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accounting interfaces mpls ipv4 rsvp-te

To enable per-application accounting for MPLS RSVP-TE IPv4 traffic and obtain traffic statistics on the interfaces, use the **accounting interfaces mpls ipv4 rsvp-te** command in the MPLS-TE accounting interface configuration mode.

accounting interfaces mpls ipv4 rsvp-te

Syntax Description

This command has no arguments or keywords.

Command Default

No default behavior or values

Command Modes

MPLS-TE accounting interface configuration mode

Command History

Usage Guidelines

No specific guidelines impact the use of this command.

Examples

This example shows how to enable per-application accounting to obtain statistics for MPLS RSVP-TE IPv4 traffic on the interfaces.

```
RP/0/RP0/CPU0:router# config
RP/0/RP0/CPU0:router(config)# accounting
RP/0/RP0/CPU0:router(config-acct)# interfaces
RP/0/RP0/CPU0:router(config-acct-if)# mpls
RP/0/RP0/CPU0:router(config-acct-if-mpls)# ipv4 rspv-te
```

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

percentage	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 *minimum bandwidth*	(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

percentage: 5

minimum bandwidth: 10

MPLS-TE automatic bandwidth interface configuration

Command History

Release	Modification
Release 7.0.12	This command was introduced.

Usage Guidelines

If you configure or modify the adjustment threshold while the automatic bandwidth is already running, the next band-aids 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 7.0.12	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* | **include-any** *name* }
no affinity { *affinity-value* **mask** *mask-value* | **exclude** *name* | **exclude-all** | **include** *name* | **include-strict** *name* | **include-any** *name* }

Syntax Description

affinity-value	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 *mask-value*	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 *name*	Configures a particular affinity to exclude.
exclude-all	Excludes all affinities.
include *name*	Configures the affinity to include in the loose sense.
include-strict *name*	Configures the affinity to include in the strict sense.
include-any *name*	Configures the affinities to include any of the affinity names.

Command Default

affinity-value: 0X00000000

mask-value: 0x0000FFFF

Command Modes

Interface configuration

Command History

Release	Modification
Release 7.5.4	The **include-any** keyword was introduced.
Release 7.0.12	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 Constrained Shortest Path First (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.

Include-any constraint

Specifies that all the links with any attribute are considered for CSPF. An include-all constraint is associated with any color.

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 197 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 a 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
```

This example shows that a link is eligible for CSPF if it includes any color.

```
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-any color
```

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

affinity name	Affinity map name-to-value designator (in hexadecimal, *0-ffffffff*).
affinity value	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.
value	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 7.0.12	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 ID	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

minutes	Frequency, in minutes, for the automatic bandwidth application. The range is from 5 to 10080 (7 days). The default is 1440.

Command Default

minutes : 1440 (24 hours)

Command Modes

MPLS-TE automatic bandwidth interface configuration

Command History

Release	Modification
Release 7.0.12	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

Task ID	Operations
mpls-te	read, write

Examples

The following example shows how to configure application frequency to 1000 minutes for MPLS-TE 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)# auto-bw
RP/0/RP0/CPU0:router(config-if-tunte-autobw)# application 1000
```

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

attribute -flags	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

attributes : 0x0

Command Modes

MPLS-TE interface configuration

Command History

Release	Modification
Release 7.0.12	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

attribute name	Attribute name expressed using alphanumeric or hexadecimal characters.Up to 32 attribute-names can be assigned.
index	Specifies an entry index for attribute names.
index-number	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 7.0.12	This command was introduced.

Usage Guidelines

The name-to-value mapping must represent a single bit of a 32-bit256-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**}

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.
attribute-set-name	A 32-bit character string, specifies the name of the attribute-set template.
affinity-value	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 *mask-value*	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 *name*	Configures a specific affinity that is to be excluded.
exclude-all	Excludes all affinities.
include *name*	Configures the affinity to include in the loose sense.
include-strict *name*	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.
range	Tunnel policy class range 1 to 7.
default	Default class for policy-based tunnel selection.
priority	Specifies the tunnel priority.
setup-range	Specifies setup priority. Range is 0 to 7.
hold-range	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.
bandwidth	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 *ct*	(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 7.0.12	This command was introduced.

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.

Task ID

Task ID	Operation
mpls-te	read, write

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 am1
RP/0/RP0/CPU0:router(config-te-mesh-group)#  destination-list dl1
```

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)#
```

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

minutes	Interval between automatic bandwidth adjustments, in minutes. The range is from 1 to 10080. The default is 5.

Command Default

minutes: 5

In addition, the **no** form of this command resets to the default.

Command Modes

MPLS-TE configuration

Command History

Release	Modification
Release 7.0.12	This command was introduced.

Usage Guidelines

The **auto-bw collect frequency** command configures the automatic bandwidth collection frequency for all the tunnels.

Modifying the global collection frequency does not restart the tunnel for the current application period. The application period continues with the modified collection frequency.

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
```

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 the interface configuration mode. To remove the automatic bandwidth function, use the **no** form of this command.

auto-bw [**auto-capacity** [{ **max-clones** | **merge-bandwidth** | **min-clones** | **nominal-bandwidth** | **split-bandwidth** } *value*]]
no auto-bw [**auto-capacity** [**max-clones** | **merge-bandwidth** | **min-clones** | **nominal-bandwidth** | **split-bandwidth**]]

Syntax Description

auto-capacity	(Optional) Enables the auto-capacity function for numbered TE tunnels.
max-clones	(Optional) Specifies the maximum number of clone tunnels that the original tunnel can create.
merge-bandwidth	(Optional) Specifies the bandwidth for merging clones with the original tunnel. If the bandwidth goes below the merge bandwidth value, MPLS-TE removes the clone tunnels.
min-clones	(Optional) Specifies the minimum number of clone tunnels that the original tunnel can create.
nominal-bandwidth	(Optional) Specifies the average bandwidth for computing the number of tunnels to satisfy the overall demand.
split-bandwidth	(Optional) Specifies the bandwidth value for splitting the original tunnel. If the tunnel bandwidth exceeds the configured split bandwidth, MPLS-TE creates tunnel clones.
value	(Optional) Value of the specified parameter.

Command Default

By default, automatic bandwidth is not enabled.

Command Modes

Interface configuration

Command History

Release	Modification
Release 7.0.12	This command was introduced.
Release 7.10.1	The auto-capacity function was introduced for numbered TE tunnels.

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)#
```

Configuration Example: Numbered TE-Tunnel

This example shows how to configure the auto-bandwidth bundle TE++ feature for a numbered te-tunnel. The lower limit and the upper limit of clones are 3 and 10, respectively. The bandwidth size for splitting and merging are 3,000,000 kbps and 1,000,000 kbps, respectively.

```
Router(config)#interface tunnel-te 20
Router(config-if)#load-interval 90
Router(config-if)#auto-bw auto-capacity
Router(config-if-tunte-autocapacity)#max-clones 10
Router(config-if-tunte-autocapacity)#min-clones 3
Router(config-if-tunte-autocapacity)#nominal-bandwidth 200000
Router(config-if-tunte-autocapacity)#merge-bandwidth 1000000
Router(config-if-tunte-autocapacity)#split-bandwidth 3000000
Router(config-if-tunte-autocapacity)#commit
```

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 7.0.12	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
```

auto-tunnel backup reoptimize (MPLS-TE)

To configure the reoptimization frequency for next-hop (NHOP) and next-next-hop (NNHOP) backup tunnels and to enter the auto-tunnel backup interface configuration mode, use the **auto-tunnel backup reoptimize** command in MPLS-TE configuration mode. To return to the default behaviour, use the **no** form of this command.

auto-tunnel backup reoptimize *frequency*

Syntax Description

frequency	Reoptimization frequency for MPLS-TE NHOP and NNHOP backup tunnels. The frequency ranges from 0 to 65535 seconds.

Command Default

Disabled

Command Modes

MPLS-TE configuration

Command History

Release	Modification
Release 7.11.1	This command was introduced.

Usage Guidelines

For any frequency in the range from 1 to 60 seconds, periodic reoptimization occurs every 60 seconds.

Task ID

Task ID	Operation
mpls-te	read, write

Example

This example shows how to set the reoptimization frequency for MPLS-TE backup tunnels:

```
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)# reoptimize 90
```

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 [**exclude-traffic segment-routing** [**all**]] [**include-ipv6**] [**destination ipv6** *ip-address*] [**metric** *value*] [**exclude-ipv4**]
no autoroute announce

Syntax Description

exclude-traffic segment-routing	(Optional) Prevents steering of MPLS labelled Segment Routing (SR) traffic into the MPLS-TE tunnel.
exclude-traffic segment-routing all	(Optional) Prevents steering of segment routing MPLS labelled traffic or IP traffic to destinations associated with a segment routing prefix SID into the MPLS-TE tunnel.
include-ipv6	(Optional) Announces the MPLS-TE tunnel to IS-IS IGP for IPv6 routing.
destination ipv6*ip-address*	(Optional) Allows to install an MPLS-TE tunnel as nexthop for the IPv6 destination.
metric *value*	(Optional) Specifies the MPLS-TE tunnel metric that the Interior Gateway Protocol (IGP) enhanced Shortest Path First (SPF) calculation uses.
exclude-ipv4	(Optional) Disables IPv4 autoroute announce.

Syntax Description

This command has no arguments or keywords.

Command Default

Announces IPv4 tunnel

Command Modes

Interface configuration

Command History

Release	Modification
Release 25.4.1	A new keyword, **exclude-ipv4**, was added to the **autoroute announce** command.
Release 25.2.1	The **destination** and **ipv6** keywords were added to configure the IPv6 destination.
Release 24.4.1	The new keyword, **all**, was added to the **autoroute announce exclude-traffic segment-routing** command.
Release 7.0.12	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 30 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 an MPLS-TE tunnel can be announced to IS-IS IGP for IPv6 routing:

```
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
```

This example shows how an MPLS-TE tunnel can be announced to IS-IS IGP for IPv6-only routing.

```
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
RP/0/RP0/CPU0:router(config-if-tunte-aa)# exclude-ipv4
RP/0/RP0/CPU0:router(config-if-tunte-aa)# include-ipv6
```

This example shows how to configure the **exclude-traffic segment-routing** command that prevents the MPLS labelled SR prefixes from resolving over the MPLS-TE tunnel:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# interface tunnel-te 3200
RP/0/RP0/CPU0:router(config-if)# autoroute announce
RP/0/RP0/CPU0:router(config-if-tunte-aa)# exclude-traffic segment-routing
```

This example shows how to configure the **exclude-traffic segment-routing all** command that prevents steering of segment routing MPLS labelled traffic or IP traffic to destinations associated with a segment routing prefix SID into the MPLS-TE tunnel:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# interface tunnel-te 3200
```

```
RP/0/RP0/CPU0:router(config-if)# autoroute announce
RP/0/RP0/CPU0:router(config-if-tunte-aa)# exclude-traffic segment-routing all
```

This example shows how to configure the IPv6 destination and the running configuration for the specified destination.

```
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
RP/0/RP0/CPU0:router(config-if-tunte-aa)# include-ipv6
RP/0/RP0/CPU0:router(config-if-tunte-aa)# destination ipv6 2000::1

RP/0/RP0/CPU0:router(config)# show running-config interface tunnel-te 1
Thu Jan  9 14:36:37.398 EST
interface tunnel-te1
 ipv4 unnumbered Loopback0
 autoroute announce
  destination ipv6 2000::1
 !
 destination 192.168.0.3
 path-option 1 dynamic
!
end
```

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

ip-address	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

Release	Modification
Release 7.0.12	This command was introduced.

Usage Guidelines

No specific guidelines impact the use of this command.

Task ID

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 7.0.12	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 26 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
```

backup-bw

To configure the backup bandwidth for an MPLS-TE backup tunnel (that is used to protect a physical interface), use the **backup-bw** command in interface configuration mode. To return to the default behavior, use the **no** form of this command.

backup-bw {*backup bandwidth* {**any-class-type** | **class-type ct**} | **global-pool** {*bandwidth* | **unlimited**} | **sub-pool** {*bandwidth* | **unlimited**} | **unlimited** {**any-class-type** | **class-type ct**}}
no backup-bw {*backup bandwidth* {**any-class-type** | **class-type ct**} | **global-pool** {*bandwidth* | **unlimited**} | **sub-pool** {*bandwidth* | **unlimited**} | **unlimited** {**any-class-type** | **class-type ct**}}

Syntax Description

backup bandwidth	Backup bandwidth in any-pool provided by an MPLS-TE backup tunnel. Bandwidth is specified in kilobits per second (kbps). Range is 1 to 4294967295.
any-class-type	Displays the backup bandwidth assigned to any class-type protected tunnels.
class-type ct	Displays the class type of the backup bandwidth. Range is 0 to 1.
global-pool *bandwidth*	(In Prestandard DS-TE with RDM) Displays the backup bandwidth in global pool provided by an MPLS-TE backup tunnel. Bandwidth is specified in kilobits per second. Range is 1 to 4294967295.
unlimited	Displays the unlimited bandwidth.
sub-pool *bandwidth*	(In Prestandard DS-TE with RDM) Displays the backup bandwidth in sub-pool provided by an MPLS-TE backup tunnel. Bandwidth is specified in kilobits per second. Range bandwidth is 1 to 4294967295. Only label switched paths (LSPs) using bandwidth from the sub-pool can use the backup tunnel.

