



MPLS Traffic Engineering AutoTunnel Mesh Groups

MPLS Traffic Engineering AutoTunnel Mesh Groups (referred to as mesh groups) allow a network administrator to configure traffic engineering (TE) label-switched paths (LSPs) by using a few command line interface (CLI) commands.

In a network topology where edge TE label switching routers (LSRs) are connected by core LSRs, the Mesh Group feature automatically constructs a mesh of TE LSPs among the provider edge (PE) routers.

Initially, you must configure each existing TE LSR to be a member of the mesh by using a minimal set of configuration commands. When the network grows (that is, when one or more TE LSRs are added to the network as a PE router), it is not necessary to reconfigure the existing TE LSR members of that mesh.

Mesh groups have the following benefits:

- Minimize the initial configuration of the network. You configure one template interface per mesh that propagates to all mesh tunnel interfaces, as needed.
- Minimize future configurations resulting from network growth. Eliminates the need to reconfigure each existing TE LSR in order to establish a full mesh of TE LSPs whenever a new PE router is added to the network.
- Existing routers set up TE LSPs to new PE routers.
- Automatically construct a mesh of TE LSPs among the PE routers.

Feature History for MPLS Traffic Engineering AutoTunnel Mesh Groups

Release	Modification
12.0(27)S	This feature was introduced.

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Corporate Headquarters:
Cisco Systems, Inc., 170 West Tasman Drive, San Jose, CA 95134-1706 USA

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Prerequisites for MPLS Traffic Engineering AutoTunnel Mesh Groups

- Be knowledgeable about MPLS traffic engineering. See the [“Additional References” section on page 11](#).
- Identify how you will set up autotunnels (that is, identify the tunnel commands that you will include in the template interface).
- Identify a block of addresses that you will reserve for mesh tunnel interfaces.

Restrictions for MPLS Traffic Engineering AutoTunnel Mesh Groups

- Mesh groups do not support interarea tunnels because the destinations of those tunnels do not exist in the local area TE database.
- Some FIB-related error messages may occur when a tunnel is created (manually or by using the AutoTunnel Mesh Group feature), deleted, or its configuration is changed. This is a known issue and is being investigated. For more information, see DDTS CSCe88386.
- SSO coexistence mode operations are not supported.
- If you copy the router configuration to or from a tftp server and the copy operation is done directly on “running-config,” the router may be reloaded. For more information, see DDTS CSCeb01635. To work around this problem, do one of the following:
 - First copy your running-config into router flash memory and then copy it from the router flash memory to the tftp server.
 - Copy configuration files from the tftp server to flash memory first, and then copy the configuration files from the flash memory to the running configuration.
- If a router has automesh configured in disabled mode, and also has autotemplate and ACL configured, automesh may be enabled automatically if the TE topology database changes. For more information, see DDTS CSCe93070.

Information About MPLS Traffic Engineering AutoTunnel Mesh Groups

To configure autotunnel mesh groups, you need to understand the following concepts:

- [Mesh Group, page 3](#)
- [Access-List, page 3](#)
- [Template Interface, page 4](#)

Mesh Group

An autotunnel mesh group (referred to as a mesh group) is a set of connections between edge LSRs in a network. There are two types of mesh groups:

- Full—All the edge LSRs are connected. Each PE router has a tunnel to each of the other PE routers.
- Partial—Some of the edge LSRs are not connected to each other by tunnels.

To set up a mesh of tunnels, do the following on each PE router:

- Enable autotunnel mesh groups globally. See the [“Enable AutoTunnel Mesh Groups Globally” section on page 5](#).
- Create an access-list.
- Create one or more template interfaces.

Access-List

The access-list determines the destination addresses for the mesh tunnel interfaces. It is useful if you preallocate a block of related IP addresses. That block of addresses can then be used to control the PE routers to which a full or partial mesh of TE tunnel LSPs will be established. The access-list considers only the addresses that are or will be learned and stored in the TE topology database.

