MPLS Command Line Reference for E-Series ExaScale

Version 8.3.1.0

December 21, 2009
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**MPLS Traffic Engineering Commands**

The MPLS traffic engineering commands are:

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debug mpls traffic-eng filter

Filter tunnel-related debugs based on source address, destination address, or tunnel number. First, configure a UDP ACL with optional source, destination address, and UDP port number. The UDP port number should correspond to the tunnel number. When an ACL with wildcards is applied using this command, traffic engineering debugs are restricted to tunnels matching this filter.

**Syntax**
```
debug mpls traffic-eng filter name acl-name
```

**Parameters**
- `name acl-name`: Enter the keyword followed by the name of an ACL to use for filtering.

**Command Mode**
EXEC Privilege

**Command History**
- Introduced: Version 8.3.1.0

---

display mpls traffic-eng path-computation

Display the CSPF path computation for tunnels.

**Syntax**
```
display mpls traffic-eng path-computation
```

**Command Mode**
EXEC Privilege

**Command History**
- Introduced: Version 8.3.1.0

---

display mpls traffic-eng link-management

Display TE-related events.

**Syntax**
```
display mpls traffic-eng link-management {bandwidth {incoming | outgoing} | errors | events | igp-updates | timers periodic-flooding}
```

**Parameters**
- `bandwidth`: Enter this keyword to display incoming bandwidth updates from RSVP and outgoing bandwidth updates to IGPs.
- `errors`: Enter this keyword to display link-management errors.
- `events`: Enter this keyword to display traffic engineering related events.
- `igp-updates`: Enter this keyword to display IGP updates into the CSPF database and registration.
- `timers periodic-flooding`: Enter this keyword to display traffic engineering timers.

**Command History**
- Introduced: Version 8.3.1.0
mpls admin-group

Create an administrative group.

Syntax

mpls admin-group group-name group-number

Parameters

group-name
Enter a string. Group names are case sensitive.

group-number
Assign the administrative group a number.
Range: 0-31

Defaults
None

Command Mode
CONFIGURATION

Command History

Version 8.3.1.0 Introduced

Example

Force10(conf)#mpls traffic-eng admin-group premium 0
Force10(conf)#mpls traffic-eng admin-group leased 5
Force10(conf)#mpls traffic-eng admin-group high_latency 31
Force10(conf)#do show run mpls
!
mpls traffic-eng admin-group premium 0
mpls traffic-eng admin-group leased 5
mpls traffic-eng admin-group high_latency 31
mpls rsvp enable
mpls traffic-eng enable
Force10(conf)#do show mpls traffic-eng admin-group

Admin Group Bit index Use count
-------------------------------- --------- ----------
premium 0 0
leased 5 0
high_latency 31 0

mpls traffic-eng

Enable TE on IS-IS Level 1 or Level 2.

Syntax

[no] mpls traffic-eng {level-1 | level-2}

Parameters

level-1
Enter this keyword to flood MPLS TE link information into IS-IS Level 1.

level-2
Enter this keyword to flood MPLS TE link information into IS-IS Level 2.

Defaults

Traffic Engineering is disabled by default in ISIS Level 1 and Level 2.

Command Mode

ROUTER ISIS

Command History

Version 8.3.1.0 Introduced
mpls traffic-eng admin-group

Assign an interface to one or more administrative groups.

Syntax

mpls traffic-eng admin-group group-name

Parameters

group-name

Defaults

None

Command Mode

INTERFACE

Command History

Version 8.3.1.0 Introduced

Example

Force10(conf-if-gi-0/12)#mpls traffic-eng admin-group premium
Force10(conf-if-gi-0/12)#mpls traffic-eng admin-group leased
Force10(conf-if-gi-0/12)#show conf
!
!interface GigabitEthernet 0/12
 ip address 192.168.20.1/24
 mpls traffic-eng admin-group leased
 mpls traffic-eng admin-group premium
 mpls rsvp bandwidth global-pool
 mpls traffic-eng enable
 no shutdown

mpls traffic-eng administrative-weight

Configure a TE metric for an interface for use when the interface is advertised as part of IGP TE extensions. The TE metric is used for CSPF path computation. Though some non-Force10 CSPF implementations can optionally look at the IGP metric, FTOS uses only the TE metric; it does not support using the IGP metric.

Syntax

[no] mpls traffic-eng administrative-weight weight

Parameters

administrative-weight weight

Enter the keyword followed by a TE metric for the interface. Range: 0-4294967295.

Defaults

The default TE metric matches the IGP metric on the interface.

Command Mode

INTERFACE

Command History

Version 8.3.1.0 Introduced
mpls traffic-eng area

Enable TE on an OSPF area.

Syntax

`mpls traffic-eng area number`

Parameters

<table>
<thead>
<tr>
<th>area number</th>
<th>Enter the keyword followed by the OSPF area number in decimal or IP address format. Decimal Range: 0-65535</th>
</tr>
</thead>
</table>

Defaults
Traffic engineering is disabled by default in all OSPF areas.

