



MPLS Traffic Engineering Commands on Cisco IOS XR Software

This chapter describes the commands that you will use to configure Multiprotocol Label Switching (MPLS) Traffic Engineering (TE) and Generalized MPLS (GMPLS). In this chapter, all GMPLS-specific commands are identified with “(GMPLS)” in the command title.

Your network must support the following Cisco features before you can enable MPLS-TE:

- MPLS
- IP Cisco Express Forwarding (CEF)
- Intermediate System-to-Intermediate System (IS-IS) or Open Shortest Path First (OSPF) routing protocol
- Resource Reservation Protocol (RSVP)

MPLS Label Distribution Protocol (LDP), Resource Reservation Protocol (RSVP), and Universal Control Plane (UCP) command descriptions are documented separately.

For detailed information about MPLS concepts, configuration tasks, and examples, refer to the *Cisco IOS XR MPLS Configuration Guide*.

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 The administrative weight (cost) of the link. Range is 0 to 4294967295.

Defaults

weight: IGP Weight (default OSPF 1, ISIS 10)

Command Modes

MPLS-TE interface configuration

Command History

Release	Modification
Release 2.0	This command was introduced on the Cisco CRS-1.
Release 3.0	No modification.
Release 3.2	This command was introduced on the Cisco XR 12000 Series Router.
Release 3.3.0	No modification.
Release 3.4.0	No modification.
Release 3.5.0	No modification.
Release 3.6.0	No modification.
Release 3.7.0	No modification.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes the proper task IDs. For detailed information about user groups and task IDs, see the *Configuring AAA Services on Cisco IOS XR Software* module of the *Cisco IOS XR System Security Configuration Guide*.

To use MPLS 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 set 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 POS 0/7/0/0
RP/0/RP0/CPU0:router(config-mpls-te-if)# admin-weight 20
```

Related Commands

Command	Description
path-selection metric	Select Path Selection Metric as TE or IGP.

affinity

To configure an affinity (the properties the tunnel requires in its links) for an MPLS-TE tunnel, use the **affinity** command in interface configuration mode. To return to the default behavior, use the **no** form of this command.

```
affinity {{affinity-value mask mask-value} | exclude name | exclude-all | include name | include-strict name}
```

```
no affinity {{affinity-value mask mask-value} | exclude name | exclude-all | include name | include-strict name}
```

Syntax Description

<i>affinity-value</i>	Configures the attribute values that are required for links to carry this tunnel. A 32-bit decimal number. Range is 0x0 to 0xFFFFFFFF, representing 32 attributes (bits), where the value of an attribute is 0 or 1.
mask <i>mask-value</i>	Checks the link attribute. A 32-bit decimal number. Range is 0x0 to 0xFFFFFFFF, representing 32 attributes (bits), where the value of an attribute mask is 0 or 1.
exclude <i>name</i>	Configures a particular affinity to exclude.
exclude-all	Excludes all affinities.
include	Configures the affinity to include in the loose sense.
include-strict	Configures the affinity to include in the strict sense.

Defaults

affinity-value: 0X00000000

mask-value: 0xFFFFFFFF

Command Modes

Interface configuration

Command History

Release	Modification
Release 2.0	This command was introduced on the Cisco CRS-1.
Release 3.0	No modification.
Release 3.2	This command was supported on the Cisco XR 12000 Series Router.
Release 3.3.0	No modification.
Release 3.4.0	Support was added for the Name-Based Affinity Constraint scheme.
Release 3.5.0	No modification.
Release 3.6.0	No modification.
Release 3.7.0	Affinity colors definition for MPLS-TE was added.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes the proper task IDs. For detailed information about user groups and task IDs, see the *Configuring AAA Services on Cisco IOS XR Software* module of the *Cisco IOS XR System Security Configuration Guide*.

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.

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. The following constraints are used to configure affinity constraints for the tunnel:

- **Include constraint**—Specifies that a link is considered for CSPF if it contains all the affinities associated with the include constraint. An acceptable link contains more affinity attributes than those associated with the include statement. You can have multiple include statements under a tunnel configuration.
- **Include-strict constraint**—Specifies that a link is considered for CSPF if it contains only the colors associated with the include-strict statement. The link cannot have any additional colors. In addition, a link without a color is rejected.
- **Exclude constraint**—Specifies that a link satisfies an exclude constraint if it does not have all the colors associated with the constraint. In addition, a link that does not have any attribute satisfies an exclude constraint.
- **Exclude-all constraint**—Specifies that only the links without any attribute are considered for CSPF. An exclude-all constraint is not associated with any color; whereas, all other constraint types are associated with up to 10 colors.

You are setting one bit for each color; however, the sample output shows multiple bits at the same time. For example, you can configure red and black colors on GigabitEthernet0/4/1/3 from the **interface** command. The sample output from the [show mpls traffic-eng link-management interfaces](#) 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

The following 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
```

The following example shows that a link is eligible for CSPF if it has at least red color. 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
```

The following example shows that a link is eligible for CSPF if it has at least red and black 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 black
```

The following 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:
```

The following example shows that a tunnel can go over a link that contains red or black affinity. A link is eligible for CSPF if it has a red color or a black color. Thus, a link with red and any other colors and a link with black and any 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 black
```

The following 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:
```

The following 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
```

The following 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
```

The following 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
```

The following 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
```

Related Commands

Command	Description
affinity-map	Assigns a numerical value to each affinity name.
attribute-flags	Configures attributes for the interface.
attribute-names	Configures attributes for the interface.
show mpls traffic-eng affinity-map	Displays the color name-to-value mappings configured on the router.
show mpls traffic-eng tunnels	Displays information about MPLS-TE tunnels.

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*

no affinity-map *affinity name*

Syntax Description	<i>affinity name</i>	Affinity map name-to-value designator (in hexadecimal, 0-ffffff).
--------------------	----------------------	---

Defaults	No default behavior or values
----------	-------------------------------

Command Modes	MPLS-TE configuration
---------------	-----------------------

Command History	Release	Modification
	Release 3.4.0	This command was introduced on the Cisco CRS-1 and the Cisco XR 12000 Series Router.
	Release 3.5.0	No modification.
	Release 3.6.0	No modification.
	Release 3.7.0	No modification.

Usage Guidelines	To use this command, you must be in a user group associated with a task group that includes the proper task IDs. For detailed information about user groups and task IDs, see the <i>Configuring AAA Services on Cisco IOS XR Software</i> module of the <i>Cisco IOS XR System Security Configuration Guide</i> .
------------------	--



Note

The name-to-value mapping must represent a single bit of a 32-bit value.

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# config
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
```

Related Commands	Command	Description
	affinity	Configures affinity (the properties that the tunnel requires in its links) for an MPLS-TE tunnel.
	show mpls traffic-eng affinity-map	Displays the color name-to-value mappings configured on the router.

attribute-flags

To configure attribute flags for an interface, use the **attribute-flags** command in MPLS-TE interface configuration mode. To return to the default behavior, use the **no** form of this command.

attribute-flags *attribute flags*

no attribute-flags *attribute flags*

Syntax Description	<i>attribute flags</i>	Links attributes that are compared to the affinity bits of a tunnel during selection of a path. Range is 0x0 to 0xFFFFFFFF, representing 32 attributes (bits) where the value of an attribute is 0 or 1.
---------------------------	------------------------	--

Defaults/Defaults	<i>attributes: 0x0</i>
--------------------------	------------------------

Command Modes	MPLS-TE interface configuration
----------------------	---------------------------------

Command History	Release	Modification
	Release 2.0	This command was introduced on the Cisco CRS-1.
	Release 3.0	No modification.
	Release 3.2	This command was supported on the Cisco XR 12000 Series Router.
	Release 3.3.0	No modification.
	Release 3.4.0	No modification.
	Release 3.5.0	No modification.
	Release 3.6.0	No modification.
	Release 3.7.0	No modification.

Usage Guidelines To use this command, you must be in a user group associated with a task group that includes the proper task IDs. For detailed information about user groups and task IDs, see the *Configuring AAA Services on Cisco IOS XR Software* module of the *Cisco IOS XR System Security Configuration Guide*.

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 POS 0/7/0/0
RP/0/RP0/CPU0:router(config-mpls-te-if)# attribute-flags 0x0101
```

Related Commands

Command	Description
admin-weight	Overrides the IGP administrative weight of the link.
affinity	Configures affinity (the properties that the tunnel requires in its links) for an MPLS-TE tunnel.
attribute-names	Configures attributes for the interface.

attribute-names

To configure attributes for the interface, use the **attribute-names** command in MPLS-TE interface configuration mode. To return to the default behavior, use the **no** form of this command.

attribute-names *attribute name*

no attribute-names *attribute name*

Syntax Description	<i>attribute name</i> Attribute name expressed using alphanumeric or hexadecimal characters.
---------------------------	--

Defaults	No default behavior or values
-----------------	-------------------------------

Command Modes	MPLS-TE interface configuration
----------------------	---------------------------------

Command History	Release	Modification
	Release 3.4.0	This command was introduced on the Cisco CRS-1 and the Cisco XR 12000 Series Router.
	Release 3.5.0	No modification.
	Release 3.6.0	No modification.
	Release 3.7.0	No modification.

Usage Guidelines	To use this command, you must be in a user group associated with a task group that includes the proper task IDs. For detailed information about user groups and task IDs, see the <i>Configuring AAA Services on Cisco IOS XR Software</i> module of the <i>Cisco IOS XR System Security Configuration Guide</i> .
-------------------------	--



Note

The name-to-value mapping must represent a single bit of a 32-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# config
RP/0/RP0/CPU0:router(config)# mpls traffic-eng int pos 0/2/0/1
RP/0/RP0/CPU0:router(config-mpls-te-if)# attribute-name red
```

Related Commands	Command	Description
	affinity	Configures affinity (the properties that the tunnel requires in its links) for an MPLS-TE tunnel.
	attribute-flags	Configures attribute flags for the interface.

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

no autoroute announce

Syntax Description This command has no arguments or keywords.

Defaults No default behavior or values

Command Modes Interface configuration

Command History

Release	Modification
Release 2.0	This command was introduced on the Cisco CRS-1.
Release 3.0	No modification.
Release 3.2	This command was supported on the Cisco XR 12000 Series Router.
Release 3.3.0	No modification.
Release 3.4.0	No modification.
Release 3.5.0	No modification.
Release 3.6.0	No modification.
Release 3.7.0	No modification.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes the proper task IDs. For detailed information about user groups and task IDs, see the *Configuring AAA Services on Cisco IOS XR Software* module of the *Cisco IOS XR System Security Configuration Guide*.

Currently, the only way to forward traffic over a tunnel is accomplished using the **autoroute announce command or static routes** command.

When you configure more than one IGP, the tunnel is announced to the IGP used to find the path to the tunnel destination.

By default, the route metric of the tunnel path to the destination equals the route metric of the shortest IGP path to that destination when **autoroute announce** is configured.

Task ID

Task ID	Operations
mpls-te	read, write

Examples

The following 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
```

Related Commands

Command	Description
interface tunnel-te	Configures an MPLS-TE tunnel interface.

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. To return to the default behavior, use the **no** form of this command.

autoroute metric { **absolute** | **relative** } *value*

no autoroute metric { **absolute** | **relative** } *value*

Syntax Description

absolute	Absolute metric mode; you can enter a positive metric value.
relative	Relative metric mode; you can enter a positive, negative, or zero value.
<i>value</i>	The metric that the IGP enhanced SPF calculation uses. Relative value range is -10 to 10. Absolute value is 1 to 4294967295.

Defaults

relative *value*: 0

Command Modes

Interface configuration

Command History

Release	Modification
Release 2.0	This command was introduced on the Cisco CRS-1.
Release 3.0	No modification.
Release 3.2	This command was supported on the Cisco XR 12000 Series Router.
Release 3.3.0	No modification.
Release 3.4.0	No modification.
Release 3.5.0	No modification.
Release 3.6.0	No modification.
Release 3.7.0	No modification.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes the proper task IDs. For detailed information about user groups and task IDs, see the *Configuring AAA Services on Cisco IOS XR Software* module of the *Cisco IOS XR System Security Configuration Guide*.

The **autoroute metric** command overwrites the default tunnel route metric of the shortest IGP path to the destination.

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
```

Related Commands

Command	Description
autoroute announce	Instructs the IGP to use the tunnel (if it is up) in its enhanced SPF calculation.
show mpls traffic-eng autoroute	Displays the tunnels announced to the IGP, including interface, destination, and bandwidth.

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

<i>backup bandwidth</i>	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	Backup bandwidth assigned to any class-type protected tunnels.
class-type <i>ct</i>	Class type of the backup bandwidth. Range is 0 to 1.
sub-pool <i>bandwidth</i>	(In Prestandard DS-TE with RDM) 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.
global-pool <i>bandwidth</i>	(In Prestandard DS-TE with RDM) 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	Unlimited bandwidth.

Defaults

Any class-type unlimited.

Command Modes

Interface configuration

Command History

Release	Modification
Release 2.0	This command was introduced on the Cisco CRS-1.
Release 3.0	No modification.
Release 3.2	This command was supported on the Cisco XR 12000 Series Router.
Release 3.3.0	No modification.
Release 3.4.0	No modification.
Release 3.5.0	No modification.
Release 3.6.0	No modification.
Release 3.7.0	No modification.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes the proper task IDs. For detailed information about user groups and task IDs, see the *Configuring AAA Services on Cisco IOS XR Software* module of the *Cisco IOS XR System Security Configuration Guide*.

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
```

Related Commands

Commands	Description
backup-path tunnel-te	Assigns one or more backup tunnels to a protected interface.
fast-reroute	Enables fast-reroute (FRR) protection for an MPLS-TE tunnel.

backup-path tunnel-te

To set an MPLS-TE tunnel to protect a physical interface against failure, use the **backup-path tunnel-te** command in MPLS-TE interface configuration mode. To return to the default behavior, use the **no** form of this command.

backup-path tunnel-te *tunnel-number*

no backup-path tunnel-te *tunnel-number*

Syntax Description

<i>tunnel-number</i>	Number of the tunnel protecting the interface. Range is 0 to 65535.
----------------------	---

Defaults

No default behavior or values

Command Modes

MPLS-TE interface configuration

Command History

Release	Modification
Release 2.0	This command was introduced on the Cisco CRS-1.
Release 3.0	No modification.
Release 3.2	This command was supported on the Cisco XR 12000 Series Router.
Release 3.3.0	No modification.
Release 3.4.0	No modification.
Release 3.5.0	No modification.
Release 3.6.0	No modification.
Release 3.7.0	No modification.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes the proper task IDs. For detailed information about user groups and task IDs, see the *Configuring AAA Services on Cisco IOS XR Software* module of the *Cisco IOS XR System Security Configuration Guide*.

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 re-routed, 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 PoS interface 0/7/0/0 using tunnel 100 and tunnel 150:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# mpls traffic-eng
RP/0/RP0/CPU0:router(config-mpls-te)# interface POS 0/7/0/0
RP/0/RP0/CPU0:router(config-mpls-te-if)# backup-path tunnel 100
RP/0/RP0/CPU0:router(config-mpls-te-if)# backup-path tunnel 150
```

Related Commands

Command	Description
backup-bw	Configures backup bandwidth for bandwidth protection.
fast-reroute	Enables fast-reroute (FRR) protection for an MPLS-TE tunnel.
show mpls traffic-eng tunnels	Displays information about MPLS-TE tunnels.

clear mpls lmp

To clear Link Management Protocol (LMP) management hello settings, use the **clear mpls lmp** command in EXEC mode.

clear mpls lmp

Syntax Description This command has no arguments or keywords.

Command Modes EXEC

Command History	Release	Modification
	Release 3.3.0	This command was introduced on the on the Cisco XR 12000 Series Router and Cisco CRS-1 router.
	Release 3.4.0	No modification.
	Release 3.5.0	No modification.
	Release 3.6.0	No modification.
	Release 3.7.0	No modification.

Usage Guidelines To use this command, you must be in a user group associated with a task group that includes the proper task IDs. For detailed information about user groups and task IDs, see the *Configuring AAA Services on Cisco IOS XR Software* module of the *Cisco IOS XR System Security Configuration Guide*.

Task ID	Task ID	Operations
	mpls-te	read, write

Examples The following example shows how to clear all LMP management hello settings:

```
RP/0/RP0/CPU0:router# clear mpls lmp
```

clear mpls traffic-eng counters tunnels

To clear (set to zero) the MPLS tunnel signaling counters, use the **clear mpls traffic-eng counters tunnels** command in EXEC mode.

```
clear mpls traffic-eng counters tunnels {all [heads | middles | tails] | name name | summary}
```

Syntax Description

all	Clears counters for all MPLS-TE tunnels.
heads middles tails	(Optional) <ul style="list-style-type: none"> Displays tunnels with their heads at this router. Displays tunnels with their midpoints at this router. Displays tunnels with their tails at this router.
name <i>name</i>	Clears counters for an MPLS-TE tunnel with the specified name.
summary	Clears the counter's summary.

Command Modes

EXEC

Command History

Release	Modification
Release 2.0	This command was introduced on the Cisco CRS-1.
Release 3.0	No modification.
Release 3.2	This command was supported on the Cisco XR 12000 Series Router.
Release 3.3.0	No modification.
Release 3.4.0	No modification.
Release 3.5.0	Support was added for the middles keyword.
Release 3.6.0	No modification.
Release 3.7.0	No modification.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes the proper task IDs. For detailed information about user groups and task IDs, see the *Configuring AAA Services on Cisco IOS XR Software* module of the *Cisco IOS XR System Security Configuration Guide*.

Use the **clear mpls traffic-eng counters tunnels** 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 tunnels all
```

The following example shows how to clear counters for tunnel 1:

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

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 EXEC mode.

clear mpls traffic-eng fast-reroute log

Syntax Description This command has no arguments or keywords.

Command Modes EXEC

Command History	Release	Modification
	Release 2.0	This command was introduced on the Cisco CRS-1.
	Release 3.0	No modification.
	Release 3.2	This command was supported on the Cisco XR 12000 Series Router.
	Release 3.3.0	No modification.
	Release 3.4.0	No modification.
	Release 3.5.0	No modification.
	Release 3.6.0	No modification.
	Release 3.7.0	No modification.

Usage Guidelines To use this command, you must be in a user group associated with a task group that includes the proper task IDs. For detailed information about user groups and task IDs, see the *Configuring AAA Services on Cisco IOS XR Software* module of the *Cisco IOS XR System Security Configuration Guide*.

Task ID	Task ID	Operations
	mpls-te	read, write

Examples The following example shows sample output before clearing the log of FRR events:

```
RP/0/RP0/CPU0:router# show mpls traffic-eng fast-reroute log
```

Node	Protected LSPs Interface	Rewrites When	Switching Time (usec)
0/0/CPU0	PO0/1/0/1 1	1	Feb 27 19:12:29.064000 147
0/1/CPU0	PO0/1/0/1 1	1	Feb 27 19:12:29.060093 165
0/2/CPU0	PO0/1/0/1 1	1	Feb 27 19:12:29.063814 129
0/3/CPU0	PO0/1/0/1 1	1	Feb 27 19:12:29.062861 128

```
RP/0/RP0/CPU0:router# clear mpls traffic-eng fast-reroute log
```

clear mpls traffic-eng link-management statistics

To clear all the MPLS-TE admission control statistics, use the **clear mpls traffic-eng link-management statistics** command in EXEC mode.

clear mpls traffic-eng link-management statistics

Syntax Description This command has no arguments or keywords.

Command Modes EXEC

Command History	Release	Modification
	Release 2.0	This command was introduced on the Cisco CRS-1.
	Release 3.0	No modification.
	Release 3.2	This command was supported on the Cisco XR 12000 Series Router.
	Release 3.3.0	No modification.
	Release 3.4.0	No modification.
	Release 3.5.0	No modification.
	Release 3.6.0	No modification.
	Release 3.7.0	No modification.

Usage Guidelines To use this command, you must be in a user group associated with a task group that includes the proper task IDs. For detailed information about user groups and task IDs, see the *Configuring AAA Services on Cisco IOS XR Software* module of the *Cisco IOS XR System Security Configuration Guide*.

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
```

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 *A.B.C.D*

no destination *A.B.C.D*

Syntax Description	<i>A.B.C.D</i>	Destination address of the MPLS-TE router ID.
--------------------	----------------	---

Defaults	None
----------	------

Command Modes	Interface configuration
---------------	-------------------------

Command History	Release	Modification
	Release 2.0	This command was introduced on the Cisco CRS-1.
	Release 3.0	No modification.
	Release 3.2	This command was supported on the Cisco XR 12000 Series Router.
	Release 3.3.0	No modification.
	Release 3.4.0	No modification.
	Release 3.5.0	No modification.
	Release 3.6.0	No modification.
	Release 3.7.0	No modification.