Example: You can create an access-list that matches all 10.1.X.X IP addresses. A template is configured with the access-list and will create mesh tunnel interfaces to destinations within the TE topology database that match that access-list.

Whenever the TE topology database is updated (for example, when a new TE LSR is inserted into the Interior Gateway Protocol [IGP]), the destination address is stored in the TE topology database of all routers in the IGP. At each update, the destination address contained in the database is compared to the access-list associated with all template interfaces. If there is a match, a mesh tunnel interface is established to the tunnel destination IP address.

Template Interface

A template interface is a logical entity; that is, it is a configuration for a tunnel interface that is not tied to specific tunnel interfaces. It can be applied dynamically, when needed.

Mesh tunnel interfaces are tunnel interfaces that are created, configured dynamically (for example, by applying (cloning) a template interface), used, and then freed when they are no longer needed.

Mesh tunnel interfaces obtain their configuration information from a template, except for the tunnel's destination address they obtain from the TE topology database that matches an access-list.

The template interface allows you to enter commands once per mesh group. These commands specify how mesh tunnel interfaces will be created. Each time a new router is added to the network, a new mesh tunnel interface is created and that configuration is duplicated from the template. Each mesh tunnel interface has the same path constraints and other parameters configured on the template interface. Only the tunnel destination address is different.

How to Configure MPLS Traffic Engineering AutoTunnel Mesh Groups

This section contains the following procedures:

- [Setting Up a Mesh of TE Tunnel LSPs, page 4](#) (required)
- [Specifying the Range of Mesh Tunnel Interface Numbers, page 8](#) (optional)
- [Showing Information About Tunnels, page 8](#) (required)
- [Monitoring Your AutoTunnel Mesh Network, page 9](#) (required)

Setting Up a Mesh of TE Tunnel LSPs

This section describes how to do the following:

- [Enable AutoTunnel Mesh Groups Globally, page 5](#)
- [Create an Access-List, page 5](#)
- [Create a Template Interface, page 6](#)

**Note**

You can perform the above actions in any order.

Enable AutoTunnel Mesh Groups Globally

SUMMARY STEPS

1. `enable`
2. `configure terminal`
3. `mpls traffic-eng auto-tunnel mesh`

DETAILED STEPS

	Command or Action	Purpose
Step 1	enable Example: Router> enable	Enables privileged EXEC mode. <ul style="list-style-type: none"> • Enter your password if prompted.
Step 2	configure terminal Example: Router# configure terminal	Enters global configuration mode.
Step 3	mpls traffic-eng auto-tunnel mesh Example: Router(config)# mpls traffic-eng auto-tunnel mesh	Enables autotunnel mesh groups globally.

Create an Access-List

SUMMARY STEPS

1. `enable`
2. `configure terminal`
3. `ip access-list {standard | extended} access-list-name`
4. `permit destination [destination-wildcard]`

DETAILED STEPS

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

	Command or Action	Purpose
Step 3	ip access-list { standard extended } <i>access-list-name</i> Example: Router(config)# ip access list standard 1	Defines an IP access list by name.
Step 4	permit <i>destination</i> [<i>destination-wildcard</i>] Example: Router(config-std-nacl)# permit destination 10.0.0.0 0.255.255.255	Sets conditions for a named IP access list.

