



MPLS Traffic Engineering Path Link and Node Protection Configuration Guide, Cisco IOS Release 12.4

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MPLS Traffic Engineering (TE)--IP Explicit Address Exclusion

The MPLS Traffic Engineering (TE)--IP Explicit Address Exclusion feature provides a means to exclude a link or node from the path for Multiprotocol Label Switching (MPLS) TE label switched path (LSP).

The feature is enabled through the **ip explicit-path** command that allows you to create an IP explicit path and enter a configuration submode for specifying the path. The feature adds to the submode commands the **exclude-address** command for specifying addresses to exclude from the path.

If the excluded address for an MPLS TE LSP identifies a flooded link, the constraint-based shortest path first (CSPF) routing algorithm does not consider that link when computing paths for the LSP. If the excluded address specifies a flooded MPLS TE router ID, the CSPF routing algorithm does not allow paths for the LSP to traverse the node identified by the router ID.

- [Finding Feature Information, page 1](#)
- [Prerequisites for MPLS Traffic Engineering \(TE\)--IP Explicit Address Exclusion, page 2](#)
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Finding Feature Information

Your software release may not support all the features documented in this module. For the latest feature information and caveats, see the release notes for your platform and software release. To find information about the features documented in this module, and to see a list of the releases in which each feature is supported, see the Feature Information Table at the end of this document.

Use Cisco Feature Navigator to find information about platform support and Cisco software image support. To access Cisco Feature Navigator, go to www.cisco.com/go/cfn. An account on Cisco.com is not required.

Prerequisites for MPLS Traffic Engineering (TE)--IP Explicit Address Exclusion

Your network must support the following Cisco IOS features in order to support IP explicit address exclusion:

- MPLS
- IP Cisco Express Forwarding
- Intermediate System-to-Intermediate System (IS-IS) or Open Shortest Path First (OSPF)

Restrictions for MPLS Traffic Engineering (TE)--IP Explicit Address Exclusion

MPLS TE will accept an IP explicit path comprised of either all excluded addresses configured by the **exclude-address** command or all included addresses configured by the **next-address** command, but not a combination of both.

Information About MPLS Traffic Engineering (TE)--IP Explicit Address Exclusion

- [MPLS Traffic Engineering, page 2](#)
- [Cisco Express Forwarding, page 2](#)

MPLS Traffic Engineering

MPLS is an Internet Engineering Task Force (IETF)-specified framework that provides for the efficient designation, routing, forwarding, and switching of traffic flows through the network.

Traffic engineering (TE) is the process of adjusting bandwidth allocations to ensure that enough is left for high-priority traffic.

In MPLS TE, the upstream router creates a network tunnel for a particular traffic stream, then fixes the bandwidth available for that tunnel.

Cisco Express Forwarding

Cisco Express Forwarding is an advanced, Layer 3 switching technology inside a router. It defines the fastest method by which a Cisco router forwards packets from ingress to egress interfaces. The **ip cef** command enables Cisco Express Forwarding globally, and the **ip route-cache cef** command enables Cisco Express Forwarding on an interface.

How to Configure MPLS Traffic Engineering (TE)--IP Explicit Address Exclusion

- [Configuring IP Explicit Address Exclusion, page 3](#)
- [Configuring an MPLS Traffic Engineering Tunnel, page 4](#)

Configuring IP Explicit Address Exclusion

SUMMARY STEPS

1. enable
2. configure terminal
3. ip explicit-path {name *path-name* | identifier *number*} [enable | disable]
4. exclude-address *ip-address*
5. exit
6. show ip explicit-path

DETAILED STEPS

	Command or Action	Purpose
Step 1	<p>enable</p> <p>Example:</p> <pre>Router> enable</pre>	<p>Enables privileged EXEC mode.</p> <ul style="list-style-type: none"> • Enter your password if prompted.
Step 2	<p>configure terminal</p> <p>Example:</p> <pre>Router# configure terminal</pre>	<p>Enters global configuration mode.</p>
Step 3	<p>ip explicit-path {name <i>path-name</i> identifier <i>number</i>} [enable disable]</p> <p>Example:</p> <pre>Router(config)# ip explicit-path name OmitR12</pre>	<p>Specifies the name or number of the explicit path, and enables the path, and enters explicit-path configuration mode.</p>

