Configuring MPLS Traffic Engineering (TE)—IP Explicit Address Exclusion

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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. It will not accept a combination of both.

Information About 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 a 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 device ID.

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 device 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 device. It defines the fastest method by which a Cisco device 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

The following section provides information about the various configuration steps for MPLS Traffic Engineering (TE)—IP Explicit Address Exclusion.

Configuring IP Explicit Address Exclusion

Procedure

	Command or Action	Purpose
Step 1	**enable** **Example:** `Device> enable`	Enables privileged EXEC mode. Enter your password, if prompted.
Step 2	**configure terminal** **Example:** `Device# configure terminal`	Enters global configuration mode.
Step 3	**ip explicit-path** {**name** *path-name* | **identifier** *number*} [**enable** | **disable**] **Example:** `Device(config)# ip explicit-path name OmitR12`	Specifies the name or number of the explicit path, and enables the path, and enters explicit-path configuration mode.
Step 4	**exclude-address** *ip-address* **Example:** `Device(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:** `Device(cfg-ip-expl-path)# exit`	Exits from explicit-path configuration mode, and returns to global configuration mode.
Step 6	**exit** **Example:** `Device(config)# exit`	Exits from global configuration mode, and returns to privileged EXEC mode.
Step 7	**show ip explicit-path** **Example:** `Device# show ip explicit-path`	Displays information about configured IP explicit paths.

Configuring an MPLS Traffic Engineering Tunnel

Procedure

	Command or Action	Purpose
Step 1	**enable** **Example:** `Device> enable`	Enables privileged EXEC mode. Enter your password, if prompted.
Step 2	**configure terminal** **Example:** `Device# configure terminal`	Enters global configuration mode.
Step 3	**interface tunnel** *number* **Example:** `Device(config)# interface tunnel11`	Configures an interface type and enters interface configuration mode.
Step 4	**ip unnumbered loopback0** **Example:** `Device(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:** `Device(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:** `Device(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:** `Device(config-if)# tunnel mpls traffic-eng bandwidth 100`	Configures the bandwidth for the MPLS traffic engineering tunnel.
Step 8	**tunnel mpls traffic-eng path-option** *number* {**dynamic** | **explicit** {**name** *path-name* | **ID** *path-number*}} [*lockdown*]	Configures the tunnel to use a named IP explicit path or a path dynamically calculated from the traffic engineering topology database.

	Command or Action	Purpose
	Example: `Device(config-if)# tunnel mpls traffic-eng path-option 2 dynamic`	• If an explicit path is unavailable a dynamic path is used. **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.
Step 9	**exit** **Example:** `Device(config-if)# exit`	Exits from interface configuration mode.
Step 10	**exit** **Example:** `Device(config)# exit`	Exits to privileged EXEC mode.
Step 11	**show mpls traffic eng tunnels** **Example:** `Device# show mpls traffic eng tunnels`	Shows information about tunnels, including the current tunnel path when 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

The following section provides configuration examples for MPLS Traffic Engineering (TE)—IP Explicit Address Exclusion.

Example: Configuring IP Explicit Address Exclusion

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.

Example: Configuring an MPLS Traffic Engineering Tunnel

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

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

Related Documents

Related Topic	Document Title
Cisco IOS commands	Cisco IOS Master Commands List, All Releases
MPLS commands	*Cisco IOS Multiprotocol Label Switching Command Reference*
MPLS configuration information	*Cisco IOS XE Multiprotocol Label Switching Configuration Guide*

Standards

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

Technical Assistance

Description	Link
The Cisco Support website provides extensive online resources, including documentation and tools for troubleshooting and resolving technical issues with Cisco products and technologies. 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. Access to most tools on the Cisco Support website requires a Cisco.com user ID and password.	http://www.cisco.com/techsupport

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

This table provides release and related information for the features explained in this module.

These features are available in all the releases subsequent to the one they were introduced in, unless noted otherwise.

Release	Feature	Feature Information
Cisco IOS XE Bengaluru 17.6.1	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).
Cisco IOS XE Cupertino 17.7.1	MPLS Traffic Engineering (TE)—IP Explicit Address Exclusion	This feature was implemented on Cisco Catalyst 9600 Series Supervisor 2 Module (C9600X-SUP-2).

Use the Cisco Feature Navigator to find information about platform and software image support. To access Cisco Feature Navigator, go to https://cfnng.cisco.com/