Create a Template Interface



Note

You can enter various commands. The commands shown below illustrate a minimal configuration.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **interface auto-template** *interface-num*
4. **ip unnumbered** *type number*
5. **tunnel mode** {**aurp** | **cayman** | **dvmrp** | **eon** | **gre** | **ipip** | **iptalk** | **mpls** | **nos**}
6. **tunnel mpls traffic-eng autoroute announce**
7. **tunnel mpls traffic-eng priority** *setup-priority* [*hold-priority*]
8. **tunnel mpls traffic-eng auto-bw** [**collect-bw**] [**frequency** *seconds*] [**max-bw** *n*] [**min-bw** *n*]
9. **tunnel mpls traffic-eng path-option** *number* {**dynamic** | **explicit** {**name** *path-name* | *path-number*}} [**lockdown**]
10. **tunnel destination access-list** *num*

DETAILED STEPS

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

	Command or Action	Purpose
Step 3	<pre>interface auto-template interface-num</pre> <p>Example: Router(config)# interface auto-template 1</p>	Creates a template interface.
Step 4	<pre>ip unnumbered type number</pre> <p>Example: Router(config-if)# ip unnumbered Loopback0</p>	Enables IP processing on an interface without assigning an explicit IP address to the interface.
Step 5	<pre>tunnel mode {aurp cayman dvmrp eon gre ipip iptalk mpls nos}</pre> <p>Example: Router(config-if)# tunnel mode mpls</p>	Sets the encapsulation mode for the tunnel interface.
Step 6	<pre>tunnel mpls traffic-eng autoroute announce</pre> <p>Example: Router(config-if)# tunnel mpls traffic-eng autoroute announce</p>	Specifies that the IGP should use the tunnel (if the tunnel is up) in its enhanced SPF calculation.
Step 7	<pre>tunnel mpls traffic-eng priority setup-priority [hold-priority]</pre> <p>Example: Router(config-if)# tunnel mpls traffic-eng priority 1 1</p>	Configures the setup and reservation priority for an MPLS TE tunnel.
Step 8	<pre>tunnel mpls traffic-eng auto-bw [collect-bw] [frequency seconds] [max-bw n] [min-bw n]</pre> <p>Example: Router(config-if)# tunnel mpls traffic-eng auto-bw</p>	Configures a tunnel for automatic bandwidth adjustment and to control the manner in which the bandwidth for a tunnel is adjusted.
Step 9	<pre>tunnel mpls traffic-eng path-option number {dynamic explicit {name path-name path-number}} [lockdown]</pre> <p>Example: Router(config-if)# tunnel mpls traffic-eng path-option 1 dynamic</p>	Configures a path option for an MPLS TE tunnel. Note The only meaningful keyword to use within an explicit-path that is linked to an Auto-Template is exclude-address .
Step 10	<pre>tunnel destination access-list num</pre> <p>Example: Router(config-if)# tunnel destination access-list 1</p>	Specifies the access-list that the template interface will use for obtaining the mesh tunnel interface destination address.

Specifying the Range of Mesh Tunnel Interface Numbers

SUMMARY STEPS

1. `enable`
2. `configure terminal`
3. `mpls traffic-eng auto-tunnel mesh tunnel-num min num max num`

DETAILED STEPS

	Command or Action	Purpose
Step 1	<code>enable</code> Example: Router> <code>enable</code>	Enables privileged EXEC mode. <ul style="list-style-type: none"> • Enter your password if prompted.
Step 2	<code>configure terminal</code> Example: Router# <code>configure terminal</code>	Enters global configuration mode.
Step 3	<code>mpls traffic-eng auto-tunnel mesh tunnel-num min <i>num</i> max <i>num</i></code> Example: Router(config)# <code>mpls traffic-eng auto-tunnel mesh tunnel-num min 1000 max 2000</code>	Configures the range of mesh tunnel interface numbers.

Showing Information About Tunnels

SUMMARY STEPS

1. `enable`
2. `configure terminal`
3. `show running interface auto-template num`
4. `show interface tunnel num configuration`

DETAILED STEPS

	Command or Action	Purpose
Step 1	enable Example: Router> enable	Enables privileged EXEC mode. <ul style="list-style-type: none"> Enter your password if prompted.
Step 2	configure terminal Example: Router# configure terminal	Enters global configuration mode.
Step 3	show running interface auto-template num Example: Router# show running interface auto-template 1	Displays interface configuration information for a tunnel interface.
Step 4	show interface tunnel num configuration Example: Router# show interface tunnel 5 configuration	Displays the configuration of the mesh tunnel interface.

