This command was introduced.

Usage Guidelines

If the command is entered without the *notification-option* argument, all MPLS-TE notification types are enabled.

SNMP notifications can be sent as either traps or inform requests.

The **snmp-server enable traps mpls traffic-eng** command enables both traps and inform requests for the specified notification types. To specify whether the notifications should be sent as traps or informs, use the **snmp-server host** command and specify the keyword **trap** or **informs**.

If you do not enter the **snmp traps mpls traffic-eng** command, no MPLS-TE notifications controlled by this command are sent. To configure the router to send these MPLS-TE SNMP notifications, you must enter at least one **snmp enable traps mpls traffic-eng** command. If you enter the command with no keywords, all MPLS-TE notification types are enabled. If you enter the command with a keyword, only the notification type related to that keyword is enabled. To enable multiple types of MPLS-TE notifications, you must issue a separate **snmp traps mpls traffic-eng** command for each notification type and notification option.

The **snmp traps mpls traffic-eng** command is used in conjunction with the **snmp host** command. Use the **snmp host** command to specify which host or hosts receive MPLS-TE SNMP notifications. To send notifications, you must configure at least one **snmp host** command.

For a host to receive an MPLS-TE notification controlled by this command, both the **snmp traps mpls traffic-eng** command and the **snmp host** command for that host must be enabled.

Task ID	Task ID	Operations
	mpls-te	read/write

Examples

This example shows how to configure a router to send MPLS-TE tunnel up SNMP notifications when a configured MPLS-TE tunnel leaves the down state and enters the up state:

```
RP/0/RP0/CPU0:router(config)# snmp traps mpls traffic-eng up
```

soft-preemption

To enable soft-preemption with default timeout on a head-end for the MPLS TE tunnel, use the **soft-preemption** command in MPLS TE mode. To disable this feature, use the **no** form of this command.

soft-preemption timeout seconds

no soft-preemption

timeout seconds	Defines the timeout for soft-preempted LSP, in seconds. The default timeout is 60. Range is from 30 to 300.
------------------------	---

Command Default The default *timeout seconds* is 60 seconds.

Command Modes MPLS TE configuration
Tunnel Interface configuration

Command History	Release	Modification
	Release 6.2.1	This command was introduced.

Usage Guidelines No specific guidelines impact the use of this command.

Task ID	Task ID	Operation
	MPLS-TE	write

This example shows how to enable soft-preemption on a specific tunnel:

```
RP/0/RP0/CPU0:router(config)#interface tunnel-te 50
RP/0/RP0/CPU0:router(config-if)#soft-preemption
```

This example shows how to enable soft-preemption on a node :

```
RP/0/RP0/CPU0:router(config)#mpls traffic-eng
RP/0/RP0/CPU0:router(config-mpls-te)#soft-preemption
RP/0/RP0/CPU0:router(config-soft-preemption)#
```

soft-preemption frr-rewrite

To enable LSP traffic over backup tunnel, when LSP is soft-preempted, use the **soft-preemption frr-rewrite** command in MPLS TE configuration mode. To disable the LSP traffic over backup tunnel, use the **no** form of this command.

soft-preemption frr-rewrite
no soft-preemption frr-rewrite

Syntax Description This command has no keywords or arguments.

Command Default FRR LSP traffic over backup tunnel is disabled.

Command Modes MPLS TE configuration

Command History	Release	Modification
	Release 6.2.1	This command was introduced.

Usage Guidelines The fast re-route backup tunnel must be available and ready for the traffic of the preempted LSP to be moved onto the FRR backup. The traffic will not be moved to the backup tunnel, if an LSP is already soft-preempted.

Task ID	Task ID	Operation
	mpls-te read, write	

This example shows how to enable FRR LSP traffic over backup tunnels, when the LSP is soft-preempted.

```
RP/0/RP0/CPU0:router#configure
RP/0/RP0/CPU0:router(config)#mpls traffic-eng
RP/0/RP0/CPU0:router(config-mpls-te)#soft-preemption frr-rewrite
```


srlg

To configure an MPLS traffic engineering shared-risk link group (SRLG) value for a link on a given interface, use the **srlg** command in global configuration mode. To disable this configuration, use the **no** form of this command.

srlg *value*
no srlg *value*

Syntax Description	<i>value</i> Value number that identifies the SRLG. Range is 0 to 4294967295.				
Command Default	Shared Risk Link Group memberships are not configured.				
Command Modes	MPLS-TE interface configuration XR Config mode				
Command History	<table border="1"> <thead> <tr> <th>Release</th> <th>Modification</th> </tr> </thead> <tbody> <tr> <td>Release 6.2.1</td> <td>This command was introduced.</td> </tr> </tbody> </table>	Release	Modification	Release 6.2.1	This command was introduced.
Release	Modification				
Release 6.2.1	This command was introduced.				
Usage Guidelines	You can enter up to 30 SRLG entries on the ingress and egress ports of the interface. SRLG entries configured over 30 are silently dropped.				
Task ID	<table border="1"> <thead> <tr> <th>Task ID</th> <th>Operations</th> </tr> </thead> <tbody> <tr> <td>mpls-te</td> <td>read, write</td> </tr> </tbody> </table>	Task ID	Operations	mpls-te	read, write
Task ID	Operations				
mpls-te	read, write				

