Implementing MPLS Transport Profile

This module describes how to implement MPLS transport profile (MPLS-TP) on the router. MPLS-TP supported by IETF enables the migration of transport networks to a packet-based network that efficiently scale to support packet services in a simple and cost-effective way. MPLS-TP combines the necessary existing capabilities of MPLS with additional minimal mechanisms in order that it can be used in a transport role.

MPLS transport profile enables you to create tunnels that provide the transport network service layer over which IP and MPLS traffic traverse.

Feature History for Implementing MPLS Transport Profile

Release	Modification
Release 4.2.0	This feature was introduced.

Restrictions for MPLS-TP

- Penultimate hop popping is not supported. Only ultimate hop popping is supported, because label mappings are configured at the MPLS-TP endpoints.
- MPLS-TP links must be configured with IP addresses.
- IPv6 addressing is not supported.

L2VPN Restrictions

- Pseudowire ID Forward Equivalence Class (FEC) (type 128) is supported, but generalized ID FEC (type 129) is not supported.
- BFD over pseudowire is not supported. Static pseudowire OAM protocol is used to signal fault on static pseudowire placed over TP tunnels using pseudowire status.
- Only Ethernet pseudowire type is supported.

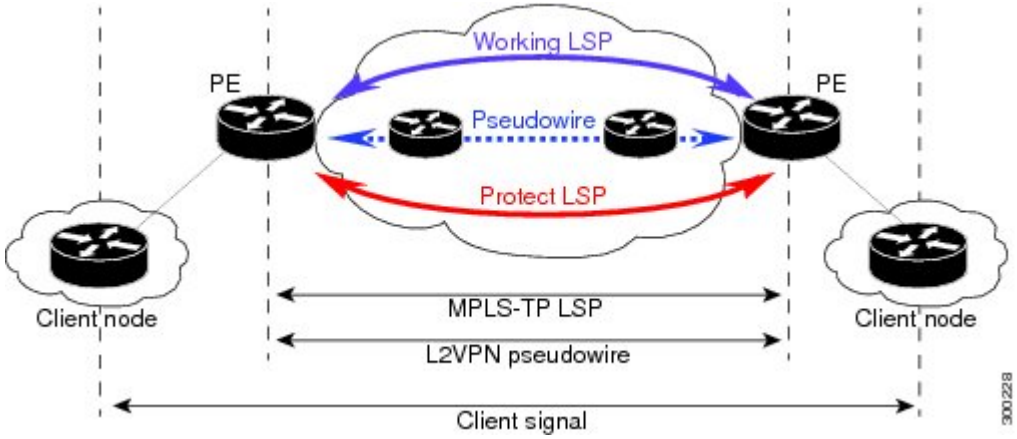
Information About Implementing MPLS Transport Profile

To implement MPLS-TP, you should understand these concepts:

MPLS Transport Profile

MPLS Transport Profile (TP) enables you to create tunnels that provide the transport network service layer over which IP and MPLS traffic traverse. MPLS-TP tunnels enable a transition from Synchronous Optical Networking (SONET) and Synchronous Digital Hierarchy (SDH) time-division multiplexing (TDM) technologies to packet switching, to support services with high bandwidth utilization and low cost. Transport networks are connection oriented, statically provisioned, and have long-lived connections. Transport networks usually avoid control protocols that change identifiers like labels. MPLS-TP tunnels provide this functionality through statically provisioned bidirectional label switched paths (LSPs). This figure shows the MPLS-TP tunnel:

Figure 1: MPLS Transport Profile Tunnel



MPLS-TP combines the necessary existing capabilities of MPLS with additional minimal mechanisms in order that it can be used in a transport role. You can set up MPLS-TP through a CLI or a network management system.

MPLS-TP tunnels have these characteristics:

- An MPLS-TP tunnel can be associated with working LSP, protect LSP, or both LSP
- Statically provisioned bidirectional MPLS-TP label switched paths (LSPs)
- Symmetric or asymmetric bandwidth reservation
- 1:1 path protection with revertive mode for MPLS-TP LSP with revertive mode for MPLS-TP LSP
- Use of Generic Alert Label (GAL) and Generic Associated Channel Header (G-ACH) to transport control packets; for example, BFD packets and pseudowire OAM packets
- BFD is used as a continuity check (CC) mechanism over MPLS-TP LSP
- Remote Defect Indication (RDI) based on BFD
- Fault OAM functions

These services are supported over MPLS-TP tunnels:

- Dynamic spoke pseudowire (for H-VPLS) over static MPLS-TP tunnels.
- Static spoke pseudowire (for H-VPLS) over static MPLS-TP tunnels.
- MS-PW services where static and dynamic pseudowire segments can be concatenated.
- MPLS ping and traceroute over MPLS TP LSP and PW.
- Static routes over MPLS-TP tunnels.
- Pseudowire redundancy for static pseudowire.
- VPWS using static or dynamic pseudowire pinned down to MPLS-TP tunnels.
- VPLS and H-VPLS using static or dynamic pseudowire pinned down to MPLS-TP tunnels.