Monitoring Your AutoTunnel Mesh Network

SUMMARY STEPS

- enable
- configure terminal
- show mpls traffic-eng tunnels property auto-tunnel mesh
- show mpls traffic-eng auto-tunnel mesh

DETAILED STEPS

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

	Command or Action	Purpose
Step 3	<pre>show mpls traffic-eng tunnels property auto-tunnel mesh</pre> <p>Example: Router# show mpls traffic-eng tunnels property auto-tunnel mesh</p>	Restricts the output of the show mpls traffic-eng tunnels command to only mesh tunnel interfaces.
Step 4	<pre>show mpls traffic-eng auto-tunnel mesh</pre> <p>Example: Router# show mpls traffic-eng auto-tunnel mesh</p>	Displays the cloned mesh tunnel interfaces of each autotemplate interface and the current range of mesh tunnel interface numbers.

Troubleshooting Tips

- Mesh tunnel interfaces can be configured directly. However, they cannot be deleted manually and manual configuration is not permanent. The configuration will be overwritten when the template changes or the mesh tunnel interface is deleted and re-created. If you attempt to manually delete a mesh tunnel interface, an error message appears.
- Enter the **show mpls traffic-eng tunnels destination *address*** command.
- Enter the **show mpls traffic-eng tunnels property auto-tunnel mesh** command.

Configuration Examples for MPLS Traffic Engineering AutoTunnel Mesh Groups

This section provides the following configuration examples:

- [Creating an Access-List Configuration: Example, page 10](#)
- [Creating a Template Configuration: Example, page 11](#)
- [Specifying the Range of Mesh Tunnel Interface Numbers Configuration: Example, page 11](#)

Creating an Access-List Configuration: Example

In the following example, any IP address in the TE topology database that matches access-list 1 will cause the creation of a mesh tunnel interface with that destination address.

```
Router(config)# ip access-list standard 1
Router(config-std-nacl)# permit 10.0.0.0 0.255.255.255
```

Creating a Template Configuration: Example

In the following example, a template is created and configured with a typical set of traffic engineering commands. The mesh group created will consist of mesh tunnel interfaces with destination addresses that match access-list 1.



Note

You can enter various commands. The following commands show a typical configuration.

```
Router(config)# interface Auto-Template 1
Router(config-if)# ip unnumbered Loopback0
Router(config-if)# tunnel mode mpls
Router(config-if)# tunnel mpls traffic-eng autoroute announce
Router(config-if)# tunnel mpls traffic-eng priority 1 1
Router(config-if)# tunnel mpls traffic-eng auto-bw
Router(config-if)# tunnel mpls traffic-eng path-option 1 dynamic
Router(config-if)# tunnel destination access-list 1
```

Specifying the Range of Mesh Tunnel Interface Numbers Configuration: Example

In the following example, the lowest mesh tunnel interface number can be 1000, and the highest mesh tunnel interface number can be 2000.

```
Router(config)# mpls traffic-eng auto-tunnel mesh tunnel-num min 1000 max 2000
```

Additional References

The following sections provide additional references related to AutoTunnel Mesh Groups.

Related Documents

Related Topic	Document Title
MPLS Traffic Engineering	<ul style="list-style-type: none"> <i>Cisco IOS Switching Services Command Reference</i>, Release 12.3

Standards

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

MIBs

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

RFCs

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

Technical Assistance

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

Command Reference

This section documents only new and modified commands.

