MPLS Traffic Engineering (TE)—IP Explicit Address Exclusion

First Published: January 16, 2003
Last Updated: February 7, 2006

The MPLS Traffic Engineering (TE)—IP Explicit Address Exclusion feature provides a means to exclude a link or node from the path for an 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 in This Module

Your Cisco IOS software release may not support all of the features documented in this module. To reach links to specific feature documentation in this module and to see a list of the releases in which each feature is supported, use the "Feature Information for MPLS Traffic Engineering (TE)—IP Explicit Address Exclusion" section on page 11.

Finding Support Information for Platforms and Cisco IOS Software Images

Use Cisco Feature Navigator to find information about platform support and Cisco IOS software image support. Access Cisco Feature Navigator at http://www.cisco.com/go/fn. You must have an account on Cisco.com. If you do not have an account or have forgotten your username or password, click **Cancel** at the login dialog box and follow the instructions that appear.

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

© 2006 Cisco Systems, Inc. All rights reserved.

Contents

- Prerequisites for MPLS Traffic Engineering (TE)—IP Explicit Address Exclusion, page 2
- Restrictions for MPLS Traffic Engineering (TE)—IP Explicit Address Exclusion, page 2
- Information About MPLS Traffic Engineering (TE)—IP Explicit Address Exclusion, page 2
- How to Configure MPLS Traffic Engineering (TE)—IP Explicit Address Exclusion, page 3
- Configuration Examples for MPLS Traffic Engineering (TE)—IP Explicit Address Exclusion, page 6
- Additional References, page 7
- Command Reference, page 8
- Glossary, page 11
- Feature Information for MPLS Traffic Engineering (TE)—IP Explicit Address Exclusion, page 11

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

To configure the MPLS Traffic Engineering (TE)—IP Explicit Address Exclusion feature, you need to understand the following concepts:

- MPLS Traffic Engineering, page 3
- Cisco Express Forwarding, page 3

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

This section contains the following procedures:

- Configuring IP Explicit Address Exclusion (required)
- Configuring an MPLS Traffic Engineering Tunnel (required)

Configuring IP Explicit Address Exclusion

To configure IP Explicit Address Exclusion, perform the following steps.

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	Purpose
Step 1	**enable** **Example:** `Router> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Router# configure terminal`	Enters global configuration mode.
Step 3	**ip explicit-path** {**name** *path-name* | **identifier** *number*} [**enable** | **disable**] **Example:** `Router(config)# ip explicit-path name OmitR12`	Specifies the name or number of the explicit path, and enables the path. Enters explicit-path configuration mode.
Step 4	**exclude-address** *ip-address* **Example:** `Router(cfg-ip-expl-path)# exclude-address 10.12.12.12`	Excludes the specified link or node from consideration by the constraint-based SPF. The *ip-address* is a link address or the router ID for a node.
Step 5	**exit** **Example:** `Router(cfg-ip-expl-path)# exit`	Exits from explicit-path configuration mode. Returns to global configuration mode.
Step 6	**show ip explicit-path** **Example:** `Router# show ip explicit-path`	Displays information about configured IP explicit paths.

Configuring an MPLS Traffic Engineering Tunnel

To configure an MPLS traffic engineering tunnel, perform the following steps.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **interface** *type number*
4. **ip unnumbered loopback0**
5. **tunnel destination** *ip-address*
6. **tunnel mode mpls traffic-eng**
7. **tunnel mpls traffic-eng bandwidth** *bandwidth*

8. **tunnel mpls traffic-eng path-option** *number* {**dynamic** | **explicit** {**name** *path-name* | **ID** *path-number*}} [**lockdown**]
9. **exit**
10. **show mpls traffic eng tunnels**

DETAILED STEPS

	Command	Purpose
Step 1	**enable** **Example:** `Router> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Router# configure terminal`	Enters global configuration mode.
Step 3	**interface** *type number* **Example:** `Router(config)# interface tunnel11`	Configures an interface type and enters interface configuration mode.
Step 4	**ip unnumbered loopback0** **Example:** `Router(config-if)# ip unnumbered loopback0`	Assigns the tunnel interface an IP address. An MPLS traffic engineering tunnel interface should be unnumbered because it represents a unidirectional link.
Step 5	**tunnel destination** *ip-address* **Example:** `Router(config-if)# tunnel destination 10.11.11.11`	Specifies the destination for a tunnel. The destination of the tunnel must be the MPLS traffic engineering router ID of the destination device.
Step 6	**tunnel mode mpls traffic-eng** **Example:** `Router(config-if)# tunnel mode mpls traffic-eng`	Sets the tunnel encapsulation mode to MPLS traffic engineering.
Step 7	**tunnel mpls traffic-eng bandwidth** *bandwidth* **Example:** `Router(config-if)# tunnel mpls traffic-eng bandwidth 100`	Configures the bandwidth for the MPLS traffic engineering tunnel.

	Command	Purpose
Step 8	**tunnel mpls traffic-eng path-option** *number* {**dynamic** | **explicit** {**name** *path-name* | **ID** *path-number*}} [*lockdown*] **Example:** `Router(config-if)# tunnel mpls traffic-eng path-option 2 dynamic`	Configures the tunnel to use a named IP explicit path or a path dynamically calculated from the traffic engineering topology database. A dynamic path is used if an explicit path is unavailable. **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" section.
Step 9	**exit** **Example:** `Router(config-if)# exit`	Exits from interface configuration mode.
Step 10	**show mpls traffic eng tunnels** **Example:** `Router# show mpls traffic eng tunnels`	Shows information about tunnels, including the current tunnel path if a tunnel is operational. 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

This section includes the following configuration examples:

- 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 tunnel11
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 Switching Services Configuration Guide*.