Command Default

Any class-type unlimited.

Command Modes

Interface configuration

Command History

Release	Modification
Release 7.0.12	This command was introduced.

Usage Guidelines

Backup bandwidth can be limited or unlimited or specific to a global pool, sub-pool, or non-specific any-pool. Backup with backup-bw in global-pool protects global-pool LSPs only; backup-bw in sub-pool protects sub-pool LSPs only.

Backup tunnels configured with limited backup bandwidth (from any/global/sub pool) are not assigned to protect LSPs configured with zero signaled bandwidth.

Backup bandwidth provides bandwidth protection for fast reroute (FRR). Bandwidth protection for FRR supports DiffServ-TE with two bandwidth pools (class-types).

Class-type 0 is strictly equivalent to global-pool; class-type 1 is strictly equivalent to sub-pool bandwidth using the Russian Doll Model (RDM).

Task ID

Task ID	Operations
mpls-te	read, write

Examples

The following example shows how to configure backup tunnel 1 for use only by LSPs that take their bandwidth from the global pool (class-type 0 tunnels). Backup tunnel 1 does not provide bandwidth protection.

```
RP/0/RP0/CPU0:router(config)# interface tunnel-te 1
RP/0/RP0/CPU0:router(config-if)# backup-bw global-pool unlimited
```

or

```
RP/0/RP0/CPU0:router(config)# interface tunnel-te 1
RP/0/RP0/CPU0:router(config-if)# backup-bw unlimited class-type 0
```

In the following example, backup tunnel 2 is used by LSPs that take their bandwidth from the sub-pool (class-type 1 tunnels) only. Backup tunnel 2 provides bandwidth protection for up to 1000 units.

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# interface tunnel-te 2
RP/0/RP0/CPU0:router(config-if)# backup-bw sub-pool 1000
```

or

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# interface tunnel-te 2
RP/0/RP0/CPU0:router(config-if)# backup-bw 1000 class-type 1
```

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

tunnel-number	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 7.0.12	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
```

bandwidth-accounting

To enable RSVP-TE bandwidth accounting and dark bandwidth advertisement for all MPLS-TE enabled links, use the **bandwidth-accounting** command in MPLS-TE configuration mode.

bandwidth-accounting [**adjustment-factor** *percentage* | **application-interval** *seconds* | **application enforced** | **sampling-interval** *seconds* | **flooding threshold** { **up** | **down** } *percentage* | **flooding sr-traffic** *percentage*]

Syntax Description

adjustment-factor *percentage*	Configures TE to over-book (>100%) or under-book (<100%) the effective maximum reservable bandwidth. The measured dark-bandwidth will be scaled based on the adjustment factor. Range is 0 to 200. The default value is 100.
application-interval *seconds*	Configures the length of the application interval in seconds. At the end of application interval, dark bandwidth rates are computed and applied to all RSVP-TE enabled interfaces. Range is 90 to 1800. The default value is 180. **Note** Model-driven telemetry supports dark bandwidth. The telemetry polling interval is reduced to 10 seconds.
application enforced	Enables enforcement of the effective maximum reservable bandwidth (BMRe) rate. This configuration is mandatory for the RSVP-TE dark bandwidth accounting feature to work properly.
sampling-interval *seconds*	Configures the length of the sampling interval in seconds. The bandwidth rate is collected from the statistics collector process (statsD) at the end of each sampling interval for each TE link. Range is from 30 to 600. The default is 60.
flooding threshold { **up** | **down** } *percentage*	Configures the reserved bandwidth change percentages threshold. When bandwidth change percentage crosses one of these thresholds, flooding is triggered. Range is from 0 to 100. The default value for **up** and **down** is 10.
flooding sr-traffic *percentage*	Configures the flooding trigger for bandwidth accounting in segment routing traffic. When the bandwidth crosses the threshold value, flooding is triggered. The range is from 0 to 100. The default value is 10.

Command Default

RSVP-TE bandwidth accounting is disabled.

Command Modes

MPLS-TE configuration

Command History

Release	Modification
Release 7.5.4	The **flooding sr-traffic** keyword was introduced.
Release 7.0.12	This command was introduced.

Usage Guidelines

If the interval is reconfigured while the timer is running, the new value is compared to the time remaining for the running timer. The timer is adjusted so that the lower of these two values is used for this interval. The subsequent interval will use the newly configured value.

Note The actual application interval might be different from the configured interval. The actual application interval is rounded based on the number of samples in one application. For example, if the sample interval is 31, and the application interval is 90, then the actual application interval will be rounded to 93.

```
RP/0/0/CPU0:ios(config-mpls-te-if)#show running-config mpls traffic-eng             \
bandwidth-accounting
Fri Feb 23 13:37:24.583 EST
mpls traffic-eng
bandwidth-accounting
  application
   interval 90
  !
  sampling-interval 31
!
!
```

Whereas the output of the **do show mpls traffic-eng link-management interfaces** command shows an application interval of 93.

```
RP/0/0/CPU0:ios(config-mpls-te-if)#do show mpls traffic-eng link-management        \
interfaces gigabitEthernet 0/0/0/1 detail
Fri Feb 23 13:37:27.345 EST

  System Information::
      Links Count         : 1 (Maximum Links Supported 800)

  Link ID:: GigabitEthernet0/0/0/1 (0.0.0.0)
    Local Intf ID: 5
    Link Status:

      Link Label Type          : PSC
      Physical BW              : 1000000 kbits/sec
      BCID                     : RDM
      Max Reservable BW        : 0 kbits/sec (reserved: 100% in, 100% out)
      Flooded Max Reservable BW: 0 kbits/sec
      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, admin-down
      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
      Bandwidth Accounting: Segment-Routing
      Bandwidth Accounting Enforced: No
      Bandwidth Utilization Details:
        Sampling Interval               : 31 sec
        Application Interval            : 93 sec
        Adjustment Factor               : 100%
        Max Reservable BW Up Threshold  : 10 (default)
        Max Reservable BW Down Threshold: 10 (default)
        Last Application at:  Never
        Next Application at:  13:38:56 Fri 23 Feb 2018 (in 89 seconds)
```

Task ID

Task ID	Operation
mpls-te	read, write

This example shows how to enable RSVP-TE bandwidth accounting and dark bandwidth advertisement for all RSVP-TE enabled links:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# mpls traffic-eng
RP/0/RP0/CPU0:router(config-mpls-te)# bandwidth-accounting
RP/0/RP0/CPU0:router(config-mpls-te-bw-account)# adjustment-factor 85
RP/0/RP0/CPU0:router(config-mpls-te-bw-account)# application-interval 90
RP/0/RP0/CPU0:router(config-mpls-te-bw-account)# application enforced
RP/0/RP0/CPU0:router(config-mpls-te-bw-account)# sampling-interval 30
RP/0/RP0/CPU0:router(config-mpls-te-bw-account)# flooding threshold up 30 down 30
RP/0/RP0/CPU0:router(config-mpls-te-bw-account)# flooding sr-traffic 30
```

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

bidirectional	Configures a bidirectional LSP.
association	Specifies association parameters for the bidirectional LSP.
id *value*	Value number that identifies the association. Range is 0 to 65535.
source-address *value*	Specifies the source IP address of the LSP from which a reverse path is required.
global-id *value*	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 7.0.12	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
```

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 *bandwidth*	Configures the minimum automatic bandwidth, in kbps, on a tunnel. The range is from 0 to 4294967295. The default is 0.
max *bandwidth*	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 7.0.12	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 *tunnel-number*	Clears the automatic bandwidth sampled output rates for a specific tunnel. The *tunnel-number* 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 7.0.12	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  Last appl  Requested  Signalled    Highest    Application
            Name     ID   BW(kbps)   BW(kbps)   BW(kbps)   BW(kbps)      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  Last appl  Requested  Signalled    Highest    Application
            Name      ID   BW(kbps)   BW(kbps)   BW(kbps)   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	*tunnel-number*	Clears a specific unused automatic backup tunnel.

Command Default

No default behavior or values

Command Modes

XR EXEC mode

Command History

Release	Modification
Release 7.0.12	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 *id*	Clears an unused auto-tunnel destinations identified by a tunnel identifier.

Command Default

None

Command Modes

XR EXEC mode

Command History

Release	Modification
Release 7.0.12	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 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 7.0.12	This command was introduced.

Usage Guidelines

No specific guidelines impact the use of this command.

Task ID

Task ID	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 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 7.0.12	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 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 7.0.12	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 in-place-bandwidth-update

To clear the in-place bandwidth counters for mid-point and tail-end LSPs in MPLS-TE tunnels, use the **clear mpls traffic-eng counters in-place-bandwidth-update** command in XR EXEC mode.

clear mpls traffic-eng counters in-place-bandwidth-update { **all** | **name** *name* | **summary** }

Syntax Description

all	Clears in-place bandwidth counters for all MPLS-TE tunnels.
name *name*	Clears in-place bandwidth update for the specified MPLS-TE tunnel name or signal name.
summary	Clears the summary of in-place bandwidth counters.

Command Default

No default behavior or values

Command Modes

XR EXEC mode

Command History

Release	Modification
Release 26.1.1	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 example shows how to clear the in-place bandwidth counters for all MPLS-TE tunnels.

```
RP/0/RP0/CPU0:router# clear mpls traffic-eng counters in-place-bandwidth-update all
```

This example shows how to clear the in-place bandwidth counters for the specified MPLS tunnel name.

```
RP/0/RP0/CPU0:router# clear mpls traffic-eng counters in-place-bandwidth-update name tunnel1
```

This example shows how to clear the summary of in-place bandwidth counters for MPLS-TE tunnels.

```
RP/0/RP0/CPU0:router# clear mpls traffic-eng counters in-place-bandwidth-update summary
```

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 *name*	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 7.0.12	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 7.0.12	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 event-history tunnels

To clear the event history for MPLS-TE tunnels, use the **clear mpls traffic-eng event-history tunnels** command in XR EXEC mode.

clear mpls traffic-eng event-history tunnels { **all** }

Syntax Description

all	Clears the event history for all MPLS-TE headend tunnels.

Command Default

No default behavior or values

Command Modes

XR EXEC mode

Command History

Release	Modification
Release 25.4.1	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 example shows how to clear the event history for all MPLS-TE headend tunnels:

```
RP/0/RP0/CPU0:router# clear mpls traffic-eng event-history tunnels 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 7.0.12	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  Rewrites When                   Switching Time
           Interface                                          (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 7.0.12	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
```

clone-tunnel

To enable LDP over traffic-engineering tunnels automatically on cloned tunnels, use the **clone-tunnel** command in the mpls-ldp address-family ipv4 configuration mode. To disable this feature, use the **no** form of this command.

clone-tunnel

Syntax Description

This command has no arguments or keywords.

Command Default

None

Command Modes

mpls-ldp address family ipv4 configuration 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 ID	Operations
mpls-te	read, write

Examples

The following example shows how to enable the LDP automatically on cloned tunnels:

```
Router(config)#configure
Router(config)#mpls ldp
Router(config-ldp)#nsr
Router(config-ldp)#router-id 10.10.1.1
Router(config-ldp)#address-family ipv4
Router(config-ldp-af)#discovery targeted-hello accept
Router(config-ldp-af)#exit
Router(config-ldp)#interface tunnel-te n1
Router(config-ldp-if)#address-family ipv4
Router(config-ldp-if-af)#clone-tunnel
Router(config-ldp-if-af)#exit
Router(config-ldp-if)#interface tunnel-te n2
Router(config-ldp-if)#address-family ipv4
Router(config-ldp-if-af)#clone-tunnel
Router(config-ldp-if-af)#exit
Router(config-ldp-if)#interface tunnel-te n3
Router(config-ldp-if)#address-family ipv4
Router(config-ldp-if-af)#clone-tunnel
Router(config-ldp-if-af)#commit
```

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 7.0.12	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 92 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

ip-address	Destination address of the MPLS-TE router ID.

Command Default

No default behavior or values

Command Modes

Interface configuration

Command History

Release	Modification
Release 7.0.12	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 7.0.12	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
```

ds-te bc-model

To enable a specific bandwidth constraint model (Maximum Allocation Model or Russian Doll Model) on the entire label switched router (LSR), use the **ds-te bc-model** command in MPLS-TE configuration mode. To return to the default behavior, use the **no** form of this command.

ds-te bc-model mam
no ds-te bc-model mam

Syntax Description

mam	Enables the Maximum Allocation Model (MAM) bandwidth constraints model.