Bidirectional LSPs

MPLS transport profile (MPLS-TP) LSPs are bidirectional and congruent where LSPs traverse the same path in both directions. An MPLS-TP tunnel can be associated with either working MPLS-TP LSP, protect MPLS-TP LSP, or both. The working LSP is the primary LSP backed up by the protect LSP. When a working LSP goes down, protect LSP is automatically activated. In order for an MPLS-TP tunnel to be operationally up, it must be configured with at least one LSP.

MPLS-TP Path Protection

Path protection provides an end-to-end failure recovery mechanism (that is, full path protection) for MPLS-TP tunnels. MPLS-TP LSPs support 1:1 path protection. You can configure the working and protect LSPs as part of configuring the MPLS-TP tunnel. The working LSP is the primary LSP used to route traffic, while the protect LSP is a backup for a working LSP. If the working LSP fails, traffic is switched to the protect LSP until the working LSP is restored, at which time traffic forwarding reverts back to the working LSP (revertive mode).

Fault OAM Support

The fault OAM protocols and messages support the provisioning and maintenance of MPLS-TP tunnels and bidirectional LSPs:

- **Generic Associated Channel**

  Generic Associated Channel (G-ACh) is the control channel mechanism associated with MPLS LSPs in addition to MPLS pseudowire. The G-ACh Label (GAL) (Label 13) is a generic alert label to identify the presence of the G-ACh in the label packet. It is taken from the reserved MPLS label space.

  G-ACh or GAL is used to support in-band OAMs of MPLS-TP LSPs and pseudowires. The OAM messages are used for fault management, connection verification, continuity check and other functions.

  These messages are forwarded along the specified MPLS LSP:

  - OAM Fault Management: Alarm Indication Signal (AIS), Link Down Indication (LDI), and Lock Report (LKR) messages (GAL with fault-OAM channel)
  - OAM Connection Verification: Ping and traceroute messages (GAL with IP channel)

- BFD messages (GAL with BFD channel)

These messages are forwarded along the specified pseudowire:

- Static pseudowire OAM messages (static pseudowire status)
- Pseudowire ping and traceroute messages

- **Fault Management: Alarm Indication Signal (AIS), Link Down Indication (LDI), and Lock Report (LKR) messages**

  LDI messages are generated at midpoint nodes when a failure is detected. The midpoint sends the LDI message to the endpoint that is reachable with the existing failure. The midpoint node also sends LKR messages to the reachable endpoint, when an interface is administratively down. AIS messages are not generated by Cisco platforms, but are processed if received. By default, the reception of LDI and LKR on the active LSP at an endpoint will cause a path protection switchover, while AIS will not.

- **Fault Management: Emulated Protection Switching for LSP Lockout**

  You can implement a form of **Emulated Protection Switching** in support of LSP Lockout using customized fault messages. When a Cisco Lockout message is sent, it does not cause the LSP to be administratively down. The Cisco Lockout message causes a path protection switchover and prevents data traffic from using the LSP. The LSP's data path remains up so that BFD and other OAM messages can continue to traverse it. Maintenance of the LSP can take place such as reconfiguring or replacing a midpoint LSR. BFD state over LSP must be **up** and MPLS ping and traceroute can be used to verify the LSP connectivity, before the LSP is put back into service by removing the lockout. You cannot lockout working and protect LSPs simultaneously.

- **LSP ping and traceroute**

  For MPLS-TP connectivity verification, you can use **ping mpls traffic-eng tunnel-tp** and **traceroute mpls traffic-eng tunnel-tp** commands. You can specify that the echo requests be sent along the working LSP or the protect LSP. You can also specify that the echo request be sent on a locked out MPLS-TP tunnel LSP (either working or protect) if the working or protect LSP is explicitly specified.