Examples

The following example shows how to configure an SRLG with 10 member links:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# mpls traffic-eng
RP/0/RP0/CPU0:router(config-mpls-te)# interface HundredGigE 0/0/0/3
RP/0/RP0/CPU0:router(config-mpls-te-if)# srlg 10
```

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router# srlg
RP/0/RP0/CPU0:router#(config-srlg)# interface HundredGigE 0/0/0/3
RP/0/RP0/CPU0:router#(config-srlg-if)# value 10
```

timers loose-path (MPLS-TE)

To configure the period between the headend retries after path errors, use the **timers loose-path** command in MPLS-TE configuration mode. To return to the default behavior, use the **no** form of this command.

```
timers loose-path retry-period value
no timers loose-path retry-period value
```

Syntax Description	retry-period <i>value</i> Configures the time, in seconds, between retries upon a path error. Range is 30 to 600.				
Command Default	<i>value</i> : 120				
Command Modes	MPLS-TE configuration				
Command History	<table border="1"> <thead> <tr> <th>Release</th> <th>Modification</th> </tr> </thead> <tbody> <tr> <td>Release 6.2.1</td> <td>This command was introduced</td> </tr> </tbody> </table>	Release	Modification	Release 6.2.1	This command was introduced
Release	Modification				
Release 6.2.1	This command was introduced				

Usage Guidelines No specific guidelines impact the use of this command.

Task ID	Task ID	Operations
	mpls-te	read, write

Examples The following example shows how to the period between retries after path errors to 300 seconds:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# mpls traffic-eng
RP/0/RP0/CPU0:router(config-mpls-te)# timers loose-path retry-period 300
```

timers removal unused (auto-tunnel backup)

To configure the frequency at which a timer scans backup autotunnels and removes tunnels that are not in use, use the **timers removal unused (auto-tunnel backup)** command in auto-tunnel backup configuration mode. To return to the default behavior, use the **no** form of this command.

```
timers removal unused frequency
no timers removal unused frequency
```

Syntax Description	<i>frequency</i> Frequency, in minutes, between backup autotunnel scans to remove tunnels that are not used. Range is 0; 5 to 10080 minutes (7 days). A value of 0 disables the scanning and removal of tunnels.				
Command Default	<i>frequency</i> : 60				
Command Modes	auto-tunnel backup configuration				
Command History	<table border="1"> <thead> <tr> <th>Release</th> <th>Modification</th> </tr> </thead> <tbody> <tr> <td>Release 6.2.1</td> <td>This command was introduced</td> </tr> </tbody> </table>	Release	Modification	Release 6.2.1	This command was introduced
Release	Modification				
Release 6.2.1	This command was introduced				
Usage Guidelines	The unused auto-tunnel backup tunnel is the tunnel that is not assigned to protect any FRR tunnel.				
Task ID	<table border="1"> <thead> <tr> <th>Task ID</th> <th>Operation</th> </tr> </thead> <tbody> <tr> <td>mpls-te</td> <td>read, write</td> </tr> </tbody> </table>	Task ID	Operation	mpls-te	read, write
Task ID	Operation				
mpls-te	read, write				

Example

The following example shows that unused automatic backup tunnels are removed after the 10 minute timer scan is reached.

```
RP/0/RP0/CPU0:router(config)# mpls traffic-eng
RP/0/RP0/CPU0:router(config-mpls-te)# auto-tunnel backup
RP/0/RP0/CPU0:router(config-te-auto-bk)# timers removal unused 10
```

timeout (soft-preemption)

To override the soft-preemption default timeout, use the **timeout** command in MPLS TE mode. To remove this configuration, use the **no** form of this command.

soft-preemption timeout *seconds*

no soft-preemption

Syntax Description	timeout <i>seconds</i> Defines the timeout for soft-preempted LSP, in seconds. The default timeout is 60. Range is from 30 to 300.	
Command Default	The default <i>timeout seconds</i> is 60 seconds.	
Command Modes	MPLS TE configuration	
Command History	Release	Modification
	Release 6.2.1	This command was introduced
Usage Guidelines	No specific guidelines impact the use of this command.	
Task ID	Task ID	Operation
	MPLS-TE	write

This example shows how to override the soft-preemption default timeout:

```
RP/0/RP0/CPU0:router(config)# mpls traffic-eng
RP/0/RP0/CPU0:router(config-mpls-te)# soft-preemption
RP/0/RP0/CPU0:router(config-soft-preemption)# timeout 60
```

topology holddown sigerr (MPLS-TE)

To specify the time that a router should ignore a link in its TE topology database in tunnel path constrained shortest path first (CSPF) computations following a TE tunnel signaling error on the link, use the **topology holddown sigerr** command in MPLS-TE configuration mode. To return to the default behavior, use the **no** form of this command.

topology holddown sigerr *seconds*
no topology holddown sigerr *seconds*

Syntax Description	<i>seconds</i> Time that the router ignores a link during tunnel path calculations, following a TE tunnel error on the link, specified in seconds. Range is 0 to 300. Default is 10.				
Command Default	<i>seconds</i> : 10				
Command Modes	MPLS-TE configuration				
Command History	<table border="1"> <thead> <tr> <th>Release</th> <th>Modification</th> </tr> </thead> <tbody> <tr> <td>Release 6.2.1</td> <td>This command was introduced</td> </tr> </tbody> </table>	Release	Modification	Release 6.2.1	This command was introduced
Release	Modification				
Release 6.2.1	This command was introduced				

Usage Guidelines A router at the headend for TE tunnels can receive a Resource Reservation Protocol (RSVP) No Route error message before the router receives a topology update from the IGP routing protocol announcing that the link is down. When this happens, the headend router ignores the link in subsequent tunnel path calculations to avoid generating paths that include the link and are likely to fail when signaled. The link is ignored until the router receives a topology update from its IGP or a link holddown timeout occurs. Use the **topology holddown sigerr** command to change the link holddown time from its 10-second default value.

Task ID	Task	Operations
	mpls-te	read, write

Examples

The following example shows how to set the link holddown time for signaling errors at 15 seconds:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# mpls traffic-eng
RP/0/RP0/CPU0:router(config-mpls-te)# topology holddown sigerr 15
```