Command or Action	Purpose
<p>Step 4 <code>exclude-address ip-address</code></p> <p>Example:</p> <pre>Router(cfg-ip-expl-path)# exclude-address 10.12.12.12</pre>	<p>Excludes the specified link or node from consideration by the constraint-based SPF.</p> <ul style="list-style-type: none"> The <i>ip-address</i> is a link address or the router ID for a node.
<p>Step 5 <code>exit</code></p> <p>Example:</p> <pre>Router(cfg-ip-expl-path)# exit</pre>	<p>Exits from explicit-path configuration mode, and returns to global configuration mode.</p>
<p>Step 6 <code>show ip explicit-path</code></p> <p>Example:</p> <pre>Router# show ip explicit-path</pre>	<p>Displays information about configured IP explicit paths.</p>

Configuring an MPLS Traffic Engineering Tunnel

SUMMARY STEPS

- `enable`
- `configure terminal`
- `interface type number`
- `ip unnumbered loopback0`
- `tunnel destination ip-address`
- `tunnel mode mpls traffic-eng`
- `tunnel mpls traffic-eng bandwidth bandwidth`
- `tunnel mpls traffic-eng path-option number {dynamic | explicit {name path-name | ID path-number}}` [`lockdown`]
- `exit`
- `show mpls traffic eng tunnels`

DETAILED STEPS

	Command or Action	Purpose
Step 1	<p>enable</p> <p>Example:</p> <pre>Router> enable</pre>	<p>Enables privileged EXEC mode.</p> <ul style="list-style-type: none"> Enter your password if prompted.
Step 2	<p>configure terminal</p> <p>Example:</p> <pre>Router# configure terminal</pre>	<p>Enters global configuration mode.</p>
Step 3	<p>interface <i>type number</i></p> <p>Example:</p> <pre>Router(config)# interface tunnell1</pre>	<p>Configures an interface type and enters interface configuration mode.</p>
Step 4	<p>ip unnumbered loopback0</p> <p>Example:</p> <pre>Router(config-if)# ip unnumbered loopback0</pre>	<p>Assigns the tunnel interface an IP address.</p> <ul style="list-style-type: none"> An MPLS traffic engineering tunnel interface should be unnumbered because it represents a unidirectional link.
Step 5	<p>tunnel destination <i>ip-address</i></p> <p>Example:</p> <pre>Router(config-if)# tunnel destination 10.11.11.11</pre>	<p>Specifies the destination for a tunnel.</p> <ul style="list-style-type: none"> The destination of the tunnel must be the MPLS traffic engineering router ID of the destination device.
Step 6	<p>tunnel mode mpls traffic-eng</p> <p>Example:</p> <pre>Router(config-if)# tunnel mode mpls traffic-eng</pre>	<p>Sets the tunnel encapsulation mode to MPLS traffic engineering.</p>
Step 7	<p>tunnel mpls traffic-eng bandwidth <i>bandwidth</i></p> <p>Example:</p> <pre>Router(config-if)# tunnel mpls traffic-eng bandwidth 100</pre>	<p>Configures the bandwidth for the MPLS traffic engineering tunnel.</p>

Command or Action	Purpose
<p>Step 8 <code>tunnel mpls traffic-eng path-option number</code> {dynamic explicit {name path-name ID path-number}} [lockdown]</p> <p>Example:</p> <pre>Router(config-if)# tunnel mpls traffic-eng path-option 2 dynamic</pre>	<p>Configures the tunnel to use a named IP explicit path or a path dynamically calculated from the traffic engineering topology database.</p> <ul style="list-style-type: none"> A dynamic path is used if an explicit path is unavailable. <p>Note To configure a path option that specifies an exclude address, specify the explicit keyword (not the dynamic keyword) and specify an IP explicit path configured according to the steps in the “Configuring IP Explicit Address Exclusion, page 3” section.</p>
<p>Step 9 <code>exit</code></p> <p>Example:</p> <pre>Router(config-if)# exit</pre>	<p>Exits from interface configuration mode.</p>
<p>Step 10 <code>show mpls traffic eng tunnels</code></p> <p>Example:</p> <pre>Router# show mpls traffic eng tunnels</pre>	<p>Shows information about tunnels, including the current tunnel path if a tunnel is operational.</p> <ul style="list-style-type: none"> By viewing the command output, you can determine the path that was used to build a tunnel. If you entered the exclude-address command, the specified link or node should not be listed.

Configuration Examples for MPLS Traffic Engineering (TE)--IP Explicit Address Exclusion

- [Configuring IP Explicit Address Exclusion Example, page 6](#)
- [Configuring an MPLS Traffic Engineering Tunnel Example, page 7](#)

Configuring IP Explicit Address Exclusion Example

The following example shows how to configure an MPLS TE tunnel with two path options: a preferred explicit path with an excluded address and a backup dynamic path.