Command Default

RDM is the default bandwidth constraint model.

Command Modes

MPLS-TE configuration

Command History

Release	Modification
Release 7.0.12	This command was introduced.

Usage Guidelines

You can configure both the MAM and RDM bandwidth values on a single interface before swapping to an alternate global MPLS-TE BC model.

If you configure bandwidth constraints without configuring the corresponding bandwidth constraint values, the router uses default bandwidth constraint values.

MAM is not supported in prestandard DS-TE mode. MAM and RDM are supported in IETF DS-TE mode; RDM is supported in prestandard DS-TE mode.

Note Changing the bandwidth constraints model affects the entire router and may have a major impact on system performance as nonzero-bandwidth tunnels are torn down.

Task ID

Task ID	Operations
mpls-te	read, write

Examples

The following example shows how to enable the MAM bandwidth constraints model:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# mpls traffic-eng
RP/0/RP0/CPU0:router(config-mpls-te)# ds-te bc-model mam
```

ds-te mode

To configure standard differentiated-service TE mode (DS-TE), use the **ds-te mode** command in MPLS-TE configuration mode. To return to the default behavior, use the **no** form of this command.

ds-te mode ietf
no ds-te mode ietf

Syntax Description

ietf	Enables IETF standard mode.

Command Default

Prestandard DS-TE is the default differentiated service mode.

Command Modes

MPLS-TE configuration

Command History

Release	Modification
Release 7.0.12	This command was introduced.

Usage Guidelines

The following two DS-TE modes are supported:

- Prestandard mode
  - The Cisco proprietary mechanism for IGPs and RSVP signalling are used and DS-TE does not interoperate with third-party vendor equipment.
- IETF mode
  - Standard defined extensions are used for IGPs and RSVP signalling and DS-TE in this mode interoperates with third-party equipment.
  - IETF mode supports two bandwidth constraint models: the Russian Doll Model (RDM) and Maximum Allocation Model (MAM).
  - RDM is the default model.
  - Router advertises variable-length bandwidth constraints, max-reservable- bandwidth, and unreserved bandwidths in TE-classes.
  - tunnels must have valid class-type and priority configured as per TE-class map in use; otherwise, tunnels remain down.
  - TE-class map (a set of tunnel priority and class-type values) is enabled to interpret unreserved bandwidth values advertised in IGP; therefore, TE-class map must be identical on all nodes for TE tunnels to be successfully established

For DS-TE to function properly, DS-TE modes must be configured identically on all MPLS-TE nodes.

If you need to change the DS-TE mode, you must bring down all tunnel interfaces and after the change, you should flood the updated bandwidth values through the network.

Note Changing the DS-TE mode affects the entire LSR and can have a major impact on system performance when tunnels are torn down.

Task ID

Task ID	Operations
mpls-te	read, write

Examples

The following example shows how to enable IETF standard mode:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# mpls traffic-eng
RP/0/RP0/CPU0:router(config-mpls-te)# ds-te mode ietf
```

ds-te te-classes

To enter DS-TE te-class map configuration mode, use the **ds-te te-classes** command in MPLS-TE configuration mode. To return to the default behavior, use the **no** form of this command.

ds-te te-classes te-class *te_class_index* {**class-type** *class_type_number* {**priority** *pri_number*} | **unused**}
no ds-te te-classes te-class *te_class_index* {**class-type** *class_type_number* {**priority** *pri_number*} | **unused**}

Syntax Description

te-class	Configures the te-class map.
te_class_index	TE class-map index. Range is 0 to 7.
class-type	Configures the class type.
class_type_number	Class type value in the te-class map. Range is 0 to 1.
priority	Configures the TE tunnel priority.
pri_number	TE tunnel priority value. Range is 0 to 7.
unused	Marks the TE-class as unused.

Command Default

The following default te-class maps are used in IETF DS-TE mode:

te-class index	class-type	priority
0	0	7
1	1	7
2	UNUSED	—
3	UNUSED	—
4	0	0
5	1	0
6	UNUSED	—
7	UNUSED	—

Note The default mapping has 4 TE-classes used with 2 class-types and, 4 TE-classes are unused. TE-class map is not used in prestandard DS-TE mode.

Command Modes

MPLS-TE configuration

Command History

Release	Modification
Release 7.0.12	This command was introduced.

Usage Guidelines

In IETF DS-TE mode, modified semantic of the unreserved bandwidth TLV is used. Each of the eight available bandwidth values advertised in the IGP corresponds to a TE class. Because IGP advertises only eight bandwidth values, only eight TE-Classes can be supported in a IETF DS-TE network. The TE-Class mapping must be configured the same way on every router in a DS-TE domain. There is, however, no method to automatically detect or enforce this required consistency.

Task ID

Task ID	Operations
mpls-te	read, write

Examples

The following example shows how to configure a TE-class 7 parameter:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# mpls traffic-eng
RP/0/RP0/CPU0:router(config-mpls-te)# ds-te te-classes te-class 7 class-type 0 priority 4
```

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

Release	Modification
Release 7.0.12	This command was introduced.

Usage Guidelines

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.

Configuration of the preferred option allows the automatic backup tunnel to come up even if a path that excludes SRLGs can not be found.

Task ID

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 7.0.12	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 7.0.12	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

interval	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

interval: 300

Command Modes

MPLS-TE configuration

Command History

Release	Modification
Release 7.0.12	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 ID	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 threshold

To set the reserved bandwidth thresholds for a link as a percentage of the total bandwidth change, use the **flooding threshold** command in MPLS-TE configuration mode. To return to the default behavior, use the **no** form of this command.

flooding threshold {**up** | **down**} *percent*
no flooding thresholds {**up** | **down**} *percent*

Syntax Description

up	Configures the upward flooding threshold as a percentage of the total link bandwidth change.
down	Configures the downward flooding threshold as a percentage of the total link bandwidth change.
percent	Bandwidth threshold level. Range is 0 to 100 .

Command Default

No default behavior or values.

Command Modes

MPLS-TE configuration

Command History

Release	Modification
Release 7.0.12	This command was introduced.

Usage Guidelines

Use the **flooding threshold** command to set the up and down thresholds as a percentage of the total bandwidth change. If the **flooding threshold** command is configured, flooding occurs only if the change from the previous flooding is greater than the configured thresholds.

Task ID

Task ID	Operations
mpls-te	read, write

Examples

The following example shows how to set the reserved bandwidth thresholds as a percentage of the total bandwidth change. Flooding occurs only if the change from the previous flooding is greater than the configured thresholds. In this example, the up and down thresholds are configured as 10 percent. That means, if the last flooded bandwidth percentage is 50 percent, then the flooding occurs only if the bandwidth goes below 40 percent, or if the bandwidth goes above 60 percent.

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# mpls traffic-eng
RP/0/RP0/CPU0:router(config-mpls-te)# flooding threshold up 10 down 10
```

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.
percent [percent]	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 7.0.12	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

forward-class	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 7.0.12	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

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.
include-ipv6	(Optional) Announces the MPLS-TE tunnel as an IPv6 forwarding adjacency.

Command Default

holdtime *time*: 0

Command Modes

Interface configuration

Command History

Release	Modification
Release 7.0.12	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-fwdadj)#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

index-id	Index number at which the path entry is inserted or modified. Range is 1 to 65535.
ipv4 unicast *IP address*	Excludes the IPv4 unicast address.

Command Default

No default behavior or values

Command Modes

Explicit path configuration

Command History

Release	Modification
Release 7.0.12	This command was introduced.

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

index-id	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 *IP address*	Excludes the IPv4 unicast address.

Command Default

No default behavior or values

Command Modes

Explicit path configuration

Command History

Release	Modification
Release 7.0.12	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

index-id	Index number at which the path entry is inserted or modified. Range is 1 to 65535.
ipv4 unicast *IP-address*	Includes the IPv4 unicast address (strict address).
loose ipv4 unicast *IP-address*	(Optional) Specifies the next unicast address in the path as a loose hop.
strict ipv4 unicast *IP-address*	(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 7.0.12	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

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 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 7.0.12	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

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 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

Release	Modification
Release 7.0.12	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 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

tunnel-id	Tunnel number. Range is 0 to 65535.

Command Default

Tunnel interfaces are disabled.

Command Modes

XR Config mode

Command History

Release	Modification
Release 7.0.12	This command was introduced.

Usage Guidelines

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.

Configuring MPLS-TE links or Tunnel-TE interface begins the TE-control process on RSP RP.

The **interface tunnel-te** command indicates that the tunnel interface is for an MPLS-TE tunnel and enables the various tunnel MPLS configuration options.

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

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 IP address is set.

Command Modes

Interface configuration

Command History

Release	Modification
Release 7.0.12	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 7.0.12	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 7.0.12	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

interval	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

interval: 180

Command Modes

MPLS-TE configuration

Command History

Release	Modification
Release 7.0.12	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 *sec*	Specifies the bundle-capacity preemption timer value in seconds.

Command Default

None

Command Modes

MPLS-TE configuration

Command History

Release	Modification
Release 7.0.12	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 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

value	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.

value: 0 (if no value is assigned)

Command Modes

Interface configuration

Command History

Release	Modification
Release 7.0.12	This command was introduced.

Usage Guidelines

Configuration schemas are supported for load balancing.

To enable the **load-share** command, you must enable unequal load balancing using the **load-share unequal** command.

Task ID

Task ID	Operations
mpls-te	read, write

Examples

The following example shows how to configure load-sharing parameters on a specified interface:

```
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
```

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 7.0.12	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.

Task ID

Task ID	Operations
mpls-te	read, write

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
```

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.
access-list	Specifies an access-list.

Command Default

Match is not set.

Command Modes

Class-map configuration

Command History

Release	Modification
Release 7.0.12	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

tunnel-limit: 4096

dest-limit: 4096

Command Modes

MPLS-TE configuration

Command History

Release	Modification
Release 7.0.12	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 7.0.12	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 *tunnel-number*	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 7.0.12	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 event-history (MPLS-TE)

To enable the event history for MPLS-TE tunnels, use the **mpls traffic-eng event-history** command in XR Config mode.

mpls traffic-eng event-history [**tunnel**]

Syntax Description

tunnel	Enables tunnel event history information.

Command Default

By default, tunnel event history is not enabled.

Command Modes

XR Config

Command History

Release	Modification
Release 25.4.1	This command was introduced.

Usage Guidelines

You can configure event history only on MPLS-TE headend tunnels.

Task ID

Task ID	Operations
mpls-te	read, write

Examples

This example shows how to enable event history on MPLS-TE headend tunnels.

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router# mpls traffic-eng event-history tunnel
RP/0/RP0/CPU0:router(config-te-evt-hist-tun)#
```

mpls traffic-eng event-history tunnel (MPLS-TE)

To configure the number of events in the tunnel history for MPLS-TE tunnels, use the **mpls traffic-eng event-history tunnel** command in XR Config mode.

mpls traffic-eng event-history tunnel [**event-count** *value*]

Syntax Description

event-count*value*	Sets the number of events in the tunnel history. Event count ranges between 1 to 1000.

Command Default

By default, tunnel event history is not enabled.

Command Modes

XR Config

Command History

Release	Modification
Release 25.4.1	This command was introduced.

Usage Guidelines

You can configure event history only on MPLS-TE headend tunnels.

Task ID

Task ID	Operations
mpls-te	read, write

Examples

This example shows how to specify the number of events in the tunnel history.