- [clear mpls traffic-eng auto-tunnel mesh](#)
- [interface auto-template](#)
- [mpls traffic-eng auto-tunnel mesh](#)
- [mpls traffic-eng auto-tunnel mesh tunnel-num](#)
- [show interface tunnel configuration](#)
- [show mpls traffic-eng auto-tunnel mesh](#)
- [show mpls traffic-eng tunnels](#)
- [show running interface auto-template](#)
- [tunnel destination access-list](#)

clear mpls traffic-eng auto-tunnel mesh

To remove all the mesh tunnel interfaces and re-create them, use the **clear mpls traffic-eng auto-tunnel mesh** command in privileged EXEC mode.

clear mpls traffic-eng auto-tunnel mesh

Syntax Description This command has no arguments or keywords.

Defaults No default behavior or values

Command Modes Privileged EXEC

Command History	Release	Modification
	12.0(27)S	This command was introduced.

Examples The following example removes all mesh tunnel interfaces and re-creates them:

```
Router# clear mpls traffic-eng auto-tunnel mesh
```

Related Commands	Command	Description
	interface auto-template	Creates the template interface.

interface auto-template

To create the template interface, use the **interface auto-template** command in global configuration mode. To delete this interface, use the **no** form of this command.

interface auto-template *interface-num*

no interface auto-template

Syntax Description	<i>interface-num</i>	Interface number. Valid values are 1 to 25.
---------------------------	----------------------	---------------------------------------------

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

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

Command History	Release	Modification
	12.0(27)S	This command was introduced.

Usage Guidelines	<p>The space before the <i>interface-num</i> argument is optional.</p> <p>Use the shutdown command to disable mesh tunnel interface creation in this template.</p>	
-------------------------	---------------------------------------------------------------------------------------------------------------------------------------------------------------------------	--

Examples	The following example establishes template interface 1:	
-----------------	---------------------------------------------------------	--

```
Router(config)# interface auto-template 1
```

Related Commands	Command	Description
	clear mpls traffic-eng auto-tunnel mesh	Removes all the mesh tunnel interfaces and re-creates them.
	mpls traffic-eng auto-tunnel mesh	Enables autotunnel mesh groups globally.
	show mpls traffic-eng auto-tunnel mesh	Displays the cloned mesh tunnel interfaces of each autotemplate interface and the current range of mesh tunnel interface numbers.

mpls traffic-eng auto-tunnel mesh

To enable autotunnel mesh groups globally, use the **mpls traffic-eng auto-tunnel mesh** command in global configuration mode. To disable this feature, use the **no** form of this command.

mpls traffic-eng auto-tunnel mesh

no mpls traffic-eng auto-tunnel mesh

Syntax Description This command has no arguments or keywords.

Defaults Autotunnel mesh groups are not enabled globally.

Command Modes Global configuration

Command History	Release	Modification
	12.0(27)S	This command was introduced.

Examples The following example enables autotunnel mesh groups globally:

```
Router(config)# mpls traffic-eng auto-tunnel mesh
```

Related Commands	Command	Description
	interface auto-template	Creates the template interface.

mpls traffic-eng auto-tunnel mesh tunnel-num

To configure the range of mesh tunnel interface numbers, use the **mpls traffic-eng auto-tunnel mesh tunnel-num** command in global configuration mode. To use the default values, use the **no** form of this command.

mpls traffic-eng auto-tunnel mesh tunnel-num min *num* max *num*

no mpls traffic-eng auto-tunnel mesh tunnel-num min *num* max *num*

Syntax Description	min <i>num</i>	Beginning number of the mesh tunnel interface. Valid values are from 1 to 65535.
	max <i>num</i>	Ending number of the mesh tunnel interface. Valid values are from 1 to 65535.

Defaults The **min** default is 64336. The **max** default is 65335.

Command Modes Global configuration

Command History	Release	Modification
	12.0(27)S	This command was introduced.

Usage Guidelines If you change an access control list (ACL) and tunnels are deleted because they no longer match the ACL, tunnels that are re-created may not be numbered sequentially; that is, the range of tunnel numbers may not be sequential.