- **Continuity Check through BFD**

  BFD session is automatically created on MPLS-TP LSPs with default parameters. You can override the default BFD parameters either through global commands or per-tunnel commands. Furthermore, you can optionally specify different BFD parameters for standby LSPs. For example, when an LSP is in standby, BFD hello messages can be sent at smaller frequency to reduce line-card CPU usage. However, when a standby LSP becomes active (for example, due to protection switching), nominal BFD parameters are used for that LSPs (for example, to run BFD hello messages at higher frequency).

MPLS-TP Links and Physical Interfaces

MPLS-TP link IDs may be assigned to physical interfaces only. Bundled interfaces and virtual interfaces are not supported for MPLS-TP link IDs.

The MPLS-TP link is used to create a level of indirection between the MPLS-TP tunnel and midpoint LSP configuration and the physical interface. The MPLS-TP **link-id** command is used to associate an MPLS-TP link ID with a physical interface and next-hop node address.

Multiple tunnels and LSPs may then refer to the MPLS-TP link to indicate they are traversing that interface. You can move the MPLS-TP link from one interface to another without reconfiguring all the MPLS-TP tunnels and LSPs that refer to the link.

Link IDs must be unique on the router or node. For more information, see the *Configuring MPLS-TP Links and Physical Interfaces* section.

Tunnel LSPs

Tunnel LSPs, whether endpoint or midpoint, use the same identifying information. However, it is entered differently.

- A midpoint consists of a forward LSP and a reverse LSP. A MPLS-TP LSP mid point is identified by its name, and forward LSP, reverse LSP, or both are configured under a submode.
- At the midpoint, determining which end is source and which is destination is arbitrary. That is, if you are configuring a tunnel between your router and a coworker's router, then your router is the source. However, your coworker considers his or her router to be the source. At the midpoint, either router could be considered the source. At the midpoint, the forward direction is from source to destination, and the reverse direction is from destination to source. For more information, see the *Configuring MPLS-TP LSPs at Midpoints* section.
- At the midpoint, the LSP number does not assume default values, and hence must be explicitly configured.
- At the endpoint, the local information (source) either comes from the global node ID and global ID, or from locally configured information using the **source** command after you enter the **interface tunnel-tp** *number* command, where number is the local or source tunnel-number.
- At the endpoint, the remote information (destination) is configured using the **destination** command after you enter the **interface tunnel-tp** *number* command. The **destination** command includes the destination node ID, optionally the global ID, and optionally the destination tunnel number. If you do not specify the destination tunnel number, the source tunnel number is used.

MPLS-TP IP-less support

Generally, MPLS-TP functionality can be deployed with or without an IP address. However, the main motivation for the IP-less model is this: an LSR can be inserted into an MPLS-TP network without changing the configurations on adjacent LSRs. In the past Cisco IOS-XR MPLS-TP release, if an interface does not have a valid IP address, BFD packets cannot be transmitted over that link, and hence MPLS-TP LSP cannot be brought up on that link. In this release, the IP-less TP link operates only in a **point-to-point** mode.

This feature, therefore, makes the need for an IP address on a TP link optional. You may deploy LSRs running Cisco IOS-XR in MPLS-TP networks with or without an IP address. With such extra flexibility, LSRs running Cisco IOS-XR can be easily deployed not only with LSRs running IOS, but with LSRs from other vendors too.