tunnel-id (auto-tunnel backup)

To configure the range of tunnel interface numbers to be used for automatic backup tunnels, use the **tunnel-id** command in auto-tunnel backup configuration mode. To delete the automatic backup tunnels, use the **no** form of this command.

tunnel-id
min *number*
max *number*
no tunnel-id

Syntax Description	
min	(Optional) Minimum number for automatic backup tunnels.
<i>number</i>	Valid values are from 0 to 65535.
max	(Optional) Maximum number for automatic backup tunnels.

Command Default No default behavior or values

Command Modes Auto-tunnel backup configuration

Command History	Release	Modification
	Release 6.2.1	This command was introduced

Usage Guidelines If you increase the tunnel ID range, the automatic backup tunnels that failed earlier will get created the next time automatic backup assignments are processed.

Restrictions:

- Command is rejected if the **max** value minus **min** value is $\geq 1K$.
- Command is rejected if **min** value $>$ **max** value.
- Command is rejected if **min** value is greater than the tunnel ID of an existing automatic backup tunnel.
- Command is rejected if **max** value is smaller than the tunnel ID of an existing automatic backup tunnel.
- Command is rejected if a statically configured tunnel ID matches with the configured **min** and **max** range of values.
- Command is rejected if a static backup assignment is already configured to a tunnel with an ID within the **min** value / **max** value range.

Task ID	Task ID	Operation
	mple-te	read, write

Example

The following example allows 800 automatic backup tunnels to be created:

```
RP/0/RP0/CPU0:router(config)# mpls traffic-eng
RP/0/RP0/CPU0:router(config-mpls-te)# auto-tunnel backup
RP/0/RP0/CPU0:router(config-te-auto-bk)# tunnel-id min 1200 max 2000
```

tunnel-id (auto-tunnel backup)



MPLS OAM Commands

This module describes Multiprotocol Label Switching (MPLS) label switched path (LSP) verification commands. These commands provide a means to detect and diagnose data plane failures and are the first set of commands in the MPLS Operations, Administration, and Maintenance (OAM) solution.

For detailed information about MPLS concepts, configuration tasks, and examples, see .

- [clear mpls oam counters, on page 454](#)
- [echo disable-vendor-extension, on page 455](#)
- [mpls oam, on page 456](#)
- [ping mpls ipv4, on page 457](#)
- [show mpls oam, on page 462](#)
- [show mpls oam database, on page 464](#)
- [traceroute mpls ipv4, on page 465](#)
- [traceroute mpls multipath, on page 469](#)

clear mpls oam counters

To clear MPLS OAM counters, use the **clear mpls oam counters** command in XR EXEC mode.

clear mpls oam counters {**global** | **interface** [*{type interface-path-id}*] | **packet**}

Syntax Description		
global		Clears global counters.
interface		Clears counters on a specified interface.
<i>type</i>		Interface type. For more information, use the question mark (?) online help function.
<i>interface-path-id</i>		Physical interface or virtual interface.
	Note	Use the show interfaces command to see a list of all interfaces currently configured on the router.
		For more information about the syntax for the router, use the question mark (?) online help function.
packet		Clears global packet counters.

Command Default No default behavior or values

Command Modes XR EXEC mode

Command History	Release	Modification
	Release 6.0	This command was introduced.

Usage Guidelines No specific guidelines impact the use of this command.

Task ID	Task ID	Operations
	mpls-ldp	execute
	mpls-static	execute

Examples

The following example shows how to clear all global MPLS OAM counters:

```
RP/0/RP0/CPU0:router# clear mpls oam counters global
```

echo disable-vendor-extension

To disable sending the vendor extension type length and value (TLV) in the echo request, use the **echo disable-vendor extension** command in MPLS OAM configuration mode. To return to the default behavior, use the **no** form of this command.

```
echo disable-vendor-extension
no echo disable-vendor-extension
```

Syntax Description This command has no arguments or keywords.

Command Default The default value is 4.

Command Modes MPLS OAM configuration mode

Command History	Release	Modification
	Release 6.0	This command was introduced.

Usage Guidelines No specific guidelines impact the use of this command.