Examples The following example specifies that the beginning number of the mesh tunnel interface is 1000, and the ending number is 2000.

```
Router(config)# mpls traffic-eng auto-tunnel mesh tunnel-num min 1000 max 2000
```

Related Commands	Command	Description
	show mpls traffic-eng auto-tunnel mesh	Displays the cloned mesh tunnel interfaces of each autotemplate interface and the current range of mesh tunnel interface numbers.

show interface tunnel configuration

To display the configuration of a mesh tunnel interface, use the **show interface tunnel configuration** command in privileged EXEC mode.

show interface tunnel *num* configuration

Syntax Description	<i>num</i>	Number of the mesh tunnel for which you want to display configuration information.
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Defaults	No default behavior or values
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Command Modes	Privileged EXEC
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Command History	Release	Modification
	12.0(27)S	This command was introduced.

Usage Guidelines	The space before the <i>num</i> argument is optional. Use this command to show the running configuration of the mesh tunnel interface.
-------------------------	-------------------------------------------------------------------------------------------------------------------------------------------

Examples The following example shows the configuration of mesh tunnel interface 5:

```
Router# show interface tunnel 5 configuration

interface tunnel 5
 ip unnumbered Loopback0
 no ip directed-broadcast
 no keepalive
 tunnel destination access-list 1
 tunnel mode mpls traffic-eng
 tunnel mpls traffic-eng autoroute announce
 tunnel mpls traffic-eng path-option 1 dynamic
```

Related Commands	Command	Description
	tunnel destination access-list	Specifies the access-list that the template interface will use for obtaining the mesh tunnel interface destination address.

show mpls traffic-eng auto-tunnel mesh

To display the cloned mesh tunnel interfaces of each autotemplate interface and the current range of mesh tunnel interface numbers, use the **show mpls traffic-eng auto-tunnel mesh** command in user and privileged EXEC mode.

show mpls traffic-eng auto-tunnel mesh

Syntax Description This command has no arguments or keywords.

Defaults No default behavior or values

Command Modes User EXEC
Privileged EXEC

Command History	Release	Modification
	12.0(27)S	This command was introduced.

Examples The following example displays the cloned mesh tunnel interfaces for autotemplate1 and indicates that the range of mesh tunnel interface numbers is between 64336 and 65337. Information for only one autotemplate is displayed because only one autotemplate was configured.

```
Router# show mpls traffic-eng auto-tunnel mesh
```

```
Auto-Templatel:
```

```
Using access-list 1 to clone the following tunnel interfaces:
```

```

Destination  Interface
-----
10.2.2.2     Tunnel164336
10.3.3.3     Tunnel164337

```

```
Mesh tunnel interface numbers: min 64336 max 65337
```

Related Commands	Command	Description
	interface auto-template	Creates the template interface.
	mpls traffic-eng auto-tunnel mesh tunnel-num	Configures the range of mesh tunnel interface numbers.

show mpls traffic-eng tunnels

To show information about tunnels, use the **show mpls traffic-eng tunnels** command in user and privileged EXEC mode. To restrict the display to information about mesh tunnel interfaces, specify the **property auto-tunnel mesh** keywords.

```
show mpls traffic-eng tunnels tunnel-interface [brief]
```

```
show mpls traffic-eng tunnels
```

```
  [property auto-tunnel mesh]
```

```
  [destination address]
```

```
  [source-id {num | ipaddress | ipaddress num}]
```

```
  [role {all | head | middle | tail | remote}]
```

```
  [{up | down}]
```

```
  [name string]
```

```
  [suboptimal constraints {none | current | max}]
```

```
  [{ [interface in phys-intf] [interface out phys-intf] | [interface phys-intf]}]
```

```
  [brief]
```