Usage Guidelines	To use this command, you must be in a user group associated with a task group that includes the proper task IDs. For detailed information about user groups and task IDs, see the <i>Configuring AAA Services on Cisco IOS XR Software</i> module of the <i>Cisco IOS XR System Security Configuration Guide</i> .
------------------	--



Note	The tunnel destination address must be a unique MPLS-TE router ID; it cannot be an MPLS-TE link address on a node.
------	--

Task ID	Task ID	Operations
	mpls-te	read, write

■ destination (MPLS-TE)

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
```

Related Commands

Command	Description
interface tunnel-te	Configures an MPLS-TE tunnel interface.
show mpls traffic-eng tunnels	Displays information about MPLS-TE tunnels.

direction (GMPLS)

To configure a bidirectional optical tunnel for GMPLS, use the **direction** command in interface configuration mode. To return to the default behavior, use the **no** form of this command.

direction {bidirectional}

no direction {bidirectional}

Syntax Description

bidirectional	Enables bidirectional tunneling.
----------------------	----------------------------------

Defaults

Default is unidirectional

Command Modes

Interface configuration

Command History

Release	Modification
Release 3.3.0	This command was introduced on the Cisco CRS-1 and Cisco XR 12000 Series Router.
Release 3.4.0	No modification.
Release 3.5.0	No modification.
Release 3.6.0	No modification.
Release 3.7.0	No modification.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes the proper task IDs. For detailed information about user groups and task IDs, see the *Configuring AAA Services on Cisco IOS XR Software* module of the *Cisco IOS XR System Security Configuration Guide*.

There are two types of MPLS-TE tunnels:

- Generic packet MPLS-TE tunnels
- Optical MPLS-TE tunnel (GMPLS tunnel)

At the configuration level, you cannot tell the difference between a packet MPLS or a GMPLS-TE tunnel. Because packet TE tunnels are unidirectional while GMPLS tunnels are bidirectional, you can identify the optical GMPLS tunnel by identifying the bidirectional configuration.

The GMPLS-TE tunnel requires that you specify the endpoint and transit switching capability so that the path computation module can determine the links that the tunnel can traverse.

The transit switching capability describes the switching capability of the LSP region that the tunnel crosses. The endpoint switching capability describes the switching capability and encoding required for the tunnel interface associated with the two ends of the bidirectional tunnel (namely, active and passive side).

Finally, for GMPLS functionality to work, you must configure the **direction and switching** commands.

direction (GMPLS)



Note

Bidirectional tunnel support is available on optical (GMPLS) tunnels only.

Task ID

Task ID	Operations
mpls-te	read, write

Examples

The following example shows how to change the tunnel direction from the default (unidirectional) to bidirectional:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# interface tunnel-te 99
RP/0/RP0/CPU0:router(config-if)# direction bidirectional
```

Related Commands

Command	Description
flooding-igp (GMPLS)	Floods selected GMPLS Traffic Engineering links.
lmp hello (GMPLS)	Configures LMP IPCC management hello settings.
match (GMPLS)	Configures or matches active and passive tunnels.
passive (GMPLS)	Configures passive GMPLS tunnels.
remote (GMPLS)	Configures remote TE links.
switching (GMPLS)	Configures TE-link switching attributes.

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.

Defaults Explicit path is enabled

Command Modes Explicit path configuration

Command History

Release	Modification
Release 2.0	This command was introduced on the Cisco CRS-1.
Release 3.0	No modification.
Release 3.2	This command was supported on the Cisco XR 12000 Series Router.
Release 3.3.0	No modification.
Release 3.4.0	No modification.
Release 3.5.0	No modification.
Release 3.6.0	No modification.
Release 3.7.0	No modification.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes the proper task IDs. For detailed information about user groups and task IDs, see the *Configuring AAA Services on Cisco IOS XR Software* module of the *Cisco IOS XR System Security Configuration Guide*.

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-explicit-path)# disable
```

■ `disable (explicit-path)`

Related Commands	Command	Description
	index exclude-address	Specifies the next IP address to exclude from the explicit path.
	index next-address	Specifies path entries at a specific index.
	show explicit-paths	Displays the configured IP explicit paths.

explicit-path

To configure an explicit path for an MPLS-TE tunnel, use the **explicit-path** command in global configuration mode. To return to the default behavior, use the **no** form of this command.

```
explicit-path {identifier number | name pathname}
```

```
no explicit-path
```

Syntax Description

identifier <i>number</i>	Configures an explicit path using a number.
name <i>pathname</i>	Configures an explicit path using a pathname.

Defaults

No default behavior or values

Command Modes

Global configuration

Command History

Release	Modification
Release 3.3.0	This command was introduced on the Cisco CRS-1 and Cisco XR 12000 Series Router.
Release 3.4.0	No modification.
Release 3.5.0	No modification.
Release 3.6.0	No modification.
Release 3.7.0	No modification.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes the proper task IDs. For detailed information about user groups and task IDs, see the *Configuring AAA Services on Cisco IOS XR Software* module of the *Cisco IOS XR System Security Configuration Guide*.

Task ID

Task ID	Operations
mpls-te	read, write

Examples

The following example shows how to configure an explicit path for an MPLS-TE tunnel:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# explicit-path identifier 200
```

■ explicit-path

Related Commands	Command	Description
	disable (explicit-path)	Prevents a path from being used by MPLS-TE tunnels.
	show explicit-paths	Displays the configured IP explicit paths.

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.

Defaults

FRR is disabled.

Command Modes

Interface configuration

Command History

Release	Modification
Release 2.0	This command was introduced on the Cisco CRS-1.
Release 3.0	No modification.
Release 3.2	This command was supported on the Cisco XR 12000 Series Router.
Release 3.3.0	No modification.
Release 3.4.0	No modification.
Release 3.5.0	No modification.
Release 3.6.0	No modification.
Release 3.7.0	No modification.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes the proper task IDs. For detailed information about user groups and task IDs, see the *Configuring AAA Services on Cisco IOS XR Software* module of the *Cisco IOS XR System Security Configuration Guide*.

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 RP failover before triggering FRR on standby RPs in order to synchronize with the active 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.

■ fast-reroute

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
```

Related Commands

Command	Description
fast-reroute protect	Configures node and bandwidth protection for an MPLS-TE tunnel.
show mpls traffic-eng tunnels	Displays information about MPLS-TE tunnels.

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

Defaults FRR is disabled.

Command Modes Interface configuration

Command History	Release	Modification
	Release 3.6.0	This command was introduced on the Cisco CRS-1 and the Cisco XR 12000 Series Router.
	Release 3.7.0	No modification.

Usage Guidelines To use this command, you must be in a user group associated with a task group that includes the proper task IDs. For detailed information about user groups and task IDs, see the *Configuring AAA Services on Cisco IOS XR Software* module of the *Cisco IOS XR System Security Configuration Guide*.

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
```

Related Commands	Command	Description
	fast-reroute	Enables fast-reroute (FRR) protection for an MPLS-TE tunnel.
	show mpls traffic-eng tunnels	Displays information about MPLS-TE tunnels.

flooding-igp (GMPLS)

To flood the GMPLS Traffic Engineering link into a specific OSPF area and instance, use the **flooding-igp** command in MPLS-TE interface configuration mode. To return to the default behavior, use the **no** form of this command.

flooding-igp ospf *instance area area*

no flooding-igp ospf *instance area area*

Syntax Description

ospf	Floods the interface into an OSPF instance
<i>instance</i>	Name of the OSPF instance into which the GMPLS link is to be flooded.
area area	Area into which the GMPLS link is to be flooded (where TE is configured).

Defaults

No default behavior or values

Command Modes

MPLS-TE interface configuration

Command History

Release	Modification
Release 3.3.0	This command was introduced on the Cisco CRS-1 and Cisco XR 12000 Series Router.
Release 3.4.0	No modification.
Release 3.5.0	No modification.
Release 3.6.0	No modification.
Release 3.7.0	No modification.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes the proper task IDs. For detailed information about user groups and task IDs, see the *Configuring AAA Services on Cisco IOS XR Software* module of the *Cisco IOS XR System Security Configuration Guide*.

A GMPLS link won't be flooded into any IGP topology unless this command is used.



Note

The **flooding-igp** command is valid for GMPLS-TE only.

Task ID

Task ID	Operations
mpls-te	read, write

Examples

The following example shows how to flood the optical GMPLS link on POS 0/1/0/0 into area 0 of OSPF instance “optical”:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# mpls traffic-eng
RP/0/RP0/CPU0:router(config-mpls-te)# interface pos0/1/0/0
RP/0/RP0/CPU0:router(config-mpls-te-if)# flooding-igp ospf optical area 0
```

Related Commands

Command	Description
destination (MPLS-TE)	Configures bidirectional optical tunnels.
lmp hello (GMPLS)	Configures LMP IPCC management hello settings.
match (GMPLS)	Configures or matches active and passive tunnels.
passive (GMPLS)	Configures passive GMPLS tunnels.
remote (GMPLS)	Configures remote TE links.
switching (GMPLS)	Configures TE-link switching attributes.

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	Threshold for decreased resource availability.
up	Threshold for increased resource availability.
<i>percent</i> [<i>percent</i>]	Bandwidth threshold level. Range is 0 to 100 for all 16 levels.

Defaults

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 2.0	This command was introduced on the Cisco CRS-1.
Release 3.0	No modification.
Release 3.2	This command was supported on the Cisco XR 12000 Series Router.
Release 3.3.0	No modification.
Release 3.4.0	No modification.
Release 3.5.0	No modification.
Release 3.6.0	No modification.
Release 3.7.0	No modification.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes the proper task IDs. For detailed information about user groups and task IDs, see the *Configuring AAA Services on Cisco IOS XR Software* module of the *Cisco IOS XR System Security Configuration Guide*.

You can configure up to sixteen 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 POS 0/7/0/0
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
```

Related Commands

Command	Description
mpls traffic-eng link-management timers periodic-flooding	Sets the length of the interval used for periodic flooding.
show mpls traffic-eng link-management advertisements	Displays local link information currently being flooded by MPLS-TE link management into the global TE topology.
show mpls traffic-eng link-management bandwidth-allocation	Displays current local link information.

forwarding-adjacency

To configure an MPLS-TE forwarding adjacency, use the **forwarding-adjacency** command in interface configuration mode. To return to the default behavior, use the **no** form of this command.

forwarding-adjacency [*holdtime time*]

no forwarding-adjacency [*holdtime time*]

Syntax Description	holdtime time (Optional) Holdtime value associated with each forwarding-adjacency LSP in milliseconds. The default is 0.
---------------------------	---

Defaults	holdtime time: 0
-----------------	-------------------------

Command Modes	Interface configuration
----------------------	-------------------------

Command History	Release	Modification
	Release 3.4.0	This command was introduced on the Cisco CRS-1 and Cisco XR 12000 Series Router.
	Release 3.5.0	No modification.
	Release 3.6.0	No modification.
	Release 3.7.0	No modification.

Usage Guidelines To use this command, you must be in a user group associated with a task group that includes the proper task IDs. For detailed information about user groups and task IDs, see the *Configuring AAA Services on Cisco IOS XR Software* module of the *Cisco IOS XR System Security Configuration Guide*.

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 not configured on a tunnel, 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 nonzero 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

The following 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
```

Related Commands

Command	Description
bandwidth (RSVP)	Configures RSVP bandwidth on an interface using prestandard DS-TE mode.
show mpls traffic-eng forwarding-adjacency	Displays forwarding-adjacency information.

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 A.B.C.D.}
```

```
no index index-id
```

Syntax Description

<i>index-id</i>	Index number at which the path entry is inserted or modified. Range is 1 to 65535.
exclude-address	To exclude an address from an IP explicit path of a tunnel, use the exclude-address command in explicit path.
ipv4 unicast <i>A.B.C.D.</i>	IPv4 unicast address to be excluded.

Defaults

No default behavior or values

Command Modes

Explicit path configuration

Command History

Release	Modification
Release 2.0	This command was introduced on the Cisco CRS-1.
Release 3.0	No modification.
Release 3.2	This command was supported on the Cisco XR 12000 Series Router. Support for the ipv4 unicast keyword was added.
Release 3.3.0	No modification.
Release 3.4.0	The index (explicit path) command was modified to create two separate commands: index exclude-address and index next-address .
Release 3.5.0	No modification.
Release 3.6.0	No modification.
Release 3.7.0	No modification.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes the proper task IDs. For detailed information about user groups and task IDs, see the *Configuring AAA Services on Cisco IOS XR Software* module of the *Cisco IOS XR System Security Configuration Guide*.

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
```

Related Commands

Command	Description
index next-address	Specifies path entries at a specific index.
show explicit-paths	Displays the configured IP explicit paths.

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 A.B.C.D.}
```

```
no index index-id
```

Syntax Description

<i>index-id</i>	Index number at which the path entry is inserted or modified. Range is 1 to 65535.
next-address	To include an address in an IP explicit path of a tunnel, use the next-address command in explicit path.
ipv4 unicast <i>A.B.C.D.</i>	IPv4 unicast address to be included (strict address).
loose ipv4 unicast <i>A.B.C.D.</i>	Specifies the next unicast address in the path as a loose hop.
strict ipv4 unicast <i>A.B.C.D.</i>	Specifies the next unicast address in the path as a strict hop.

Defaults

No default behavior or values

Command Modes

Explicit path configuration

Command History

Release	Modification
Release 2.0	This command was introduced on the Cisco CRS-1.
Release 3.0	No modification.
Release 3.2	This command was supported on the Cisco XR 12000 Series Router. Support for the ipv4 unicast keyword was added.
Release 3.3.0	No modification.
Release 3.4.0	The index (explicit path) command was added to create two separate commands: index exclude-address and index next-address . Support was added for loose and strict keywords for the index next-address command .
Release 3.5.0	No modification.
Release 3.6.0	No modification.
Release 3.7.0	No modification.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes the proper task IDs. For detailed information about user groups and task IDs, see the *Configuring AAA Services on Cisco IOS XR Software* module of the *Cisco IOS XR System Security Configuration Guide*.

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
```

Related Commands

Command	Description
index exclude-address	Specifies the next IP address to exclude from the explicit path.
show explicit-paths	Displays the configured IP explicit paths.

interface tunnel-te

To configure an MPLS-TE tunnel interface, use the **interface tunnel-te** command in global configuration mode. To return to the default behavior, use the **no** form of this command.

```
interface tunnel-te tunnel-id
```

```
no interface tunnel-te tunnel-id
```

Syntax Description	<i>tunnel-id</i>	Specifies a tunnel number. Range is 0 to 65535.
--------------------	------------------	---

Defaults	Tunnel interfaces are disabled.
----------	---------------------------------

Command Modes	Global configuration
---------------	----------------------

Command History	Release	Modification
	Release 2.0	This command was introduced on the Cisco CRS-1.
	Release 3.0	No modification.
	Release 3.2	This command was supported on the Cisco XR 12000 Series Router.
	Release 3.3.0	No modification.
	Release 3.4.0	No modification.
	Release 3.5.0	No modification.
	Release 3.6.0	No modification.
	Release 3.7.0	Policy-based tunnel selection example was added.

Usage Guidelines	<p>To use this command, you must be in a user group associated with a task group that includes the proper task IDs. For detailed information about user groups and task IDs, see the <i>Configuring AAA Services on Cisco IOS XR Software</i> module of the <i>Cisco IOS XR System Security Configuration Guide</i>.</p>
------------------	--

You cannot have two tunnels using the same encapsulation mode with exactly the same source and destination address. The workaround is to create a loopback interface, and 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 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. Use this command to configure these options:

- **affinity**
- **autoroute announce**
- **autoroute metric**
- **backup-bw**
- **signalled-bandwidth**

- **signalled-name**
- **fast-reroute**
- **path-option**
- **path-selection**
- **priority**
- **record-route**
- **policy-class**

**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
```

Related Commands

Command	Description
affinity	Configures affinity (the properties that the tunnel requires in its links) for an MPLS-TE tunnel.
autoroute metric	Instructs the IGP to use the tunnel in its enhanced SPF calculation, if the tunnel is in an up state.
backup-bw	Configures backup bandwidth for FRR.
fast-reroute	Enables fast-reroute (FRR) protection for an MPLS-TE tunnel.
path-option	Configures a path option for an MPLS tunnel.
path-selection metric	Configures a path selection metric—TE or IGP.
policy-class	Configures policy-based tunnel selection (PBTS) to direct traffic into specific TE tunnels.
priority (MPLS-TE)	Configures setup and reservation priority for an MPLS-TE tunnel.
record-route	Configures record-route on an MPLS-TE tunnel.

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 *interface-name*

no ipv4 unnumbered *interface-name*

Syntax Description

<i>interface-name</i>	Name of the interface. Loopback is commonly used.
-----------------------	---

Defaults

No IP address is set

Command Modes

Interface configuration

Command History

Release	Modification
Release 2.0	This command was introduced on the Cisco CRS-1.
Release 3.0	No modification.
Release 3.2	This command was supported on the Cisco XR 12000 Series Router.
Release 3.3.0	No modification.
Release 3.4.0	No modification.
Release 3.5.0	No modification.
Release 3.6.0	No modification.
Release 3.7.0	No modification.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes the proper task IDs. For detailed information about user groups and task IDs, see the *Configuring AAA Services on Cisco IOS XR Software* module of the *Cisco IOS XR System Security Configuration Guide*.

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.

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
```

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

<i>value</i>	Load-share value, equivalent to the bandwidth in Kbps (that is, the same value in configuration). Range is 1 to 4294967295. Default is 0.
--------------	---

Defaults

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 3.5.0	This command was introduced on the Cisco CRS-1.
Release 3.6.0	No modification.
Release 3.7.0	No modification.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes the proper task IDs. For detailed information about user groups and task IDs, see the *Configuring AAA Services on Cisco IOS XR Software* module of the *Cisco IOS XR System Security Configuration Guide*.

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
```

Related Commands	Command	Description
	load-share unequal	Enables unequal load-sharing.
	signalled-bandwidth	Configures the bandwidth required for an MPLS-TE tunnel.

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.

Defaults 'By default, unequal load-balancing is disabled and equal load-balancing occurs.