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router# mpls traffic-eng event-history tunnel event-count 25
RP/0/RP0/CPU0:router(config)#
```

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 7.0.12	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

isis-level	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 7.0.12	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 bandwidth-accounting apply all

To apply measured rates to all RSVP-TE enabled interfaces immediately, use the **mpls traffic-eng link-management bandwidth-accounting apply all** in EXEC mode.

mpls traffic-eng link-management bandwidth-accounting apply all

Syntax Description

This command has no arguments or keywords.

Command Default

No default behavior or values

Command Modes

EXEC

Command History

Release	Modification
Release 7.0.12	This command was introduced.

Usage Guidelines

The **bandwidth-accounting apply all** command acts like the end of an application interval. The measured rates are applied immediately, which may cause RSVP-TE bandwidth-accounting to flood the updated bandwidth values immediately. This command does not affect the periodic application of the bandwidth.

Task ID

Task ID	Operation
mpls-te	read, write

Example

```
RP/0/RP0/CPU0:router# mpls traffic-eng link-management bandwidth-accounting apply all
```

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 7.0.12	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

tunnel ID	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

Release	Modification
Release 7.0.12	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 configures the switchover for path-protection for tunnel-te:

```
RP/0/RP0/CPU0:router# mpls traffic-eng path-protection switchover tunnel-te 8
```

mpls traffic-eng pce reoptimize disable

To disable the reoptimization timer for the PCE computed LSPs within MPLS-TE, use the **mpls traffic-eng pce reoptimize disable** command in XR Config mode.

To remove the **mpls traffic-eng pce reoptimize disable** configuration, use the **no** form of this command.

mpls traffic-eng pce reoptimize disable

Syntax Description

This command has no arguments or keywords.

Command Default

This command is disabled by default.

Command Modes

XR Config mode

Command History

Release	Modification
Release 25.1.1	This command was introduced.

Usage Guidelines

No specific guidelines impact the use of this command.

Task ID

Task ID	Operations
mpls-te	read, write, execute

Examples

This example shows how to disable the reoptimization timer for the PCE computed LSPs within MPLS-TE and verifies whether the reoptimization timer is disabled.

```
RP/0/0/CPU0:ios(config)#mpls traffic-eng pce reoptimize disable
RP/0/0/CPU0:rtrA(config)#commit
Fri Nov  1 10:11:18.818 PDT
RP/0/0/CPU0:ios(config)#show running-config mpls traffic-eng pce
Fri Nov  1 10:11:23.788 PDT
mpls traffic-eng
 pce
  reoptimize 60
  reoptimize disable
 !
```

This example shows how to remove the **mpls traffic-eng pce reoptimize disable** configuration.

```
RP/0/0/CPU0:ios(config)#no mpls traffic-eng pce reoptimize disable
RP/0/0/CPU0:ios(config)#commit
```

This example shows how to remove the PCE reoptimize timer configuration. The **no mpls traffic-eng pce reoptimize** <*reoptimize-timer*> command reverts the reoptimization timer for MPLS-TE PCE tunnels to the default 3600 seconds.

```
RP/0/0/CPU0:ios(config)#no mpls traffic-eng pce reoptimize 60
RP/0/0/CPU0:ios(config)#commit
```

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 7.0.12	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 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

tunnel-id	(Optional) MPLS-TE tunnel identification expressed as a number. Range is from 0 to 65535.
tunnel-name	(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.
tunnel-id	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 7.0.12	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 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

group_id	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 7.0.12	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 resetup (EXEC)

To trigger the re-setup of TE tunnels, clearing the LSP states, use the **mpls traffic-eng resetup** command in XR EXEC mode.

mpls traffic-eng resetup {**P2MP** | **P2P** | **name**}

Syntax Description

P2MP	*tunnel-id*	Re-setup a specific P2MP tunnel by tunnel-id. The P2MP tunnel ID range is from 0 to 65535.
P2P	*tunnel-id*	Re-setup a specific P2P tunnel by tunnel-id. The P2MP tunnel ID range is from 0 to 65535.
name	*name*	Re-setup a specific tunnel by the given name.

Command Default

No default behavior or values

Command Modes

XR EXEC mode

Command History

Release	Modification
Release 5.1.1	This command was introduced.

Task ID

Task ID	Operations
mpls-te	execute

Examples

The following example shows how to re-setup a specific tunnel by the given name (tunnel-te1):

```
RP/0/RP0/CPU0:router#mpls traffic-eng resetup name tunnel-te1
```

The following example shows how to re-setup a specific P2P tunnel based on the specified tunnel-id (tunnel-id 1):

```
RP/0/RP0/CPU0:router#mpls traffic-eng resetup P2P tunnel-id 1
```

The following example shows how to re-setup a P2MP tunnel based on the specified tunnel-id (tunnel-id 2):

```
RP/0/RP0/CPU0:router#mpls traffic-eng resetup P2MP tunnel-id 2
```

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 7.0.12	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 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 *weight*	Value added to link admin-weight during SRLG-aware path computation. Range is 0 to 4294967295.
value *srlg-value*	SRLG value. Range is 0 to 4294967295.
static	Assign SRLG to topology link based on IP address.
ipv4 address *ip-address* **next-hop ipv4 address** *next-hop-ip-address*	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 7.0.12	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 topology block-verify-after-rpfo

To block path verification for the specified time after an RP failover when nonstop routing (NSR) is not configured, use the **mpls traffic-eng topology block-verify-after-rpfo** command in Global Configuration mode. To remove the configuration, use the **no** form of the command.

mpls traffic-eng topology block-verify-after-rpfo *time*

Syntax Description

time	Specifies the time in seconds until which the verification is blocked.

Command Default

By default, path verification is not blocked.

Command Modes

Global Configuration

Command History

Release	Modification
Release 6.5.1	This command was introduced.

Usage Guidelines

You should only use this command to prevent the verification failure that causes unprotected LSPs to flap if you have configured nonstop forwarding (NSF) only and performed an RP failover with NSR disabled.

Task ID

Task ID	Operations
mpls-te	read, write

Examples

This example shows how to block the path verification for 150 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 block-verify-after-rpfo 150
```

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 for the IPv4 unicast address and IPv6 unicast address families, 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.
Release 25.3.1	The **mpls traffic-eng restricted** configuration is now supported for the IPv6 unicast address.

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
```

This example shows how to specify an autoroute tunnel as designated path for the IPv6 unicast address.

```
Router# configure
Router(config)# router isis 1
Router(config-isis)# address-family ipv6 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* [**description** *tunnel-description*] [**self-ping** *max-count*] [**self-ping** *max-count*] [**reoptimize** *tunnel-reoptimize-config*]
no named-tunnels

Syntax Description

tunnel-name	Configures the given name to the TE tunnel. **Note** If the tunnel name contains more than one word, use hyphens to separate the words.
tunnel-description	Sets a description for the tunnel.
self-ping *max-count*	Configures the maximum number of self-ping probes that are to be sent.
reoptimize*tunnel-reoptimize-config*	Reoptimizes the timer frequency in seconds. The value ranges from 0 to 65535. When the frequency is set to 0, the periodic reoptimization on the tunnel is disabled.

Command Default

None

Command Modes

MPLS-TE configuration

Command History

Release	Modification
Release 7.11.1	The **description** keyword was introduced.
Release 7.5.3	The following were modified: • The **self-ping** keyword was added. • The maximum supported string length of the tunnel name is changed from 54 to 64 characters.
Release 7.0.12	This command was introduced.

Usage Guidelines

Starting from Cisco IOS XR Release 7.5.3, the maximum supported string length of the tunnel name is changed from 54 to 64 characters.

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
```

Describe Tunnel

The following example shows how to add a description for the TE tunnel:

```
Router# configure
Router(config)# mpls traffic-eng
Router(config-mpls-te)# named-tunnels tunnel-te ABC
Router(config-te-tun-name)# description New tunnel
Router(config-te-tun-name)# commit
```

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. */
Router# configure
Router(config)# mpls traffic-eng
Router(config-mpls-te)# named-tunnels tunnel-te ABC
Router(config-te-tun-name)# self-ping
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 7.0.12	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 tunnnels 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
```

overlay-encapsulation mpls-udp

To enable MPLS over UDP encapsulation, use the **overlay-encapsulation mpls-udp** command in interface configuration mode. To return to the default behavior, use the **no** form of this command.

overlay-encapsulation mpls-udp

Syntax Description

This command has no arguments or keywords.

Command Default

No default behavior or values

Command Modes

Interface configuration mode

Command History

Release	Modification
Release 7.5.3	This command was introduced.

Usage Guidelines

Supported on routers with line cards based on Q200 Silicon.

Task ID

Task ID	Operations
mpls-te	read, write

Examples

The following example shows how to enable MPLS over UDP encapsulation:

```
Router# configure
Router(config)# interface nve1
Router(config-if)# overlay-encapsulation mpls-udp
Router(config-if)# source-interface Loopback0
Router(config-if)# logging events link-status
Router(config-if)# commit
```

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

percentage	Bandwidth change percent to trigger an overflow. The range is from 1 to 100.
min *bandwidth*	(Optional) Configures the bandwidth change value, in kbps, to trigger an overflow. The range is from 10 to 4294967295. The default is 10.
limit *limit*	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 7.0.12	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

preference-priority	Path option number. Range is from 1 to 1000.
protecting *number*	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 *path-name*	Specifies the path name of the IP explicit path.
identifier *path-number*	Specifies a path number of the IP explicit path.
protected-by *path-option-level*	(Optional) Configures path protection for an explicit path that is protected by another explicit path.
isis *instance-name*	(Optional) Limits CSPF to a single IS-IS instance and area.
attribute-set *name*	(Optional) Specifies the attribute set for the LSP.
level *level*	Configures the level for IS-IS. The range is from 1 to 2.
lockdown	(Optional) Specifies that the LSP cannot be reoptimized.
ospf *instance-name*	(Optional) Limits CSPF to a single OSPF instance and area.
area	Configures the area for OSPF.
value	Decimal value for the OSPF area ID.
address	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 7.0.12	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	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-option (Named Tunnels)

To configure one or more path options - each identified by a unique name - for a given MPLS-TE named tunnel, use the **path-option** command in MPLS-TE named-tunnels configuration mode. To delete the path option, use the **no** form of this command.

path-option *path-name* { **preference** *preference-priority* | **computation** { **dynamic** | **explicit** *explicit-path-name* | **attribute-set** } **retry-timer** *seconds* }

Syntax Description

path-name	Configures the given name to the path. **Note** If the path-option name contains more than one word, use hyphens to separate the words.
preference *preference-priority*	Specifies the path option preference. The range is from 1 to 4294967295. Lower values have a higher preference.
computation	Specifies the computation method for the path.
dynamic	Specifies that the path is dynamically calculated.
explicit	Specifies that an explicit path is used.
explicit-path-name	Configures the given name to the explicit path.
attribute-set *name*	Specifies the attribute-set name. You can specify a maximum 64 characters.
retry-timer *seconds*	Specifies the timeout period in seconds before the headend node retries to establish Label Switched Paths (LSPs). The timeout range is 1 to 600 seconds.

Command Default

None

Command Modes

MPLS-TE named tunnels configuration

Command History

Release	Modification
Release 7.5.4	The **retry-timer** keyword was added.
Release 7.5.3	The **attribute-set** keyword was added.
Release 7.0.12	This command was introduced.

Usage Guidelines

No specific guidelines impact the use of this command.

Task ID

Task ID	Operation
mpls-te	read, write

The following example shows how to configure one or more path options for a given MPLS-TE named 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-SJ
RP/0/RP0/CPU0:router(config-mpls-te-tunnel-name)#destination 192.168.0.1
RP/0/RP0/CPU0:router(config-mpls-te-tunnel-name)#path-option VIA-SF
RP/0/RP0/CPU0:router(config-path-option-name)#preference 10
RP/0/RP0/CPU0:router(config-path-option-name)#computation explicit MyExplicitPath
RP/0/RP0/CPU0:router(config-path-option-name)#exit
RP/0/RP0/CPU0:router(config-mpls-te-tunnel-name)#path-option SHORTEST
RP/0/RP0/CPU0:router(config-path-option-name)#preference 20
RP/0/RP0/CPU0:router(config-path-option-name)#computation dynamic
RP/0/RP0/CPU0:router(config-path-option-name)#exit
```

The following example shows how to configure attribute-set for path options for a given MPLS-TE named tunnel:

```
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-te-named-tunnels)#tunnel-te cisco
RP/0/RP0/CPU0:router(config-te-tun-name)#path-option 1
RP/0/RP0/CPU0:router(config-po-name)#attribute-set P1
RP/0/RP0/CPU0:router(config-po-name)#retry-timer 300
RP/0/RP0/CPU0:router(config-po-name)#commit
```

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 7.0.12	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 ID	Operations
mpls-te	read, write

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

seconds	Time, in seconds, between path-protection event and tunnel reoptimization. Range is from 0 to 604800.

Command Default

seconds: 180 (3 minutes)

Command Modes

MPLS-TE configuration

Command History

Release	Modification
Release 7.0.12	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

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

cost-limit-value	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 7.0.12	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 7.0.12	This command was introduced.

Usage Guidelines

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.

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).

Task ID

Task ID	Operations
mpls-te	read, write

Examples

This example shows how to use the **path-selection ignore overload head** command:

```
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
```

```
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

affinity-value	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 *affinity-mask*	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 *type*	(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 7.0.12	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 ID	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
FFFFFFFF
```

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 7.0.12	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 (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 { **delay** | **igp** | **te** }
no path-selection metric

Syntax Description

igp	Configures Interior Gateway Protocol (IGP) metrics.
te	Configures TE metrics. This is the default.
delay	Configures delay metrics.

Command Default

The default is TE metrics.

Command Modes

Interface configuration

Command History

Release	Modification
Release 7.0.12	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 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
```

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 { **delay** | **igp** | **te** }
no path-selection metric

Syntax Description

igp	Configures an Interior Gateway Protocol (IGP) metric.
te	Configures a TE metric.
delay	Configures the delay metric.