Syntax Description

<i>tunnel-interface</i>	Displays information for the specified tunneling interface.
brief	(Optional) Displays the information in brief format.
property auto-tunnel mesh	(Optional) Restricts the display to mesh tunnel interfaces.
destination <i>address</i>	(Optional) Restricts the display to tunnels destined to the specified IP address.
source-id	(Optional) Restricts the display to tunnels with a matching source IP address or tunnel number.
<i>num</i>	(Optional) Tunnel number.
<i>ipaddress</i>	(Optional) Source IP address.
<i>ipaddress num</i>	(Optional) Source IP address and tunnel number.
role	(Optional) Restricts the display to tunnels with the indicated role (all, head, middle, tail, or remote).
all	(Optional) Displays all tunnels.
head	(Optional) Displays tunnels with their heads at this router.
middle	(Optional) Displays tunnels with their midpoints at this router.
tail	(Optional) Displays tunnels with their tails at this router.
remote	(Optional) Displays tunnels with their heads at another router; this is a combination of the middle and tail keyword values.
up	(Optional) Displays tunnels if the tunnel interface is up. Tunnel midpoints and tails are typically up or not present.
down	(Optional) Displays tunnels that are down.

show mpls traffic-eng tunnels

name <i>string</i>	(Optional) Displays tunnels with the specified name. The tunnel name is derived from the interface description, if specified; otherwise, it is the interface name. The tunnel name is included in the signalling message so it is available at all hops.
suboptimal constraints <i>none</i>	(Optional) Displays tunnels whose path metric is greater than the shortest unconstrained path. Selected tunnels have a longer path than the IGP's shortest path.
suboptimal constraints <i>current</i>	(Optional) Displays tunnels whose path metric is greater than the current shortest path, constrained by the tunnel's configured options. Selected tunnels would have a shorter path if they were reoptimized immediately.
suboptimal constraints <i>max</i>	(Optional) Displays tunnels whose path metric is greater than the current shortest path, constrained by the tunnel's configured options, and considering only the network's capacity. Selected tunnels would have a shorter path if no other tunnels were consuming network resources.
interface in <i>phys-intf</i>	(Optional) Displays tunnels that use the specified input interface.
interface out <i>phys-intf</i>	(Optional) Displays tunnels that use the specified output interface.
interface <i>phys-intf</i>	(Optional) Displays tunnels that use the specified interface as an input or output interface.
brief	(Optional) Specifies one line per tunnel.

Defaults

No default behavior or values

Command Modes

User EXEC

Privileged EXEC

Command History

Release	Modification
12.0(5)S	This command was introduced.
12.1(3)T	The new brief format includes input and output interface command information. The suboptimal and interface keywords were added to the nonbrief format. The nonbrief, nonsummary formats each include the history of LSP selection.
12.0(27)S	The property auto-tunnel mesh keywords were added.

Usage Guidelines

To restrict the display output to information about mesh tunnel interfaces, specify the **property auto-tunnel mesh** keywords.

Examples

The following example displays information about mesh tunnel interfaces:

```
Router# show mpls traffic-eng tunnels property auto-tunnel mesh brief
```

```
Signalling Summary:
  LSP Tunnels Process:      running
  RSVP Process:             running
  Forwarding:               enabled
  Periodic reoptimization:  every 3600 seconds, next in 491
seconds
  Periodic FRR Promotion:   Not Running
  Periodic auto-bw collection: disabled
TUNNEL NAME                DESTINATION    UP IF    DOWN IF
STATE/PROT
router_t64336              10.2.2.2      -        Se2/0
up/up
router_t64337              10.3.3.3      -        Se2/0
up/up
Displayed 2 (of 2) heads, 0 (of 0) midpoints, 0 (of 0) tails
```

Related Commands

Command	Description
interface auto-template	Creates the template interface.
tunnel destination access-list	Specifies the access-list that the template interface will use for obtaining the mesh tunnel interface destination address.

show running interface auto-template

To display configuration information for a tunnel's interface, use the **show running interface auto-template** command in privileged EXEC mode.

show running interface auto-template *num*

Syntax Description	<i>num</i>	Number of the tunnel interface for which you want to display information.
---------------------------	------------	---------------------------------------------------------------------------

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

Command Modes	Privileged EXEC
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Command History	Release	Modification
	12.0(27)S	This command was introduced.