Command Modes MPLS-TE configuration

Command History	Release	Modification
	Release 3.5.0	This command was introduced on the Cisco CRS-1.
	Release 3.6.0	No modification.
	Release 3.7.0	No modification.

Usage Guidelines To use this command, you must be in a user group associated with a task group that includes the proper task IDs. For detailed information about user groups and task IDs, see the *Configuring AAA Services on Cisco IOS XR Software* module of the *Cisco IOS XR System Security Configuration Guide*.

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
```

Related Commands	Command	Description
	load-share	Configures load-sharing balancing parameters for a specified interface.
	signalled-bandwidth	Configures the bandwidth required for an MPLS-TE tunnel.

Imp hello (GMPLS)

To configure Link Management Protocol (LMP) IPCC management hello settings, use the **imp hello** command in MPLS-TE neighbor Imp configuration submode. To return to the default behavior, use the **no** form of this command.

imp hello [*hello send interval* \ *hello dead interval*]

no imp hello [*hello send interval* \ *hello dead interval*]

Syntax Description	
<i>hello send interval</i>	Time between sending hello keep alive message. Range is 100 to 21845 milliseconds.
<i>hello dead interval</i>	Time to wait without receiving a hello from the neighbor before declaring the IPCC down again. Range is 100 to 21845 milliseconds.

Defaults No default behavior or values

Command Modes MPLS-TE neighbor Imp configuration submode

Command History	Release	Modification
	Release 3.3.0	This command was introduced on the Cisco CRS-1 and Cisco XR 12000 Series Router.
	Release 3.4.0	No modification.
	Release 3.5.0	No modification.
	Release 3.6.0	No modification.
	Release 3.7.0	No modification.

Usage Guidelines To use this command, you must be in a user group associated with a task group that includes the proper task IDs. For detailed information about user groups and task IDs, see the *Configuring AAA Services on Cisco IOS XR Software* module of the *Cisco IOS XR System Security Configuration Guide*.

You can disable hellos using the **imp static** command.

Task ID	Task ID	Operations
	mpls-te	read, write

Examples The following example shows how to configure Link Management Protocol (LMP) IPCC management hello settings:

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

■ Imp hello (GMPLS)

```
RP/0/RP0/CPU0:router(config-mpls-te)# lmp neighbor lmp
RP/0/RP0/CPU0:router(config-mpls-te)# lmp neighbor gmpls3 lmp hello 400 1200
```

Related Commands

Command	Description
destination (MPLS-TE)	Configures bidirectional optical tunnels.
flooding-igp (GMPLS)	Floods selected GMPLS Traffic Engineering links.
match (GMPLS)	Configures or matches active and passive tunnels.
passive (GMPLS)	Configures passive GMPLS tunnels.
remote (GMPLS)	Configures remote TE links.
switching (GMPLS)	Configures TE-link switching attributes.

match (GMPLS)

To match an active tunnel to a passive tunnel, use the **match** command in interface configuration mode. To return to the default behavior, use the **no** form of this command.

match identifier *tunnel number*

no match identifier *tunnel number*

Syntax Description	identifier	Id of the active tunnel to match with this passive tunnel
	<i>tunnel number</i>	Tunnel number. Range is 0 to 65535.

Defaults No default behavior or values

Command Modes Interface configuration

Command History	Release	Modification
	Release 3.3.0	This command was introduced on the Cisco CRS-1 and Cisco XR 12000 Series Router.
	Release 3.4.0	No modification.
	Release 3.5.0	No modification.
	Release 3.6.0	No modification.
	Release 3.7.0	No modification.

Usage Guidelines To use this command, you must be in a user group associated with a task group that includes the proper task IDs. For detailed information about user groups and task IDs, see the *Configuring AAA Services on Cisco IOS XR Software* module of the *Cisco IOS XR System Security Configuration Guide*.

You must enter the hostname for the head router then underscore `_t`, and the tunnel number for the head router. If `tunnel-te1` is configured on the head router with a hostname of `gmpls1`, CLI is `match identifier gmpls1_t1`.

Task ID	Task ID	Operations
	mpls-te	read, write

Examples The following example shows how to match the active tunnel ID to the passive tunnel:

```
RP/0/RP0/CPU0:router# config
RP/0/RP0/CPU0:router(config)# interface tunnel-te 1
RP/0/RP0/CPU0:router(config-if)# match identifier gmpls1_t1
```

Related Commands	Command	Description
	destination (MPLS-TE)	Configures bidirectional optical tunnels.
	flooding-igp (GMPLS)	Floods selected GMPLS Traffic Engineering links.
	lmp hello (GMPLS)	Configures LMP IPCC management hello settings.
	passive (GMPLS)	Configures passive GMPLS tunnels.
	remote (GMPLS)	Configures remote TE links.
	switching (GMPLS)	Configures TE-link switching attributes.

mpls traffic-eng 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 **mpls traffic-eng ds-te bc-model** command in global configuration mode. To return to the default behavior, use the no form of this command.

mpls traffic-eng ds-te bc-model mam

no mpls traffic-eng ds-te bc-model mam

Syntax Description

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

Defaults

RDM is the default bandwidth constraint model.

Command Modes

Global configuration

Command History

Release	Modification
Release 3.3.0	This command was introduced on the Cisco CRS-1 and Cisco XR 12000 Series Router.
Release 3.4.0	No modification.
Release 3.5.0	No modification.
Release 3.6.0	No modification.
Release 3.7.0	No modification.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes the proper task IDs. For detailed information about user groups and task IDs, see the *Configuring AAA Services on Cisco IOS XR Software* module of the *Cisco IOS XR System Security Configuration Guide*.

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

Related Commands

Command	Description
show mpls traffic-eng ds-te te-class	Displays the Diff-Serv TE-class map in use.

mpls traffic-eng ds-te mode

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

mpls traffic-eng ds-te mode {ietf}

no mpls traffic-eng ds-te mode {ietf}

Syntax Description

ietf	Enables IETF standard mode.
-------------	-----------------------------

Defaults

Prestandard DS-TE is the default differentiated service mode.

Command Modes

Global configuration

Command History

Release	Modification
Release 3.3.0	This command was introduced on the Cisco CRS-1 and Cisco XR 12000 Series Router.
Release 3.4.0	No modification.
Release 3.5.0	No modification.
Release 3.6.0	No modification.
Release 3.7.0	No modification.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes the proper task IDs. For detailed information about user groups and task IDs, see the *Configuring AAA Services on Cisco IOS XR Software* module of the *Cisco IOS XR System Security Configuration Guide*.

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

Related Commands

Command	Description
mpls traffic-eng ds-te te-classes	Configures MPLS DS-TE TE-class maps.
show mpls traffic-eng ds-te te-class	Displays the Diff-Serv TE-class map in use.

mpls traffic-eng ds-te te-classes

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

```
mpls traffic-eng ds-te te-classes {te-class te_class_index class-type class_type_number priority pri_number}
```

```
no mpls traffic-eng ds-te te-classes {te-class te_class_index class-type class_type_number priority pri_number}
```

Syntax Description

te-class	Configures the te-class map.
<i>te_class_index</i>	TE class-map index. Range is 0 to 7.
class-type	Class type to be used
<i>class_type_number</i>	Class type value in the te-class map. Range is 0 to 1.
priority	TE tunnel priority.
<i>pri_number</i>	TE tunnel priority value. Range is 0 to 7.

Defaults

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

Global configuration

Command History	Release	Modification
	Release 3.3.0	This command was introduced on the Cisco CRS-1 and Cisco XR 12000 Series Router.
	Release 3.4.0	No modification.
	Release 3.5.0	No modification.
	Release 3.6.0	No modification.
	Release 3.7.0	No modification.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes the proper task IDs. For detailed information about user groups and task IDs, see the *Configuring AAA Services on Cisco IOS XR Software* module of the *Cisco IOS XR System Security Configuration Guide*.

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

Related Commands

Command	Description
mpls traffic-eng ds-te te-classes	Configures MPLS DS-TE TE-class maps.
show mpls traffic-eng ds-te te-class	Displays the Diff-Serv TE-class map in use.

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 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.

Defaults No default behavior or values

Command Modes EXEC

Command History	Release	Modification
	Release 3.2	This command was introduced on the Cisco CRS-1 and the Cisco XR 12000 Series Router.
	Release 3.3.0	No modification.
	Release 3.4.0	No modification.
	Release 3.5.0	No modification.
	Release 3.6.0	No modification.
	Release 3.7.0	No modification.

Usage Guidelines To use this command, you must be in a user group associated with a task group that includes the proper task IDs. For detailed information about user groups and task IDs, see the *Configuring AAA Services on Cisco IOS XR Software* module of the *Cisco IOS XR System Security Configuration Guide*.

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
```

Related Commands	Command	Description
	mpls traffic-eng fast-reroute timers promotion	Specifies how often the router considers switching a protected MPLS-TE tunnel to a new backup tunnel.

mpls traffic-eng fast-reroute timers promotion

To specify 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 **mpls traffic-eng fast-reroute timers promotion** command in global configuration mode. To return to the default behavior, use the **no** form of this command.

mpls traffic-eng fast-reroute timers promotion {*interval*}

no mpls traffic-eng fast-reroute timers promotion

Syntax Description

<i>interval</i>	Interval (in seconds) between scans to determine if a label switched path (LSP) should use a new, better backup tunnel. Range is 0 to 604800. A value of 0 disables backup tunnel promotions.
-----------------	---

Defaults

interval: 300 seconds (5 minutes)

Command Modes

Global configuration

Command History

Release	Modification
Release 2.0	This command was introduced on the Cisco CRS-1.
Release 3.0	No modification.
Release 3.2	This command was introduced on the Cisco XR 12000 Series Router.
Release 3.3.0	No modification.
Release 3.4.0	No modification.
Release 3.5.0	No modification.
Release 3.6.0	No modification.
Release 3.7.0	No modification.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes the proper task IDs. For detailed information about user groups and task IDs, see the *Configuring AAA Services on Cisco IOS XR Software* module of the *Cisco IOS XR System Security Configuration Guide*.

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# config  
RP/0/RP0/CPU0:router(config)# mpls traffic-eng fast-reroute timers promotion 600
```

Related Commands

Command	Description
mpls traffic-eng fast-reroute promote	Configures the router to use a new or more efficient backup MPLS-TE tunnel when a current tunnel is overloaded.

mpls traffic-eng interface

To enable MPLS-TE on an interface and to enter MPLS-TE interface submode, use the **mpls traffic-eng interface** command in global configuration mode. To return to the default behavior, use the **no** form of this command.

mpls traffic-eng interface *type interface-id*

no mpls traffic-eng interface *type interface-id*

Syntax Description

interface	(Optional) Displays information on the specified interface.
<i>type</i>	Interface type. For more information, use the question mark (?) online help function.
<i>interface-id</i>	Identifies a 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.

Defaults

No default behavior or values

Command Modes

Global configuration

Command History

Release	Modification
Release 2.0	This command was introduced on the Cisco CRS-1.
Release 3.0	No modification.
Release 3.2	This command was introduced on the Cisco XR 12000 Series Router.
Release 3.3.0	No modification.
Release 3.4.0	No modification.
Release 3.5.0	No modification.
Release 3.6.0	No modification.
Release 3.7.0	No modification.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes the proper task IDs. For detailed information about user groups and task IDs, see the *Configuring AAA Services on Cisco IOS XR Software* module of the *Cisco IOS XR System Security Configuration Guide*.

You must enter MPLS-TE interface mode to configure specific interface parameters on physical interfaces.

Configuring MPLS-TE or Tunnel-TE begins the TE-control process on 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 POS 0/7/0/1
```

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 POS 0/7/0/1
```

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 router configuration mode. To return to the default behavior, use the **no** form of this command.

```
mpls traffic-eng level {isis-level}
```

```
no mpls traffic-eng level {isis-level}
```

Syntax Description

<i>isis-level</i>	IS-IS level (1, 2, or both) where MPLS-TE is enabled.
-------------------	---

Defaults

No default behavior or values

Command Modes

Router configuration

Command History

Release	Modification
Release 2.0	This command was introduced on the Cisco CRS-1.
Release 3.0	No modification.
Release 3.2	This command was introduced on the Cisco XR 12000 Series Router.
Release 3.3.0	No modification.
Release 3.4.0	Support was added to enable MPLS Traffic Engineering in both IS-IS Level 1 and Level 2.
Release 3.5.0	No modification.
Release 3.6.0	No modification.
Release 3.7.0	No modification.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes the proper task IDs. For detailed information about user groups and task IDs, see the *Configuring AAA Services on Cisco IOS XR Software* module of the *Cisco IOS XR System Security Configuration Guide*.

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
```

Related Commands

Command	Description
mpls traffic-eng router-id (MPLS-TE)	Specifies that the TE router identifier for the node is the IP address associated with a given interface.

mpls traffic-eng link-management flood

To initiate an immediate flooding of all the local MPLS-TE links, use the **mpls traffic-eng link-management flood** command in 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.

Defaults No default behavior or values

Command Modes EXEC

Command History

Release	Modification
Release 2.0	This command was introduced on the Cisco CRS-1.
Release 3.0	No modification.
Release 3.2	This command was introduced on the Cisco XR 12000 Series Router.
Release 3.3.0	No modification.
Release 3.4.0	No modification.
Release 3.5.0	No modification.
Release 3.6.0	No modification.
Release 3.7.0	No modification.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes the proper task IDs. For detailed information about user groups and task IDs, see the *Configuring AAA Services on Cisco IOS XR Software* module of the *Cisco IOS XR System Security Configuration Guide*.



Note

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
```

Related Commands	Command	Description
	show mpls traffic-eng link-management advertisements	Show MPLS-TE link-management advertisements.

mpls traffic-eng 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 **mpls traffic-eng link-management timers bandwidth-hold** command in global configuration mode. To return to the default behavior, use the **no** form of this command.

mpls traffic-eng link-management timers bandwidth-hold *holdtime*

no mpls traffic-eng link-management timers bandwidth-hold *holdtime*

Syntax Description	<i>holdtime</i>	Number of seconds that bandwidth can be held. Range is 1 to 300. Default is 15.
--------------------	-----------------	---

Defaults	<i>holdtime</i> : 15 seconds
----------	------------------------------

Command Modes	Global configuration
---------------	----------------------

Command History	Release	Modification
	Release 2.0	This command was introduced on the Cisco CRS-1.
	Release 3.0	No modification.
	Release 3.2	This command was introduced on the Cisco XR 12000 Series Router.
	Release 3.3.0	No modification.
	Release 3.4.0	No modification.
	Release 3.5.0	No modification.
	Release 3.6.0	No modification.
	Release 3.7.0	No modification.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes the proper task IDs. For detailed information about user groups and task IDs, see the *Configuring AAA Services on Cisco IOS XR Software* module of the *Cisco IOS XR System Security Configuration Guide*.

This 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 link-management timers bandwidth-hold 10
```

Related Commands	Command	Description
	show mpls traffic-eng link-management bandwidth-allocation	Displays current local link information and bandwidth hold time.

mpls traffic-eng link-management timers periodic-flooding

To set the length of the interval for periodic flooding, use the **mpls traffic-eng link-management timers periodic-flooding** command in global configuration mode. To return to the default behavior, use the **no** form of this command.

mpls traffic-eng link-management timers periodic-flooding *interval*

no mpls traffic-eng 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 seconds.

Defaults

interval: 180 seconds (3 minutes)

Command Modes

Global configuration

Command History

Release	Modification
Release 2.0	This command was introduced on the Cisco CRS-1.
Release 3.0	No modification.
Release 3.2	This command was introduced on the Cisco XR 12000 Series Router.
Release 3.3.0	No modification.
Release 3.4.0	No modification.
Release 3.5.0	No modification.
Release 3.6.0	No modification.
Release 3.7.0	No modification.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes the proper task IDs. For detailed information about user groups and task IDs, see the *Configuring AAA Services on Cisco IOS XR Software* module of the *Cisco IOS XR System Security Configuration Guide*.

Use the **mpls traffic-eng link-management timers periodic-flooding** command to advertise 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 link-management timers periodic-flooding  
120
```

Related Commands

Command	Description
flooding thresholds	Sets the reserved bandwidth flooding thresholds for a link.
show mpls traffic-eng link-management summary	Displays the current periodic flooding interval.

mpls traffic-eng lmp router-id

To configure the router ID for the optical instance using the LMP protocol, use the **mpls traffic-eng lmp router-id** command in MPLS-TE configuration mode. To return to the default behavior, use the **no** form of this command.

mpls traffic-eng lmp router-id [*ipv4 address* | *interface-name*]

no mpls traffic-eng lmp router-id [*ipv4 address* | *interface-name*]

Syntax Description

<i>ipv4 address</i>	(Optional) The router ID expressed as an IPv4 address.
<i>interface-name</i>	(Optional) The router ID expressed as an interface name.

Defaults

No default behavior or values

Command Modes

MPLS-TE configuration

Command History

Release	Modification
Release 3.3.0	This command was introduced on the Cisco CRS-1 and Cisco XR 12000 Series Router.
Release 3.4.0	No modification.
Release 3.5.0	No modification.
Release 3.6.0	No modification.
Release 3.7.0	No modification.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes the proper task IDs. For detailed information about user groups and task IDs, see the *Configuring AAA Services on Cisco IOS XR Software* module of the *Cisco IOS XR System Security Configuration Guide*.

Task ID

Task ID	Operations
mpls-te	read, write

Examples

The following example shows how configure the LMP router ID for IPv4 address 172.24.20.164:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# mpls traffic-engineering
RP/0/RP0/CPU0:router(config-mpls-te)# lmp router-id router 172.24.20.164
```

Related Commands

Command	Description
clear mpls lmp	Clears Link Management Protocol (LMP) management hello settings.

mpls traffic-eng maximum tunnels

To specify the maximum number of MPLS-TE tunnels that can be configured, use the **mpls traffic-eng maximum tunnels** command in global configuration mode. To return to the default behavior, use the **no** form of this command.

```
mpls traffic-eng maximum tunnels {tunnel-limit}
```

```
no mpls traffic-eng maximum tunnels {tunnel-limit}
```

Syntax Description	<i>tunnel-limit</i>	Maximum number of tunnel TE interfaces. Range is 0 to 65536.
--------------------	---------------------	--

Defaults	<i>tunnel-limit</i> : 2500
----------	----------------------------

Command Modes	Global configuration
---------------	----------------------

Command History	Release	Modification
	Release 2.0	This command was introduced on the Cisco CRS-1.
	Release 3.0	No modification.
	Release 3.2	This command was introduced on the Cisco XR 12000 Series Router.
	Release 3.3.0	No modification.
	Release 3.4.0	No modification.
	Release 3.5.0	No modification.
	Release 3.6.0	No modification.
	Release 3.7.0	No modification.