Task ID	Task ID	Operations
	mpls-ldp	read, write
	mpls-static	read, write

Examples

The following example shows how to disable inclusion of the vendor extensions TLV in the echo requests:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# mpls oam
RP/0/RP0/CPU0:router(config-oam)# echo disable-vendor-extension
```

mpls oam

To enable MPLS OAM LSP verification, use the **mpls oam** command in XR Config mode. To return to the default behavior, use the **no** form of this command.

mpls oam
no mpls oam

Syntax Description This command has no arguments or keywords.

Command Default By default, MPLS OAM functionality is disabled.

Command Modes XR Config mode

Command History	Release	Modification
	Release 6.0	This command was introduced.

Usage Guidelines The **mpls oam** command and OAM functionality is described in the RFC 4379.

Task ID	Task ID	Operations
	mpls-ldp	read, write
	mpls-static	read, write

Examples

The following example shows how to enable MPLS OAM:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router (config)# mpls oam
RP/0/RP0/CPU0:router (config-oam)#
```

ping mpls ipv4

To check MPLS host reachability and network connectivity by specifying the destination type as a Label Distribution Protocol (LDP) IPv4 address, use the **ping mpls ipv4** command in XR EXEC mode.

```
ping mpls ipv4 address/mask [destination start-address end-address increment] [dsmap] [exp exp-bits]
[force-explicit-null] [interval min-send-delay] [output interface type interface-path-id [nexthop
nexthop-address]][pad pattern][repeat count] [reply {dscp dscp-value | reply mode{ipv4 | no-reply
| router-alert} | reply pad-tlv}] [size packet-size] [source source-address] [sweep min value max
value increment] [timeout timeout] [ttl value] [verbose] [fec-type {bgp | generic | ldp}]
```

Syntax Description

<i>address/mask</i>	Address prefix of the target and number of bits in the target address network mask.
destination <i>start address end address address increment</i>	(Optional) Specifies a network 127/8 address to be used as the destination address in the echo request packet. <i>start address</i> Start of the network address. <i>end address</i> Start of the ending network address. <i>address increment</i> Incremental value of the network address, which is expressed as a decimal number value or IP address.
dsmap	(Optional) Indicates that a downstream mapping (DSMAP) type length and value should be included in the LSP echo request.
exp <i>exp-bits</i>	(Optional) Specifies the MPLS experimental field value in the MPLS header for echo replies. Range is 0 to 7. Default is 0.
force-explicit-null	(Optional) Forces an unsolicited explicit null label to be added to the MPLS label stack and allows LSP ping to be used to detect LSP breakages at the penultimate hop.
interval <i>min-send-delay</i>	(Optional) Specifies a send interval, in milliseconds, between requests. Range is 0 to 3600000. Default is 0.
output interface	(Optional) Specifies the output interface where echo request packets are sent.
<i>type</i>	Interface type. For more information, use the question mark (?) online help function.

<i>interface-path-id</i>	Physical interface or virtual interface. Note Use the show interfaces command to see a list of all interfaces currently configured on the router. For more information, use the question mark (?) online help function.
nexthop	(Optional) Specifies the nextop as an IP address.
<i>nexthop-iaddress</i>	(Optional) IP address for the next hop.
pad pattern	(Optional) Specifies the pad pattern for an echo request.
repeat count	(Optional) Specifies the number of times to resend a packet. Range is 1 to 2147483647. Default is 5.
reply dscp dscp-value	Specifies the differentiated service codepoint value for an MPLS echo reply.
reply mode [ipv4 router-alert no-reply]	Specifies the reply mode for the echo request packet. no-reply Do not reply ipv4 Reply with an IPv4 UDP packet (this is the default) router-alert Reply with an IPv4 UDP packet with the IP router alert set
reply pad-tlv	Indicates that a pad TLV should be included.
size packet size	(Optional) Specifies the packet size or number of bytes in each MPLS echo request packet. Range is 100 to 17986. Default is 100.
source source-address	(Optional) Specifies the source address used in the echo request packet.

sweep <i>min value max value interval</i>	(Optional) Specifies a range of sizes for the echo packets sent. min value Minimum or start size for an echo packet (range is 100 to 17986) max value Maximum or end size for an echo packet (range is 100 to 17986) interval Number used to increment an echo packet size (range is 1 to 8993)
timeout <i>timeout</i>	(Optional) Specifies the timeout interval, in seconds. Range is 0 to 3600. Default is 2.
ttl <i>value</i>	(Optional) Specifies the TTL value to be used in the MPLS labels (range is 1 to 255).
verbose	(Optional) Enables verbose output information, including MPLS echo reply, sender address of the packet, and return codes.
fec-type	(Optional) Specifies FEC type to be used. generic Use FEC type as generic ldp Use FEC type as LDP

Command Default

exp *exp bits*: 0
interval *min-send-delay*: 0
repeat *count* : 5
reply-mode: IPv4
timeout *timeout* : 2

Command Modes

XR EXEC mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

The **output interface** keyword specifies the output interface on which the MPLS echo request packets are sent. If the specified output interface is not part of the LSP, the packets are not transmitted.

In cases where the sweep keyword is used, values larger than the outgoing interface's MTU are not transmitted.

The **ping** command sends an echo request packet to an address, and then awaits a reply. Ping output can help you evaluate path-to-host reliability, delays over the path, and whether the host can be reached or is functioning.



Note The **ping mpls** command is not supported on optical LSPs. If an optical LSP is encountered along the LSP's path, it is treated as a physical interface.