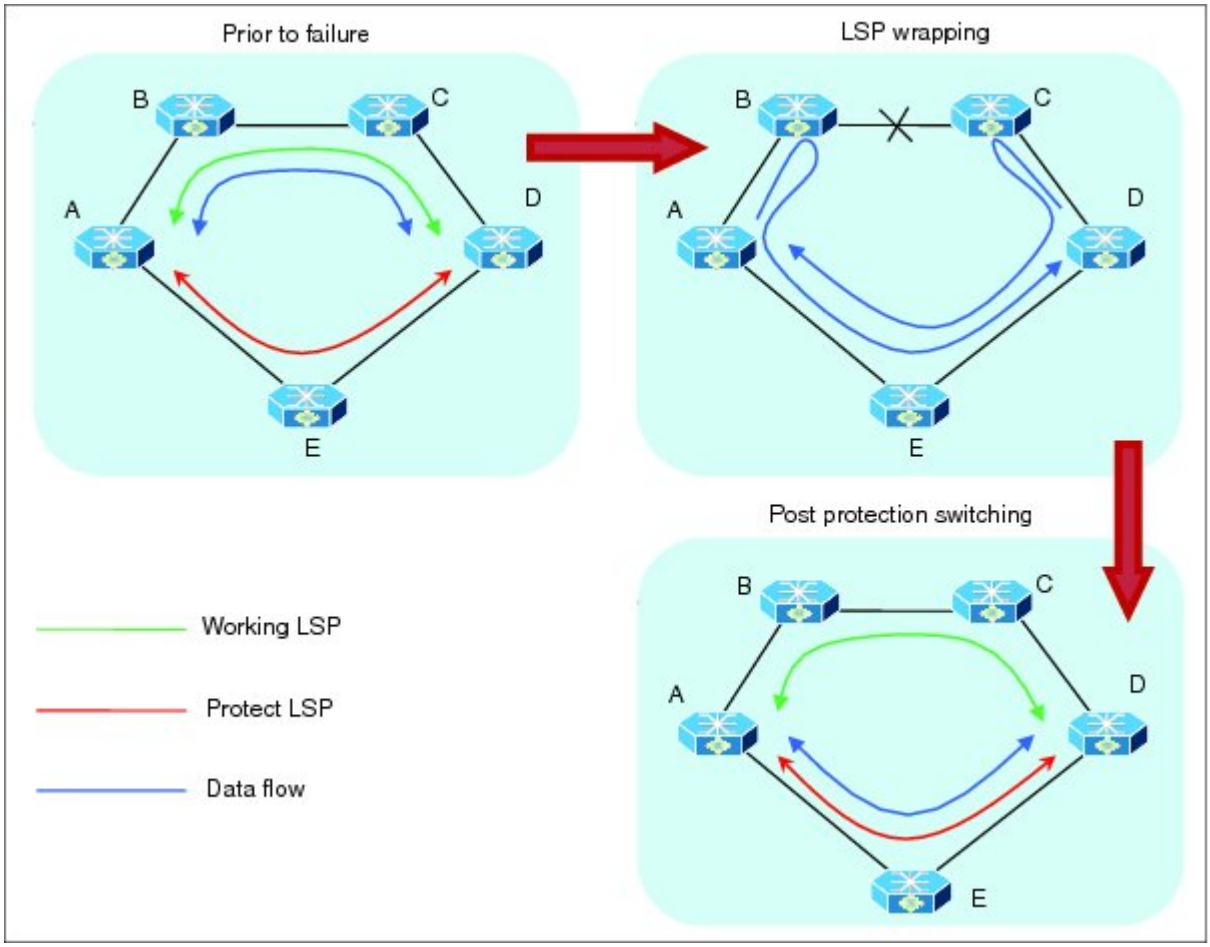
MPLS-TP LSP Wrapping

In the MPLS-TP LSP Wrapping protection scheme, a protected MPLS-TP tunnel is associated with a working LSP and protect LSP. This helps to prevent traffic loss as soon as a mid-point LSR detects a failure at physical layer rather than waiting for BFD to time-out. Also, a delay in activating protection switch due to mid-point failure does not further increase the traffic loss.

MPLS-TP LSP wrapping has to enabled only on the MID node. MPLS-TP LSP wrapping helps in detecting mid-link failure scenarios; other failures and failures on end node is detected by BFD timeout and TP-OAM message.

As shown in the figure below, when an LSR (e.g., Router B) detects a failure, it forwards the incoming traffic over an impacted LSP onto the reverse LSP, if it exists. The traffic re-directed into the reverse LSP is loopback traffic. Looping back traffic is carried out by the forwarding engine without control plane's involvement. The label stack of a loopback packet will be modified such that the source of the traffic identifies the packet.

Figure 2: MPLS-TP LSP Wrapping Mechanism



When the forwarding engine at an end-point recognizes a packet from loopback traffic, it sforwards the packet on protect LSP. As BFD packets over impacted LSPs are also looped-back, the end-point will drop such BFD packets so that BFD sessions over the impacted LSPs is timed-out and protection switching is activated. Optionally, when an end-point receives the first looped-back packet, it activates protection switching.

A working LSP remains wrapped until protection switching is activated. Once activated, protect LSP will carry traffic as usual. When failure is removed and BFD session comes back up resulting in activation of working LSP.

How to Implement MPLS Transport Profile

MPLS Transport Profile (MPLS-TP) supported by IETF enables the migration of transport networks to a packet-based network that efficiently scale to support packet services in a simple and cost effective way.