Usage Guidelines	To use this command, you must be in a user group associated with a task group that includes the proper task IDs. For detailed information about user groups and task IDs, see the <i>Configuring AAA Services on Cisco IOS XR Software</i> module of the <i>Cisco IOS XR System Security Configuration Guide</i> .
------------------	--

Task ID	Task ID	Operations
	mpls-te	read, write

Examples	The following example shows how to set the tunnel-te configuration limit to 3000:
----------	---

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# mpls traffic-eng maximum tunnels 3000
```

Related Commands	Command	Description
	show mpls traffic-eng maximum tunnels	Displays the configuration of the maximum tunnel-te interfaces allowed.

mpls traffic-eng path-protection switchover (GMPLS)

To specify a manual switchover for path protection for a GMPLS optical LSP, use the **mpls traffic-eng path-protection switchover** command in global configuration mode. To disable this feature, use the **no** form of this command.

mpls traffic-eng path-protection switchover {*tunnel name* | *number*}

no mpls traffic-eng path-protection switchover {*tunnel name* | *number*}

Syntax Description

<i>tunnel name</i>	Name of the tunnel that is used for a switchover.
<i>number</i>	Tunnel ID number for the tunnel that is used for a switchover. The range is from 0 to 65535.

Defaults

No manual path protection is invoked on either the head or tail router.

Command Modes

Global configuration

Command History

Release	Modification
Release 3.3.2	This command was introduced on the Cisco CRS-1 and Cisco XR 12000 Series Router.
Release 3.4.0	No modification.
Release 3.5.0	No modification.
Release 3.6.0	No modification.
Release 3.7.0	No modification.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes the proper task IDs. For detailed information about user groups and task IDs, see the *Configuring AAA Services on Cisco IOS XR Software* module of the *Cisco IOS XR System Security Configuration Guide*.

Use the **mpls traffic-eng path-protection switchover** command to run on both tunnel head and tunnel tail at the same time. The **mpls traffic-eng path-protection switchover** command must be issued on both head and tail router of the GMPLS LSP to achieve the complete path switchover at both ends.

Task ID

Task ID	Operations
mpls-te	read, write

Examples

The following example sets the tunnel ID number to 1:

```
RP/0/RP0/CPU0:router(config)# mpls traffic-eng path-protection switchover 1
```

Related Commands

Command	Description
path-option	Configures a path option for an MPLS-TE tunnel.

mpls traffic-eng path-selection ignore overload

To ignore the Intermediate System-to-Intermediate System (IS-IS) overload bit setting for MPLS-TE, use the **mpls traffic-eng path-selection ignore overload** command in global configuration mode. To return to the default behavior, use the **no** form of this command.

mpls traffic-eng path-selection ignore overload

no mpls traffic-eng path-selection ignore overload

Syntax Description This command has no arguments or keywords.

Defaults No default behavior or values

Command Modes Global configuration

Command History	Release	Modification
	Release 3.7.0	This command was introduced on the Cisco CRS-1 and Cisco XR 12000 Series Router.

Usage Guidelines To use this command, you must be in a user group associated with a task group that includes the proper task IDs. For detailed information about user groups and task IDs, see the *Configuring AAA Services on Cisco IOS XR Software* module of the *Cisco IOS XR System Security Configuration Guide*.

Use the **mpls traffic-eng path-selection ignore overload** command to ensure that label switched paths (LSPs) are broken because of routers whose IS-IS overload bit is enabled.

Task ID	Task ID	Operations
	mpls-te	read, write

Examples The following example shows how to use the **mpls traffic-eng path-selection ignore overload** command:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# mpls traffic-eng path-selection ignore overload
```

mpls traffic-eng path-selection loose-expansion affinity

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 **mpls traffic-eng path-selection loose-expansion affinity** command in global configuration mode. To return to the default behavior, use the **no** form of this command.

```
mpls traffic-eng path-selection loose-expansion affinity affinity-value mask affinity-mask
[class-type type]
```

```
no mpls traffic-eng path-selection loose-expansion affinity affinity-value mask affinity-mask
[class-type type]
```

Syntax Description

<i>affinity-value</i>	Attribute values required for links carrying this tunnel. A 32-bit decimal number. Range is 0x0 to 0xFFFFFFFF, representing 32 attributes (bits), where the value of an attribute is 0 or 1.
mask <i>affinity-mask</i>	Link attribute to be checked. A 32-bit decimal number. Range is 0x0 to 0xFFFFFFFF, representing 32 attributes (bits), where the value of an attribute mask is 0 or 1.
class-type <i>type</i>	[Optional] Class-type of the tunnel bandwidth request. Range is 0 to 1.

Defaults

affinity-value: 0X00000000

mask-value: 0xFFFFFFFF

Command Modes

Global configuration

Command History

Release	Modification
Release 3.4.0	This command was introduced on the Cisco CRS-1 and Cisco XR 12000 Series Router.
Release 3.5.0	No modification.
Release 3.6.0	No modification.
Release 3.7.0	No modification.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes the proper task IDs. For detailed information about user groups and task IDs, see the *Configuring AAA Services on Cisco IOS XR Software* module of the *Cisco IOS XR System Security Configuration Guide*.



Note

The new affinity scheme (based on names) is not supported for loose hop expansion. New configuration does not affect the already Up tunnels.

mpls traffic-eng path-selection loose-expansion affinity

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 path-selection loose-expansion affinity 55
mask FFFFFFFF
```

Related Commands

Command	Description
mpls traffic-eng path-selection loose-expansion metric	Configures a metric type to be used to expand a path to the next loose hop for a tunnel on an area border router.
mpls traffic-eng path-selection metric	Configures the MPLS-TE tunnel path-selection metric.

mpls traffic-eng path-selection loose-expansion metric

To specify 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 **mpls traffic-eng path-selection loose-expansion metric** command in global configuration mode. To return to the default behavior, use the **no** form of this command.

```
mpls traffic-eng path-selection loose-expansion metric {igp | te} [class-type type]
```

```
no mpls traffic-eng path-selection loose-expansion metric {igp | te} [class-type type]
```

Syntax Description	igp	Uses an Interior Gateway Protocol (IGP) metric.
	te	Uses a TE metric. This is the default.
	class-type type	(Optional) Class-type of the tunnel bandwidth request. Range is 0 to 1.

Defaults TE Metric

Command Modes Global configuration

Command History	Release	Modification
	Release 3.4.0	This command was introduced on the Cisco CRS-1 and Cisco XR 12000 Series Router.
	Release 3.5.0	No modification.
	Release 3.6.0	No modification.
	Release 3.7.0	No modification.

Usage Guidelines To use this command, you must be in a user group associated with a task group that includes the proper task IDs. For detailed information about user groups and task IDs, see the *Configuring AAA Services on Cisco IOS XR Software* module of the *Cisco IOS XR System Security Configuration Guide*.



Note

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 path-selection loose-expansion metric igp
```

Related Commands	Command	Description
	mpls traffic-eng path-selection loose-expansion affinity	Specifies the affinity value to be used to expand a path to the next loose hop for a tunnel on an area border router.
	mpls traffic-eng path-selection metric	Configures a metric type to be used to expand a path to the next loose hop for a tunnel on an area border router.

mpls traffic-eng path-selection metric

To specify the MPLS-TE tunnel path-selection metric, use the **mpls traffic-eng path-selection metric** command in global configuration mode. To return to the default behavior, use the **no** form of this command.

```
mpls traffic-eng path-selection metric {igp | te}
```

```
no mpls traffic-eng path-selection metric {igp | te}
```

Syntax Description	igp	Uses an Interior Gateway Protocol (IGP) metric.
	te	Uses a TE metric. This is the default variable.

Defaults	TE metric
----------	-----------

Command Modes	Global configuration
---------------	----------------------

Command History	Release	Modification
	Release 2.0	This command was introduced on the Cisco CRS-1.
	Release 3.0	No modification.
	Release 3.2	This command was introduced on the Cisco XR 12000 Series Router.
	Release 3.3.0	No modification.
	Release 3.4.0	No modification.
	Release 3.5.0	No modification.
	Release 3.6.0	No modification.
	Release 3.7.0	No modification.

Usage Guidelines	To use this command, you must be in a user group associated with a task group that includes the proper task IDs. For detailed information about user groups and task IDs, see the <i>Configuring AAA Services on Cisco IOS XR Software</i> module of the <i>Cisco IOS XR System Security Configuration Guide</i> .
------------------	--

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.
- If the **mpls traffic-eng path-selection metric** command was entered to specify 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)# mpls traffic-eng path-selection metric igp
```

Related Commands

Command	Description
mpls traffic-eng path-selection loose-expansion affinity	Specifies the affinity value to be used to expand a path to the next loose hop for a tunnel on an area border router.
mpls traffic-eng path-selection loose-expansion metric	Configures a metric type to be used to expand a path to the next loose hop for a tunnel on an area border router.

mpls traffic-eng pce address

To configure the IPv4 self address for Path Computation Element (PCE), use the **mpls traffic-eng pce address** command in global configuration mode. To return to the default behavior, use the **no** form of this command.

mpls traffic-eng pce address ipv4 address

no mpls traffic-eng pce address ipv4 address

Syntax Description	ipv4 address	IPv4 address for PCE.
--------------------	--------------	-----------------------

Defaults	No default behavior or values
----------	-------------------------------

Command Modes	Global configuration
---------------	----------------------

Command History	Release	Modification
	Release 3.5.0	This command was introduced on the Cisco CRS-1 and Cisco XR 12000 Series Router.
	Release 3.6.0	No modification.
	Release 3.7.0	No modification.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes the proper task IDs. For detailed information about user groups and task IDs, see the *Configuring AAA Services on Cisco IOS XR Software* module of the *Cisco IOS XR System Security Configuration Guide*.

The IP address is used in the TCP communication with the other PCEs or PCCs. Also, this address is advertised using IGP.

Task ID	Task ID	Operations
	mpls-te	read, write

Examples

The following example shows how to configure the IPv4 self address for PCE:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# mpls traffic-eng pce address ipv4 10.10.10.10
```

Related Commands	Command	Description
	mpls traffic-eng pce peer	Configures an IPv4 self address for a PCE peer.
	path-option	Configures a path option for an MPLS-TE tunnel.

mpls traffic-eng pce peer

To configure an IPv4 self address for a PCE peer, use the **mpls traffic-eng pce peer** command in global configuration mode. To return to the default behavior, use the **no** form of this command.

mpls traffic-eng pce peer ipv4 *address*

no mpls traffic-eng pce peer ipv4 *address*

Syntax Description	ipv4 <i>address</i>	IPv4 address for PCE.
---------------------------	----------------------------	-----------------------

Defaults	TE metric
-----------------	-----------

Command Modes	Global configuration
----------------------	----------------------

Command History	Release	Modification
	Release 3.5.0	This command was introduced on the Cisco CRS-1 and Cisco XR 12000 Series Router.
Release 3.6.0	No modification.	
Release 3.7.0	No modification.	

Usage Guidelines	To use this command, you must be in a user group associated with a task group that includes the proper task IDs. For detailed information about user groups and task IDs, see the <i>Configuring AAA Services on Cisco IOS XR Software</i> module of the <i>Cisco IOS XR System Security Configuration Guide</i> .
-------------------------	--

Task ID	Task ID	Operations
	mpls-te	read, write

Examples	The following example shows how to configure an IPv4 self address for a PCE peer:
-----------------	---

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router (config)# mpls traffic-eng pce peer ipv4 11.11.11.11
```

Related Commands	Command	Description
	mpls traffic-eng pce address	Configures the IPv4 self address for PCE.
	path-option	Configures a path option for an MPLS-TE tunnel.

mpls traffic-eng reoptimize (global)

To configure the reoptimization interval for all TE tunnels, use the **mpls traffic-eng reoptimize** command in global configuration mode. To return to the default behavior, use the **no** form of this command

```
mpls traffic-eng reoptimize {frequency}
```

```
no mpls traffic-eng reoptimize {frequency}
```

Syntax Description	frequency	Timer frequency range. Range is 0 to 604800.
--------------------	-----------	--

Defaults	3600 seconds
----------	--------------

Command Modes	Global configuration
---------------	----------------------

Command History	Release	Modification
	Release 2.0	This command was introduced on the Cisco CRS-1.
	Release 3.0	No modification.
	Release 3.2	This command was supported on the Cisco XR 12000 Series Router.
	Release 3.3.0	No modification.
	Release 3.4.0	No modification.
	Release 3.5.0	No modification.
	Release 3.6.0	No modification.
	Release 3.7.0	No modification.

Usage Guidelines	To use this command, you must be in a user group associated with a task group that includes the proper task IDs. For detailed information about user groups and task IDs, see the <i>Configuring AAA Services on Cisco IOS XR Software</i> module of the <i>Cisco IOS XR System Security Configuration Guide</i> .
------------------	--

Task ID	Task ID	Operations
	mpls-te	read, write

Examples	The following example shows how to configure reoptimization interval to 60 seconds:
----------	---

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router#(config) mpls traffic-eng reoptimize 60
```

■ **mpls traffic-eng reoptimize (global)**

Related Commands	Command	Description
	mpls traffic-eng reoptimize (EXEC)	Configures the reoptimization interval of all TE tunnels.

mpls traffic-eng reoptimize (EXEC)

To force immediate reoptimization of all TE tunnels, use the **mpls traffic-eng reoptimize** command in EXEC mode.

```
mpls traffic-eng reoptimize [tunnel_id | tunnel_name]
```

Syntax Description		
	<i>tunnel_id</i>	MPLS-TE tunnel identification expressed as a number.
	<i>tunnel_name</i>	TE tunnel identification expressed as a name.

Defaults No default behavior or values

Command Modes EXEC

Command History	Release	Modification
	Release 2.0	This command was introduced on the Cisco CRS-1.
	Release 3.0	No modification.
	Release 3.2	This command was supported on the Cisco XR 12000 Series Router.
	Release 3.3.0	No modification.
	Release 3.4.0	No modification.
	Release 3.5.0	No modification.
	Release 3.6.0	No modification.
	Release 3.7.0	No modification.

Usage Guidelines To use this command, you must be in a user group associated with a task group that includes the proper task IDs. For detailed information about user groups and task IDs, see the *Configuring AAA Services on Cisco IOS XR Software* module of the *Cisco IOS XR System Security Configuration Guide*.

Task ID	Task ID	Operations
	mpls-te	read, write

Examples The following example shows how to immediately reoptimize all TE tunnels reoptimized:

```
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
```

■ **mpls traffic-eng reoptimize (EXEC)**

Related Commands	Command	Description
	mpls traffic-eng reoptimize (global)	Forces immediate reoptimization of all TE tunnels.

mpls traffic-eng reoptimize timers delay

To delay removal or relabeling of the old label switched paths (LSPs) (reoptimized LSP from the forwarding plane) after tunnel reoptimization, use the **mpls traffic-eng reoptimize timers delay** command in global configuration mode. To restore the default value, use the **no** form of this command.

```
mpls traffic-eng reoptimize timers delay {cleanup | installation} delay-time
```

```
no mpls traffic-eng reoptimize timers delay {cleanup | installation} delay-time
```

Syntax Description

cleanup	Delays removal of the old LSPs after tunnel reoptimization.
installation	Delays installation of a new label after tunnel reoptimization.
<i>delay-time</i>	Reoptimization delay time in seconds. A value of 0 disables delay. The valid range is from 0 to 300 seconds for cleanup time, and 0 to 3600 seconds for installation time.

Defaults

cleanup: 20 seconds

installation: 20 seconds

Command Modes

Global configuration

Command History

Release	Modification
Release 2.0	This command was introduced on the Cisco CRS-1.
Release 3.0	No modification.
Release 3.2	This command was supported on the Cisco XR 12000 Series Router.
Release 3.3.0	No modification.
Release 3.4.0	No modification.
Release 3.5.0	No modification.
Release 3.6.0	No modification.
Release 3.7.0	No modification.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes the proper task IDs. For detailed information about user groups and task IDs, see the *Configuring AAA Services on Cisco IOS XR Software* module of the *Cisco IOS XR System Security Configuration Guide*.

A device with Multiprotocol Label Switching traffic engineering (MPLS-TE) tunnels periodically examines tunnels with established LSPs to discover if 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 **mpls traffic-eng 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 reoptimize timer delay cleanup 60
```

The following example shows how to set the reoptimization installation delay time to 1 hour:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# mpls traffic-eng reoptimize delay installation 3600
```

Related Commands	Command	Description
	mpls traffic-eng reoptimize (global)	Reoptimizes all traffic engineering tunnels immediately.
	mpls traffic-eng reoptimize (EXEC)	Configures the reoptimization interval of all TE tunnels.

mpls traffic-eng router-id (MPLS-TE)

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 router configuration mode. To return to the default behavior, use the **no** form of this command.

mpls traffic-eng router-id *interface-name*

no mpls traffic-eng no router-id *interface-name*

Syntax Description

<i>interface-name</i>	Interface whose primary IP address is the router's identifier.
-----------------------	--

Defaults

No default behavior or values

Command Modes

Router configuration

Command History

Release	Modification
Release 2.0	This command was introduced on the Cisco CRS-1.
Release 3.0	No modification.
Release 3.2	This command was supported on the Cisco XR 12000 Series Router.
Release 3.3.0	No modification.
Release 3.4.0	No modification.
Release 3.5.0	No modification.
Release 3.6.0	No modification.
Release 3.7.0	No modification.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes the proper task IDs. For detailed information about user groups and task IDs, see the *Configuring AAA Services on Cisco IOS XR Software* module of the *Cisco IOS XR System Security Configuration Guide*.

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.

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 1
RP/0/RP0/CPU0:router(config-router)# mpls traffic-eng router-id Loopback0
```

```
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 router-id Loopback0
```

Related Commands

Command	Description
mpls traffic-eng level	Configures a router running OSPF MPLS so that it floods TE for the indicated IS-IS level.

mpls traffic-eng router-id secondary

To configure a secondary TE router identifier in MPLS-TE to be used locally (not advertised through IGP), use the **mpls traffic-eng router-id secondary** command in global configuration mode. To return to the default behavior, use the **no** form of this command.

```
mpls traffic-eng router-id secondary A.B.C.D
```

```
no mpls traffic-eng no router-id secondary A.B.C.D
```

Syntax Description	A.B.C.D	IPv4 address to be used as secondary TE router ID.
---------------------------	---------	--

Defaults	No default behavior or values
-----------------	-------------------------------

Command Modes	Global configuration
----------------------	----------------------

Command History	Release	Modification
	Release 3.4.1	This command was introduced on the Cisco CRS-1 and Cisco XR 12000 Series Router.
	Release 3.5.0	No modification.
	Release 3.6.0	No modification.
	Release 3.7.0	No modification.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes the proper task IDs. For detailed information about user groups and task IDs, see the *Configuring AAA Services on Cisco IOS XR Software* module of the *Cisco IOS XR System Security Configuration Guide*.

Use the **mpls traffic-eng 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 router-id secondary 1.1.1.1
RP/0/RP0/CPU0:router(config)# mpls traffic-eng router-id secondary 2.2.2.2
```

■ mpls traffic-eng router-id secondary

Related Commands	Command	Description
	mpls traffic-eng router-id (MPLS-TE)	Specifies that the TE router identifier for the node is the IP address associated with a given interface.

mpls traffic-eng signalling advertise explicit-null

To specify that tunnels terminating on a router use explicit-null labels, use the **mpls traffic-eng signalling advertise explicit-null** command in global configuration mode. To return to the default behavior, use the **no** form of this command.

mpls traffic-eng signalling advertise explicit-null

no mpls traffic-eng signalling advertise explicit-null

Syntax Description

This command has no arguments or keywords.

Defaults

Implicit-null labels are advertised.

Command Modes

Global configuration

Command History

Release	Modification
Release 2.0	This command was introduced on the Cisco CRS-1.
Release 3.0	No modification.
Release 3.2	This command was supported on the Cisco XR 12000 Series Router.
Release 3.3.0	No modification.
Release 3.4.0	No modification.
Release 3.5.0	No modification.
Release 3.6.0	No modification.
Release 3.7.0	No modification.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes the proper task IDs. For detailed information about user groups and task IDs, see the *Configuring AAA Services on Cisco IOS XR Software* module of the *Cisco IOS XR System Security Configuration Guide*.