Command Mode
ROUTER OSPF

Command History
Version 8.3.1.0 Introduced

mpls traffic-eng enable

Enable CSPF-based traffic engineering computation and TE advertisements for one or all interfaces.

Syntax

`mpls traffic-eng enable`

Defaults
CSPF-based computation and TE advertisements are disabled globally by default.

Command Modes
CONFIGURATION (enables CSPF-based TE computation and TE advertisement process)

INTERFACE (enables traffic engineering on an interface)

Command History
Version 8.3.1.0 Introduced

mpls traffic-eng flooding

Configure flooding threshold values. When RSVP bandwidth usage on an interface crosses the threshold, a TE advertisement is generated by the IGPs to propagate this information to other routers.

Syntax

`mpls traffic-eng flooding thresholds {up | down} {value} [[value] ...]`

Parameters

| up | down | Enter the keyword `up` to set thresholds for increased resource availability, or the keyword `down` to set thresholds for decreased resource availability. |
| value | Enter one or more (up to 18) flooding threshold values. Range: 0-100% |
mpls traffic-eng link-management

Configure global link-management timers.

Syntax

```plaintext
[m no] mpls traffic-eng link-management timers {periodic-flooding | bandwidth-hold} seconds
```

Parameters

- **bandwidth-hold**: Enter this keyword followed by the number of seconds bandwidth is held on an interface upon receiving a PATH message before it is confirmed by a RESV message.

- **periodic-flooding**: Enter this keyword followed by the interval at which link bandwidth information is flooded into IGP TE advertisements. If the bandwidth change crosses a threshold value in the up or down direction, it is immediately flooded by IGPs. If the change does not cross a threshold, then periodic flooding is used to send this information in TE advertisements to other IGP routers in the same area.

- **seconds**: Enter the flood or hold time in seconds. Range: 1-300 seconds

Defaults

Default flooding interval is 180 seconds. Default hold time is 15 seconds.

Command Mode

INTERFACE

Command History

Version 8.3.1.0 Introduced

Related Commands

mpls traffic-eng flooding

mpls traffic-eng path-selection

When the CSPF algorithm encounters two equal cost paths to a particular node, it can either choose the path that has the highest maximum reservable bandwidth (default) or, when configured by this command, the path that has the minimum hop count.

Syntax

```plaintext
mpls traffic-eng path-selection hop-count
```
mpls traffic-eng router-id

Configure a TE router ID for OSPF or IS-IS.

**Syntax**

```
[no] mpls traffic-eng router-id interface
```

**Parameters**

<table>
<thead>
<tr>
<th>router-id interface</th>
<th>Enter the keyword followed by the interface the IP address of which will be the TE router ID.</th>
</tr>
</thead>
</table>

**Defaults**

None

**Command Mode**

- ROUTER OSPF
- ROUTER ISIS

**Command History**

- **Version 8.3.1.0** Introduced

---

**show ip ospf mpls traffic-eng interface**

Display the TE advertisements that OSPF is sending on behalf of a particular interface or for all interfaces to its neighbors. The advertised information includes the bandwidth that is currently available with OSPF after threshold filtering is done by link management. Bandwidth is displayed in bytes per second (Bps).

**Syntax**

```
show ip ospf mpls traffic-eng interface [name]
```

**Parameters**

<table>
<thead>
<tr>
<th>interface name</th>
<th>Enter the keyword followed by the interface to display advertisements generated for a particular interface.</th>
</tr>
</thead>
</table>

**Command Mode**

EXEC Privilege

**Command History**

- **Version 8.3.1.0** Introduced

---
show mpls traffic-eng admin-group

Display configured administrative groups.

Syntax

show mpls traffic-eng admin-group

Command Mode

EXEC Privilege

Example

Force10#do show mpls traffic-eng admin-group
Admin Group Bit index Use count
--------------------------------- ---------  ----------
premium                           0          0
leased                             5          0
high_latency                       31         0

show mpls traffic-eng link-management

Display TE-related interface information for all interfaces on the router or a specific interface. This command collects brief information provided by other link-management commands and additional configuration information, such as link attributes.

Syntax

show mpls traffic-eng link-management \{igp-neighbors \[interface name\] | interfaces name\}

Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>igp-neighbors</td>
<td>Enter the keyword to display the IGP neighbors that are present on all interfaces, or a particular interface if the interface option is used, to which TE advertisements are being sent. It is not necessary for the neighbor to be TE enabled.</td>
</tr>
<tr>
<td>[interface name]</td>
<td>Interface name to display advertised bandwidth information.</td>
</tr>
<tr>
<td>interfaces name</td>
<td>Interface name to display advertised bandwidth information.</td>
</tr>
</tbody>
</table>

Command Mode

EXEC Privilege
show mpls traffic-eng link-management advertisements

Display the currently advertised unreserved bandwidth for all interfaces or a specific interface. The actual bandwidth unreserved on the interface might be different, but might not have been passed to IGP to advertise because bandwidth reservations have not exceeded a threshold or the periodic-flood timer has not expired.