These procedures are used to implement MPLS-TP:

Configuring the Node ID and Global ID

Perform this task to configure node ID and global ID on the router.

SUMMARY STEPS

1. **configure**
2. **mpls traffic-eng**
3. **tp**
4. **node-id** *node-id*
5. **global-id** *num*
6. **commit**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**configure**	
Step 2	**mpls traffic-eng** **Example:** `RP/0/RSP0/CPU0:router(config)# mpls traffic-eng`	Enters MPLS TE configuration mode.
Step 3	**tp** **Example:** `RP/0/RSP0/CPU0:router(config-mpls-te)# mpls tp`	Enters MPLS transport profile (TP) configuration mode. You can configure MPLS TP specific parameters for the router from this mode.
Step 4	**node-id** *node-id* **Example:** `RP/0/RSP0/CPU0:router(config-mpls-te-tp)# node-id 10.0.0.1`	Specifies the default MPLS TP node ID, which is used as the default source node ID for all MPLS TP tunnels configured on the router. **Note** The node ID is a 32-bit number represented in IPv4 address format, and can be optionally assigned to each node.
Step 5	**global-id** *num* **Example:** `RP/0/RSP0/CPU0:router(config-mpls-te-tp)# global-id 10`	Specifies the default global ID used for all endpoints and midpoints. This command makes the node ID globally unique in a multi-provider tunnel. Otherwise, the node ID is only locally meaningful.

	Command or Action	Purpose
		Note The global ID is a 32-bit number, and can be assigned to each node.
Step 6	**commit**	

Configuring Pseudowire OAM Attributes

Perform this task to configure pseudowire OAM attributes.

SUMMARY STEPS

1. **configure**
2. **l2vpn**
3. **pw-oam refresh transmit** *value*
4. **commit**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**configure**	
Step 2	**l2vpn** **Example:** `RP/0/RSP0/CPU0:router(config)# l2vpn`	Enters L2VPN configuration mode.
Step 3	**pw-oam refresh transmit** *value* **Example:** `RP/0/RSP0/CPU0:router(config-l2vpn)# pw-oam refresh transmit 20`	Specifies the OAM timeout refresh intervals.
Step 4	**commit**	

Configuring the Pseudowire Class

When you create the pseudowire class, you specify the parameters of the pseudowire, such as the use of the control word and preferred path.

SUMMARY STEPS

1. **configure**
2. **l2vpn**
3. **pw-class** *name*
4. **encapsulation mpls**
5. **preferred-path interface tunnel-tp** *tunnel-number*

6. **commit**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**configure**	
Step 2	**l2vpn** **Example:** `RP/0/RSP0/CPU0:router(config)# l2vpn`	Enters L2VPN configuration mode.
Step 3	**pw-class** *name* **Example:** `RP/0/RSP0/CPU0:router(config-l2vpn)# pw-class foo`	Creates a pseudowire OAM class named foo and enters pseudowire OAM class configuration mode.
Step 4	**encapsulation mpls** **Example:** `RP/0/RSP0/CPU0:router(config-l2vpn-pwc)# encapsulation mpls`	Sets pseudowire encapsulation to MPLS.
Step 5	**preferred-path interface tunnel-tp** *tunnel-number* **Example:** `RP/0/RSP0/CPU0:router(config-l2vpn-pwc-mpls)# preferred-path interface tunnel-tp 10`	Specifies TP tunnel interface 10 for the preferred-path.
Step 6	**commit**	

Configuring the Pseudowire

Perform this task to configure the pseudowire.

SUMMARY STEPS

1. **configure**
2. **interface** *type interface-path-id*
3. **pseudowire-class** *class-name*
4. **encapsulation mpls**
5. **preferred-path interface tunnel-tp** *tunnel-number*
6. **commit**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**configure**	

	Command or Action	Purpose
Step 2	**interface** *type interface-path-id* **Example:** `RP/0/RSP0/CPU0:router(config)# interface tunnel-tp 20`	Enters MPLS transport protocol tunnel interface configuration mode.
Step 3	**pseudowire-class** *class-name* **Example:** `RP/0/RSP0/CPU0:router(config-if)# pseudowire-class foo`	Creates a pseudowire class and enters pseudowire class configuration mode.
Step 4	**encapsulation mpls** **Example:** `RP/0/RSP0/CPU0:router# encapsulation mpls`	Specifies the encapsulation type.
Step 5	**preferred-path interface tunnel-tp** *tunnel-number* **Example:** `RP/0/RSP0/CPU0:router# preferred-path interface tunnel-tp 10`	Specifies TP tunnel interface 10 for the preferred-path. **Note** When a PW class with tunnel-tp interface as a preferred path is defined, this specified class can be associated with any PW.
Step 6	**commit**	

Configuring the MPLS TP Tunnel

On the endpoint routers, create an MPLS TP tunnel and configure its parameters.