Command Default

The default is TE metric.

Command Modes

MPLS-TE configuration

Command History

Release	Modification
Release 7.0.12	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
```

pce tcp-ao

To perform MPLS-TE PCE authentication using TCP Authentication Option (TCP-AO), use the **pce tcp-ao** command in MPLS-TE configuration mode.

pce tcp-ao <password> *include-tcp-options*

Syntax Description

pce tcp-ao <password>	Password string.
include-tcp-options	Includes TCP options in the header for MAC calculation.

Command Default

This command is disabled by default.

Command Modes

MPLS-TE interface configuration

Command History

Release	Modification
Release 26.1.1	This command was introduced.

Usage Guidelines

No specific guidelines impact the use of this command.

Task ID

Task ID	Operations
mpls-te	read, write, execute

Examples

This example shows how to configure MPLS-TE PCE authentication using TCP-AO.

```
Router# configure terminal
Router(config)# mpls traffic-eng
Router(config-mpls-te)# pce tcp-ao <password> include-tcp-options
```

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

setup-priority	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.
hold-priority	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

setup-priority: 7

hold-priority: 7

Command Modes

Interface configuration

Command History

Release	Modification
Release 7.0.12	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 7.0.12	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
```

redelegation-timeout

To configure the time (in seconds) that a path computation client (PCC) must wait before re-delegating LSPs after a PCEP session with the active stateful PCE is disconnected, use the **redelegation-timeout** command in MPLS-TE pce configuration mode.

redelegation-timeout *seconds*

Syntax Description

seconds	Specifies redelegation timeout for LSPs after session failure in seconds. The range is from 0 to 3600.

Command Default

seconds: 180

Command Modes

MPLS-TE pce configuration

Command History

Release	Modification
Release 7.0.12	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 configure the time (in seconds) that a PCC must wait before re-delegating LSPs:

```
RP/0/0/CPU0:ios#configure
RP/0/0/CPU0:ios(config)#mpls traffic-eng pce
RP/0/0/CPU0:ios(config-mpls-te-pce)#stateful-client timers redelegation-timeout 30
```

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.
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 7.0.12	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 7.0.12	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

frequency Timer frequency range, in seconds. Range is from 0 to 604800.

Note:

- 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

frequency: 3600

Command Modes

MPLS-TE configuration

Command History

Release	Modification
Release 7.0.12	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 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.
seconds	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.
delay-time	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.
delay-time	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.
seconds	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 *delay*: 0

cleanup *delay*: 20

delay-time: 20

installation *delay*: 20

path-protection: 180

Command Modes

MPLS-TE configuration

Command History

Release	Modification
Release 7.0.12	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.
queue	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 7.0.12	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

IP address	IPv4 address to be used as secondary TE router ID.

Command Default

No default behavior or values

Command Modes

MPLS-TE configuration

Command History

Release	Modification
Release 7.0.12	This command was introduced.

Usage Guidelines

Use the **router-id secondary** command on tail end nodes to terminate verbatim tunnels to secondary TE RIDs as destinations.

You can configure up to 32 IPv4 addresses as TE secondary router IDs.

Task ID

Task ID	Operations
mpls-te	read, write

Examples

The following example shows how to configure a secondary TE router identifier in MPLS-TE:

```
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
```

set encapsulation-type mpls-udp

To set MPLS over UDP encapsulation, use the **set encapsulation-type mpls-udp** command in route-policy interface submode. To return to the default behavior, use the **no** form of this command.

set encapsulation-type mpls-udp

Syntax Description

This command has no arguments or keywords.

Command Default

No default behavior or values

Command Modes

Route-policy interface submode

Command History

Release	Modification
Release 7.5.3	This command was introduced.

Usage Guidelines

Supported on routers with line cards based on Q200 Silicon.

Task ID

Task ID	Operations
mpls-te	read, write

Examples

The following example shows how to set MPLS over UDP encapsulation:

```
Router(config)#prefix-set BGP-NH-1
Router(config-pfx)# 192.0.2.1/32 le 32,
Router(config-pfx)# 192.0.3.1/32 le 32,
Router(config-pfx)# 192.0.4.1/32 le 32,
Router(config-pfx)# 192.0.5.1/32 le 32
Router(config-pfx)#exit
Router(config)#commit

Router(config)#route-policy MPLSoUDP-Encap-1
Router(config-rpl)#if next-hop in BGP-NH-1 then
Router(config-rpl-if)#set encapsulation-type mpls-udp
Router(config-rpl-if)#else
Router(config-rpl-else)#pass
Router(config-rpl-else)#endif
Router(config-rpl)#end-policy
Router(config)#commit
```

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 *path-name*	(Optional) Displays the name of the explicit path.
identifier *number*	(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 7.0.12	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 1: 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

tunnel-number	Specifies TE tunnel number. Range is from 0 to 6553.
location *location-id*	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 7.0.12	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 *1*:

```
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 7.0.12	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
                                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
abcdefghabcdefghabcdefghabcdefgh                       31            80000000
```

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

Table 2: 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.
attribute-set-name	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 7.0.12	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 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 7.0.12	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:
             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             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 *mesh-value*	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 *name*	Displays mesh-groups configured with a specific attribute set.
destination *address*	Displays only the destinations with a specified address.
destination-list *name*	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 7.0.12	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 an 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 th 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 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

IP-address	(Optional) Tunnel leading to this address.
name *tunnel-name*	Specifies a tunnel by name.

Command Default

None

Command Modes

XR EXEC mode

Command History

Release	Modification
Release 7.0.12	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 3: 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 chunks

To display the usage of memory chunks for MPLS-TE tunnels, use the **show mpls traffic-eng chunks** command in XR EXEC mode.

show mpls traffic-eng chunks **standby**

Syntax Description

detail	Displays detailed information about the memory usage by MPLS-TE tunnels.
standby	Displays memory information for the standby node.

Command Default

None

Command Modes

XR EXEC mode

Command History

Release	Modification
Release 25.4.1	The output includes the memory usage information by MPLS-TE event history.
Release 7.0.12	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 example displays the memory utilized including the memory information for the tunnel event history using the **show mpls traffic-eng chunks** command:

```
RP/0/RP0/CPU0:router# show mpls traffic-eng chunks

  Tue Dec  9 06:30:40.055 UTC
Pool name            InUse     Free      Allocs    Deallocs  Sib creat Sib trimm
-------------------- --------- --------- --------- --------- --------- ---------
mpls wavl Chunks             0     32000         0         0         0         0
mpls wavl Chunks            28      7972        28         0         0         0
mpls wavl Chunks           101      3899       101         0         0         0
mpls wavl Chunks            59      1941        59         0         0         0
mpls wavl Chunks            27       973        27         0         0         0
mpls wavl Chunks             9       491         9         0         0         0
mpls wavl Chunks             0       240         0         0         0         0
mpls wavl Chunks             0       120         0         0         0         0
TE S2L chunk                 0       200         0         0         0         0
TE S2L stats chunk           0      1024         0         0         0         0
TE LSP chunk                 0       200         0         0         0         0
TE collab chunk             15        25        15         0         0         0
```

```
TE FSM Q chunk              0       128         0         0         0         0
TE NextHop Route Po         0       128         0         0         0         0
TE Binding Sid Cont         0       128         0         0         0         0
TE CHKPT Q Elements         0       600        10        10         0         0
RSVP CHKPT LIST Chu         0      8192         0         0         0         0
TE Tunnel Service R         0       128         0         0         0         0
TE Tunnel Service R         0       128         0         0         0         0
RSVP API CTX                0       156         0         0         0         0
RSVP API CTX stats          0        48         0         0         0         0
RSVP API CTX event          0      1248         0         0         0         0
RSVP API CTX event          0      1248         0         0         0         0
RSVP API CTX Histor         0      1248         0         0         0         0
TE S2L RW chunk             0       124         0         0         0         0
TE S2L RW chunk             0       128         0         0         0         0
TE Event History            0       200         0         0         0         0
VIF Pulse Context c         0      1024       668       668         0         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 7.0.12	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 4: 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 bandwidth-accounting

To display bandwidth accounting statistics, use the **show mpls traffic-eng counters bandwidth-accounting** command in EXEC mode.

show mpls traffic-eng counters bandwidth-accounting

Syntax Description

This command has no arguments or keywords.

Command Default

No default behavior or values

Command Modes

EXEC

Command History

Release	Modification
Release 7.0.12	This command was introduced.

Usage Guidelines

Counters are global and for all interfaces combined.

Task ID

Task ID	Operations
mpls-te	read

The following sample output shows the bandwidth accounting statistics:

```
RP/0/RP0/CPU0:router# show mpls traffic-eng counters bandwidth-accounting
Bandwidth Accounting Statistics:
  Total number of bandwidth samples collected    : 388
  Total number of bandwidth applications         : 128
  Total number of invalid bandwidth samples      : 0
  Total number of skipped bandwidth applications : 0
```

show mpls traffic-eng counters global

To display global statistics for MPLS-TE tunnels, use the **show mpls traffic-eng counters global** command in XR EXEC mode.

show mpls traffic-eng counters global standby

Syntax Description

standby	Displays information about standby node.

Command Default

None

Command Modes

XR EXEC mode

Command History

Release	Modification
Release 25.4.1	The output includes the event history information.
Release 7.0.12	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 example displays the output with the event history memory consumption using the **show mpls traffic-eng counters global** command:

```
RP/0/RP0/CPU0:router# show mpls traffic-eng counters global

Tue Dec  9 05:28:18.911 UTC
Global Statistics:
  Number of VIF                             : 0
  Number of LSP                             : 0
  Number of S2L                             : 0
  Checkpoint request queue high watermark   : 1
  Checkpoint response queue high watermark  : 1
  Checkpoint reschedules                    : 7
  Checkpoint enqueues (request queue)       : 5
  Checkpoint dequeues (request queue)       : 5
  Checkpoint enqueues (response queue)      : 5
  Checkpoint dequeues (response queue)      : 5
  Checkpoint write (VIF)                    : 0
  Checkpoint read (VIF)                     : 0
  Checkpoint write (DST)                    : 0
  Checkpoint read (DST)                     : 0
  Checkpoint write (S2L)                    : 0
  Checkpoint read (S2L)                     : 0
```

```
Checkpoint write (Autobackup)              : 0
Checkpoint read (Autobackup)               : 0
Checkpoint write (PI backup)               : 0
Checkpoint read (PI backup)                : 0
Number of RSVP connection                  : 0
Number of RSVP disconnection               : 0
Number of RSVP restart time change         : 0
Number of LSD connection                   : 1
Number of LSD disconnection                : 0
Number of LSD replay                       : 1
Number of LMRIB connection                 : 1
Number of LMRIB disconnection              : 0
Number of LMRIB restart time change        : 1
Number of LMRIB restart failed             : 0
Number of LMRIB restart passed             : 1
Number of LMRIB recovery failed            : 0
Number of LMRIB recovery passed            : 1
Number of RSI connection                   : 1
Number of RSI disconnection                : 0
Event-history size (bytes)
 Tunnels (excluding chunks)                : 16444912
```

show mpls traffic-eng counters in-place-bandwidth-update

To display in-place bandwidth counters for mid- point and tail-end LSPs in MPLS-TE tunnels, use the **show mpls traffic-eng counters in-place-bandwidth-update** command in XR EXEC mode.

show mpls traffic-eng counters in-place-bandwidth-update { *tunnel-id* | **all** | **name** *name* | **summary** }

Syntax Description

tunnel-id	Displays the in-place bandwidth counters for the specified tunnel ID.
all	Displays the in-place bandwidth counters for all MPLS-TE tunnels.
name *name*	Displays the in-place bandwidth update for the specified MPLS-TE tunnel name or signal name.
summary	Displays the in-place bandwidth counters' summary.

Command Default

None

Command Modes

XR EXEC mode

Command History

Release	Modification
Release 26.1.1	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 example displays in-place bandwidth counters for the specified tunnel ID.

```
RP/0/RP0/CPU0:router# show mpls traffic-eng counters in-place-bandwidth-update 3369

Tue Dec  2 06:37:58.818 PST

Tunnel Mid/Tail: R1_t5 Source: 192.168.0.1 P2MP ID: 83929280 Tunnel ID: 3369 LSP ID: 2
Cumulative LSP Counters:
  Total      : 0
  Successful : 0
  Failed     : 0
```

This example displays in-place bandwidth counters for the specified MPLS tunnel name.