Use the **mpls traffic-eng signalling advertise explicit-null** command to specify that tunnels terminating on this router use explicit-null labels. This command applies to tunnel labels advertised to next to last (penultimate) hop.

The explicit label is used to carry quality-of-service (QoS) information up to the terminating-end router of the label switched path (LSP).

Task ID

Task ID	Operations
mpls-te	read, write

mpls traffic-eng signalling advertise explicit-null**Examples**

The following example shows how to configure explicit null tunnel labels:

```
RP/0/RP0/CPU0:router# configure  
RP/0/RP0/CPU0:router (config)# mpls traffic-eng signalling advertise explicit-null
```

Related Commands

Command	Description
mpls traffic-eng path-selection loose-expansion metric	Configures a metric type to be used to expand a path to the next loose hop for a tunnel on an area border router.

mpls traffic-eng timers loose-path

To configure the period between the headend retries after path errors, use the **mpls traffic-eng timers loose-path** command in global configuration mode. To return to the default behavior, use the **no** form of this command.

mpls traffic-eng timers loose-path retry-period *value*

no mpls traffic-eng timers loose-path retry-period *value*

Syntax Description

retry-period *value* Time between retries upon a path error. Range is 30 to 600 seconds.

Defaults

retry-period *value*: 120 seconds

Command Modes

Global configuration

Command History

Release	Modification
Release 3.4.0	This command was introduced on the Cisco CRS-1 and Cisco XR 12000 Series Router.
Release 3.5.0	No modification.
Release 3.6.0	No modification.
Release 3.7.0	No modification.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes the proper task IDs. For detailed information about user groups and task IDs, see the *Configuring AAA Services on Cisco IOS XR Software* module of the *Cisco IOS XR System Security Configuration Guide*.

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 timers loose-path retry-period 300
```

Related Commands

Command	Description
mpls traffic-eng path-selection loose-expansion affinity	Specifies the affinity value to be used to expand a path to the next loose hop for a tunnel on an area border router.

mpls traffic-eng topology holddown sigerr

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 signalling error on the link, use the **mpls traffic-eng topology holddown sigerr** command in global configuration mode. To return to the default behavior, use the **no** form of this command.

mpls traffic-eng topology holddown sigerr *seconds*

no mpls traffic-eng topology holddown sigerr *seconds*

Syntax Description	<i>seconds</i>	Time router ignores a link during tunnel path calculations, following a TE tunnel error on the link. Range is 0 to 300. Default is 10.
---------------------------	----------------	--

Defaults	<i>seconds</i> : 10
-----------------	---------------------

Command Modes	Global configuration
----------------------	----------------------

Command History	Release	Modification
	Release 2.0	This command was introduced on the Cisco CRS-1.
	Release 3.0	No modification.
	Release 3.2	This command was supported on the Cisco XR 12000 Series Router.
	Release 3.3.0	No modification.
	Release 3.4.0	No modification.
	Release 3.5.0	No modification.
	Release 3.6.0	No modification.
	Release 3.7.0	No modification.

Usage Guidelines To use this command, you must be in a user group associated with a task group that includes the proper task IDs. For detailed information about user groups and task IDs, see the *Configuring AAA Services on Cisco IOS XR Software* module of the *Cisco IOS XR System Security Configuration Guide*.

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 **mpls traffic-eng 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 topology holddown sigerr 15
```

Related Commands

Command	Description
show mpls traffic-eng topology	Displays the current MPLS-TE global topology of this node as well as the signaling error holddown time.

passive (GMPLS)

To configure a passive GMPLS tunnel, use the **passive** command in tunnel-te interface configuration mode. To return to the default behavior, use the **no** form of this command.

passive

no passive

Syntax Description This command has no arguments or keywords.

Defaults No default behavior or values

Command Modes Interface tunnel-te configuration

Command History

Release	Modification
Release 3.3.0	This command was introduced on the Cisco CRS-1 and Cisco XR 12000 Series Router.
Release 3.4.0	No modification.
Release 3.5.0	No modification.
Release 3.6.0	No modification.
Release 3.7.0	No modification.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes the proper task IDs. For detailed information about user groups and task IDs, see the *Configuring AAA Services on Cisco IOS XR Software* module of the *Cisco IOS XR System Security Configuration Guide*.

Task ID

Task ID	Operations
mpls-te	read, write

Examples

The following example shows how to configure a passive GMPLS virtual interface tunnel:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# interface tunnel-te 99
RP/0/RP0/CPU0:router(config-if)# passive
```

Related Commands	Command	Description
	destination (MPLS-TE)	Configures bidirectional optical tunnels.
	flooding-igp (GMPLS)	Floods selected GMPLS Traffic Engineering links.
	lmp hello (GMPLS)	Configures LMP IPCC management hello settings.
	match (GMPLS)	Configures or matches active and passive tunnels.
	remote (GMPLS)	Configures remote TE links.
	switching (GMPLS)	Configures TE-link switching attributes.

path-option

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 { number | protecting number } { dynamic | explicit { name pathname | identifier
path-number } } [isis instance name { level level } ] [ospf instance name { area area ID } ]
[verbatim] [lockdown]
```

```
no path-option { number | protecting number } { dynamic | explicit { name pathname |
path-number } } [isis instance name { level level } ] [ospf instance name { area area ID } ]
[verbatim] [lockdown]
```

Syntax Description		
	<i>number</i>	Specifies a path option number. Range is 1 to 1000.
	protecting number	Specifies a path setup option to protect a path. The range for the path option number is 1 to 1000.
	dynamic	Specifies that label switched paths (LSP) are dynamically calculated.
	explicit	Specifies that LSP paths are IP explicit paths.
	name <i>pathname</i>	Specifies the path name of the IP explicit path.
	identifier <i>path-number</i>	Specifies a path number of the IP explicit path.
	verbatim	(Optional) Bypasses the Topology/CSPF check for explicit paths.
	lockdown	(Optional) Specifies that the LSP cannot be reoptimized.
	isis <i>instance name</i>	(Optional) Limits CSPF to a single IS-IS instance and area.
	level <i>level</i>	Configures the level for IS-IS. The range is from 1 to 2.
	ospf <i>instance name</i>	(Optional) Limits CSPF to a single OSPF instance and area.
	area <i>area ID</i>	Configures the area for OSPF. The range is from 0 to 4294967295.

Defaults No default behavior or values

Command Modes Tunnel-te interface configuration

Command History	Release	Modification
	Release 2.0	This command was introduced on the Cisco CRS-1.
	Release 3.0	No modification.
	Release 3.2	This command was supported on the Cisco XR 12000 Series Router.
	Release 3.3.0	No modification.
	Release 3.3.2	The protecting keyword was added to support GMPLS protection and restoration.
	Release 3.4.0	No modification.
	Release 3.4.1	Both the verbatim and lockdown keywords can be used together.
	Release 3.5.0	No modification.

Release	Modification
Release 3.6.0	No modification.
Release 3.7.0	An IGP-area is specified with the path-option command. Both the isis keyword and the ospf keyword were added.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes the proper task IDs. For detailed information about user groups and task IDs, see the *Configuring AAA Services on Cisco IOS XR Software* module of the *Cisco IOS XR System Security Configuration Guide*.

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. 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.

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
```

Related Commands	Command	Description
	mpls traffic-eng path-protection switchover (GMPLS)	Specifies a switchover for path protection.
	show explicit-paths	Displays the configured IP explicit paths.

path-selection metric

To specify an MPLS-TE tunnel path-selection metric type, use the **path-selection metric** command in interface configuration mode. To return to the default behavior, use the **no** form of this command.

path-selection metric { **igp** | **te** }

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

Syntax Description

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

Defaults

TE metrics

Command Modes

Interface configuration

Command History

Release	Modification
Release 2.0	This command was introduced on the Cisco CRS-1.
Release 3.0	No modification.
Release 3.2	This command was supported on the Cisco XR 12000 Series Router.
Release 3.3.0	No modification.
Release 3.4.0	No modification.
Release 3.5.0	No modification.
Release 3.6.0	No modification.
Release 3.7.0	No modification.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes the proper task IDs. For detailed information about user groups and task IDs, see the *Configuring AAA Services on Cisco IOS XR Software* module of the *Cisco IOS XR System Security Configuration Guide*.

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.
- If the **mpls traffic-eng path-selection metric** command was entered to specify 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 designate that the MPLS-TE tunnel use the IGP metric for path selection:

```
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
```

Related Commands

Command	Description
show mpls traffic-eng topology	Displays the tunnel path used.

policy-class

To configure policy-based tunnel selection (PBTS) to direct traffic into specific TE tunnels, use the **policy-class** command in interface configuration mode. To disable this feature, use the **no** form of this command.

policy-class *1 - 7*

no policy-class

Syntax Description	<i>1 - 7</i>	Sets the policy-class-attribute to map the correct traffic class to this policy.
---------------------------	--------------	--

Defaults	No default behavior or values
-----------------	-------------------------------

Command Modes	Interface configuration
----------------------	-------------------------

Command History	Release	Modification
	Release 3.6.0	This command was introduced on the Cisco CRS-1 router.
Release 3.7.0	This command was supported on the Cisco XR 12000 Series Router.	

Usage Guidelines	To use this command, you must be in a user group associated with a task group that includes the proper task IDs. For detailed information about user groups and task IDs, see the <i>Configuring AAA Services on Cisco IOS XR Software</i> module of the <i>Cisco IOS XR System Security Configuration Guide</i> .
-------------------------	--

Use the **policy-class** command to enable policy-based tunnel selection (PBTS). See *Cisco IOS XR MPLS Configuration Guide* for more information on PBTS.

To display the configured PBTS policy-class value, use the **show mpls traffic-eng tunnels** command.

To display information about PBTS configuration, use the **show cef** and **show cef hardware** commands in *Cisco IOS XR IP Addresses and Service Command Reference*.

Task ID	Task ID	Operations
	mpls-te	read, write

Examples	The following example shows how to configure a policy class:
-----------------	--

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# interface tunnel-te 1
RP/0/RP0/CPU0:router(config-if)# policy-class 7
```

Related Commands	Command	Description
	interface tunnel-te	Configures an MPLS-TE tunnel interface.
	show cef	Displays the IPv4 or IPv6 Cisco Express Forwarding table.
	show cef hardware	Displays Cisco Express Forwarding IPv4 or IPv6 hardware status and configuration information.
	show mpls traffic-eng tunnels	Displays information about MPLS-TE tunnels.

priority (MPLS-TE)

To configure the setup and reservation priority for an MPLS-TE tunnel, use the **priority** command in interface configuration mode. To return to the default behavior, use the **no** form of this command.

priority *setup-priority hold-priority*

no priority *setup-priority hold-priority*

Syntax Description

<i>setup-priority</i>	The 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 (where a lower number indicates a higher priority). Therefore, an LSP with a setup priority of 0 can preempt any LSP with a non-0 priority.
<i>hold-priority</i>	The 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 (where a lower number indicates a higher priority).

Defaults

setup-priority: 7

hold-priority: 7

Command Modes

Interface configuration

Command History

Release	Modification
Release 2.0	This command was introduced on the Cisco CRS-1.
Release 3.0	No modification.
Release 3.2	This command was supported on the Cisco XR 12000 Series Router.
Release 3.3.0	No modification.
Release 3.4.0	No modification.
Release 3.5.0	No modification.
Release 3.6.0	No modification.
Release 3.7.0	No modification.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes the proper task IDs. For detailed information about user groups and task IDs, see the *Configuring AAA Services on Cisco IOS XR Software* module of the *Cisco IOS XR System Security Configuration Guide*.

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.

■ priority (MPLS-TE)

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
```

Related Commands

Command	Description
interface tunnel-te	Configures an MPLS-TE tunnel interface.

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.

Defaults

No default behavior or values

Command Modes

Interface configuration

Command History

Release	Modification
Release 2.0	This command was introduced on the Cisco CRS-1.
Release 3.0	No modification.
Release 3.2	This command was supported on the Cisco XR 12000 Series Router.
Release 3.3.0	No modification.
Release 3.4.0	No modification.
Release 3.5.0	No modification.
Release 3.6.0	No modification.
Release 3.7.0	No modification.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes the proper task IDs. For detailed information about user groups and task IDs, see the *Configuring AAA Services on Cisco IOS XR Software* module of the *Cisco IOS XR System Security Configuration Guide*.



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 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
```

Related Commands

Command	Description
show mpls traffic-eng tunnels	Displays information about MPLS-TE tunnels.

remote (GMPLS)

To configure LMP Neighbor remote TE links, use the **remote** command in MPLS-TE interface lmp data link adjacency configuration mode. To return to the default behavior, use the **no** form of this command.

```
remote {interface-id unnum identifier | switching capability {fsc | lsc | psc1} | te-link-id {ipv4
address | unnum identifier}}
```

```
no remote {interface-id unnum identifier | switching capability {fsc | lsc | psc1} | te-link-id {ipv4
address | unnum identifier}}
```

Syntax Description	Parameter	Description
	interface-id	LMP Neighbor remote interface identifier.
	unnum <i>identifier</i>	Unnumbered interface identifier. Range is 1 to 4294967295.
	switching-capability	Remote LMP MPLS-TE interface switching capability.
	fsc lsc psc1	Capability types: Fiber-Switch Capable, Lambda-Switch Capable, Packet-Switch Capable.
	te-link-id	Remote LMP MPLS-TE link ID address.
	ipv4 <i>address</i>	IPv4 address.
	unnum <i>identifier</i>	Unnumbered interface and identifier.

Defaults No default behavior or values

Command Modes LMP data link adjacency configuration mode

Command History	Release	Modification
	Release 3.3.0	This command was introduced on the Cisco CRS-1 and Cisco XR 12000 Series Router.
	Release 3.4.0	No modification.
	Release 3.5.0	No modification.
	Release 3.6.0	No modification.
	Release 3.7.0	No modification.

Usage Guidelines To use this command, you must be in a user group associated with a task group that includes the proper task IDs. For detailed information about user groups and task IDs, see the *Configuring AAA Services on Cisco IOS XR Software* module of the *Cisco IOS XR System Security Configuration Guide*.

Task ID	Task ID	Operations
	mpls-te	read, write

Examples

The following example shows how to configure LMP Neighbor remote TE links for unnumber interface-id 1066:

```
RP0/0/RP0/CPU0:router# configure
RP0/0/RP0/CPU0:router(config)# mpls traffic-eng
RP0/0/RP0/CPU0:router(config-mpls-te)# interface POS 0/1/0/0
RP0/0/RP0/CPU0:router(config-mpls-te-if)# lmp data-link adjacency
RP0/0/RP0/CPU0:router(config-mpls-te-if-adj)# remote interface-id unnum 1066
```

Related Commands

Command	Description
destination (MPLS-TE)	Configures bidirectional optical tunnels.
flooding-igp (GMPLS)	Floods selected GMPLS Traffic Engineering links.
lmp hello (GMPLS)	Configures LMP IPCC management hello settings.
match (GMPLS)	Configures or matches active and passive tunnels.
passive (GMPLS)	Configures passive GMPLS tunnels.
switching (GMPLS)	Configures TE-link switching attributes.

show explicit-paths

To display the configured IP explicit paths, use the **show explicit-paths** command in EXEC mode.

```
show explicit-paths [path name | identifier number]
```

Syntax Description	
path name	(Optional) Name of the explicit path.
identifier number	(Optional) Number of the explicit path. Range is 1 to 65535.

Defaults No default behavior or values

Command Modes EXEC

Command History	Release	Modification
	Release 2.0	This command was introduced on the Cisco CRS-1.
	Release 3.0	No modification.
	Release 3.2	This command was supported on the Cisco XR 12000 Series Router.
	Release 3.3.0	No modification.
	Release 3.4.0	No modification.
	Release 3.5.0	No modification.
	Release 3.6.0	No modification.
	Release 3.7.0	No modification.

Usage Guidelines To use this command, you must be in a user group associated with a task group that includes the proper task IDs. For detailed information about user groups and task IDs, see the *Configuring AAA Services on Cisco IOS XR Software* module of the *Cisco IOS XR System Security Configuration Guide*.

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 is 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
```

Table 26 describes the significant fields shown in the display.

Table 26 *show explicit-paths 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 is 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 is 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
```

Related Commands

Command	Description
index exclude-address	Specifies the next IP address to exclude from the explicit path.
index next-address	Specifies path entries at a specific index.

show mpls traffic-eng affinity-map

To display the color name-to-value mappings configured on the router, use the **show mpls traffic-eng autoroute** command in EXEC mode.

```
show mpls traffic-eng affinity-map]
```

Syntax Description This command has no arguments or keywords.

Defaults No default behavior or values

Command Modes EXEC

Command History	Release	Modification
	Release 3.4.0	This command was introduced on the Cisco CRS-1 and Cisco XR 12000 Series Router.
	Release 3.5.0	No modification.
	Release 3.6.0	No modification.
	Release 3.7.0	No modification.

Usage Guidelines To use this command, you must be in a user group associated with a task group that includes the proper task IDs. For detailed information about user groups and task IDs, see the *Configuring AAA Services on Cisco IOS XR Software* module of the *Cisco IOS XR System Security Configuration Guide*.

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 is sample output from the **show mpls traffic-eng affinity-map** command:

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

```
Affinity Name      Affinity Value
-----
blue               0x2
green              0x4
red                0x1
```

Table 27 describes the significant fields shown in the display.

Table 27 *show mpls traffic-eng affinity-map Field Descriptions*

Field	Description
Affinity Name/Affinity Value	Displays the affinity names and values associated with the tunnel affinity constraints.

Related Commands

Command	Description
affinity	Configures an affinity (the properties the tunnel requires in its links) for an MPLS-TE tunnel.
affinity-map	Assigns a numerical value to each affinity name.

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 EXEC mode.

show mpls traffic-eng autoroute [A.B.C.D.]

Syntax Description	A.B.C.D	(Optional) Displays tunnels leading to this address.
---------------------------	---------	--

Defaults No default behavior or values

Command Modes EXEC

Command History	Release	Modification
	Release 2.0	This command was introduced on the Cisco CRS-1.
	Release 3.0	No modification.
	Release 3.2	This command was supported on the Cisco XR 12000 Series Router.
	Release 3.3.0	No modification.
	Release 3.4.0	No modification.
	Release 3.5.0	No modification.
	Release 3.6.0	No modification.
	Release 3.7.0	No modification.

Usage Guidelines To use this command, you must be in a user group associated with a task group that includes the proper task IDs. For detailed information about user groups and task IDs, see the *Configuring AAA Services on Cisco IOS XR Software* module of the *Cisco IOS XR System Security Configuration Guide*.

The enhanced shortest path first (SPF) calculation of the IGP has been modified so that it uses traffic-engineering tunnels. The **show mpls traffic-eng autoroute** command displays those tunnels IGP is currently using in its enhanced SPF calculation (that is, which tunnels are up and have autoroute configured).