SUMMARY STEPS

1. **configure**
2. **interface tunnel-tp** *number*
3. **description** *tunnel-desc*
4. **bandwidth** *num*
5. **source** *source node-ID*
6. **destination** *destination node-ID* [**global-id** *destination global ID*] **tunnel-id** *destination tunnel ID*]
7. **working-lsp**
8. **in-label** *num*
9. **out-label** *mpls label* **out-link** *link ID*
10. **lsp-number** *value*
11. **exit**
12. **protect-lsp**
13. **in-label** *num*
14. **out-label** *mpls label* **out-link** *link ID*
15. **lsp-number** *value*

16. exit
17. **commit**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**configure**	
Step 2	**interface tunnel-tp** *number* **Example:** `RP/0/RSP0/CPU0:router(config)# interface tunnel-tp 10`	Enters tunnel tp interface configuration mode. The range is from 0 to 65535.
Step 3	**description** *tunnel-desc* **Example:** `RP/0/RSP0/CPU0:router(config-if)# description head-end tunnel`	Specifies a tunnel tp description.
Step 4	**bandwidth** *num* **Example:** `RP/0/RSP0/CPU0:router(config-if)# tp bandwidth 1000`	Specifies the tunnel bandwidth in kbps. The range is from 0 to 4294967295.
Step 5	**source** *source node-ID* **Example:** `RP/0/RSP0/CPU0:router(config-if)# source 10.0.0.1`	Specifies the source node of the tunnel.
Step 6	**destination** *destination node-ID* [**global-id** *destination global ID*] **tunnel-id** *destination tunnel ID*] **Example:** `RP/0/RSP0/CPU0:router(config-if)# destination 10.0.0.1 global-id 10 tunnel-id 2`	Specifies the destination node of the tunnel.
Step 7	**working-lsp** **Example:** `RP/0/RSP0/CPU0:router(config-if)# working-lsp`	Specifies a working LSP, also known as the primary LSP. This LSP is used to route traffic.
Step 8	**in-label** *num* **Example:** `RP/0/RSP0/CPU0:router(config-if-work)# in-label 111`	Specifies the in-label.

	Command or Action	Purpose
Step 9	**out-label** *mpls label* **out-link** *link ID* **Example:** `RP/0/RSP0/CPU0:router(config-if-work)# out-label 111 out-link 10`	Specifies the out-label.
Step 10	**lsp-number** *value* **Example:** `RP/0/RSP0/CPU0:router(config-if-work)# lsp-number 10`	Specifies the LSP ID of the working LSP.
Step 11	**exit** **Example:** `RP/0/RSP0/CPU0:router(config-if-work)# exit`	Exits from working LSP interface configuration mode.
Step 12	**protect-lsp** **Example:** `RP/0/RSP0/CPU0:router(config-if)# protect-lsp`	Specifies a backup for a working LSP. If the working LSP fails, traffic is switched to the protect LSP until the working LSP is restored, at which time traffic forwarding reverts back to the working LSP.
Step 13	**in-label** *num* **Example:** `RP/0/RSP0/CPU0:router(config-if-protect)# in-label 113`	Specifies the in-label.
Step 14	**out-label** *mpls label* **out-link** *link ID* **Example:** `RP/0/RSP0/CPU0:router(config-if-protect)# out-label 112 out-link 2`	Specifies the out-label and out-link.
Step 15	**lsp-number** *value* **Example:** `RP/0/RSP0/CPU0:router(config-if-protect)# lsp-number 10`	Specifies the LSP ID of the protect LSP.
Step 16	exit **Example:** `RP/0/RSP0/CPU0:router(config-if-protect)# exit`	Exits from protect LSP interface configuration mode.
Step 17	**commit**	

Configuring MPLS-TP LSPs at Midpoint

Perform this task to configure the MPLS-TP LSPs at the midpoint router.

Note When configuring the LSPs at the midpoint routers, make sure that the configuration does not reflect traffic back to the originating node.