**Syntax**

```
show mpls traffic-eng link-management advertisements [interface name]
```

**Parameters**

- `interface name`: Enter the keyword followed by the interface to display advertised bandwidth information for the interface.

**Command Mode**

EXEC Privilege

**Command History**

<table>
<thead>
<tr>
<th>Version 8.3.1.0</th>
<th>Introduced</th>
</tr>
</thead>
</table>

**Example**

```
Force10#show mpls traffic-eng link-management advertise
Interface:: GigabitEthernet 5/7
Neighbor ID: 60.60.60.60 (area: ospf 100 area 0)
```

```
Force10#show mpls traffic-eng link-management interfaces
System Information::
Links Count: 1
Interface:: GigabitEthernet 5/7
Link Status:
Link IP: 17.1.1.1
SRLGs: None
Physical Bandwidth: 1000000 kbits/sec
Max Res Global BW: 750000 kbits/sec
Max Res Sub BW: 0 kbits/sec
Link State: MPLS TE on, RSVP on, admin-up, flood on
Inbound Admission: allow-all
Outbound Admission: allow-if-room
Admin. Weight: 1
IGP Area 1: ospf 100 area 0:
IGP Neighbor Count: 1
IGP Neighbor: 60.60.60.60
```
Example
Force10#show mpls traffic-eng link-management advertisements
Flooding Status: ready
Configured Areas: 1
IGP Area 1: ospf 100 area 0
  Header Information:
  IGP System ID: 50.50.50.50
  MPLS TE Router ID: 50.50.50.50
  Flooded Links: 1

  Interface: GigabitEthernet 5/7
  Link Subnet Type: Broadcast
  Link IP Address: 17.1.1.1
  Designated Router: 17.1.1.2
  TE metric: 1
  IGP metric: 1
  SRLGs: None
  Physical Bandwidth: 1000000 kbits/sec
  Res. Global BW: 750000 kbits/sec
  Res. Sub BW: 0 kbits/sec

  Downstream:

<table>
<thead>
<tr>
<th>Global Pool</th>
<th>Sub Pool</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reservable Bandwidth 0:</td>
<td>750000</td>
</tr>
<tr>
<td>Reservable Bandwidth 1:</td>
<td>750000</td>
</tr>
<tr>
<td>Reservable Bandwidth 2:</td>
<td>750000</td>
</tr>
<tr>
<td>Reservable Bandwidth 3:</td>
<td>750000</td>
</tr>
<tr>
<td>Reservable Bandwidth 4:</td>
<td>750000</td>
</tr>
<tr>
<td>Reservable Bandwidth 5:</td>
<td>750000</td>
</tr>
<tr>
<td>Reservable Bandwidth 6:</td>
<td>750000</td>
</tr>
<tr>
<td>Reservable Bandwidth 7:</td>
<td>750000</td>
</tr>
</tbody>
</table>

show mpls traffic-eng link-management bandwidth-allocation

Display the currently advertised bandwidth reservation information for all interfaces or a specific interface. The actual bandwidth advertised on the interface by IGP's might be different but might not have been passed to IGP's to advertise because the current bandwidth has not exceeded a threshold or the periodic-flood timer has not expired.

Syntax
show mpls traffic-eng link-management bandwidth-allocation [interface name]

Parameters

- **interface name**: Enter the keyword followed by the interface to display advertised bandwidth information for the interface.

Command Mode
EXEC Privilege

Command History
- Version 8.3.1.0: Introduced
**show mpls traffic-eng topology**

Display the TE topology information maintained by the CSPF database. This is the database used for all CSPF computations for tunnels.

**Syntax**

```
show mpls traffic-eng topology [ip-address | area number | level [1 | 2]] [brief]
```

**Parameters**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ip-address</td>
<td>Enter an IP address to display all topology entries that match the particular address either by router ID or by interface IP address.</td>
</tr>
<tr>
<td>area number</td>
<td>Enter the keyword followed by the area number to display topology information specific to a particular OSPF area.</td>
</tr>
<tr>
<td>level [1</td>
<td>2]</td>
</tr>
<tr>
<td>brief</td>
<td>Enter the keyword to display brief topology information.</td>
</tr>
</tbody>
</table>