Additional References

The following sections provide references related to the MPLS Traffic Engineering (TE)—IP Explicit Address Exclusion feature.

Related Documents

Related Topic	Document Title
MPLS commands	*Cisco IOS Multiprotocol Label Switching Command Reference*, Release 12.4

Standards

Standard	Title
No new or modified standards are supported by this feature.	—

MIBs

MIB	MIBs Link
No new or modified MIBs are supported by this feature.	—

RFCs

RFC	Title
No new or modified RFCs are supported by this feature.	—

Technical Assistance

Description	Link
The Cisco Technical Support & Documentation website contains thousands of 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/techsupport

Command Reference

This section documents modified commands only.

- **exclude-address**

exclude-address

An IP explicit path is a list of IP addresses, each representing a node or link in the explicit path. To exclude an address from an IP explicit path, use the **exclude-address** command after entering explicit path configuration mode via the **ip-explicit path** command. To remove an address exclusion from an IP explicit path use the **no index** command.

exclude-address *A.B.C.D*

no index *number*

Syntax Description

A.B.C.D	Excludes an address from subsequent partial path segments. You can enter the IP address of a link or the router ID of a node.
number	Removes the specified address exclusion from an IP explicit path.

Defaults

Addresses are not excluded from an IP explicit path unless explicitly excluded by the **exclude-address** command.

Command Modes

Subcommand

Command History

Release	Modification
12.0(14)S	This command was introduced.
12.2(11)S	This command was integrated into Cisco IOS Release 12.2(11)S.
12.2(28)SB	This command was integrated into Cisco IOS Release 12.2(28)SB.

Usage Guidelines

If you enter the **exclude-address** command and specify the IP address of a link, the constraint-based SPF routine does not consider that link when it sets up MPLS traffic engineering paths. If the excluded address is a flooded MPLS traffic engineering router ID, the constraint-based SPF routine does not consider that entire node. The person performing the configuration must know the router IDs of the routers because it will not be apparent whether the specified number is for a link or for a node.

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

Examples

The following example shows how to create a IP explicit path with identifier 500 and enter the explicit path subcommand mode to configure the path:

```
Router(config)# ip explicit-path identifier 500
```

The following continues by showing how to exclude IP addresses 10.0.0.125 and 10.0.0.135 from IP explicit path 500:

```
Router(config-ip-expl-path)# exclude-address 10.0.0.125
Explicit Path identifier 500:
       1: exclude-address 10.0.0.125
Router(config-ip-expl-path)# exclude-address 10.0.0.135
Explicit Path identifier 500:
       1: exclude-address 10.0.0.125
       2: exclude-address 10.0.0.135
Router(config-ip-expl-path)# end
```

To remove IP address 10.0.0.125 from the excluded addresses for explicit path 500, use the following commands:

```
Router(config)# ip explicit-path identifier 500
Router(cfg-ip-expl-path)# no index 1
Explicit Path identifier 500:
    2: exclude-address 10.0.0.135
Router(cfg-ip-expl-path)# end
```

Related Commands

Command	Description
ip explicit-path	Enters the subcommand mode for Internet protocol (IP) explicit paths and creates or modifies a specified path.

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.

Note See *Internetworking Terms and Acronyms* for terms not included in this glossary.

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

Table 1 lists the release history for this feature.

Not all commands may be available in your Cisco IOS software release. For details on when support for a specific command was introduced, see the command reference documentation.

Cisco IOS software images are specific to a Cisco IOS software release, a feature set, and a platform. Use Cisco Feature Navigator to find information about platform support and Cisco IOS software image support. Access Cisco Feature Navigator at http://www.cisco.com/go/fn. You must have an account on Cisco.com. If you do not have an account or have forgotten your username or password, click **Cancel** at the login dialog box and follow the instructions that appear.

Note Table 1 lists only the Cisco IOS software release that introduced support for a given feature in a given Cisco IOS software release train. Unless noted otherwise, subsequent releases of that Cisco IOS software release train also support that feature.

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

Cisco logo, and Welcome to the Human Network are trademarks of Cisco Systems, Inc.; Changing the Way We Work, Live, Play, and Learn is a serv
ıs, Inc.; and Access Registrar, Aironet, Catalyst, CCDA, CCDP, CCIE, CCIP, CCNA, CCNP, CCSP, Cisco, the Cisco Certified Internetwork Expert logo
Cisco Systems, Cisco Systems Capital, the Cisco Systems logo, Cisco Unity, Enterprise/Solver, EtherChannel, EtherFast, EtherSwitch, Fast Step,
ormShare, GigaDrive, HomeLink, Internet Quotient, IOS, iPhone, IP/TV, iQ Expertise, the iQ logo, iQ Net Readiness Scorecard, iQuick Study, LightStre
e, MGX, Networkers, Networking Academy, Network Registrar, PIX, ProConnect, ScriptShare, SMARTnet, StackWise, The Fastest Way to Increase Y
d TransPath are registered trademarks of Cisco Systems, Inc. and/or its affiliates in the United States and certain other countries.

demarks mentioned in this document or Website are the property of their respective owners. The use of the word partner does not imply a partnership
co and any other company. (0711R)

Any Internet Protocol (IP) addresses used in this document are not intended to be actual addresses. Any examples, command display output, and figures included in the document are shown for illustrative purposes only. Any use of actual IP addresses in illustrative content is unintentional and coincidental.

© 2006 Cisco Systems, Inc. All rights reserved.