Task ID

Task ID Operations

```
mpls-ldp read,
write
```

Examples

The following example shows the destination type as a label distribution protocol (LDP) prefix and specifies a range of sizes for the echo packets sent:

```
RP/0/RP0/CPU0:router# ping mpls ipv4 7.7.7.7/32 verbose sweep 100 200 15 repeat 1
```

```
  Sending 1, [100..200]-byte MPLS Echos to 7.7.7.7/32,
    timeout is 2 seconds, send interval is 0 msec:
```

```
Codes: '!' - success, 'Q' - request not sent, '.' - timeout,
'L' - labeled output interface, 'B' - unlabeled output interface,
'D' - DS Map mismatch, 'F' - no FEC mapping, 'f' - FEC mismatch,
'M' - malformed request, 'm' - unsupported tlvs, 'N' - no rx label,
'P' - no rx intf label prot, 'p' - premature termination of LSP,
'R' - transit router, 'I' - unknown upstream index,
'X' - unknown return code, 'x' - return code 0
```

Type escape sequence to abort.

```
!      size 100, reply addr 178.0.0.1, return code 3
!      size 115, reply addr 178.0.0.1, return code 3
!      size 130, reply addr 178.0.0.1, return code 3
!      size 145, reply addr 178.0.0.1, return code 3
!      size 160, reply addr 178.0.0.1, return code 3
!      size 175, reply addr 178.0.0.1, return code 3
!      size 190, reply addr 178.0.0.1, return code 3
```

Success rate is 100 percent (7/7), round-trip min/avg/max = 2/2/4 ms

The following example shows the destination type as a label distribution protocol (LDP) prefix and specifies FEC type as generic and verbose option:

```
RP/0/RP0/CPU0:router# ping mpls ipv4 7.7.7.7/32 fec-type generic output interface TenGigE
0/0/0/11 nexthop 79.1.0.2 verbose
```

```
  Sending 5, 100-byte MPLS Echos to 7.7.7.7/32,
    timeout is 2 seconds, send interval is 0 msec:
```

```
Codes: '!' - success, 'Q' - request not sent, '.' - timeout,
'L' - labeled output interface, 'B' - unlabeled output interface,
'D' - DS Map mismatch, 'F' - no FEC mapping, 'f' - FEC mismatch,
'M' - malformed request, 'm' - unsupported tlvs, 'N' - no rx label,
'P' - no rx intf label prot, 'p' - premature termination of LSP,
'R' - transit router, 'I' - unknown upstream index,
```



```
'X' - unknown return code, 'x' - return code 0
```

```
Type escape sequence to abort.
```

```
!      size 100, reply addr 178.0.0.1, return code 3  
!      size 100, reply addr 178.0.0.1, return code 3  
!      size 100, reply addr 178.0.0.1, return code 3  
!      size 100, reply addr 178.0.0.1, return code 3  
!      size 100, reply addr 178.0.0.1, return code 3
```

```
Success rate is 100 percent (5/5), round-trip min/avg/max = 2/2/3 ms
```

show mpls oam

To display MPLS OAM information, use the **show mpls oam** command in XR EXEC mode.

show mpls oam {**client** | **counters** {**global** | **packet**} | **interface** *type interface-path-id*}

Syntax Description	
client	Displays clients registered with LSPV server.
counters global	Displays LSP verification global counters.
counters packet	Displays LSP verification packet counters.
interface	Displays LSP verification information for a specific interface.
<i>type</i>	Interface type. For more information, use the question mark (?) online help function.
<i>interface-path-id</i>	Physical interface or virtual interface.
	<p>Note Use the show interfaces command to see a list of all interfaces currently configured on the router.</p> <p>For more information about the syntax for the router, use the question mark (?) online help function.</p>

Command Default No default behavior or values

Command Modes XR EXEC mode

Command History	Release	Modification
	Release 6.0	This command was introduced.

Usage Guidelines No specific guidelines impact the use of this command.

Task ID	Task ID	Operations
	mpls-ldp	read
	mpls-static	read

Examples

The following example shows how to display MPLS OAM client information:

```
RP/0/RP0/CPU0:router# show mpls oam client
```

```
Client Process: l2vpn_mgr Node: 0/RP0/CPU0 Pid: 7200 Service: 3
Client Process: mpls_ldp Node: 0/RP0/CPU0 Pid: 7201 Service: 2
Client Process: bgp Node: 0/RP0/CPU0 Pid: 7488 Service: 5
```

This table describes the significant fields shown in the display.

Table 72: show mpls oam client Command Field Descriptions

Field	Description
Client Process	Process of client.

show mpls oam database

To display MPLS OAM database information, use the **show mpls oam database** command in XR EXEC mode.

show mpls oam database { **requests** | **tt-requests** } [**detail**] [**handle** *handle-value*]

Syntax Description	
requests	Displays request database
tt-requests	Displays tree trace request database
detail	(Optional) Displays displayed information.
handle	(Optional) Displays handle information.
<i>handle-value</i>	Generic handle value. Range is from 0 to 4294967295.

Command Default No default behavior or values

Command Modes XR EXEC mode

Command History	Release	Modification
	Release 6.0	This command was introduced.

Usage Guidelines No specific guidelines impact the use of this command.