**Command History**

Version 8.3.1.0 Introduced
**Example**  
Force10#show mpls traffic-eng topology  
IGP Id: 100.1.2.1, MPLS TE Id: 100.1.2.1 Router Node (ospf 1 area 0)  
link 1: Broadcast, DR: 192.168.20.6  
  Interface Address: 192.168.20.5  
  TE Metric: 1, IGP metric: 1  
  Admin Groups: affinity1  
  SRLGs: None  
  Physical BW: 1000000 (kbps)  
  Max Reservable BW Global: 900000 (kbps) Sub-pool: 0 (kbps)  
  | Total Allocated | Global Pool | Sub Pool |  |
  |-----------------|-------------|----------|
  | BW (kbps)       | BW (kbps)   | BW (kbps)|  |
  |-----------------|-------------|----------|
  | bw prio0        | 0           | 900000   | 0 |
  | bw prio1        | 0           | 900000   | 0 |
  | bw prio2        | 0           | 900000   | 0 |
  | bw prio3        | 0           | 900000   | 0 |
  | bw prio4        | 0           | 900000   | 0 |
  | bw prio5        | 0           | 900000   | 0 |
  | bw prio6        | 0           | 900000   | 0 |
  | bw prio7        | 100000      | 800000   | 0 |

link 2: Broadcast, DR: 192.168.20.2  
  Interface Address: 192.168.20.1  
  TE Metric: 1, IGP metric: 1  
  Admin Groups: affinity0  
  SRLGs: None  
  Physical BW: 1000000 (kbps)  
  Max Reservable BW Global: 500000 (kbps) Sub-pool: 0 (kbps)  
  | Total Allocated | Global Pool | Sub Pool |  |
  |-----------------|-------------|----------|
  | BW (kbps)       | BW (kbps)   | BW (kbps)|  |
  |-----------------|-------------|----------|
  | bw prio0        | 0           | 500000   | 0 |
  | bw prio1        | 0           | 500000   | 0 |
  | bw prio2        | 0           | 500000   | 0 |
  | bw prio3        | 0           | 500000   | 0 |
  | bw prio4        | 0           | 500000   | 0 |
  | bw prio5        | 0           | 500000   | 0 |
  | bw prio6        | 0           | 500000   | 0 |
  | bw prio7        | 100000      | 400000   | 0 |

**show mpls traffic-eng topology path**  
Compute a path using configuration information of a particular tunnel and display the current result of hops from the topology database. This takes into account the shared bandwidth information between the original tunnel and the current query. Optionally a particular explicit path can be configured.  
**Syntax**  
`show mpls traffic-eng topology path tunnel number [explicit name name]`  
**Parameters**  
- `path tunnel tunnel number` Enter the keywords followed by the tunnel number to display the path for this particular tunnel.  
- `explicit name name` Enter the keywords followed by the explicit path name to compute the path for the tunnel.  
**Command Mode** EXEC Privilege  
**Command History**  
Version 8.3.1.0 Introduced
Example
Force10#show mpls traffic-eng topology path tunnel tunnel 1
Query parameters:
  Destination: 60.60.60.60
  Bandwidth: 1000
  Priorities: 7 (setup), 7 (hold)
  Affinity: 0x0 (value), 0xffff (mask)
  Specific Explicit path: None
Query Result:
  Hops in path: 2 (TE metric: 1)
  Min Bandwidth Along Path: 744000 (kbps)
  Max Bandwidth Along Path: 1000000 (kbps)
  Hop 0: 17.1.1.1
  Hop 1: 17.1.1.2

RSVP Traffic Engineering Commands

The RSVP-TE commands are:

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- clear mpls rsvp statistics
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- debug mpls rsvp dump on page 16
- debug mpls rsvp filter on page 17
- debug mpls rsvp signalling on page 17
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- mpls rsvp bandwidth logging on page 18
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- mpls rsvp signalling refresh on page 20
- mpls rsvp signalling refresh reduction on page 20
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- show mpls rsvp hello on page 22
- show mpls rsvp interface on page 23
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- show mpls rsvp signalling refresh on page 24
- show mpls rsvp bandwidth on page 24
- show mpls rsvp reservation on page 25
- show mpls rsvp statistics on page 26

clear mpls rsvp hello counters

Clear hello counters for all instances.

Syntax

clear mpls rsvp hello counters {packets | statistics}
clear mpls rsvp lsp

Clear RSVP-TE triggered LSPs.

Syntax
clear mpls rsvp lsp {* | destination {* | dest-address} [source {* | src-address}] [tunnel number]}

Parameters

* | destination
   Enter * to clear all LSPs that originate or are transiting the system, or enter destination to clear all LSPs with a specific destination address.

* | dest-address
   Enter * to clear all LSPs with any destination address, or specify the destination address.

source {* | src-address]
   Enter the keyword followed by * to clear LSPs with any source, or enter the keyword followed by the source IP address.

tunnel number
   Enter the keyword followed by a tunnel number to clear all LSPs mapped to the specified tunnel.

Command Mode
EXEC Privilege

Command History
Version 8.3.1.0 Introduced

Related Commands
clear mpls rsvp statistics

Clear MPLS RSVP statistics.

Syntax
clear mpls rsvp statistics {packets | teardown}

Parameters

packets
   Enter this keyword to clear RSVP packet counters.

teardown
   Enter this keyword to clear teardown statistics.
### debug mpls rsvp

Display RSVP related messages and events.