Task ID	Task ID	Operations
	mpls-te	read

Examples

The following is 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)
```

**Note**

Tunnels are organized by destination. All tunnels to a destination carry a share of the traffic tunneled to that destination.

Table 28 describes the significant fields shown in the display.

Table 28 *show mpls traffic-eng autoroute Field Descriptions*

Field	Description
Destination	Multiprotocol Label Switching (MPLS) TE tail-end router ID.
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.

Related Commands

Command	Description
autoroute metric	Specifies the MPLS-TE tunnel metric that the IGP-enhanced SPF calculation will use.
mpls traffic-eng topology holddown sigerr	Causes the IGP to use the tunnel (if it is up) in its enhanced SPF calculation.
show mpls traffic-eng tunnels	Displays information about MPLS-TE tunnels.

show mpls traffic-eng counters tunnel

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

```
show mpls traffic-eng counters tunnel { tunnel number | all [heads | middles | tails] | name |
summary }
```

Syntax Description		
	<i>tunnel number</i>	Displays statistics for the input tunnel number.
	all	Displays statistics for all tunnels.
	heads	Displays statistics for all tunnel heads.
	middles	Displays statistics for all tunnel midpoints.
	tails	Displays statistics for all tunnel tails.
	name	Displays statistics for a specified tunnel.
	summary	Displays a summary of signaling statistics.

Defaults No default behavior or values

Command Modes EXEC

Command History	Release	Modification
	Release 2.0	This command was introduced on the Cisco CRS-1.
	Release 3.0	No modification.
	Release 3.2	This command was supported on the Cisco XR 12000 Series Router.
	Release 3.3.0	No modification.
	Release 3.4.0	No modification.
	Release 3.5.0	Support was added for the middles keyword.
	Release 3.6.0	No modification.
	Release 3.7.0	No modification.

Usage Guidelines To use this command, you must be in a user group associated with a task group that includes the proper task IDs. For detailed information about user groups and task IDs, see the *Configuring AAA Services on Cisco IOS XR Software* module of the *Cisco IOS XR System Security Configuration Guide*.

Task ID	Task ID	Operations
	mpls-te	read

show mpls traffic-eng counters tunnel

Examples

The following is sample output from the **show mpls traffic-eng counters tunnel** command, using the **all** keyword, which displays tunnel signaling statistics for all tunnels:

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

Tunnel Head: tunnel-te160
Match Resv Create:      5  Sender Create:      4  Path Error:      0
Match Resv Change:     0  Sender Modify:     1  Path Change:     0
Match Resv Delete:     3  Sender Delete:     3  Path Delete:     1
Total:                  21  Unknown:          4

Tunnel Head: tunnel-te170
Match Resv Create:     0  Sender Create:     0  Path Error:     0
Match Resv Change:     0  Sender Modify:     0  Path Change:     0
Match Resv Delete:     0  Sender Delete:     0  Path Delete:     0
Total:                  0  Unknown:          0
```

The following is sample output from the **show mpls traffic-eng counters tunnel** command using the *tunnel number* argument, which displays statistics for the input tunnel number:

```
RP/0/RP0/CPU0:router# show mpls traffic-eng counters tunnel 1

Tunnel Head: tunnel-te1
Match Resv Create:     1  Sender Create:     1  Path Error:     0
Match Resv Change:     0  Sender Modify:     0  Path Change:     0
Match Resv Delete:     0  Sender Delete:     0  Path Delete:     0
Total:                  3  Unknown:          0
```

Table 29 describes the significant fields shown in the display.

Table 29 *show mpls traffic-eng counters tunnel* 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.

Related Commands

Command	Description
clear mpls traffic-eng counters tunnels	Clears the counters for MPLS-TE tunnels.

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 EXEC mode.

show mpls traffic-eng ds-te te-class

Syntax Description This command has no arguments or keywords.

Command Modes EXEC

Command History	Release	Modification
	Release 3.3.0	This command was introduced on the Cisco CRS-1 and Cisco XR 12000 Series Router.
	Release 3.4.0	No modification.
	Release 3.5.0	No modification.
	Release 3.6.0	No modification.
	Release 3.7.0	No modification.

Usage Guidelines To use this command, you must be in a user group associated with a task group that includes the proper task IDs. For detailed information about user groups and task IDs, see the *Configuring AAA Services on Cisco IOS XR Software* module of the *Cisco IOS XR System Security Configuration Guide*.



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

Task ID	Task ID	Operations
	mpls-te	read, write

Examples The following is 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
```

Table 30 describes the significant fields shown in the display.

Table 30 *show mpls traffic-eng ds-te te-class 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 forwarding

To display forwarding information on tunnels that were admitted locally, use the **show mpls traffic-eng forwarding** command in EXEC mode.

```
show mpls traffic-eng forwarding [interface type interface-id]
```

Syntax Description

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

Command Modes

EXEC

Command History

Release	Modification
Release 2.0	This command was introduced on the Cisco CRS-1.
Release 3.0	No modification.
Release 3.2	This command was supported on the Cisco XR 12000 Series Router.
Release 3.3.0	No modification.
Release 3.4.0	No modification.
Release 3.5.0	No modification.
Release 3.6.0	No modification.
Release 3.7.0	No modification.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes the proper task IDs. For detailed information about user groups and task IDs, see the *Configuring AAA Services on Cisco IOS XR Software* module of the *Cisco IOS XR System Security Configuration Guide*.

Task ID

Task ID	Operations
mpls-te	read

Examples

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

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

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      LOC_LBL  OUT_LBL  Backup
-----
10.10.10.10 1_34    -            PO0/2/0/1    0        61      tunnel-te15
10.10.10.10 15_2     -            PO0/2/0/2    0        3       unknown
```

[Table 31](#) describes the significant fields shown in the display.

Table 31 *show mpls traffic-eng forwarding Field Descriptions*

Field	Description
Tunnels Count	Total number of tunnels admitted.
Tunnels Selected	Number of tunnels to be displayed.
Bandwidth descriptor legend	BW pool type and status displayed with the tunnel entry (see Table 33).
TUNNEL ID	Tunnel identification.
UP IF	Upstream interface that the tunnel used.
DOWN IF	Downstream interface used by the tunnel.
PRIORITY	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 B0 follows the bandwidth number, the bandwidth is from the global pool/class-type 0. If an B1 follows the bandwidth number the bandwidth is from the sub-pool/class-type 1.

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 EXEC mode.

```
show mpls traffic-eng forwarding-adjacency [A.B.C.D]
```

Syntax Description	<i>A.B.C.D</i> Destination IPv4 address for forwarding adjacency.
---------------------------	---

Command Modes	EXEC
----------------------	------

Command History	Release	Modification
	Release 3.4.0	This command was introduced on the Cisco CRS-1 and Cisco XR 12000 Series Router.
Release 3.5.0	No modification.	
Release 3.6.0	No modification.	
Release 3.7.0	No modification.	

Usage Guidelines To use this command, you must be in a user group associated with a task group that includes the proper task IDs. For detailed information about user groups and task IDs, see the *Configuring AAA Services on Cisco IOS XR Software* module of the *Cisco IOS XR System Security Configuration Guide*.

Task ID	Task ID	Operations
	mpls-te	read

Examples The following is sample output from the **show mpls traffic-eng forwarding-adjacency** command:

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

destination 3.3.3.3 has 1 tunnels
tunnel-te1 (traffic share 0, next-hop 3.3.3.3)
(Adjacency Announced: yes, holdtime 0)
```

Related Commands	Command	Description
		forwarding-adjacency

show mpls traffic-eng igp-areas

To display MPLS-TE internal area storage, use the **show mpls traffic-eng igp-areas** command in EXEC mode.

show mpls traffic-eng igp-areas

Syntax Description This command has no arguments or keywords.

Command Modes EXEC

Command History	Release	Modification
	Release 3.4.0	This command was introduced on the Cisco CRS-1 and the Cisco XR 12000 Series Router.
	Release 3.5.0	No modification.
	Release 3.6.0	No modification.
	Release 3.7.0	Sample output was modified so that the tunnels and links are not displayed in each area.

Usage Guidelines To use this command, you must be in a user group associated with a task group that includes the proper task IDs. For detailed information about user groups and task IDs, see the *Configuring AAA Services on Cisco IOS XR Software* module of the *Cisco IOS XR System Security Configuration Guide*.

Task ID	Task ID	Operations
	mpls-te	read

Examples The following is 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

```

Table 32 describes the significant fields shown in the display.

Table 32 *show mpls traffic-eng igp-areas 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	Indicates if 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 EXEC mode.

show mpls traffic-eng link-management admission-control [*interface type interface-id*]

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

Command Modes	EXEC
---------------	------

Command History	Release	Modification
	Release 2.0	This command was introduced on the Cisco CRS-1.
	Release 3.0	No modification.
	Release 3.2	This command was supported on the Cisco XR 12000 Series Router.
	Release 3.3.0	No modification.
	Release 3.4.0	Support was added for the Name-Based Affinity Constraint scheme.
	Release 3.5.0	No modification.
	Release 3.6.0	No modification.
	Release 3.7.0	No modification.

Usage Guidelines	To use this command, you must be in a user group associated with a task group that includes the proper task IDs. For detailed information about user groups and task IDs, see the <i>Configuring AAA Services on Cisco IOS XR Software</i> module of the <i>Cisco IOS XR System Security Configuration Guide</i> .
------------------	--

Task ID	Task ID	Operations
	mpls-te	read

Examples

The following is 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   -           PO0/2/0/1   7/7 Resv Admitted 100      RB0
10.10.10.10 15_2      -           PO0/2/0/2   7/7 Resv Admitted 0        B0
```

Table 33 describes the significant fields shown in the display.

Table 33 *show mpls traffic-eng link-management admission-control 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. In the sample output above, shown as RG (Locked BW in global pool).
TUNNEL ID	Tunnel identification.
UP IF	Upstream interface used by the tunnel.
DOWN IF	Downstream interface used by the tunnel.
PRIORITY	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 is sample output from the **show mpls traffic-eng link-management interface** command:

```
RP/0/RP0/CPU0:router# show mpls traffic-eng link-management int pos 0/2/0/1

System Information::
  Links Count      : 1

Link ID:: POS0/2/0/1 (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
```

```
show mpls traffic-eng link-management admission-control
```

```

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)

```

Table 34 describes the significant fields shown in the display.

Table 34 *show mpls traffic-eng link-management interface 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. Packet switch capable
2. Time-division multiplexing
3. 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 EXEC mode.

show mpls traffic-eng link-management advertisements

Syntax Description

This command has no arguments or keywords.

Command Modes

EXEC

Command History

Release	Modification
Release 2.0	This command was introduced on the Cisco CRS-1.
Release 3.0	No modification.
Release 3.2	This command was supported on the Cisco XR 12000 Series Router.
Release 3.3.0	No modification.
Release 3.4.0	No modification.
Release 3.5.0	No modification.
Release 3.6.0	No modification.
Release 3.7.0	No modification.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes the proper task IDs. For detailed information about user groups and task IDs, see the *Configuring AAA Services on Cisco IOS XR Software* module of the *Cisco IOS XR System Security Configuration Guide*.

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 (as shown in the examples that follow).

Task ID

Task ID	Operations
mpls-te	read

Examples

The following is sample output from the **show mpls traffic-eng link-management advertisements** command:

```
RP/0/RP0/CPU0:router# show mpls traffic-eng link management advertisements

Flooding Status           : ready
  Last Flooding           : 35 seconds ago
  Last Flooding Trigger   : Link BW changed
  Next Periodic Flooding In : 53 seconds
  Diff-Serv TE Mode       : IETF
```

show mpls traffic-eng link-management advertisements

```

Configured Areas          : 2

IGP Area[1]:: isis 1 level-2
  Flooding Protocol      : ISIS
  IGP System ID         : 0000.0000.0001.00
  MPLS-TE Router ID    : 10.10.10.10
  Flooded Links        : 2

Link ID:: 0 (POS0/2/0/1)
  Link IP Address       : 7.2.2.1
  O/G Intf ID          : 4
  Neighbor              : ID 0000.0000.0002.00, IP 7.2.2.2
  SRLGs                :
  TE Metric            : 10
  IGP Metric           : 10
  Physical BW          : 155520 kbits/sec
  BCID                 : MAM
  Max Reservable BW    : 1000 kbits/sec
  BC0                  : 600 kbits/sec
  BC1                  : 400 kbits/sec

Downstream::
                                Reservable BW
                                -----
  TE-class[0]:                600  kbits/sec
  TE-class[1]:                400  kbits/sec
  TE-class[2]:                 0  kbits/sec
  TE-class[3]:                 0  kbits/sec
  TE-class[4]:                600  kbits/sec
  TE-class[5]:                400  kbits/sec
  TE-class[6]:                 0  kbits/sec
  TE-class[7]:                 0  kbits/sec

Attribute Flags: 0x00000000

Link ID:: 1 (POS0/2/0/2)
  Link IP Address       : 7.1.1.1
  O/G Intf ID          : 5
  Neighbor              : ID 0000.0000.0002.00, IP 7.1.1.2
  SRLGs                :
  TE Metric            : 10
  IGP Metric           : 10
  Physical BW          : 155520 kbits/sec
  BCID                 : MAM
  Max Reservable BW    : 1000 kbits/sec
  BC0                  : 600 kbits/sec
  BC1                  : 400 kbits/sec

Downstream::
                                Reservable BW
                                -----
  TE-class[0]:                600  kbits/sec
  TE-class[1]:                400  kbits/sec
  TE-class[2]:                 0  kbits/sec
  TE-class[3]:                 0  kbits/sec
  TE-class[4]:                600  kbits/sec
  TE-class[5]:                400  kbits/sec
  TE-class[6]:                 0  kbits/sec
  TE-class[7]:                 0  kbits/sec

Attribute Flags: 0x00000000

IGP Area[2]:: ospf 100 area 0
  Flooding Protocol    : OSPF
  IGP System ID       : 10.10.10.10

```

```

MPLS-TE Router ID   : 10.10.10.10
Flooded Links       : 2

Link ID:: 0 (POS0/2/0/1)
  Link IP Address    : 7.2.2.1
  O/G Intf ID       : 4
  Neighbor           : ID 20.20.20.20, IP 7.2.2.2
  SRLGs              :
  TE Metric          : 1
  IGP Metric         : 1
  Physical BW        : 155520 kbits/sec
  BCID               : MAM
  Max Reservable BW : 1000 kbits/sec
  BC0                : 600 kbits/sec
  BC1                : 400 kbits/sec

Downstream::
                                Reservable BW
                                -----
  TE-class[0]:                600  kbits/sec
  TE-class[1]:                400  kbits/sec
  TE-class[2]:                 0  kbits/sec
  TE-class[3]:                 0  kbits/sec
  TE-class[4]:                600  kbits/sec
  TE-class[5]:                400  kbits/sec
  TE-class[6]:                 0  kbits/sec
  TE-class[7]:                 0  kbits/sec

Attribute Flags: 0x00000000

Link ID:: 1 (POS0/2/0/2)
  Link IP Address    : 7.1.1.1
  O/G Intf ID       : 5
  Neighbor           : ID 20.20.20.20, IP 7.1.1.2
  SRLGs              :
  TE Metric          : 1
  IGP Metric         : 1
  Physical BW        : 155520 kbits/sec
  BCID               : MAM
  Max Reservable BW : 1000 kbits/sec
  BC0                : 600 kbits/sec
  BC1                : 400 kbits/sec

Downstream::
                                Reservable BW
                                -----
  TE-class[0]:                600  kbits/sec
  TE-class[1]:                400  kbits/sec
  TE-class[2]:                 0  kbits/sec
  TE-class[3]:                 0  kbits/sec
  TE-class[4]:                600  kbits/sec

Attribute Flags: 0x00000000

```

Table 35 describes the significant fields shown in the display.

Table 35 *show mpls traffic-eng link-management advertisements Field Descriptions*

Field	Description
Flooding Status	Status of the link management flooding system.
Last Flooding	Number of seconds since the last flooding occurred.
Last Flooding Trigger	Description of last flooding event triggering the flooding.
Next Periodic Flooding In	Number of seconds until TE floods the LSA ¹ .
Diff-Serv TE Mode	Diff-Serv TE mode, prestandard or IETF.
Configured Areas	Number of the configured IGP ² areas.
IGP Area [1] ID	Name of the first IGP area.
Flooding Protocol	IGP that is flooding information for this area.
IGP System ID	Identification that IGP flooding uses in this area to identify this node.
MPLS-TE Router ID	MPLS-TE router ID.
Flooded Links	Number of links flooded in this area.
Link ID	Index of the link described.
Link IP Address	Local IP address of the link.
Neighbor	IGP neighbor.
SRLGs ³	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.
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	ID of the bandwidth constraints model, 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.
Downstream	Direction of the LSP path message.
Reservable BW[x]	Bandwidth available for reservations in the global TE topology and sub-pools.
Attribute Flags	Link attribute flags being flooded.
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.

1. Link State Advertisement
2. Interior Gateway Protocol
3. 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 EXEC mode.

show mpls traffic-eng link-management bandwidth-allocation [*interface type interface-id*]

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

Command Modes EXEC

Command History	Release	Modification
	Release 2.0	This command was introduced on the Cisco CRS-1.
	Release 3.0	No modification.
	Release 3.2	This command was supported on the Cisco XR 12000 Series Router.
	Release 3.3.0	No modification.
	Release 3.4.0	No modification.
	Release 3.5.0	No modification.
	Release 3.6.0	No modification.
	Release 3.7.0	No modification.

Usage Guidelines To use this command, you must be in a user group associated with a task group that includes the proper task IDs. For detailed information about user groups and task IDs, see the *Configuring AAA Services on Cisco IOS XR Software* module of the *Cisco IOS XR System Security Configuration Guide*.

Advertised and current information may differ depending on how flooding is configured.

Task ID	Task ID	Operations
	mpls-te	read

show mpls traffic-eng link-management bandwidth-allocation

Examples

The following is 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 POS
0/2/0/1
```

System Information::

```
Links Count      : 4
Bandwidth Hold time : 15 seconds
```

Link ID:: POS0/2/0/1 (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

Table 36 describes the significant fields shown in the display.

Table 36 *show mpls traffic-eng link-management bandwidth-allocation Field Descriptions*

Field	Description
Links Count	Number of links configured for MPLS-TE.
Bandwidth Hold Time	Time (in seconds) that bandwidth can be held.
Link ID	Interface name and IP address of the link.
Link Label type	Label type of the link, for example: <ul style="list-style-type: none"> • PSC¹ • TDM² • FSC³
Physical BW	Link bandwidth capacity (in bits per second).
BCID	Bandwidth constraints 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.

1. Packet switch capable
2. Time-division multiplexing
3. Fiber switch capable

show mpls traffic-eng link-management bfd-neighbors

To display TE-enabled Bidirectional Forwarding Detection (BFD) neighbors, use the **show mpls traffic-eng link-management bfd-neighbors** command in EXEC mode.

```
show mpls traffic-eng link-management bfd-neighbors [type interface-id]
```

Syntax Description

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

Command Modes

EXEC

Command History

Release	Modification
Release 3.2	This command was introduced on the Cisco CRS-1.
Release 3.3.0	No modification.
Release 3.4.0	No modification.
Release 3.5.0	No modification.
Release 3.6.0	No modification.
Release 3.7.0	No modification.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes the proper task IDs. For detailed information about user groups and task IDs, see the *Configuring AAA Services on Cisco IOS XR Software* module of the *Cisco IOS XR System Security Configuration Guide*.

Task ID

Task ID	Operations
mpls-te, network	read, read

Examples

The following is sample output from the **show mpls traffic-eng link-management bfd-neighbors** command:

```
Link ID:: POS0/6/0/0
BFD Neighbor Address: 7.3.3.1, State: Up
Link ID:: POS0/6/0/1
No BFD Neighbor
Link ID:: POS0/6/0/2
BFD Neighbor Address: 7.4.4.1, State: Down
```

Table 37 describes the significant fields shown in the display.