Configure the IP explicit path named OmitR12, which excludes the router with router ID 10.12.12.12:

```
ip explicit-path name OmitR12
exclude-address 10.12.12.12
  Explicit Path name OmitR12:
  1: exclude-address 10.12.12.12
exit
```

To verify the configuration of the explicit path, use the **show ip explicit-path** command.

```
show ip explicit-paths name OmitR12
```

```
PATH OmitR12 (loose source route, path complete, generation 3)
 1: exclude-address 10.12.12.12
```

**Note**

You must know the router IDs for LSRs (nodes) in the network; in this example, that 10.12.12.12 is a router ID. Otherwise, it will not be apparent whether the specified address is the IP address of a link or a router ID.

Configuring an MPLS Traffic Engineering Tunnel Example

The following example configures Tunnel11 with its two options, where the preferred path option is the IP explicit path OmitR2:

```
interface tunne l11
ip unnumbered loopback0
tunnel destination 10.11.11.11
tunnel mode mpls traffic-eng
tunnel mpls traffic-eng path-option 1 explicit name OmitR12
tunnel mpls traffic-eng path-option 2 dynamic
```

**Note**

There are additional commands for configuring properties for TE tunnels such as bandwidth and priority. For descriptions of those commands, refer to the *Cisco IOS IP Switching Services Configuration Guide*.

Additional References

Related Documents

Related Topic	Document Title
MPLS commands	<i>Cisco IOS Multiprotocol Label Switching Command Reference</i>

Standards

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

MIBs

MIB	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

RFC	Title
No new or modified RFCs are supported by this release.	--

Technical Assistance

Description	Link
<p>The Cisco Support website provides extensive online resources, including documentation and tools for troubleshooting and resolving technical issues with Cisco products and technologies.</p> <p>To receive security and technical information about your products, you can subscribe to various services, such as the Product Alert Tool (accessed from Field Notices), the Cisco Technical Services Newsletter, and Really Simple Syndication (RSS) Feeds.</p> <p>Access to most tools on the Cisco Support website requires a Cisco.com user ID and password.</p>	http://www.cisco.com/techsupport

Feature Information for MPLS Traffic Engineering (TE)--IP Explicit Address Exclusion

The following table provides release information about the feature or features described in this module. This table lists only the software release that introduced support for a given feature in a given software release train. Unless noted otherwise, subsequent releases of that software release train also support that feature.

Use Cisco Feature Navigator to find information about platform support and Cisco software image support. To access Cisco Feature Navigator, go to www.cisco.com/go/cfn. An account on Cisco.com is not required.

Table 1 Feature Information for MPLS Traffic Engineering (TE)--IP Explicit Address Exclusion

Feature Name	Releases	Feature Configuration Information
MPLS Traffic Engineering (TE)-- IP Explicit Address Exclusion	12.0(14)ST 12.2(4)T 12.2(4)T2 12.2(14)S 12.0(32)S 12.2(28)SB	<p>The MPLS Traffic Engineering (TE)--IP Explicit Address Exclusion feature provides a means to exclude a link or node from the path for Multiprotocol Label Switching (MPLS) TE label switched path (LSP).</p> <p>The following command was introduced by this feature: exclude-address.</p> <p>In 12.0(14)ST, this feature was introduced.</p> <p>In 12.2(4)T, this feature was integrated into Release 12.2(4)T.</p> <p>In 12.2(4)T2, this feature was integrated into Release 12.2(4)T2.</p> <p>In 12.2(14)S, this feature was integrated into Release 12.2(14)S.</p> <p>In 12.0(32)S, this feature was integrated into Release 12.0(32)S.</p> <p>In 12.2(28)SB, this feature was integrated into Release 12.2(28)SB.</p>

Glossary

CEF --Cisco express forwarding. A means for accelerating the forwarding of packets within a router, by storing route lookup information in several data structures instead of in a route cache.

IP explicit path --A list of IP addresses, each representing a node or link in the explicit path.

link --Network communications channel consisting of a circuit or transmission path and all related equipment between a sender and a receiver. Sometimes referred to as a line or a transmission link.

MPLS --Multiprotocol Label Switching. Switching method that forwards IP traffic using a label. This label instructs the routers and the switches in the network where to forward the packets based on preestablished IP routing information.

node --Endpoint of a network connection or a junction common to two or more lines in a network. Nodes can be interconnected by links, and serve as control points in the network.

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