```
RP/0/RP0/CPU0:router# show mpls traffic-eng counters in-place-bandwidth-update name tunnel1
```

```
Tue Dec  2 06:38:44.426 PST

Tunnel Mid/Tail: tunnel1 Source: 192.168.0.1 P2MP ID: 83929280 Tunnel ID: 5 LSP ID: 2
Cumulative LSP Counters:
  Total      : 0
  Successful : 0
  Failed     : 0
```

This example display in-place bandwidth counters for all MPLS-TE tunnels.

```
RP/0/RP0/CPU0:router# show mpls traffic-eng counters in-place-bandwidth-update all

Tue Dec  2 06:38:58.990 PST

Tunnel Mid/Tail: R1_t5 Source: 192.168.0.1 P2MP ID: 83929280 Tunnel ID: 5 LSP ID: 2

Cumulative LSP Counters:
  Total      : 0
  Successful : 0
  Failed     : 0
```

This example displays the summary of in-place bandwidth counters.

```
RP/0/RP0/CPU0:router# show mpls traffic-eng counters in-place-bandwidth-update summary

Tue Dec  2 06:39:11.259 PST

Summary of counters:
  Total      : 0
  Successful : 0
  Failed     : 0
```

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.
tunnel-number	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.
tunnel-name	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 7.0.12	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 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                          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                          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                          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                          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                      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 5: 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:router#show mpls traffic-eng counters soft-preemption
```

```
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-te1
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 ds-te te-class

To display the Diff-Serv TE-class map in use, use the **show mpls traffic-eng ds-te te-class** command in XR EXEC mode.

show show mpls traffic-eng ds-te te-class

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 7.0.12	This command was introduced.

Usage Guidelines

TE-class is used only in IETF DS-TE mode.

Task ID

Task ID	Operations
mpls-te	read, write

Examples

The following shows a sample output from the **show mpls traffic-eng ds-te te-class** command:

```
RP/0/RP0/CPU0:router# show mpls traffic-eng ds-te te-class

  te-class 0: class-type 0 priority 7 status default
  te-class 1: class-type 1 priority 7 status default
  te-class 2: unused
  te-class 3: unused
  te-class 4: class-type 0 priority 0 status default
  te-class 5: class-type 1 priority 0 status default
  te-class 6: unused
  te-class 7: unused
```

This table describes the significant fields shown in the display.

Table 6: show mpls traffic-eng ds-te te-class Command Field Descriptions

Field	Description
te-class	TE-class map, pair of class-type, and priority.
class-type	class-type of the tunnel.
status	Source of the TE-class map, either default or user configured.

show mpls traffic-eng event-history tunnels

To display the event history for MPLS-TE tunnels, use the **show mpls traffic-eng event-history tunnels** command in XR EXEC mode.

show mpls traffic-eng event-history tunnels { **all** | **name** *tunnel-name* }

Syntax Description

all	Displays the event history for all MPLS-TE headend tunnels.
name *tunnel-name*	Displays the event history for the specified MPLS-TE headend tunnel.

Command Default

No default behavior or values

Command Modes

XR EXEC mode

Command History

Release	Modification
Release 25.4.1	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 example displays the event history for all MPLS-TE headend tunnels:

```
RP/0/RP0/CPU0:router# show mpls traffic-eng event-history tunnels all
Thu Dec 18 07:30:41.116 UTC
Name: tunnel-te1
 Event history (oldest first):
 ID                   Time                 LSP  Event-Type  Rep  Event-Message
 01765952238563713907  Dec 17 06:17:50.600    2  Path        0  BW:300 kbps ERO: 10.1.3.103
 10.3.5.105
 01765952238563713909  Dec 17 06:17:50.703    2  Resv        0  BW:300 kbps RRO:
 01765952238563713910  Dec 17 06:17:50.703    2  Oper State  0  New tunnel state: UP

Name: tunnel-T10
 Event history (oldest first):
 ID                   Time                 LSP  Event-Type  Rep  Event-Message
 01765952238563713933  Dec 17 07:15:28.220    5  Path Tear   0
 01765952238563713934  Dec 17 07:15:32.660    8  Path        0  BW:300 kbps ERO: 10.1.2.102
 10.2.4.104
 01765952238563713935  Dec 17 07:15:32.763    8  Resv        0  BW:300 kbps RRO:
 01765952238563713936  Dec 17 07:15:32.803    6  Path Tear   0
 01765952238563713937  Dec 17 07:15:37.387    9  Path        0  BW:300 kbps ERO: 10.1.2.102
 10.2.4.104
 01765952238563713938  Dec 17 07:15:37.480    9  Resv        0  BW:300 kbps RRO:
 01765952238563713939  Dec 17 07:15:37.517    7  Path Tear   0
 01765952238563713940  Dec 17 07:15:47.193   10  Path        0  BW:300 kbps ERO: 10.1.2.102
 10.2.4.104
```

```
 01765952238563713941  Dec 17 07:15:47.283    10  Resv          0  BW:300 kbps RRO:
 01765952238563713942  Dec 17 07:15:47.320     8  Path Tear     0
 01765952238563713943  Dec 17 07:16:07.420     9  Path Tear     0
 01765952238563713944  Dec 17 07:16:15.573    11  Path          0  BW:300 kbps ERO: 10.1.2.102
 10.2.4.104
 01765952238563713945  Dec 17 07:16:15.670    11  Resv          0  BW:300 kbps RRO:
 01765952238563713946  Dec 17 07:16:35.810    10  Path Tear     0
 01765952238563713947  Dec 17 07:22:49.863    12  Path          0  BW:300 kbps ERO: 10.1.2.102
 10.2.4.104
 01765952238563713948  Dec 17 07:22:49.963    12  Resv          0  BW:300 kbps RRO:
 01765952238563713949  Dec 17 07:23:10.103    11  Path Tear     0
 01765952238563713950  Dec 17 07:23:49.240    13  Path          0  BW:300 kbps ERO: 10.1.2.102
 10.2.4.104
 01765952238563713951  Dec 17 07:23:49.340    13  Resv          0  BW:300 kbps RRO:
 01765952238563713952  Dec 17 07:24:09.480    12  Path Tear     0

Name: tunnel-A
 Event history (oldest first):
 ID                    Time                   LSP  Event-Type  Rep  Event-Message
 01765952238563713856  Dec 17 06:17:38.293     2  Path         0  BW:0 kbps ERO: 10.1.2.102
 10.2.4.104
 01765952238563713877  Dec 17 06:17:38.413     2  Resv         0  BW:0 kbps RRO:
 01765952238563713894  Dec 17 06:17:38.463     2  Oper State   0  New tunnel state: UP

Name: tunnel-B
 Event history (oldest first):
 ID                    Time                   LSP  Event-Type  Rep  Event-Message
 01765952238563713857  Dec 17 06:17:38.293     2  Path         0  BW:0 kbps ERO: 10.1.2.102
 10.2.4.104
 01765952238563713873  Dec 17 06:17:38.413     2  Resv         0  BW:0 kbps RRO:
 01765952238563713891  Dec 17 06:17:38.457     2  Oper State   0  New tunnel state: UP

Name: tunnel-C
 Event history (oldest first):
 ID                    Time                   LSP  Event-Type  Rep  Event-Message
 01765952238563713858  Dec 17 06:17:38.293     2  Path         0  BW:0 kbps ERO: 10.1.2.102
 10.2.4.104
 01765952238563713878  Dec 17 06:17:38.413     2  Resv         0  BW:0 kbps RRO:
 01765952238563713895  Dec 17 06:17:38.463     2  Oper State   0  New tunnel state: UP

Name: SELFPING-101
 Event history (oldest first):
 ID                    Time                   LSP  Event-Type  Rep  Event-Message
 01769076278173248001  Jan 22 05:30:13.487     2  Path         0  BW:0 kbps ERO: 10.10.10.2
 17.17.17.2 17.17.17.3 22.22.22.3 22.22.22.4 192.168.0.4
 01769076278173248002  Jan 22 05:30:13.546     2  Resv         0  BW:0 kbps RRO:
 01769076278173248003  Jan 22 05:30:23.551     2  Self-Ping    0  Timed-out (started at
Jan 22 05:01:30.769)
 01769076278173248004  Jan 22 05:30:23.554     2  Oper State   0  New tunnel state: UP

Name: SELFPING-103
 Event history (oldest first):
 ID                    Time                   LSP  Event-Type  Rep  Event-Message
 01769076278173248011  Jan 22 05:31:54.518     2  Path         0  BW:0 kbps ERO: 10.10.10.2
 17.17.17.2 17.17.17.3 22.22.22.3 22.22.22.4 192.168.0.4
 01769076278173248012  Jan 22 05:31:54.581     2  Resv         0  BW:0 kbps RRO:
 01769076278173248013  Jan 22 05:32:02.917     2  Self-Ping    0  Aborted (started at Jan
 22 05:01:30.769)
 01769076278173248014  Jan 22 05:32:02.925     2  Path Tear    0
 01769076278173248015  Jan 22 05:32:02.936     3  Path         0  BW:0 kbps ERO: 11.11.11.2
 17.17.17.2 17.17.17.3 22.22.22.3 22.22.22.4 192.168.0.4
 01769076278173248016  Jan 22 05:32:02.987     3  Resv         0  BW:0 kbps RRO:
 01769076278173248017  Jan 22 05:32:06.994     3  Self-Ping    0  Succeeded (started at
```

```
Jan 22 05:01:30.769)
 01769076278173248018  Jan 22 05:32:06.995     3  Oper State    0  New tunnel state: UP
```

This example displays the event history for the specified MPLS-TE headend tunnel:

```
RP/0/RP0/CPU0:router# show mpls traffic-eng event-history tunnels name tunnel-T10
Thu Dec 18 07:30:57.167 UTC

Name: tunnel-T10
 Event history (oldest first):
 ID                    Time                  LSP  Event-Type  Rep  Event-Message
 01765952238563713933  Jan 1 07:15:28.220     5  Path Tear     0
 01765952238563713934  Jan 1 07:15:32.660     8  Path          0  BW:300 kbps ERO: 10.1.2.102
 10.2.4.104
 01765952238563713935  Jan 1 07:15:32.763     8  Resv          0  BW:300 kbps RRO:
 01765952238563713936  Jan 1 07:15:32.803     6  Path Tear     0
 01765952238563713937  Jan 1 07:15:37.387     9  Path          0  BW:300 kbps ERO: 10.1.2.102
 10.2.4.104
 01765952238563713938  Jan 1 07:15:37.480     9  Resv          0  BW:300 kbps RRO:
 01765952238563713939  Jan 1 07:15:37.517     7  Path Tear     0
 01765952238563713940  Jan 1 07:15:47.193    10  Path          0  BW:300 kbps ERO: 10.1.2.102
 10.2.4.104
 01765952238563713941  Jan 1 07:15:47.283    10  Resv          0  BW:300 kbps RRO:
 01765952238563713942  Jan 1 07:15:47.320     8  Path Tear     0
 01765952238563713943  Jan 1 07:16:07.420     9  Path Tear     0
 01765952238563713944  Jan 1 07:16:15.573    11  Path          0  BW:300 kbps ERO: 10.1.2.102
 10.2.4.104
 01765952238563713945  Jan 1 07:16:15.670    11  Resv          0  BW:300 kbps RRO:
 01765952238563713946  Jan 1 12:23:05.711    10  Self-Ping     0  Succeeded (started at Jan
  1 12:23:05.709)
 01765952238563713947  Jan 1 07:16:35.810    10  Path Tear     0
 01765952238563713948  Jan 1 07:22:49.863    12  Path          0  BW:300 kbps ERO: 10.1.2.102
 10.2.4.104
 01765952238563713949  Jan 1 07:22:49.963    12  Resv          0  BW:300 kbps RRO:
 01765952238563713950  Jan 1 07:23:10.103    11  Path Tear     0
 01765952238563713951  Jan 1 07:23:49.240    13  Path          0  BW:300 kbps ERO: 10.1.2.102
 10.2.4.104
 01765952238563713952  Jan 1 07:23:49.340    13  Resv          0  BW:300 kbps RRO:
 01765952238563713953  Jan 1 07:24:09.480    12  Path Tear     0
 01765952238563713954  Jan 1 12:45:45.473    11  Self-Ping     0  Succeeded (started at Jan
  1 12:45:45.472)
```

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 *tunnel-name*	(Optional) Restricts tunnels with this backup tunnel name.
source *source-address*	(Optional) Restricts tunnels for this specified tunnel source IPv4 address.
tunnel-id *tunnel-id*	(Optional) Restricts tunnels for this tunnel identifier. Range for the *tunnel-id* argument is from 0 to 65535.
interface	(Optional) Displays information on the specified interface.
type	(Optional) 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.
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

Command History

Release	Modification
Release 7.0.12	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
209.165.202.129 1_23          -                             HundredGigE0/0/0/3    16000
  3        tt1300
209.165.202.129 1100_9        -                             HundredGigE0/0/0/3    16002
  16001    unknown
209.165.202.129 1200_9        -                             HundredGigE0/0/0/3    16001
  16000    unknown
209.165.202.129 1300_2        -                             HundredGigE0/0/0/4    16005
  16021    unknown
209.165.202.129 1400_9        -                             HundredGigE0/0/0/3    16003
  16002    unknown
```

This table describes the significant fields shown in the display.