Table 37 *show mpls traffic-eng link-management bfd Field Descriptions*

Field	Description
Link ID	Link by which the neighbor is reached.
BFD Neighbor Address	Neighbor address and Up/Down state.

Related Commands

Command	Description
bfd fast-detect (MPLS-TE)	Enables BFD for communication failure detection.
bfd minimum-interval (MPLS-TE)	Sets the BFD interval.
bfd multiplier (MPLS-TE)	Sets the BFD multiplier.

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 EXEC mode.

```
show mpls traffic-eng link-management igp-neighbors [igp-id {isis | ospf ospf-id} | interface
  type interface-id | A.B.C.D. A.B.C.D.]
```

Syntax Description

igp-id	(Optional) Displays the IGP neighbors that are using a specified IGP identification.
isis <i>isis-address</i>	(Optional) Displays the specified Intermediate System-to-Intermediate System (IS-IS) neighbor when neighbors are displayed by IGP ID.
ospf <i>ospf-id</i>	(Optional) Displays the specified Open Shortest Path first (OSPF) neighbor when neighbors are displayed by IGP ID.
interface	(Optional) Displays information on the specified interface.
<i>type</i>	Interface type. For more information, use the question mark (?) online help function.
<i>interface-id</i>	Identifies a 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.
A.B.C.D. <i>A.B.C.D.</i>	(Optional) Displays the IGP neighbors that are using a specified IGP IP address.

Command Modes

EXEC

Command History

Release	Modification
Release 2.0	This command was introduced on the Cisco CRS-1.
Release 3.0	No modification.
Release 3.2	This command was supported on the Cisco XR 12000 Series Router.
Release 3.3.0	No modification.
Release 3.4.0	No modification.
Release 3.5.0	No modification.
Release 3.6.0	No modification.
Release 3.7.0	No modification.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes the proper task IDs. For detailed information about user groups and task IDs, see the *Configuring AAA Services on Cisco IOS XR Software* module of the *Cisco IOS XR System Security Configuration Guide*.

Task ID	Task ID	Operations
	mpls-te	read

Examples

The following is 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: POS0/7/0/0
  No Neighbors
```

```
Link ID: POS0/7/0/1
  Neighbor ID: 10.90.90.90 (area: ospf area 0, IP: 10.15.12.2)
```

[Table 38](#) describes the significant fields shown in the display.

Table 38 *show mpls traffic-eng link-management igp-neighbors 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 EXEC mode.

show mpls traffic-eng link-management interfaces [*type interface-id*]

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

Command Modes EXEC

Command History	Release	Modification
	Release 2.0	This command was introduced on the Cisco CRS-1.
	Release 3.0	No modification.
	Release 3.2	This command was supported on the Cisco XR 12000 Series Router.
	Release 3.3.0	No modification.
	Release 3.4.0	No modification.
	Release 3.4.1	No more than 100 links can be configured under MPLS-TE/Fast Reroute (FRR).
	Release 3.5.0	No modification.
	Release 3.6.0	No modification.
	Release 3.7.0	No modification.

Usage Guidelines To use this command, you must be in a user group associated with a task group that includes the proper task IDs. For detailed information about user groups and task IDs, see the *Configuring AAA Services on Cisco IOS XR Software* module of the *Cisco IOS XR System Security Configuration Guide*.

You cannot configure more than 100 links under MPLS-TE.

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 pos 0/2/0/1

System Information::
  Links Count          : 4 (Maximum Links Supported 100)

Link ID:: POS0/2/0/1 (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
  Max Res BW (RDM)     : 100000 kbits/sec
  BC0 (RDM)            : 100000 kbits/sec
  BC1 (RDM)            : 50000 kbits/sec
  Max Res BW (MAM)     : 1000 kbits/sec
  BC0 (MAM)            : 600 kbits/sec
  BC1 (MAM)            : 400 kbits/sec
  Admin Weight         : 1 (OSPF), 10 (ISIS)
  Neighbors            :
                        ID 0000.0000.0002.00, IP 7.2.2.2 (Up)
                        ID 20.20.20.20, IP 7.2.2.2 (Up)

Flooding Status: (2 area)
  IGP Area[1]: isis 1 level-2, flooded
  IGP Area[2]: ospf 100 area 0, flooded
```

Table 39 describes the significant fields shown in the display.

Table 39 *show mpls traffic-eng link-management interfaces 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.
MPLS-TE Link State	Status of the MPLS link.
Inbound Admission	Link admission policy for inbound tunnels.
Outbound Admission	Link admission policy for outbound tunnels.
IGP Neighbor Count	IGP ¹ neighbors directly reachable over this link.
Admin. Weight	Administrative weight associated with this link.

Table 39 *show mpls traffic-eng link-management interfaces Field Descriptions (continued)*

Field	Description
Neighbors	Neighbor on 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.

1. Interior Gateway Protocol

show mpls traffic-eng link-management statistics

To display interface resources or a summary of link management information, use the **show mpls traffic-eng link-management statistics** command in EXEC mode.

show mpls traffic-eng link-management statistics [**summary** | **interface** *type interface-id*]

Syntax Description	
statistics	(Optional) Statistics on link management.
summary	(Optional) Statistics summary.
interface	(Optional) Interface for which information is requested.
<i>type</i>	Interface type. For more information, use the question mark (?) online help function.
<i>interface-id</i>	Identifies a physical interface or a virtual interface.
	<p>Note Use the show interfaces command to see a list of all possible interfaces currently configured on the router.</p> <p>For more information about the syntax for the router, use the question mark (?) online help function.</p>

Command Modes	
	EXEC

Command History	Release	Modification
	Release 2.0	This command was introduced on the Cisco CRS-1.
	Release 3.0	No modification.
	Release 3.2	This command was supported on the Cisco XR 12000 Series Router.
	Release 3.3.0	No modification.
	Release 3.4.0	No modification.
	Release 3.5.0	No modification.
	Release 3.6.0	No modification.
	Release 3.7.0	No modification.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes the proper task IDs. For detailed information about user groups and task IDs, see the *Configuring AAA Services on Cisco IOS XR Software* module of the *Cisco IOS XR System Security Configuration Guide*.

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 is 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 Requests	Setup Admits	Setup Rejects	Setup Errors	Tear Requests	Tear Preempts	Tear Errors
Path	13	12	1	0	10	0	0
Resv	8	8	0	0	5	0	0

[Table 40](#) describes the significant fields shown in the display.

Table 40 *show mpls traffic-eng link-management statistics summary 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 EXEC mode.

show mpls traffic-eng link-management summary

Syntax Description This command has no keywords or arguments.

Command Modes EXEC

Command History	Release	Modification
	Release 2.0	This command was introduced on the Cisco CRS-1.
	Release 3.0	No modification.
	Release 3.2	This command was supported on the Cisco XR 12000 Series Router.
	Release 3.3.0	No modification.
	Release 3.4.0	No modification.
	Release 3.4.1	No more than 100 links can be configured for MPLS-TE Fast Reroute (FRR).
	Release 3.5.0	No modification.
	Release 3.6.0	No modification.
	Release 3.7.0	No modification.

Usage Guidelines To use this command, you must be in a user group associated with a task group that includes the proper task IDs. For detailed information about user groups and task IDs, see the *Configuring AAA Services on Cisco IOS XR Software* module of the *Cisco IOS XR System Security Configuration Guide*.

You cannot configure more than 100 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
-----
```

■ **show mpls traffic-eng link-management summary**

```

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

```

Table 41 describes the significant fields shown in the display.

Table 41 *show mpls traffic-eng link-management summary* 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 ¹ 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.

1. 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 EXEC mode.

show mpls traffic-eng maximum tunnels

Syntax Description This command has no arguments or keywords.

Command Modes EXEC

Command History	Release	Modification
	Release 2.0	This command was introduced on the Cisco CRS-1.
	Release 3.0	No modification.
	Release 3.2	This command was supported on the Cisco XR 12000 Series Router.
	Release 3.3.0	No modification.
	Release 3.4.0	No modification.
	Release 3.5.0	No modification.
	Release 3.6.0	No modification.
	Release 3.7.0	No modification.

Usage Guidelines To use this command, you must be in a user group associated with a task group that includes the proper task IDs. For detailed information about user groups and task IDs, see the *Configuring AAA Services on Cisco IOS XR Software* module of the *Cisco IOS XR System Security Configuration Guide*.

Task ID	Task ID	Operations
	mpls-te	read

Examples The following is sample output from the **show mpls traffic-eng maximum tunnels** command:

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

Current Max      Absolute Max      Current Count
-----
          2500             4096             20
```

Table 42 describes the significant fields shown in the display.

Table 42 *show mpls traffic-eng maximum tunnels Field Descriptions*

Field	Description
Current Max	Allowable configurable TE tunnels on this router.
Absolute Max	Maximum TE tunnels configurable (limited by the Current Max value, above).
Current Count	Number of configured TE tunnels.

Related Commands

Command	Description
mpls traffic-eng maximum tunnels	Specifies the maximum number of tunnel TE interfaces that can be configured.

show mpls traffic-eng topology

To display the MPLS-TE network topology currently known at this node, use the **show mpls traffic-eng topology** command in EXEC mode.

```
show mpls traffic-eng topology [path destination A.B.C.D. [affinity number mask number |
bandwidth number | priority level] | tunnel tunnel-number] | [isis nsap-address | ospf
ospf-address {router | network}] [A.B.C.D.] [brief] [model-type {rdm | mam}]
```

Syntax Description

path destination	(Optional) Path to a destination from this router.
<i>A.B.C.D.</i>	(Optional) Node IP address (router identifier to interface address).
affinity number	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 number	Link attribute to be checked. 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.
bandwidth number	Bandwidth value required by this label switched path (LSP).
priority level	Priority used when signaling a LSP for this tunnel to determine which existing tunnels can be preempted.
tunnel tunnel-number	(Optional) Path of a tunnel from this route. Range is 0 to 65535.
isis nsap-address	(Optional) Node router identification, if Intermediate System-to-Intermediate System (IS-IS) is enabled.
ospf ospf-address	(Optional) Node router identifier, if Open Shortest Path First (OSPF) is enabled.
router	Given OSPF address is of type router node.
network	Given OSPF address is of type network node.
brief	(Optional) Brief form of the output providing a less detailed version of the topology.
model-type {rdm mam}	(Optional) Bandwidth constraints model type, RDM or MAM

Command Modes

EXEC

show mpls traffic-eng topology

Command History

Release	Modification
Release 2.0	This command was introduced on the Cisco CRS-1.
Release 3.0	No modification.
Release 3.2	This command was supported on the Cisco XR 12000 Series Router.
Release 3.3.0	No modification.
Release 3.4.0	No modification.
Release 3.5.0	No modification.
Release 3.6.0	No modification.
Release 3.6.0	No modification.
Release 3.7.0	No modification.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes the proper task IDs. For detailed information about user groups and task IDs, see the *Configuring AAA Services on Cisco IOS XR Software* module of the *Cisco IOS XR System Security Configuration Guide*.

This show command has two output formats based on Diff-Serv TE mode configured as shown in the examples.

Task ID

Task ID	Operations
mpls-te	read, write

Examples

The following is 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 is 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 is 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:, Encoding:
  BC Model ID:RDM
  Physical BW:155520 (kbps), Max Reservable BW Global:100000 (kbps)
  Max Reservable BW Sub:50000 (kbps)

```

	Total Allocated BW (kbps)	Global Pool Reservable BW (kbps)	Sub Pool Reservable 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 is 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
  Switching Capability:, Encoding:
  BC Model ID:MAM
  Physical BW:155520 (kbps), Max Reservable BW:1000 (kbps)
  BC0:600 (kbps) BC1:400 (kbps)

```

	Total Allocated BW (kbps)	Reservable 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

show mpls traffic-eng topology

```

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
  Switching Capability:, Encoding:
  BC Model ID:MAM
  Physical BW:155520 (kbps), Max Reservable BW:1000 (kbps)
  BC0:600 (kbps) BC1:400 (kbps)

```

	Total Allocated BW (kbps)	Reservable 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 is sample output for the **show mpls traffic-eng 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

```

Table 43 describes the significant fields shown in the display.

Table 43 *show mpls traffic-eng topology Field Descriptions*

Field	Description
My_System_id	IGP ¹ system or IGP router ID.
Signalling error holddown	Link hold-down timer configured to handle path error events to exclude link from topology.
IGP Id	Identification of the advertising router.
Link	MPLS-TE link.
Frag Id	GP LSA ² fragment identifier.
Nbr Intf Address	Neighbor Interface address of this link.
TE Metric	TE cost of link.
Switching Capability	Switching capability: packet, optical, lambda.
Physical BW	Physical line rate.
BC Model ID	Bandwidth Constraints Model ID, RDM or MAM.
Max Reservable BW	Maximum bandwidth (in kilobits per second) that you can reserve on a link.

Table 43 *show mpls traffic-eng topology Field Descriptions (continued)*

Field	Description
Max Reservable BW Global	Maximum bandwidth (in kilobits per second) that you can reserve on a link in global-pool (prestandard and RDM).
Max Reservable BW Sub	Maximum bandwidth (in kilobits per second) that you can reserve on a link in sub-pool (prestandard and RDM).
BC0	Maximum bandwidth (in kilobits per second) that you can reserve on a link in BC0.
BC1	Maximum bandwidth (in kilobits per second) that you can reserve on a link in BC1.
TE-class[index]	Available bandwidth in TE-class (map of class-type and priority) at given index.
Total Allocated BW	Bandwidth (in Kbps) allocated at that priority.
Global Pool Reservable BW	Available bandwidth (in kbps) reservable at that priority in global pool (prestandard RDM).
Sub Pool Reservable BW	Available bandwidth (in kbps) reservable at that priority in sub-pool (prestandard RDM).

1. Interior Gateway Protocol
2. Link State Advertisement

Related Commands

Command	Description
show mpls traffic-eng tunnels	Displays information about MPLS-TE tunnels.

show mpls traffic-eng tunnels

To display information about MPLS-TE tunnels, use the **show mpls traffic-eng tunnels** command in EXEC mode.

```
show mpls traffic-eng tunnels [backup [name tunnel-name | promotion-timer |
protected-interface | topology | tunnel-number]] [brief] [destination destination-address]
[down] [interface [in | out | inout] interface-id] [name tunnel-name | tunnel-number]
[property [backup-tunnel | fast-reroute]] [protection] [role [all | heads | tails]] [source
source-address] [suboptimal constraints [current | max | none]] [summary | up [igp ospf |
isis] | [within-last interval] | [reoptimized within-last interval] | [class-type ct]] [detail]
[tabular]
```

Syntax	Description
backup	(Optional) Displays FRR ¹ backup tunnels information. The information includes the physical interface protected by the tunnel, the number of TE LSPs ² protected, and the bandwidth protected.
name <i>tunnel-name</i>	(Optional) Displays the tunnel with given name.
promotion-timer <i>promotion-timer</i>	(Optional) Displays the configured fast-reroute (FRR) backup tunnel promotion timer value in seconds.
protected-interface	(Optional) Displays FRR protected interfaces.
topology	(Optional) Displays FRR topology.
<i>tunnel-number</i>	(Optional) Restricts the display to the specified tunnel number.
brief	(Optional) Brief form of command.
destination <i>destination-address</i>	(Optional) Restricts the display to tunnels destined to the specified IP address.
down	(Optional) Displays tunnels that are down.
interface in <i>interface-id</i>	(Optional) Displays tunnels that use the specified input interface.
interface out <i>interface-id</i>	(Optional) Displays tunnels that use the specified output interface.
interface inout <i>interface-id</i>	(Optional) Displays tunnels that use the specified interface as an input or output interface.
name <i>tunnel-name</i> <i>tunnel number</i>	(Optional) Displays tunnels of the specified name or tunnel number.
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.

role [all heads tails]	(Optional) <ul style="list-style-type: none"> Displays all tunnels. Displays tunnels with their heads at this router. Displays tunnels with their tails at this router.
source <i>source-address</i>	(Optional) Restricts the display to tunnels with a matching source IP address.
suboptimal constraints [current max none]	(Optional) Displays tunnels whose path metric is <ul style="list-style-type: none"> Greater than the current shortest path constrained by the tunnel's configured options (current) Greater than the current shortest path, constrained by the configured options for the tunnel, and considering only the network capacity (max) Greater than the shortest unconstrained path (none) <p>Selected tunnels would have a shorter path if they were reoptimized immediately.</p>
summary	(Optional) Displays summary of configured tunnels.
up [[igp ospf isis] within-last interval] [class-type ct]	(Optional) <ul style="list-style-type: none"> Displays tunnels if the tunnel interface is up. Display tunnels with path calculated using given IGP type (<i>ospf</i> or <i>isis</i>). Displays tunnels that came up within-last given time interval. Displays tunnels using given class-type value config
reoptimized within-last interval	(Optional) Displays tunnels reoptimized within-last given time interval.
detail	(Optional) Displays detail information about headend tunnels.
tabular	(Optional) Displays a table showing TE LSPs, with one entry per line.
1. Fast Reroute	
2. Label Switched Paths	

Command Modes

EXEC

Command History

Release	Modification
Release 2.0	This command was introduced on the Cisco CRS-1.
Release 3.0	No modification.
Release 3.2	This command was supported on the Cisco XR 12000 Series Router.
Release 3.3.0	Added tabular keyword.
Release 3.4.0	No modification.
Release 3.5.0	The command output was updated to support unequal load-balancing parameters.

show mpls traffic-eng tunnels

Release	Modification
Release 3.6.0	No modification.
Release 3.7.0	If specified, sample output was modified to display the area on its own line after the existing path-option information.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes the proper task IDs. For detailed information about user groups and task IDs, see the *Configuring AAA Services on Cisco IOS XR Software* module of the *Cisco IOS XR System Security Configuration Guide*.

Use the **brief** form of the **show mpls traffic-eng tunnels** command to display information specific to a tunnel interface. Use the command form without the **brief** keyword to display information including the destination address, source ID, role, name, suboptimal constraints, and interface.

Task ID

Task ID	Operations
mpls-te	read, write

Examples

The following 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 1

Name: tunnel-te1 Destination: 103.0.0.3
Status:
  Admin:    up Oper:    up Path:  valid Signalling: connected

  path option 1, type dynamic (Basis for Setup, path weight 2)
    OSPF 0 area 0
    G-PID: 0x0800 (derived from egress interface properties)

Config Parameters:
  Bandwidth:    9001 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:    9001
  Direction:   unidirectional
  Endpoint switching capability: unknown, encoding type: unassigned
  Transit switching capability: unknown, encoding type: unassigned

History:
  Tunnel has been up for: 4d19h
  Current LSP:
    Uptime: 4d19h
  Prior LSP:
    ID: path option 1 [10]
    Removal Trigger: path verification failed

Path info (ospf 0 area 0):
Hop0: 11.0.0.1
Hop1: 11.0.0.2
Hop2: 11.4.4.2
Hop3: 11.4.4.3
Hop4: 103.0.0.3
```

The following is 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 pos
0/6/0/0
```

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: 1.1.1.1

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
```

[Table 44](#) describes the significant fields shown in the display.

Table 44 *show mpls traffic-eng tunnels Field Descriptions*

Field	Description
LSP Tunnels Process	Status of the LSP ¹ tunnels process.
RSVP Process	Status of the RSVP process.
Forwarding	Status of forwarding (enabled or disabled).
Periodic reoptimization	Time until the next periodic reoptimization (in seconds).
Periodic FRR Promotion	Time until the next periodic FRR ² promotion (in seconds).
Periodic auto-bw collection	Time until the next periodic auto-bw collection (in seconds).
Name	Interface configured at the tunnel head.