Usage Guidelines	The space before the <i>num</i> argument is optional.
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Examples	The following example displays information for interface 1:
-----------------	-------------------------------------------------------------

```
Router# show running interface auto-template 1

interface auto-templatel
 ip unnumbered Loopback0
 no ip directed-broadcast
 no keepalive
 tunnel destination access-list 1
 tunnel mode mpls traffic-eng
 tunnel mpls traffic-eng autoroute announce
 tunnel mpls traffic-eng path-option 1 dynamic
```

Related Commands	Command	Description
	interface auto-template	Creates the template interface.
	tunnel destination access-list	Specifies the access-list that the template interface will use for obtaining the mesh tunnel interface destination address.

tunnel destination access-list

To specify the access-list that the template interface will use for obtaining the mesh tunnel interface destination address, use the **tunnel destination access-list** command in interface configuration mode. To remove the access-list from this template interface, use the **no** form of this command.

tunnel destination access-list *num*

no tunnel destination access-list *num*

Syntax Description

<i>num</i>	Number of the access-list.
------------	----------------------------

Defaults

No default behavior or values

Command Modes

Interface configuration

Command History

Release	Modification
12.0(27)S	This command was introduced.

Usage Guidelines

This command can exist only on template interfaces.

If you specify an access-list that does not exist, no tunnels are set up.

If you enter the **shutdown** command on the autotemplate interface, the command is executed on all the cloned tunnel interfaces. To delete all the cloned tunnel interfaces, enter **no tunnel destination** on the autotemplate. To delete tunnel interfaces for a particular autotemplate, go to that interface and enter **no tunnel destination**.

Examples

The following example configures the template interface to use access-list 1 to obtain the tunnel destination address.

```
Router(config-if)# tunnel destination access-list

interface auto-template 1
 tunnel destination access-list 1
```

Related Commands

Command	Description
interface auto-template	Creates the template interface.
mpls traffic-eng auto-tunnel mesh	Configures the range of mesh tunnel interface numbers.

Glossary

CE router—customer edge router. A router, which is part of a customer's network, that interfaces to a PE router.

customer network—A network that is under the control of an end customer. A customer network can use private addresses. Customer networks are logically isolated from each other and from the service provider's network.

edge router—A router at the edge of the network. It defines the boundaries of the MPLS network. It receives and transmits packets.

head-end—The LSR at which a tunnel originates. The tunnel's "head" or tunnel interface resides at this LSR as well.

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

LSP—label-switched path. A path that is followed by a labeled packet over several hops, starting at an ingress LSR and ending at an egress LSR.

label-switched path (LSP) tunnel—A configured connection between two routers, using label switching to carry the packets.

LSR—label switching router. A Layer 3 router that forwards a packet based on the value of a label encapsulated in the packet.

mesh group—A set of LSRs that are members of a full mesh or partial mesh of TE LSPs.

MPLS traffic engineering—Multiprotocol Label Switching traffic engineering. A constraint-based routing algorithm for routing LSP tunnels.

P router—Provider core router.

PE router—Provider edge router. A router, at the edge of the service provider's network, that interfaces to CE routers.

router—A network layer device that uses one or more metrics to determine the optimal path along which network traffic should be forwarded. Routers forward packets from one network to another based on network layer information.

tail-end—The downstream, receive end of a tunnel.

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

tunnel—A secure communication path between two peers, such as two routers. A traffic engineering tunnel is a label-switched tunnel that is used for traffic engineering. Such a tunnel is set up through means other than normal Layer 3 routing; it is used to direct traffic over a path different from the one that Layer 3 routing could cause the tunnel to take.

**Note**

Refer to *Internetworking Terms and Acronyms* for terms not included in this glossary.

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