Table 7: 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

IP-address	(Optional) Destination IPv4 address for forwarding adjacency.

Command Default

No default behavior or values

Command Modes

XR EXEC mode

Command History

Release	Modification
Release 7.0.12	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 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 7.0.12	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 8: 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.
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 7.0.12	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)
```

```
  ---------------------- ---------- ----------         --- ------------- ---------------

  10.10.10.10 1_34         -          HundredGigE0/0/0/3  7/7 Resv Admitted 100         RB0

  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 9: 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 10: 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[1], TDM[2], FSC[3].
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.

[1] PSC = Packet switch capable.

[2] TDM = Time-division multiplexing.
[3] 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 7.0.12	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
```

```
    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 11: 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[4]	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.

[4] 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.
type	(Optional) 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

No default behavior or values

Command Modes

XR EXEC mode

Command History

Release	Modification
Release 7.0.12	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 HundredGigE
 0/0/0/3

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 12: 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: • PSC[5] • TDM[6] • FSC[7]
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.

[5] PSC = Packet switch capable.
[6] TDM = Time-division multiplexing.
[7] 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 *isis-address*	Displays the specified Intermediate System-to-Intermediate System (IS-IS) neighbor system ID when neighbors are displayed by IGP ID.
ospf *ospf-id*	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.
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.
IP-address	(Optional) IGP neighbors that are using a specified IGP IP address.

Command Modes

XR EXEC mode

Command History

Release	Modification
Release 7.0.12	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
```

```
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 13: 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

type	(Optional) 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

No default behavior or values

Command Modes

XR EXEC mode

Command History

Release	Modification
Release 7.0.12	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
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 14: 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[8].	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.

Field	Description
IGP Neighbor Count	IGP[9] neighbors directly reachable over this link.
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.

[8] SRLGs = Shared Risk Link Groups.
[9] IGP = Interior Gateway Protocol .

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 [**interface***type interface-path-id*]

Syntax Description

interface	Displays information on the specified interface.
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

None

Command Modes

XR EXEC mode

Command History

Release	Modification
Release 7.0.12	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          BW   Class  Time
                                                S/H        Kbps    Type   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 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 7.0.12	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
```

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

Table 15: 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 7.0.12	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 16: 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[10] 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.

[10] 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 7.0.12	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
```

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

Table 17: 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 7.0.12	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): 35000/0 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

    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  Pri  Bandwidth  BW Type
                                              Type  S/H  (in kbps)
------ ------ --------------- --------------- ------- ---- ---------- --------
     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 ID	Operations
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 18: 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**}] [**model-type** {**rdm** | **mam**}] [**srlg**][**static**]

Syntax Description

IP-address	(Optional) Node IP address (router identifier to interface address).
destination *IP-address*	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.
P2P -tunnel-number	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 *level*	(Optional) Displays the priority used when signaling a LSP for this tunnel, to determine which existing tunnels can be preempted.
isis *nsap-address*	(Optional) Displays the node router identification, if Intermediate System-to-Intermediate System (IS-IS) is enabled.
ospf *ospf-address*	(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.
model-type { **rdm** | **mam** }	(Optional) Displays the bandwidth constraints model type, RDM or MAM.
srlg	(Optional) Displays the SRLG information.
static	(Optional) Displays the staticically configured SRLG.

Command Default

No default behavior or values

Command Modes

XR EXEC mode

Command History

Release	Modification
Release 7.0.12	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 sample output shows the MPLS-TE network topology with the name of the affinity attribute of the link:

```
RP/0/RP0/CPU0:router# show mpls traffic-eng topology

  Link[1]:Point-to-Point, Nbr IGP Id:192.168.0.1, Nbr Node Id:9, gen:23
        Frag Id:25, Intf Address:13.9.1.1, Intf Id:0
        Nbr Intf Address:13.9.1.3, Nbr Intf Id:0
        TE Metric:1, IGP Metric:1, Attribute Flags:0x0
        Attribute Names:
        Switching Capability:, Encoding:
        BC Model ID:RDM
        Physical BW:155520 (kbps), Max Reservable BW Global:116640 (kbps)
        Max Reservable BW Sub:0 (kbps)
                                 Global Pool       Sub Pool
                 Total Allocated Reservable        Reservable
                 BW (kbps)       BW (kbps)         BW (kbps)
                 ---------------  -----------      ----------
          bw[0]:            0         116640               0
          bw[1]:            0         116640               0
          bw[2]:            0         116640               0
          bw[3]:            0         116640               0
          bw[4]:            0         116640               0
          bw[5]:            0         116640               0
          bw[6]:            0         116640               0
          bw[7]:            0         116640               0

    Link[2]:Broadcast, DR:12.9.0.2, Nbr Node Id:1, gen:23
        Frag Id:28, Intf Address:12.9.0.1, Intf Id:0
        Nbr Intf Address:0.0.0.0, Nbr Intf Id:0
        TE Metric:1, IGP Metric:1, Attribute Flags:0x4
        Attribute Names: red2
        Switching Capability:, Encoding:
        BC Model ID:RDM
        Physical BW:1000000 (kbps), Max Reservable BW Global:10000 (kbps)
        Max Reservable BW Sub:0 (kbps)
                                 Global Pool       Sub Pool
                 Total Allocated Reservable        Reservable
                 BW (kbps)       BW (kbps)         BW (kbps)
                 ---------------  -----------      ----------
          bw[0]:            0          10000               0
          bw[1]:            0          10000               0
          bw[2]:            0          10000               0
          bw[3]:            0          10000               0
          bw[4]:            0          10000               0
          bw[5]:            0          10000               0
          bw[6]:            0          10000               0
          bw[7]:            0          10000               0
```

The following shows a sample output from the **show mpls traffic-eng topology** command in detail form in prestandard DS-TE mode:

```
RP/0/RP0/CPU0:router# show mpls traffic-eng topology

  My_System_id: 0000.0000.0002.00 (isis   level-2)
  My_System_id: 20.20.20.20 (ospf   area 0)
  My_BC_Model_Type: RDM

  Signalling error holddown: 10 sec Global Link Generation 36

  IGP Id: 0000.0000.0002.00, MPLS-TE Id: 20.20.20.20 Router Node  (isis   level-2)

  Link[0]:Point-to-Point, Nbr IGP Id:0000.0000.0003.00, Nbr Node Id:3, gen:36
        Frag Id:0, Intf Address:7.3.3.1, Intf Id:0
         Nbr Intf Address:7.3.3.2, Nbr Intf Id:0
        TE Metric:10, IGP Metric:10, Attribute Flags:0x0
        Switching Capability:SRLGs: 10, Encoding:20
        Switching Capability:, Encoding:
  BC Model ID:RDM
  Physical BW:155520 (kbps), Max Reservable BW Global:100000 (kbps)
        Max Reservable BW Sub:50000 (kbps)
                                  Global Pool       Sub Pool
                 Total Allocated  Reservable       Reservable
                 BW (kbps)        BW (kbps)        BW (kbps)
                 ---------------  -----------      ----------
           bw[0]:            0         100000           50000
           bw[1]:            0         100000           50000
           bw[2]:            0         100000           50000
           bw[3]:            0         100000           50000
           bw[4]:            0         100000           50000
           bw[5]:            0         100000           50000
           bw[6]:            0         100000           50000
           bw[7]:            0         100000           50000
```

The following shows a sample output from the **show mpls traffic-eng topology** command in detail form in IETF DS-TE mode.

```
RP/0/RP0/CPU0:router# show mpls traffic-eng topology

  My_System_id: 0000.0000.0001.00 (isis 1 level-2)
  My_System_id: 10.10.10.10 (ospf 100 area 0)
  My_BC_Model_Type: MAM

  Signalling error holddown: 10 sec Global Link Generation 84

  IGP Id: 0000.0000.0001.00, MPLS-TE Id: 10.10.10.10 Router Node  (isis 1 level-2)

  Link[0]:Point-to-Point, Nbr IGP Id:0000.0000.0002.00, Nbr Node Id:6, gen:84
        Frag Id:0, Intf Address:7.2.2.1, Intf Id:0
         Nbr Intf Address:7.2.2.2, Nbr Intf Id:0
        TE Metric:10, IGP Metric:10, Attribute Flags:0x0
        TE Metric:SRLGs: 10, IGP Metric:10, Attribute Flags:0x020
        Switching Capability:, Encoding:
  BC Model ID:MAM
        Physical BW:155520 (kbps), Max Reservable BW:1000 (kbps)
        BC0:600 (kbps) BC1:400 (kbps)
                       Total Allocated   Reservable
                       BW (kbps)         BW (kbps)
                       ---------------   -----------
          TE-class[0]:           10            590
```

```
          TE-class[1]:            0            400
          TE-class[2]:            0              0
          TE-class[3]:            0              0
          TE-class[4]:            0            600
          TE-class[5]:            0            400
  Link[1]:Point-to-Point, Nbr IGP Id:0000.0000.0002.00, Nbr Node Id:6, gen:84
        Frag Id:0, Intf Address:7.1.1.1, Intf Id:0
         Nbr Intf Address:7.1.1.2, Nbr Intf Id:0
        TE Metric:10, IGP Metric:10, Attribute Flags:0x0
        TE Metric:SRLGs: 10, IGP Metric:10, Attribute Flags:0x020
        Switching Capability:, Encoding:
        BC Model ID:MAM
        Physical BW:155520 (kbps), Max Reservable BW:1000 (kbps) BC0:600 (kbps) BC1:400
(kbps)
                        Total Allocated   Reservable
                        BW (kbps)         BW (kbps)
                        ---------------   -----------
          TE-class[0]:           10            590
          TE-class[1]:            0            400
          TE-class[2]:            0              0
          TE-class[3]:            0              0
          TE-class[4]:            0            600
          TE-class[5]:            0            400
          TE-class[6]:            0              0
          TE-class[7]:            0              0
```

The following shows a sample output for the **show mpls traffic-eng topology** command in brief form:

```
RP/0/RP0/CPU0:router# show mpls traffic-eng topology 192.168.0.145 brief

  IGP Id: 0000.0000.0010.00, MPLS TE Id: 192.168.0.145 Router Node  (ISIS test level-1)
    Link[0]:Point-to-Point, Nbr IGP Id:0000.0000.0234.00, Nbr Node Id:4, gen:5
        Frag Id:0, Intf Address:10.3.11.145, Intf Id:0
        Nbr Intf Address:10.3.11.143, Nbr Intf Id:0
        TE Metric:10, IGP Metric:10, Attribute Flags:0x0
        SRLGs: 10, 20
        Attribute Names:  red2
        Switching Capability:, Encoding:
        BC Model ID:RDM
        Physical BW:155520 (kbps), Max Reservable BW Global:0 (kbps)
        Max Reservable BW Sub:0 (kbps)
```

The following sample output shows a brief topology for the affinity attributes:

```
RP/0/RP0/CPU0:router# show mpls traffic-eng topology affinity

  affinity
  Mon Mar 23 13:25:47.236 EST EST
  My_System_id: 10.0.0.1 (OSPF 100 area 0)
  My_System_id: 0000.0000.0001.00 (IS-IS 100 level-2)
  My_BC_Model_Type: RDM

  Signalling error holddown: 10 sec Global Link Generation 233

  IGP Id: 0000.0000.0001.00, MPLS TE Id: 11.11.1.1 Router Node  (IS-IS 100 level-2)

  IGP Id: 10.0.0.1, MPLS TE Id: 10.0.0.1 Router Node  (OSPF 100 area 0)
    Link[0]:      Intf Address: 12.9.1.1, Nbr Intf Address: 12.9.1.2
        Attribute Flags: 0x0
        Attribute Names:
```

```
  Link[1]:      Intf Address: 13.9.1.1, Nbr Intf Address: 13.9.1.3
      Attribute Flags: 0x0
      Attribute Names:
  Link[2]:      Intf Address: 12.9.0.1, DR: 12.9.0.2
      Attribute Flags: 0x4
      Attribute Names: red2
  Link[3]:      Intf Address: 14.9.0.1, DR: 14.9.0.4
      Attribute Flags: 0x0
      Attribute Names:
  Link[4]:      Intf Address: 13.9.0.1, DR: 13.9.0.3
      Attribute Flags: 0x0
      Attribute Names:

IGP Id: 4.4.4.4, MPLS TE Id: 4.4.4.4 Router Node  (OSPF 100 area 0)
  Link[0]:      Intf Address: 34.9.1.4, Nbr Intf Address: 34.9.1.3
      Attribute Flags: 0x0
      Attribute Names:
  Link[1]:      Intf Address: 14.9.0.4, DR: 14.9.0.4
      Attribute Flags: 0x1e
      Attribute Names: red1 red2 red3 red4
  Link[2]:      Intf Address: 24.9.0.4, DR: 24.9.0.4
      Attribute Flags: 0x0
      Attribute Names:
  Link[3]:      Intf Address: 34.9.0.4, DR: 34.9.0.3
      Attribute Flags: 0x0
      Attribute Names:
  Link[4]:      Intf Address: 24.9.1.4, Nbr Intf Address: 24.9.1.2
      Attribute Flags: 0x0
      Attribute Names:
```