Table 44 *show mpls traffic-eng tunnels Field Descriptions (continued)*

Field	Description
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.

1. Link-State Packet
2. Fast Reroute

The following is 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: POS0/6/0/0
  LSP signalling info:
    Original: out i/f: POS0/7/0/0, 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
```

Table 45 describes the significant fields shown in the display.

Table 45 *show mpls traffic-eng tunnels protection Field Descriptions*

Field	Description
Tunnel#	Number of the MPLS-TE backup tunnel.
LSP Head/router	If this node is head or router for this LSP ¹ .
Instance	LSP ID.
Backup tunnel	If this backup tunnel providing protection is NHOP/NNHOP.
out if	Backup tunnel's outgoing interface

Table 45 *show mpls traffic-eng tunnels protection Field Descriptions (continued)*

Field	Description
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.

1. Link-State Packet

The following 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 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: POS0/7/0/0
  Protected lsps: 0
  Backup BW: any-class unlimited, Inuse: 0 kbps
```

[Table 46](#) describes the significant fields shown in the display.

Table 46 *show mpls traffic-eng tunnels backup Field Descriptions*

Field	Description
Tunnel#	Number of the MPLS-TE backup tunnel.
Dest	IP address of the destination of the backup tunnel.
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 this backup.
Protected lsps:	Number of LSPs currently protected by this backup
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 inuse on this backup.

The following is 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: POS0/5/0/1
  Tunnel100 UNUSED : out i/f:                               Admin: down Oper: down
```

■ **show mpls traffic-eng tunnels**

```
Interface: POS0/7/0/0
  Tunnel160   NHOP : out i/f: POS0/6/0/0   Admin:   up   Oper:   up
```

Table 47 describes the significant fields shown in the display.

Table 47 *show mpls traffic-eng tunnels backup protected-interface Field Descriptions*

Field	Description
Interface	MPLS-TE-enabled FRR protected interface.
Tunnel#	FRR protected tunnel on the interface.
NHOP/NNHOP/UNUSED	State of Protected tunnel: unused, next hop, next-next hop.
out i/f	Outgoing interface of the backup tunnel providing the protection.

The following is sample output from the **show mpls traffic-eng tunnels up** command using the **igp ospf** keywords:

```
RP/0/RP0/CPU0:router# show mpls traffic-eng tunnels up igp ospf
```

Signalling Summary:

```
    LSP Tunnels Process: running
    RSVP Process:      running
    Forwarding:        enabled
    Periodic reoptimization: every 3600 seconds, next in 3381 seconds
    Periodic FRR Promotion: every 300 seconds, next in 81 seconds
    Periodic auto-bw collection: disabled
```

```
Name: tunnel-tell Destination: 30.30.30.30
```

Status:

```
Admin:   up Oper:   up Path:  valid Signalling: connected
```

```
path option 1, type explicit back (Basis for Setup, path weight 1)
G-PID: 0x0800 (derived from egress interface properties)
```

Config Parameters:

```
Bandwidth:      0 kbps (CT0) Priority:  7 7 Affinity: 0x0/0xffff
Number of configured name based affinities: 2
Name based affinity constraints in use:
  Include bit map      : 0x4 (refers to undefined affinity name)
  Include-strict bit map: 0x4
```

Metric Type: TE (default)

```
AutoRoute: disabled LockDown: disabled Loadshare:      0 bw-based
Auto-bw: disabled(0/0) 0 Bandwidth Requested:      0
Direction: unidirectional
Endpoint switching capability: unknown, encoding type: unassigned
Transit switching capability: unknown, encoding type: unassigned
```

History:

```
Tunnel has been up for: 00:00:21
Current LSP:
  Uptime: 00:00:21
Prior LSP:
  ID: path option 1 [4]
  Removal Trigger: tunnel shutdown
```

Path info (ospf area 0):

```
Hop0: 7.4.4.2
Hop1: 30.30.30.30
```

Displayed 1 (of 3) heads, 0 (of 0) midpoints, 0 (of 0) tails
 Displayed 1 up, 0 down, 0 recovering, 0 recovered heads

The following is sample output from the **show mpls traffic-eng tunnels** command using the **up within-last** keywords:

```
RP/0/RP0/CPU0:router# show mpls traffic-eng tunnels up within-last 200

Signalling Summary:
    LSP Tunnels Process: running
    RSVP Process: running
    Forwarding: enabled
    Periodic reoptimization: every 3600 seconds, next in 3381 seconds
    Periodic FRR Promotion: every 300 seconds, next in 81 seconds
    Periodic auto-bw collection: disabled

Name: tunnel-tell Destination: 30.30.30.30
Status:
  Admin: up Oper: up Path: valid Signalling: connected

  path option 1, type explicit back (Basis for Setup, path weight 1)
  G-PID: 0x0800 (derived from egress interface properties)

Config Parameters:
  Bandwidth: 0 kbps (CT0) Priority: 7 7 Affinity: 0x0/0xffff
  Number of configured name based affinities: 2
  Name based affinity constraints in use:
    Include bit map : 0x4 (refers to undefined affinity name)
    Include-strict bit map: 0x4
Metric Type: TE (default)
  AutoRoute: disabled LockDown: disabled Loadshare: 0 bw-based
  Auto-bw: disabled(0/0) 0 Bandwidth Requested: 0
  Direction: unidirectional
  Endpoint switching capability: unknown, encoding type: unassigned
  Transit switching capability: unknown, encoding type: unassigned

History:
  Tunnel has been up for: 00:00:21
  Current LSP:
    Uptime: 00:00:21
  Prior LSP:
    ID: path option 1 [4]
    Removal Trigger: tunnel shutdown

Path info (ospf area 0):
  Hop0: 7.4.4.2
  Hop1: 30.30.30.30
```

Displayed 1 (of 3) heads, 0 (of 0) midpoints, 0 (of 0) tails
 Displayed 1 up, 0 down, 0 recovering, 0 recovered heads

The following is 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
```

show mpls traffic-eng tunnels

```
Name: tunnel-tel Destination: 30.30.30.30
Status:
  Admin:    up Oper:    up Path:  valid Signalling: connected

  path option 1, type explicit prot1 (Basis for Setup, path weight 1)
  G-PID: 0x0800 (derived from egress interface properties)

Config Parameters:
  Bandwidth:      66 kbps (CT0) Priority:  7 7 Affinity: 0x0/0xffff
  Metric Type: IGP (global)
  AutoRoute:  enabled LockDown: disabled Loadshare:      66 bw-based
  Auto-bw: disabled(0/0) 0 Bandwidth Requested:      66
  Direction: unidirectional
  Endpoint switching capability: unknown, encoding type: unassigned
  Transit switching capability: unknown, encoding type: unassigned

History:
  Tunnel has been up for: 00:14:04
  Current LSP:
    Uptime: 00:03:52
    Selection: reoptimization
  Prior LSP:
    ID: path option 1 [2013]
    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
```

The following is sample output from the **show mpls traffic-eng tunnels** command using the **detail** keyword:

```
RP/0/RP0/CPU0:router# show mpls traffic-eng tunnel 1 detail

Name: tunnel-tel Destination: 24.24.24.24
Status:
  Admin:    up Oper:    up

  Working Path:  valid Signalling: connected
  Protecting Path:  valid Protect Signalling: connected
  Working LSP is carrying traffic

  path option 1, type explicit po4 (Basis for Setup, path weight 1)
  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: POS0/4/0/0, 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: POS0/6/0/0, 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

```

The following is sample output from the **show mpls traffic-eng tunnels** command using the **role mid** keyword:

```

RP/0/RP0/CPU0:router# show mpls traffic-eng tunnel 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: POS0/2/0/1, 33
OutLabel: POS0/3/0/0, 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:

```

show mpls traffic-eng tunnels

```

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

```

Table 48 describes the significant fields shown in the display.

Table 48 *show mpls traffic-eng tunnels tabular 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).
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.

Related Commands

Command	Description
backup-bw	Specifies the bandwidth type LSPs can use for a backup tunnel, whether the backup tunnel should provide bandwidth protection, and if so, how much and in which bandwidth pool.
mpls traffic-eng interface	Enables MPLS-TE tunnel signaling on an interface.

signalled-bandwidth

To configure the bandwidth required for an MPLS-TE tunnel, use the **signalled-bandwidth** command in interface configuration mode. To return to the default 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

<i>bandwidth</i>	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 0 to 4294967295.
class-type <i>ct</i>	Class-type of the tunnel bandwidth request. Range is 0 to 1. Class-type 0 is strictly equivalent to global-pool. Class-type 1 is strictly equivalent to sub-pool.
sub-pool <i>bandwidth</i>	Reserves the bandwidth in the sub-pool instead of the global pool. Range is 1 to 4294967295. A sub-pool bandwidth value of 0 is not allowed.

Defaults

The default is 0 in class-type 0.

Command Modes

Interface configuration

Command History

Release	Modification
Release 2.0	This command was introduced on the Cisco CRS-1.
Release 3.0	No modification.
Release 3.2	This command was introduced on the Cisco XR 12000 Series Router.
Release 3.3.0	No modification.
Release 3.4.0	No modification.
Release 3.5.0	No modification.
Release 3.6.0	No modification.
Release 3.7.0	No modification.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes the proper task IDs. For detailed information about user groups and task IDs, see the *Configuring AAA Services on Cisco IOS XR Software* module of the *Cisco IOS XR System Security Configuration Guide*.

The **signalled-bandwidth** command supports two bandwidth pools (class-types) for **Diff-Serv Aware TE** (DS-TE) feature.

**Note**

The Cisco DiffServe 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

The following 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# config
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
```

The following 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# config
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
```

Related Commands

Command	Description
show mpls traffic-eng tunnels	Displays information about MPLS-TE tunnels.

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

<i>name</i>	Name used to signal the tunnel.
-------------	---------------------------------

Defaults

Default name is the hostname_tID, where ID is the tunnel interface number.

Command Modes

Interface configuration

Command History

Release	Modification
Release 3.3.0	This command was introduced on the Cisco CRS-1 and Cisco XR 12000 Series Router.
Release 3.4.0	No modification.
Release 3.5.0	No modification.
Release 3.6.0	No modification.
Release 3.7.0	No modification.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes the proper task IDs. For detailed information about user groups and task IDs, see the *Configuring AAA Services on Cisco IOS XR Software* module of the *Cisco IOS XR System Security Configuration Guide*.

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
```

Related Commands

Command	Description
show mpls traffic-eng tunnels	Displays information about MPLS-TE tunnels.

snmp traps mpls traffic-eng

To enable the router to send MPLS-TE Simple Network Management Protocol (SNMP) notifications or informs, use the **snmp traps mpls traffic-eng** command in global configuration mode. To return to the default behavior, use the **no** form of this command.

snmp traps mpls traffic-eng [*notification-option*]

no snmp traps mpls traffic-eng [*notification-option*]

Syntax Description

<i>notification-option</i>	(Optional) Specifies the notification option to enable the sending of notifications to indicate changes in the status of MPLS-TE tunnels. Use one of the following values: <ul style="list-style-type: none"> • up • down • reoptimize • reroute
----------------------------	--

Defaults

No default behavior or values

Command Modes

Global configuration

Command Modes

Release	Modification
Release 2.0	This command was introduced on the Cisco CRS-1.
Release 3.0	No modification.
Release 3.2	This command was supported on the Cisco XR 12000 Series Router.
Release 3.3.0	No modification.
Release 3.4.0	No modification.
Release 3.5.0	No modification.
Release 3.6.0	No modification.
Release 3.7.0	No modification.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes the proper task IDs. For detailed information about user groups and task IDs, see the *Configuring AAA Services on Cisco IOS XR Software* module of the *Cisco IOS XR System Security Configuration Guide*.

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

The following 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
```

Related Commands

Command	Description
snmp-server host	Specifies the recipient of a Simple Network Management Protocol (SNMP) notification operation.

switching (GMPLS)

To configure TE-link switching attributes, use the **switching** command in MPLS-TE interface configuration mode. To return to the default behavior, use the **no** form of this command.

```
switching {key value} {link [capability switching | encoding encoding type]}
```

```
no switching {key value} {link [capability switching | encoding encoding type]}
```

Syntax Description

key	Interface Switching Capability Key.
<i>key value</i>	Local interface switching capability key value. Range is 1-99.
link	Enables link switching.
capability <i>switching</i>	Configures switching capability type.
encoding <i>encoding type</i>	Enables local encoding. Range is 1 to 99.

Defaults

No default behavior or values

Command Modes

MPLS-TE interface configuration

Command Modes

Release	Modification
Release 3.3.0	This command was introduced on the Cisco CRS-1 and Cisco XR 12000 Series Router.
Release 3.4.0	No modification.
Release 3.5.0	No modification.
Release 3.6.0	No modification.
Release 3.7.0	No modification.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes the proper task IDs. For detailed information about user groups and task IDs, see the *Configuring AAA Services on Cisco IOS XR Software* module of the *Cisco IOS XR System Security Configuration Guide*.

Task ID

Task ID	Operations
mpls-te	read, write

Examples

The following example shows how to configure interface switching key on Packet-over-SONET (PoS) interface 0/7/0/1:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# mpls traffic-eng
RP/0/RP0/CPU0:router(config-mpls-te)# interface POS 0/7/0/1
RP/0/RP0/CPU0:router(config-mpls-te-if)# switching key 66
```

Related Commands

Command	Description
flooding-igp (GMPLS)	Floods selected GMPLS Traffic Engineering links.
lmp hello (GMPLS)	Configures LMP IPCC management hello settings.
match (GMPLS)	Configures or matches active and passive tunnels.
passive (GMPLS)	Configures passive GMPLS tunnels.
remote (GMPLS)	Configures remote TE links.
switching (GMPLS)	Configures TE-link switching attributes.

switching endpoint (GMPLS)

To specify the switching capability and encoding types for all endpoint TE links used to signal the optical tunnel that is mandatory to set up the GMPLS LSP, use the **switching endpoint** command in tunnel-te interface configuration mode. To disable this feature, use the **no** form of this command.

switching endpoint *capability switching type encoding encoding type*

no switching endpoint *capability switching type encoding encoding type*

Syntax Description

<i>capability switching type</i>	Capability switching type is the optical LSP switching capability descriptor. The following types are used: <ul style="list-style-type: none"> psc1—Specifies Packet-Switch Capable-1 that is equivalent to numeric 1. lsc—Specifies Lambda-Switch Capable that is equivalent to numeric 150. fsc—Specifies Fiber-Switch Capable that is equivalent to numeric 200.
encoding <i>encoding type</i>	Specifies the transport capability of the TE link over which the GMPLS LSP is established. For SONET links, the encoding is specified as sonetsdh. For Ethernet links, the encoding is specified as ethernet.

Defaults

No default behavior or values

Command Modes

Tunnel-te interface configuration

Command History

Release	Modification
Release 3.3.2	This command was introduced on the Cisco CRS-1 and Cisco XR 12000 Series Router.
Release 3.4.0	No modification.
Release 3.5.0	No modification.
Release 3.6.0	No modification.
Release 3.7.0	No modification.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes the proper task IDs. For detailed information about user groups and task IDs, see the *Configuring AAA Services on Cisco IOS XR Software* module of the *Cisco IOS XR System Security Configuration Guide*.

Use the **switching endpoint** command to configure the optical LSP. The switching and encoding types must match with the configured values at the termination point of the LSP.

Task ID	Task ID	Operations
	mpls-te	read, write

Examples

The following example shows how to configure switching capability as psc1 and the encoding type as sonetsdh for the **switching endpoint** command:

```
RP/0/RP0/CPU0:router(config)# interface tunnel-te1
RP/0/RP0/CPU0:router(config-if)# ipv4 address 99.99.99.2 255.255.255.254
RP/0/RP0/CPU0:router(config-if)# signalled-name tunnel-te1
RP/0/RP0/CPU0:router(config-if)# switching endpoint psc1 encoding sonetsdh
RP/0/RP0/CPU0:router(config-if)# priority 22
RP/0/RP0/CPU0:router(config-if)# signalled-bandwidth 2488320
RP/0/RP0/CPU0:router(config-if)# destination 109.109.109.109
RP/0/RP0/CPU0:router(config-if)# direction bidirectional
RP/0/RP0/CPU0:router(config-if)# path-option 1 explicit name g1-p1-p2
RP/0/RP0/CPU0:router(config-if)# path-option protecting 1 explicit name g2-p1-p2
```

Related Commands

Command	Description
switching transit (GMPLS)	Specifies the switching capability and encoding types for all transit TE links used to signal the optical tunnel.

switching transit (GMPLS)

To specify the switching capability and encoding types for all transit TE links used to signal the optical tunnel to configure an optical LSP, use the **switching transit** command in tunnel-te interface configuration mode. To disable this feature, use the **no** form of this command.

switching transit *capability switching type encoding encoding type*

no switching transit *capability switching type encoding encoding type*

Syntax Description

<i>capability switching type</i>	Capability switching type is the optical LSP switching capability descriptor. The following types are used: <ul style="list-style-type: none"> psc1—Specifies Packet-Switch Capable-1 that is equivalent to numeric 1. lsc—Specifies Lambda-Switch Capable that is equivalent to numeric 150. fsc—Specifies Fiber-Switch Capable that is equivalent to numeric 200.
encoding <i>encoding type</i>	Specifies the transport capability of the TE link over which the GMPLS LSP is established. For SONET links, the encoding is specified as sonetsdh. For Ethernet links, the encoding is specified as ethernet.

Defaults

No default behavior or values

Command Modes

Tunnel-te interface configuration

Command History

Release	Modification
Release 3.3.2	This command was introduced on the Cisco CRS-1 and Cisco XR 12000 Series Router.
Release 3.4.0	No modification.
Release 3.5.0	No modification.
Release 3.6.0	No modification.
Release 3.7.0	No modification.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes the proper task IDs. For detailed information about user groups and task IDs, see the *Configuring AAA Services on Cisco IOS XR Software* module of the *Cisco IOS XR System Security Configuration Guide*.

Use the **switching transit** command to configure the optical LSP. The switching and encoding types must match with the configured values at the termination point of the LSP.

Task ID	Task ID	Operations
	mpls-te	read, write

Examples

The following example shows how to configure switching capability as lsc and the encoding type as sonetsdh for the **switching transit** command:

```
RP/0/RP0/CPU0:router# config
RP/0/RP0/CPU0:router(config)# interface tunnel-te1
RP/0/RP0/CPU0:router(config-if)# ipv4 address 99.99.99.2 255.255.255.254
RP/0/RP0/CPU0:router(config-if)# signalled-name tunnel-te1
RP/0/RP0/CPU0:router(config-if)# switching transit lsc encoding sonetsdh
RP/0/RP0/CPU0:router(config-if)# priority 22
RP/0/RP0/CPU0:router(config-if)# signalled-bandwidth 2488320
RP/0/RP0/CPU0:router(config-if)# destination 109.109.109.109
RP/0/RP0/CPU0:router(config-if)# direction bidirectional
RP/0/RP0/CPU0:router(config-if)# path-option 1 explicit name g1-p1-p2
RP/0/RP0/CPU0:router(config-if)# path-option protecting 1 explicit name g2-p1-p2
```

Related Commands

Command	Description
switching endpoint (GMPLS)	Specifies the switching capability and encoding types for all endpoint TE links used to signal the optical tunnel.