Task ID	Task ID	Operations
	mpls-ldp	read
	mpls-static	read

Examples

The following example shows how to display detailed MPLS OAM database information:

```
RP/0/RP0/CPU0:router# show mpls oam database request detail
```

traceroute mpls ipv4

To learn the routes that packets follow when traveling to their Label Distribution Protocol (LDP) IPv4 destination, use the **traceroute mpls** command in XR EXEC mode.

```
traceroute mpls ipv4address/mask [destination start-address end-address address-increment] [exp
exp-bits] [flags fec] [force-explicit-null] [output {interface type interface-path-id [nexthop
nexthop-address] | [nexthop nexthop-address}]}] [reply {dscp dscp-value | reply mode {ipv4 |
router-alert}]}] [source source-address] [timeout timeout] [ttl value] [verbose] [fec-type {bgp |
generic | ldp}]
```

Syntax Description

<i>address/mask</i>	Specifies the destination type as a label distribution protocol (LDP) prefix. Address prefix of the target and number of bits in the target address network mask.
destination start-address end-address address-increment	Specifies a network 127 address to be used as the destination address in the echo request packet. start address Start of the network address. end address End of the network address. address increment Incremental value of the network address.
exp exp-bits	(Optional) Specifies the MPLS experimental field value in the MPLS header for echo replies. Range is 0 to 7. Default is 0.
flags fec	(Optional) Specifies that forwarding equivalent class (FEC) stack checking is to be performed at transit routers.
force-explicit-null	(Optional) Forces an unsolicited explicit null label to be added to the MPLS label stack and allows LSP ping to be used to detect LSP breakages at the penultimate hop.
output interface	(Optional) Specifies the output interface in which echo request packets are sent.
<i>type</i>	Interface type. For more information, use the question mark (?) online help function.
<i>interface-path-id</i>	Physical interface or virtual interface. Note Use the show interfaces command to see a list of all interfaces currently configured on the router. For more information, use the question mark (?) online help function.
nexthop	(Optional) Specifies the IP address for the next hop.

<i>nexthop-address</i>	(Optional) IP address for the next hop.
reply dscp <i>dscp-value</i>	(Optional) Specifies the differentiated service codepoint value for an MPLS echo reply.
reply mode { ipv4 router-alert }	(Optional) Specifies the reply mode for the echo request packet. ipv4 Reply with IPv4 UDP packet (this is the default) router-alert Reply with IPv4 UDP packet with router alert
source <i>source-address</i>	(Optional) Specifies the source address used in the echo request packet.
timeout <i>timeoutt</i>	(Optional) Specifies the timeout interval, in seconds. Range is from 0 to 3600. Default is 2.
ttl <i>value</i>	(Optional) Specifies the maximum number of hops (range is 1 to 255).
verbose	(Optional) Enables verbose output information, including MPLS echo reply, sender address of the packet, and return codes.
fec-type	(Optional) Specifies FEC type to be used. bgp Use FEC type as BGP generic Use FEC type as generic ldp Use FEC type as LDP

Command Default
exp *exp-bits*: 0
reply mode: IPv4
timeout *timeout*: 2

Command Modes
XR EXEC mode

Command History	Release	Modification
	Release 6.0	This command was introduced.

Usage Guidelines



Note The **tracertoute mpls** command is not supported on optical LSPs. If an optical LSP is encountered along the LSPs path, it is treated as a physical interface.

For detailed configuration information about MPLS LSP trace operations, see *System Monitoring Configuration Guide*.

Task ID	Task ID Operations
	mpls-ldp read, write

Examples

The following example shows how to trace a destination:

```
RP/0/RP0/CPU0:router# traceroute mpls ipv4 7.7.7.7/32 destination 127.0.0.10 127.0.0.15 1
```

```
Tracing MPLS Label Switched Path to 7.7.7.7/32, timeout is 2 seconds
```

```
Codes: '!' - success, 'Q' - request not sent, '.' - timeout,
'L' - labeled output interface, 'B' - unlabeled output interface,
'D' - DS Map mismatch, 'F' - no FEC mapping, 'f' - FEC mismatch,
'M' - malformed request, 'm' - unsupported tlvs, 'N' - no rx label,
'P' - no rx intf label prot, 'p' - premature termination of LSP,
'R' - transit router, 'I' - unknown upstream index,
'X' - unknown return code, 'x' - return code 0
```

```
Type escape sequence to abort.
```

```
Destination address 127.0.0.10
 0 79.4.0.1 MRU 1500 [Labels: 24008 Exp: 0]
L 1 79.4.0.2 MRU 1500 [Labels: implicit-null Exp: 0] 5 ms
! 2 178.0.0.1 4 ms
```

```
Destination address 127.0.0.11
 0 79.5.0.1 MRU 1500 [Labels: 24008 Exp: 0]
L 1 79.5.0.2 MRU 1500 [Labels: implicit-null Exp: 0] 3 ms
! 2 178.0.0.1 2 ms
```

```
Destination address 127.0.0.12
 0 79.1.0.1 MRU 1500 [Labels: 24008 Exp: 0]
L 1 79.1.0.2 MRU 1500 [Labels: implicit-null Exp: 0] 3 ms
! 2 178.0.0.1 2 ms
```

```
Destination address 127.0.0.13
 0 79.2.0.1 MRU 1500 [Labels: 24008 Exp: 0]
L 1 79.2.0.2 MRU 1500 [Labels: implicit-null Exp: 0] 3 ms
! 2 178.0.0.1 2 ms
```

```
Destination address 127.0.0.14
 0 79.4.0.1 MRU 1500 [Labels: 24008 Exp: 0]
L 1 79.4.0.2 MRU 1500 [Labels: implicit-null Exp: 0] 3 ms
! 2 178.0.0.1 2 ms
```

```
Destination address 127.0.0.15
 0 79.5.0.1 MRU 1500 [Labels: 24008 Exp: 0]
L 1 79.5.0.2 MRU 1500 [Labels: implicit-null Exp: 0] 3 ms
! 2 178.0.0.1 3 ms
```