**Syntax**

```plaintext
debug mpls rsvp {events | errors | hello | reliable | reservation | routing | timers periodic-flood}
```

**Parameters**

- `events` Enter this keyword to display RSVP-TE events.
- `errors` Enter this keyword to display RSVP-TE errors.
- `hello` Enter this keyword to display RSVP-TE hellos.
- `reliable` Enter this keyword to display RSVP-TE reliability messages.
- `routing` Enter this keyword to display routing related events, and queries to RTM and CSPF from RSVP.
- `timers periodic-flood` Enter these keywords to display RSVP-TE timers.

**Command Mode**

EXEC Privilege

**Command History**

- Version 8.3.1.0 Introduced

### debug mpls rsvp dump

Display detailed packet dumps of signaling messages.

**Syntax**

```plaintext
debug mpls rsvp dump {hello | path | resv | summary-refresh}
```

**Parameters**

- `hello` Enter this keyword to display hello messages.
- `path` Enter this keyword to display PathErr and PathTear messages.
- `resv` Enter this keyword to display ResvErr and ResvTear messages.
- `summary-refresh` Enter this keyword to display Srefesh messages.

**Command Mode**

EXEC Privilege

**Command History**

- Version 8.3.1.0 Introduced
debug mpls rsvp filter

Filter traffic-engineering debugs based on source address, destination address or tunnel number. To configure a filter, first configure a UDP ACL with optional source, destination address, and UDP port number. The UDP port number should correspond to the tunnel number. When an ACL with wildcards is applied using this command, traffic engineering debugs are restricted to tunnels matching this filter.

Syntax

debug mpls rsvp filter name name

Parameters

name name Enter this keyword followed by the name of an ACL.

Command Mode

EXEC Privilege

Command History

Version 8.3.1.0 Introduced

debug mpls rsvp signalling

Display RSVP signaling messages.

Syntax

depth mpls rsvp signalling {path | resv | summary-refresh}

Parameters

path Enter this keyword to display PathErr and PathTear messages.

resv Enter this keyword to display ResvErr and ResvTear messages.

summary-refresh Enter this keyword to display Srefresh messages.

Command Mode

EXEC Privilege

Command History

Version 8.3.1.0 Introduced

mpls ip propagate-ttl

Disabling TTL propagation changes how ingress and egress LSR nodes read and process the TTL value in a label. A label must have a value in the TTL field. By default, an ingress LSR reads the TTL field in the IP header of the incoming packet, decrements it by 1, and copies what is left into the TTL field of the MPLS header. Core LSRs forward the packet only if the TTL value in the uppermost label is not 0. With the no mpls ip propagate-ttl command, the behavior changes such that the IP header TTL does not reflect the hops taken across the MPLS core. Routers in the MPLS core network do not appear in traceroute information.

Syntax

[no] mpls ip propagate-ttl

Defaults

TTL is propagated by default.
mpls rsvp bandwidth

Enable RSVP on the interface.

Syntax

[no] mpls rsvp bandwidth global-pool [bandwidth]

Parameters

global-pool bandwidth Enter the keyword followed by a bandwidth percentage to reserve bandwidth for RSVP on the interface.

Range: 0-65000%

Defaults

RSVP is disabled by default on an interface. Enabling RSVP without any explicit bandwidth configuration allocates 75% of interface bandwidth for RSVP.

Command Mode

INTERFACE

Command History

Version 8.3.1.0 Introduced

mpls rsvp bandwidth logging

Log a message when LSP bandwidth consumption on an interface exceeds 90% of the available RSVP bandwidth on the interface.

Syntax

[no] mpls rsvp bandwidth logging

Defaults

Logging of 90% threshold exceeded messages is disabled by default.

Command Mode

INTERFACE

Command History

Version 8.3.1.0 Introduced
mpls rsvp enable

Enable MPLS RSVP globally.

Syntax

[no] mpls rsvp enable

Defaults

Disabled

Command Mode

CONFIGURATION

Command History

Version 8.3.1.0 Introduced

Example

Force10#show run mpls
!
mpls rsvp enable
mpls rsvp signalling hello graceful-restart enable
mpls rsvp signalling hello graceful-restart recovery-time 60000
mpls traffic-eng enable
Force10#show mpls traffic-eng tunnels summary
Traffic-engineering Process: running
RSVP Process: running
Tunnel Management Process: running
MPLS traffic forwarding: running
Periodic reoptimization: every 3600 seconds, next in 3411 seconds
Signalling summary:
  Tunnel interfaces 1500, currently signalling 101, established 101
  Headend tunnel instance activations 735, deactivations 634
  LSP count midpoint 0, tailend 0

mpls rsvp signalling hello

Enable RSVP hello signaling.