The following sample output for the **show mpls traffic-eng topology** command that shows the output to a single link:

```
RP/0/RP0/CPU0:router# show mpls traffic-eng topology 12.9.1.1 link-only

Wed Sep  2 13:24:48.821 EST


IGP Id: 0000.0000.0002.00, MPLS TE Id: 172.16.0.1 Router Node  (IS-IS 100 level-2)

  Link[0]:Point-to-Point, Nbr IGP Id:0000.0000.0001.00, Nbr Node Id:-1, gen:277740
      Frag Id:0, Intf Address:12.9.1.2, Intf Id:0
      Nbr Intf Address:12.9.1.1, Nbr Intf Id:0
      TE Metric:10, IGP Metric:10, Attribute Flags:0x0
      Attribute Names:
      Switching Capability:, Encoding:
      BC Model ID:RDM
      Physical BW:155520 (kbps), Max Reservable BW Global:116640 (kbps)
      Max Reservable BW Sub:0 (kbps)
                               Global Pool       Sub Pool
               Total Allocated   Reservable        Reservable
               BW (kbps)         BW (kbps)         BW (kbps)
               ---------------   -----------       ----------
        bw[0]:            0         116640               0
        bw[1]:            0         116640               0
        bw[2]:            0         116640               0
        bw[3]:            0         116640               0
        bw[4]:            0         116640               0
        bw[5]:            0         116640               0
        bw[6]:            0         116640               0
        bw[7]:            0         116640               0
```

```
IGP Id: 172.16.0.1, MPLS TE Id: 172.16.0.1 Router Node  (OSPF 100 area 0)

  Link[3]:Point-to-Point, Nbr IGP Id:10.0.0.1, Nbr Node Id:-1, gen:277737
      Frag Id:29, Intf Address:12.9.1.2, Intf Id:0
      Nbr Intf Address:12.9.1.1, Nbr Intf Id:0
      TE Metric:1, IGP Metric:1, Attribute Flags:0x0
      Attribute Names:
      Switching Capability:, Encoding:
      BC Model ID:RDM
      Physical BW:155520 (kbps), Max Reservable BW Global:116640 (kbps)
      Max Reservable BW Sub:0 (kbps)
                               Global Pool       Sub Pool
              Total Allocated  Reservable        Reservable
              BW (kbps)        BW (kbps)         BW (kbps)
              ---------------  -----------       ----------
        bw[0]:            0        116640               0
        bw[1]:            0        116640               0
        bw[2]:            0        116640               0
        bw[3]:            0        116640               0
        bw[4]:            0        116640               0
        bw[5]:            0        116640               0
        bw[6]:            0        116640               0
        bw[7]:            0        116640               0
```

The following shows a sample output for the **show mpls traffic-eng topology model-type mam** command:

```
RP/0/RP0/CPU0:router# show mpls traffic-eng topology model-type mam

  IGP Id: 0000.0000.0001.00, MPLS-TE Id: 10.10.10.10 Router Node  (isis 1 level-2)
    Link[0]:      Intf Address:7.2.2.1, Nbr Intf Address:7.2.2.2
    Link[1]:      Intf Address:7.1.1.1, Nbr Intf Address:7.1.1.2

  IGP Id: 0000.0000.0002.00, MPLS-TE Id: 20.20.20.20 Router Node  (isis 1 level-2)
    Link[0]:      Intf Address:7.2.2.2, Nbr Intf Address:7.2.2.1
    Link[1]:      Intf Address:7.1.1.2, Nbr Intf Address:7.1.1.1
    Link[2]:      Intf Address:7.3.3.1, Nbr Intf Address:7.3.3.2

  IGP Id: 0000.0000.0003.00, MPLS-TE Id: 30.30.30.30 Router Node  (isis 1 level-2)
    Link[0]:      Intf Address:7.3.3.2, Nbr Intf Address:7.3.3.1
```

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      51.1.2.1        100.0.0.1       IS-IS 1 level-2
         2      51.1.2.1        100.0.0.1       IS-IS 1 level-2
         3      51.1.2.1        100.0.0.1       IS-IS 1 level-2
         4      51.1.2.1        100.0.0.1       IS-IS 1 level-2
         5      51.1.2.1        100.0.0.1       IS-IS 1 level-2
         6      51.1.2.1        100.0.0.1       IS-IS 1 level-2
         7      51.1.2.1        100.0.0.1       IS-IS 1 level-2
         8      51.1.2.1        100.0.0.1       IS-IS 1 level-2
        10      50.4.5.5        100.0.0.5       IS-IS 1 level-2
        30      50.4.5.5        100.0.0.5       IS-IS 1 level-2
```

```
        77      50.4.5.5        100.0.0.5       IS-IS 1 level-2
        88      50.4.5.5        100.0.0.5       IS-IS 1 level-2
      1500      50.4.5.5        100.0.0.5       IS-IS 1 level-2
  10000000      50.4.5.5        100.0.0.5       IS-IS 1 level-2
4294967290      50.4.5.5        100.0.0.5       IS-IS 1 level-2
4294967295      50.4.5.5        100.0.0.5       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
 50.4.5.5 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 : 50.4.5.5
SRLGs Excluded: 10, 30, 77, 88, 1500, 10000000
                4294967290, 4294967295
Hop0:50.5.1.5
Hop1:50.5.1.1
Hop2:51.1.2.1
Hop3:51.1.2.2
Hop4:100.0.0.2
```

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:

```
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
Hop0:50.5.1.5
Hop1:50.5.1.1
Hop2:50.1.2.1
Hop3:50.1.2.2
Hop4:100.0.0.2
```

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[11] backup tunnels information. The information includes the physical interface protected by the tunnel, the number of TE LSPs[12] 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 *destination-address*	(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.
type	(Optional) 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.
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.
tunnel-id	(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 *interval*	(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 *source-address*	(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 *ct*	(Optional) Displays tunnels using the given class-type value configuration.

[11] FRR = Fast Reroute.
[12] LSPs = Label Switched Paths.

Command Default

None

Command Modes

XR EXEC mode

Command History

Release	Modification
Release 7.0.12	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 r1r2r3gig_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 19: show mpls traffic-eng tunnels Command Field Descriptions

Field	Description
LSP Tunnels Process	Status of the LSP[13] 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[14] 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.

[13] LSP = Link-State Packet.
[14] 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-te11  Destination: 192.168.0.1
    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
```

```
    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 20: 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[15].
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 [16].

[15] LSP = Link-State Packet.
[16] 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 21: 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 22: 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-te11  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-te1  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-te1  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
```

```
    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                LSP     Destination          Source     Tun     FRR    LSP
  Name                   ID         Address         Address   State   State   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
```

```
  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     LSP      Destination          Source             FRR     LSP  Path
              Name      ID         Address         Address   State    State    Role  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 23: 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, 192.168.0.1, 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 24: 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-te1  Destination: 0.0.0.0
```

```
  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 25: 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: • 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 26: 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 Familes	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 timout 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      192.168.0.1
                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
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 27: 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)
  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
                      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-te1  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-te1
  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 7.0.12	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 ID	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    LSP  Last appl  Requested  Signalled    Highest    Application
  Name       ID   BW(kbps)   BW(kbps)   BW(kbps)   BW(kbps)      Time Left
  ------------- ------ ---------- ---------- ---------- ---------- --------------
  tunnel-te0      1          10         10         50      2h 5m
  tunnel-te1      5          500        300        420     1h 10m
```

This table describes the significant fields shown in the display.

Table 28: 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 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 *group-name*	(Optional) Specifies a group.
inherit-location *location*	(Optional) Specifies a particular location.
interface *type*	(Optional) Displays information on the specific 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.
location	(Optional) Specifies a node.
node-id	Node ID. The *node-id* argument is entered in the *rack/slot/module* notation.
all	Specifies all locations.
mgmt-nodes	Specifies all management nodes.
mapping	(Optional) Specifies a mapping
location	Node location
name	Name of the mapping
name *name*	(Optional) Specifies an SRLG name.
optical-interface *interface-id*	(Optional) Specifies an optical interface.
producers *name*	(Optional) Specifies a SRLG producer.
value *value-number*	(Optional) Displays SRLG value numbers.
trace	(Optional) Displays trace information for SRLG.
file *filename*	(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.
entries	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 7.0.12	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-bandwidth

To configure the bandwidth required for an MPLS-TE tunnel, use the **signalled-bandwidth** command in interface configuration mode. To disable the behavior, use the **no** form of this command.

signalled-bandwidth {*bandwidth* [**class-type** *ct*] | **sub-pool** *bandwidth*}
no signalled-bandwidth {*bandwidth* [**class-type** *ct*] | **sub-pool** *bandwidth*}

Syntax Description

bandwidth	Bandwidth required for an MPLS-TE tunnel. Bandwidth is specified in kilobits per second. By default, bandwidth is reserved in the global pool. Range is from 0 to 4294967295.
class-type *ct*	(Optional) Configures the class type of the tunnel bandwidth request. Range is from 0 to 1. Class-type 0 is strictly equivalent to global-pool. Class-type 1 is strictly equivalent to subpool.
sub-pool *bandwidth*	Reserves the bandwidth in the subpool instead of the global pool. Range is 1 to 4294967295. A subpool bandwidth value of 0 is not allowed.

Command Default

The default is 0 in class-type 0.

Command Modes

Interface configuration

Command History

Release	Modification
Release 7.0.12	This command was introduced.

Usage Guidelines

The **signalled-bandwidth** command supports two bandwidth pools (class-types) for the Diff-Serv Aware TE (DS-TE) feature. This command is also used as the bandwidth startup value to bring up the auto bandwidth enabled tunnels.

Note The Cisco Diff-Serve Aware TE feature is compliant to IETF standard and will interoperate with third party vendor DS-TE. Both Russian Doll Model and Maximum Allocation Model for bandwidth allocation are supported. We recommended that IETF terminology be used in DS-TE bandwidth configurations, namely, Class-type (CT) and Bandwidth Constraints (BC).

Task ID

Task ID	Operations
mpls-te	read, write

Examples

This example shows how to set the bandwidth required for an MPLS-TE tunnel to 1000 in the global pool (class-type 0):

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# interface tunnel-te 1
RP/0/RP0/CPU0:router(config-if)# signalled-bandwidth 1000

RP/0/RP0/CPU0:router(config)# interface tunnel-te 1
RP/0/RP0/CPU0:router(config-if)# signalled-bandwidth 1000 class-type 0
```

This example shows how to set the bandwidth required for an MPLS-TE tunnel to 1000 in the sub-pool (class-type 1):

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# interface tunnel-te 1
RP/0/RP0/CPU0:router(config-if)# signalled-bandwidth sub-pool 1000

RP/0/RP0/CPU0:router(config)# interface tunnel-te 1
RP/0/RP0/CPU0:router(config-if)# signalled-bandwidth 1000 class-type 1
```

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 7.0.12	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
```

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 7.0.12	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 7.0.12	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 7.0.12	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

value	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

Release	Modification
Release 7.0.12	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

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#(config)# srlg
RP/0/RP0/CPU0:router#(config-srlg)# interface HundredGigE 0/0/0/3
RP/0/RP0/CPU0:router#(config-srlg-if)# value 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 *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

Command History

Release	Modification
Release 7.0.12	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
```

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 *value*	Configures the time, in seconds, between retries upon a path error. Range is 30 to 600.

Command Default

value: 120

Command Modes

MPLS-TE configuration

Command History

Release	Modification
Release 7.0.12	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

frequency	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

frequency: 60

Command Modes

auto-tunnel backup configuration

Command History

Release	Modification
Release 7.0.12	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

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
```

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

seconds	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

seconds: 10

Command Modes

MPLS-TE configuration

Command History

Release	Modification
Release 7.0.12	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 ID	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.
number	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 7.0.12	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 >= 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
```