

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 router ID.

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

Your network must support the following Cisco IOS XE 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

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.MPLS is a 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.

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

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. **exit**
7. **show ip explicit-path**

DETAILED STEPS

Procedure

	Command or Action	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, and 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, and returns to global configuration mode.
Step 6	**exit** **Example:** `Router(config)# exit`	Exits from global configuration mode, and returns to privileged EXEC mode.
Step 7	**show ip explicit-path** **Example:** `Router# show ip explicit-path`	Displays information about configured IP explicit paths.

Configuring an MPLS Traffic Engineering Tunnel

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **interface tunnel** *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. **exit**
11. **show mpls traffic eng tunnels**

DETAILED STEPS

Procedure

	Command or Action	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 tunnel** *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:**	Specifies the destination for a tunnel. • The destination of the tunnel must be the MPLS traffic engineering router ID of the destination device.

	Command or Action	Purpose
	`Router(config-if)# tunnel destination 10.11.11.11`	
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.
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, on page 2" section.
Step 9	**exit** **Example:** `Router(config-if)# exit`	Exits from interface configuration mode.
Step 10	**exit** **Example:** `Router(config)# exit`	Exits to privileged EXEC mode.
Step 11	**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

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 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 Multiprotocol Label Switching Command Reference.

Additional References

Related Documents

Related Topic	Document Title
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, 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 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 and Documentation website provides online resources to download documentation, software, and tools. Use these resources to install and configure the software and to troubleshoot and resolve technical issues with Cisco products and technologies. Access to most tools on the Cisco Support and Documentation website requires a Cisco.com user ID and password.	http://www.cisco.com/cisco/web/support/index.html

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	Cisco IOS XE Release 2.3	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). This feature was integrated into Cisco IOS XE Release 2.3. The following command was introduced by this feature: **exclude-address**.

Glossary

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.