Syntax

[no] mpls rsvp signalling hello {enable | interval milliseconds | misses number}

Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>enable</td>
<td>Enter this keyword to enable RSVP Hello signaling on the interface.</td>
</tr>
<tr>
<td>interval milliseconds</td>
<td>Enter this keyword followed by a hello interval in milliseconds. Range: 1000-3000 milliseconds</td>
</tr>
<tr>
<td>misses number</td>
<td>Enter the number of hello misses that may be missed before declaring a neighbor unavailable. Range: 1-10</td>
</tr>
</tbody>
</table>

Defaults

The RSVP hello feature is disabled by default on an interface. The default hello interval is 10000 msecs. The default hello misses on an interface is 3.

Command Mode

INTERFACE

Command History

Version 8.3.1.0 Introduced
mpls rsvp signalling refresh

Configure the interval at which Path and Resv state must be refreshed.

Syntax

```plaintext
[no] mpls rsvp signalling refresh {interval seconds | misses number}
```

Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>interval</td>
<td>Enter this keyword followed by a non-default refresh interval.</td>
</tr>
<tr>
<td></td>
<td>Range: 5-3600 seconds</td>
</tr>
<tr>
<td>misses</td>
<td>Enter this keyword followed by the number of RSVP refresh messages that</td>
</tr>
<tr>
<td>number</td>
<td>may be missed before RSVP regards the LSP state as expired.</td>
</tr>
<tr>
<td></td>
<td>Range: 2-10</td>
</tr>
</tbody>
</table>

Defaults

The default refresh reduction interval is 30 seconds. The default refresh message misses is 4.

Command Mode

CONFIGURATION

Command History

- **Version 8.3.1.0** Introduced

Example

```plaintext
Force10(conf)#mpls rsvp signalling refresh interval 120
Force10(conf)#mpls rsvp signalling refresh misses 10
Force10(conf)#
Force10#show mpls rsvp signalling refresh
Refresh interval 120000 msecs, allowed misses 10
Refresh reduction is enabled
Local epoch 0x7edb3c
Message IDs in use 2, total allocated 13, total freed 2
No-Ack Desired disabled
```

mpls rsvp signalling refresh reduction

Enable RSVP refresh reduction.

Syntax

```plaintext
[no] mpls rsvp signalling refresh reduction {enable | no-ack}
```

Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>enable</td>
<td>Enter this keyword to enable RSVP refresh reduction.</td>
</tr>
<tr>
<td>no-ack</td>
<td>Enter this keyword to disable the ACK option for RSVP refresh reduction. By disabling this feature, messages sent with Message IDs are not required to be acknowledged by the receiver, further reducing RSVP signaling traffic.</td>
</tr>
</tbody>
</table>

Defaults

Refresh reduction is disabled by default. The refresh reduction ACK-required flag is enabled by default.

Command Mode

CONFIGURATION

Command History

- **Version 8.3.1.0** Introduced
### mpls rsvp signalling ttl-check

Check the time-to-live (TTL) field in the header of RSVP and IP packets. When enabled, PATH messages (only) are dropped if the TTL check fails.

**Syntax**

```plaintext
mpls rsvp signalling ttl-check
```

**Command Mode**

CONFIGURATION

**Command History**

Version 8.3.1.0 Introduced

### mpls traffic-eng affinity

Configure affinity-related global parameters.

**Syntax**

```plaintext
[no] mpls traffic-eng affinity {ingress-check | send-non-ra}
```

**Parameters**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ingress-check</td>
<td>Enter this keyword to check resource affinity and link color match at the incoming interface of a PATH message. Usually only the outgoing interface is checked before forwarding a PATH message onto it. This feature gives additional control over what LSPs can pass through the router.</td>
</tr>
<tr>
<td>send-non-ra</td>
<td>Enter this keyword to exclude resource affinity from the RSVP messages. Configuring this option enables the system to interoperate with routers that do not process resource affinity in the SESSION_ATTRIBUTE (C_Type = 1) object. RFC 2205 requires that all routers forward the packet unmodified even if they do not understand this object. However, some third-party vendors reject the RSVP message containing this attribute.</td>
</tr>
</tbody>
</table>

**Defaults**

Resource affinity check is disabled on the ingress interface by default. Sending resource affinity in the session attribute object is enabled by default.

**Command Mode**

CONFIGURATION

**Command History**

Version 8.3.1.0 Introduced

**Usage**

FTOS provides only one affinity value per link; only the bits within this single value may be adjusted.
mpls rsvp graceful-shutdown

Enable an active shutdown of RSVP sessions on the local router when RSVP is disabled.

**Syntax**

mpls rsvp graceful-shutdown

**Defaults**

Disabled

**Command Mode**

CONFIGURATION

**Example**

```
Force10(conf)#mpls rsvp graceful-shutdown
Force10(conf)#do show mpls process rsvp status
Keys: Process 10097, event 20061, IPC 73
IDs: Service 132, instance 0
--
RSVP parameters::
Router Name: Force10
Retry: Global frequency enabled, interval 30
Reoptimization: Status enabled, interval 3600
Ingress affinity check: disabled
Sending non-RA session attribute: disabled
RSVP TTL and IP TTL check: disabled
Graceful Shutdown: enabled
```

**Usage Information**

This command provides a user-initiated approach to shutting down RSVP. By default, Graceful Shutdown is disabled since a large number of RSVP sessions may take a long time to shut down, and a session timeout on neighbor routers might be preferred.