The following example shows how to trace a destination with FEC type specified as generic and verbose option:

```
RP/0/RP0/CPU0:router# router#traceroute mpls ipv4 7.7.7.7/32 fec-type generic output interface TenGigE 0/0/0/11.1 nexthop 79.1.0.2 verbose
```

```
Tracing MPLS Label Switched Path to 7.7.7.7/32, timeout is 2 seconds
```

```
Codes: '!' - success, 'Q' - request not sent, '.' - timeout,  
'L' - labeled output interface, 'B' - unlabeled output interface,  
'D' - DS Map mismatch, 'F' - no FEC mapping, 'f' - FEC mismatch,  
'M' - malformed request, 'm' - unsupported tlvs, 'N' - no rx label,  
'P' - no rx intf label prot, 'p' - premature termination of LSP,  
'R' - transit router, 'I' - unknown upstream index,  
'X' - unknown return code, 'x' - return code 0
```

```
Type escape sequence to abort.
```

```
0 79.1.0.1 79.1.0.2 MRU 1500 [Labels: 24008 Exp: 0]  
L 1 79.1.0.2 178.0.0.1 MRU 1500 [Labels: implicit-null Exp: 0] 4 ms, ret code 8  
! 2 178.0.0.1 3 ms, ret code 3
```


traceroute mpls multipath

To discover all possible paths of an LSP between the ingress and egress routers, use the **traceroute mpls multipath** command in XR EXEC mode.

```
traceroute mpls multipath ipv4 address/mask [destination start-address/end-address ] [exp exp-bits]
[flags fec] [force-explicit-null] [hashkey ipv4 bitmap bit-size] [interval min-send-delay] [output
{interface type interface-path-id [nexthop nexthop-address] | [nexthop nexthop-address]}] [reply
{dscp dscp-value | reply mode{ipv4 | router-alert}}] [retry-count count] [source source-address]
[timeout timeout] [ttl value] [verbose] [fec-type {bgp | generic | ldp}]
```

Syntax Description	
ipv4	Specifies the destination type as a Label Distribution Protocol (LDP) IPv4 address.
<i>address/mask</i>	Address prefix of the target and number of bits in the target address network mask.
destination <i>start-address</i> <i>end-address</i>	(Optional) Specifies a network 127 address to be used as the destination address in the echo request packet. start-address Start of the network address. end-address End of the network address.
exp <i>exp-bits</i>	(Optional) Specifies the MPLS experimental field value in the MPLS header for echo replies. Range is 0 to 7. Default is 0.
flags fec	(Optional) Specifies that forwarding equivalent class (FEC) stack checking is to be performed at transit routers.
force-explicit-null	(Optional) Forces an unsolicited explicit null label to be added to the MPLS label stack and allows LSP ping to be used to detect LSP breakages at the penultimate hop.
hashkey ipv4 bitmap <i>bit-size</i>	(Optional) Allows user control of the hash key/multipath settings. Range is 0 to 256. The default is 32.
interval <i>min-send-delay</i>	(Optional) Specifies a send interval, in milliseconds, between requests. Range is 0 to 3600000. Default is 0.
output interface	(Optional) Specifies the output interface where echo request packets are sent.
<i>type</i>	Interface type. For more information, use the question mark (?) online help function.

<i>interface-path-id</i>	Physical interface or virtual interface. Note Use the show interfaces command to see a list of all interfaces currently configured on the router. For more information, use the question mark (?) online help function.
nexthop	(Optional) Specifies the IP address for the next hop.
<i>nexthop-address</i>	(Optional) IP address for the next hop.
reply dscp <i>dscp-value</i>	(Optional) Specifies the differentiated service codepoint value for an MPLS echo reply.
reply mode [ipv4 router-alert]	(Optional) Specifies the reply mode for the echo request packet. ipv4 Reply with IPv4 UDP packet (this is the default) router-alert Reply with IPv4 UDP packet with router alert
retry-count <i>count</i>	(Optional) Specifies the number of retry attempts during multipath LSP traceroute. A retry is attempted if an outstanding echo request <ul style="list-style-type: none"> times out waiting for the corresponding echo reply. fails to find a valid destination address set to exercise a specific outgoing path. Range is 0 to 10. Default is 3.
source <i>source-address</i>	(Optional) Specifies the source address used in the echo request packet.
timeout <i>timeout</i>	(Optional) Specifies the timeout interval, in seconds. Range is from 0 to 3600. Default is 2.
ttl <i>value</i>	(Optional) Specifies the maximum number of hops (range is 1 to 255).
verbose	(Optional) Enables verbose output information, including MPLS echo reply, sender address of the packet, and return codes.
fec-type	(Optional) Specifies FEC type to be used. bgp Use FEC type as BGP generic Use FEC type as generic ldp Use FEC type as LDP

Command Default**exp** *exp-bits* : 0**hashkey** **ipv4 bitmap** *bit-size*: 4

interval *min-send-delay*: 0

reply mode: IPv4

retry-count: 3

timeout *timeout* : 2

Command Modes XR EXEC mode

Command History	Release	Modification
	Release 6.0	This command was introduced.