SUMMARY STEPS

1. **configure**
2. **mpls traffic-eng**
3. **tp mid** *name*
4. **tunnel-name** *name*
5. **lsp-number** *value*
6. **source** *node -ID* **tunnel-id** *number*
7. **destination** *node -ID* **tunnel-id** *number*
8. **commit**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**configure**	
Step 2	**mpls traffic-eng** **Example:** `RP/0/RSP0/CPU0:router(config)# mpls traffic-eng`	Enters MPLS TE configuration mode.
Step 3	**tp mid** *name* **Example:** `RP/0/RSP0/CPU0:router(config-mpls-te)# tp mid foo`	Specifies the MPLS-TP tunnel mid-point identifier.
Step 4	**tunnel-name** *name* **Example:** `RP/0/RSP0/CPU0:router(config-mpls-te-tp-mid)# tunnel-name midtunnel`	Specifies the name of the tunnel whose mid point is being configured.
Step 5	**lsp-number** *value* **Example:** `RP/0/RSP0/CPU0:router(config-mpls-te-tp-mid)# lsp-number 10`	Specifies the LSP ID.
Step 6	**source** *node -ID* **tunnel-id** *number* **Example:**	Specifies the source node ID and tunnel ID.

	Command or Action	Purpose
	`RP/0/RSP0/CPU0:router(config-mpls-te-tp-mid-fwd)# source 10.0.0.1 tunnel-id 12`	
Step 7	**destination** *node -ID* **tunnel-id** *number* **Example:** `RP/0/RSP0/CPU0:router(config-mpls-te-tp-mid-rev)# source 10.0.0.2 tunnel-id 12`	Specifies the destination node ID and tunnel ID.
Step 8	**commit**	

Configuring MPLS-TP Links and Physical Interfaces

MPLS-TP link IDs may be assigned to physical interfaces only.

Note Bundled interfaces and virtual interfaces are not supported for MPLS-TP link IDs.

SUMMARY STEPS

1. **configure**
2. **mpls traffic-eng**
3. **interface** *type interface-path-id*
4. **link-id** *value* **next-hop** *address*
5. **commit**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**configure**	
Step 2	**mpls traffic-eng** **Example:** `RP/0/RSP0/CPU0:router(config-mpls-te)# mpls traffic-eng`	Enters MPLS TE configuration mode.
Step 3	**interface** *type interface-path-id* **Example:** `RP/0/RSP0/CPU0:router(config-mpls-te)# interface POS 0/6/0/0`	Configures an interface type and path ID to be associated with a MPLS TE mode.
Step 4	**link-id** *value* **next-hop** *address* **Example:** `RP/0/RSP0/CPU0:router(config-mpls-te-if)# link-id 22 next-hop 10.1.1.2`	Configures an interface type and path ID to be associated with a MPLS TE mode. **Note** You must provide the next-hop IP address.

	Command or Action	Purpose
		Note You can define a link ID once. If you attempt to use the same MPLS-TP link ID with different interface or next-hop address, the configuration gets rejected. You have to remove the existing link ID configuration before using the same link ID with a different interface or next-hop address.
Step 5	**commit**	

Configuring MPLS-TP LSP Wrapping

Perform this task to configure the MPLS-TP LSP wrapping.

Note When configuring the LSPs at the midpoint routers, make sure that the configuration does not reflect traffic back to the originating node.

SUMMARY STEPS

1. **configure**
2. **mpls traffic-eng**
3. **tp mid** *name*
4. **tunnel-name** *name*
5. **fast-protect**
6. **commit**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**configure**	
Step 2	**mpls traffic-eng** **Example:** `RP/0/RSP0/CPU0:router(config)# mpls traffic-eng`	Enters MPLS TE configuration mode.
Step 3	**tp mid** *name* **Example:** `RP/0/RSP0/CPU0:router(config-mpls-te)# tp mid midpt1`	Specifies the MPLS-TP tunnel mid-point identifier.
Step 4	**tunnel-name** *name* **Example:**	(Optional) Specifies the name of the tunnel whose mid point is being configured.

	Command or Action	Purpose
	`RP/0/RSP0/CPU0:router(config-mpls-te-tp-mid)# tunnel-name midtunnel`	
Step 5	**fast-protect** **Example:** `RP/0/RSP0/CPU0:router(config-mpls-te-tp-mid)# fast-protect`	Enables MPLS-TP LSP wrapping.
Step 6	**commit**	