**Related Commands**

- `show mpls process rsvp hello` on page 54: Display RSVP hello instance information.
show mpls rsvp interface

Display all MPLS RSVP enabled interfaces.

Syntax

show mpls rsvp [interface name]

Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>interface name</td>
<td>Enter the keyword followed by the interface.</td>
</tr>
</tbody>
</table>

Command Mode

EXEC Privilege

Command History

Version 8.3.1.0  Introduced

Example

Force10#show mpls rsvp interface
Gi 1/0 administratively up, operationally up
IP Address 1.1.1.2
Hello disabled, interval 0 seconds, misses 0
Bfd disabled, interval 100, min_rx 100, multiplier 3, role Active
Refresh reduction disabled
Global bandwidth pool: 750000 kbps
Available bandwidth in global pool: 750000 kbps
Logging bandwidth usage at 90% level disabled

show mpls rsvp neighbor

Display all active MPLS RSVP neighbors.

Syntax

show mpls rsvp neighbor [detail]

Parameter

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>detail</td>
<td>Enter this keyword to display detailed information about neighbors.</td>
</tr>
</tbody>
</table>

Command Mode

EXEC Privilege
show mpls rsvp signalling refresh

Display the currently configured RSVP signaling refresh parameters.

**Syntax**

```
show mpls rsvp signalling refresh
```

**Command Mode**

EXEC Privilege

**Example**

```
Force10#show mpls rsvp signalling refresh
Refresh interval 30000 msecs, allowed misses 3
Refresh reduction is disabled
Local epoch 0x7edcd0
Message IDs in use 0, total allocated 0, total freed 0
No-Ack Desired disabled
```

show mpls rsvp bandwidth

Display RSVP statistics bandwidth for all interfaces or a specific interface, including held and locked bandwidth.

**Syntax**

```
show mpls rsvp bandwidth [interface name]
```

**Parameters**

- `interface name`
  - Enter the keyword followed by the interface.

**Command Mode**

EXEC Privilege

**Example**

```
Force10#show mpls rsvp bandwidth
```

**Command History**

<table>
<thead>
<tr>
<th>Version</th>
<th>Introduced</th>
</tr>
</thead>
<tbody>
<tr>
<td>8.3.1.0</td>
<td>Introduced</td>
</tr>
</tbody>
</table>

**Example**

```
Force10#show mpls rsvp neighbor
Neighbor: 17.1.1.2
Interface GigabitEthernet 5/7, BFD disabled
Refresh reduction feature is currently disabled
Refresh reduction capability is unavailable
Reliable messaging support is available
Remote epoch 0x000, Retransmitted messages: 0
Number of LSPs referring to this neighbor 8
Highest rcvd message id 0x0
Time since last RSVP signaling message received 00:00:00
Time since last RSVP signaling message sent 00:00:04
```

```
Force10#show mpls rsvp signaling refresh
Refresh interval 30000 msecs, allowed misses 3
Refresh reduction is disabled
Local epoch 0x7edcd0
Message IDs in use 0, total allocated 0, total freed 0
No-Ack Desired disabled
```
Example

"BW CONFIRMED" displays the bandwidth that has been confirmed by receiving a RESV message, "BW BLOCKED" displays the confirmed bandwidth plus the bandwidth blocked by PATH messages.

Force10#show mpls rsvp bandwidth

General Parameters:::
Bandwidth Hold time: 15 secs

Interface Bandwidth Information:::

Interface:  GigabitEthernet 0/0
Physical Bandwidth: 1000000 kbits/sec
Max Res Global BW: 500000 kbits/sec
Max Res Sub BW: 0 kbits/sec
Admin Groups: affinity0
Flooded flag: off
Reservations: total 2, active 2
Downstream Global Pool Bandwidth Information (kbits/sec):

<table>
<thead>
<tr>
<th>KEEP PRIORITY</th>
<th>BW BLOCKED</th>
<th>BW CONFIRMED</th>
<th>BW AVAILABLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>0</td>
<td>500000</td>
</tr>
<tr>
<td>1</td>
<td>0</td>
<td>0</td>
<td>500000</td>
</tr>
<tr>
<td>2</td>
<td>0</td>
<td>0</td>
<td>500000</td>
</tr>
<tr>
<td>3</td>
<td>0</td>
<td>0</td>
<td>500000</td>
</tr>
<tr>
<td>4</td>
<td>0</td>
<td>0</td>
<td>500000</td>
</tr>
<tr>
<td>5</td>
<td>0</td>
<td>0</td>
<td>500000</td>
</tr>
<tr>
<td>6</td>
<td>0</td>
<td>0</td>
<td>500000</td>
</tr>
<tr>
<td>7</td>
<td>0</td>
<td>100000</td>
<td>399872</td>
</tr>
</tbody>
</table>