Usage Guidelines The **hashkey ipv4 bitmap** keyword and *bit-size* value control how many addresses are encoded in the DSMAP multipath field. Larger values allow more coverage of equal cost multiple paths throughout the network, but with more processing at the head, mid, and tail routers.

Task ID	Task ID	Operations
	mpls-ldp	read, write

Examples

The following example shows how to specify the destination type as an LDP IPv4 prefix:

```
RP/0/RP0/CPU0:router# traceroute mpls multipath ipv4 7.7.7.7/32 verbose force-explicit-null
```

```
Starting LSP Path Discovery for 7.7.7.7/32
```

```
Codes: '!' - success, 'Q' - request not sent, '.' - timeout,
'L' - labeled output interface, 'B' - unlabeled output interface,
'D' - DS Map mismatch, 'F' - no FEC mapping, 'f' - FEC mismatch,
'M' - malformed request, 'm' - unsupported tlvs, 'N' - no rx label,
'P' - no rx intf label prot, 'p' - premature termination of LSP,
'R' - transit router, 'I' - unknown upstream index,
'X' - unknown return code, 'x' - return code 0
```

Type escape sequence to abort.

```
L!
Path 0 found,
output interface TenGigE0/0/0/11.1 nexthop 79.1.0.2
source 79.1.0.1 destination 127.0.0.0
0 79.1.0.1 79.1.0.2 MRU 1500 [Labels: 24008/explicit-null Exp: 0/0] multipaths 0
L 1 79.1.0.2 178.0.0.1 MRU 1500 [Labels: implicit-null/explicit-null Exp: 0/0] ret code 8
multipaths 1
! 2 178.0.0.1, ret code 3 multipaths 0
L!
Path 1 found,
output interface TenGigE0/0/0/11.2 nexthop 79.2.0.2
source 79.2.0.1 destination 127.0.0.0
0 79.2.0.1 79.2.0.2 MRU 1500 [Labels: 24008/explicit-null Exp: 0/0] multipaths 0
L 1 79.2.0.2 178.0.0.1 MRU 1500 [Labels: implicit-null/explicit-null Exp: 0/0] ret code 8
multipaths 1
! 2 178.0.0.1, ret code 3 multipaths 0
L!
```

```

Path 2 found,
  output interface TenGigE0/0/0/11.4 nexthop 79.4.0.2
  source 79.4.0.1 destination 127.0.0.0
    0 79.4.0.1 79.4.0.2 MRU 1500 [Labels: 24008/explicit-null Exp: 0/0] multipaths 0
L 1 79.4.0.2 178.0.0.1 MRU 1500 [Labels: implicit-null/explicit-null Exp: 0/0] ret code 8
multipaths 1
! 2 178.0.0.1, ret code 3 multipaths 0
L!
Path 3 found,
  output interface TenGigE0/0/0/11.5 nexthop 79.5.0.2
  source 79.5.0.1 destination 127.0.0.0
    0 79.5.0.1 79.5.0.2 MRU 1500 [Labels: 24008/explicit-null Exp: 0/0] multipaths 0
L 1 79.5.0.2 178.0.0.1 MRU 1500 [Labels: implicit-null/explicit-null Exp: 0/0] ret code 8
multipaths 1
! 2 178.0.0.1, ret code 3 multipaths 0

Paths (found/broken/unexplored) (4/0/0)
Echo Request (sent/fail) (8/0)
Echo Reply (received/timeout) (8/0)
Total Time Elapsed 44 ms

```

The following example shows how to specify the FEC type as LDP with verbose option:

```

RP/0/RP0/CPU0:router# traceroute mpls multipath ipv4 7.7.7.7/32 fec-type ldp output interface
TenGigE 0/0/0/11 nexthop 79.1.0.2

```

```

Starting LSP Path Discovery for 7.7.7.7/32

```

```

Codes: '!' - success, 'Q' - request not sent, '.' - timeout,
'L' - labeled output interface, 'B' - unlabeled output interface,
'D' - DS Map mismatch, 'F' - no FEC mapping, 'f' - FEC mismatch,
'M' - malformed request, 'm' - unsupported tlvs, 'N' - no rx label,
'P' - no rx intf label prot, 'p' - premature termination of LSP,
'R' - transit router, 'I' - unknown upstream index,
'X' - unknown return code, 'x' - return code 0

```

```

Type escape sequence to abort.

```

```

L!
Path 0 found,
  output interface TenGigE0/0/0/11.1 nexthop 79.1.0.2
  source 79.1.0.1 destination 127.0.0.0
    0 79.1.0.1 79.1.0.2 MRU 1500 [Labels: 24008 Exp: 0] multipaths 0
L 1 79.1.0.2 178.0.0.1 MRU 1500 [Labels: implicit-null Exp: 0] ret code 8 multipaths 1
! 2 178.0.0.1, ret code 3 multipaths 0

Paths (found/broken/unexplored) (1/0/0)
Echo Request (sent/fail) (2/0)
Echo Reply (received/timeout) (2/0)
Total Time Elapsed 10 ms

```



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