Force10#

show mpls rsvp reservation

Display the RSVP reservations on an interface. This command displays both confirmed and blocked reservations.

show mpls rsvp reservation [destination ip-address | source ip-address | interface name | tunnel tunnel number] [detail]

Parameters

<table>
<thead>
<tr>
<th>destination ip-address</th>
<th>Enter the keyword followed by the destination IP address to display reservations matching LSPs that have the specified destination address.</th>
</tr>
</thead>
<tbody>
<tr>
<td>source ip-address</td>
<td>Enter the keyword followed by the source IP address to display reservations matching LSPs that have the specified source address.</td>
</tr>
<tr>
<td>interface name</td>
<td>Enter the keyword followed by the interface to display reservations for LSPs that have the specified interface as their outgoing interface.</td>
</tr>
<tr>
<td>tunnel tunnel number</td>
<td>Enter the keywords followed by the tunnel number to display reservations for LSPs that have the specified tunnel number.</td>
</tr>
<tr>
<td>detail</td>
<td>Enter this keyword to display extended reservation information.</td>
</tr>
</tbody>
</table>

Command Mode  EXEC Privilege

Command History

<table>
<thead>
<tr>
<th>Version</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>8.3.1.0</td>
<td>Introduced</td>
</tr>
</tbody>
</table>
show mpls rsvp statistics

Display RSVP statistics.

Syntax

show mpls rsvp statistics {packets [interface name] | teardown}

Parameters

- **packets**: Enter this keyword to display RSVP packet statistics for all interfaces.

- **interface name**: Enter the keyword followed by the interface to display packet statistics for a specific interface.

- **teardown**: Enter this keyword to RSVP statistics related to RSVP session teardown.

Command Mode

EXEC Privilege

Example

```
Force10#show mpls rsvp statistics packets
Message type  Receive    Transmit
GigabitEthernet 5/7:
Path          0          1188
PathErr       0          0
PathTear      0          4
Resv          1229      0
ResvErr       0          0
ResvTear      0          0
ResvConf      0          0
DiagReq       0          0
DiagResp      0          0
ResvTearConf  0          0
Bundle        0          0
Ack           0          0
SRefresh      0          0
Hello         38         39
Notify        0          0
IntegChlg     0          0
IntegResp     0          0
I_AM_DSBM_W   0          0
I_AM_DSBM     0          0
```

Usage Information

When two tunnels have the same ID on the same interface, traffic is filtered based on the source/destination address combination, which will be unique.
RSVP BFD Commands

The RSVP BFD commands are:

- mpls rsvp bfd all-neighbors on page 27
- mpls rsvp bfd all-neighbors disable on page 27

**mpls rsvp bfd all-neighbors**

Register for BFD on all interfaces or a single RSVP-enabled interface.

**Syntax**

```
[no] mpls rsvp bfd all-neighbors [interval seconds min_rx min_rx multiplier value role [active | passive]]
```

**Parameters**

- `interval seconds` Enter the keyword followed by an interval in seconds for transmitting BFD hello messages. Range: 50-1000 milliseconds
- `min_rx min_rx` Enter the keyword followed by a minimum receive time. Range: 50-1000 milliseconds
- `multiplier value` Enter the keyword followed by the number of BFD messages that may be missed before a session is torn down. Range: 3-50
- `role [active | passive]` Enter the keyword followed by the role the router should act in, active or passive, in the BFD session.

**Defaults**

BFD is disabled by default.

**Command Mode**

- CONFIGURATION

**Command History**

Version 8.3.1.0 Introduced

**mpls rsvp bfd all-neighbors disable**

Disable BFD for RSVP on a single interface.

**Syntax**

```
[no] mpls rsvp bfd all-neighbors disable
```

**Defaults**

BFD is disabled by default.

**Command Mode**

- INTERFACE
debug mpls traffic-eng fast-reroute

Debug fast-reroute scenarios such as backup selection.

Syntax
dep mpls traffic-eng fast-reroute

Command Mode EXEC Privilege

Command History

<table>
<thead>
<tr>
<th>Command History</th>
<th>Version 8.3.1.0</th>
<th>Introduced</th>
</tr>
</thead>
</table>

mpls traffic-eng backup-path

Configure a particular MPLS-enabled tunnel as the bypass tunnel for all LSPs that are egressing the system through this interface.

Syntax
[no] mpls traffic-eng backup-path tunnel number

Parameters

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>tunnel number</td>
<td>Enter the keyword tunnel followed by the tunnel number.</td>
</tr>
</tbody>
</table>

Defaults

There are no default bypass tunnels for an interface.

Command Mode INTERFACE

Command History

<table>
<thead>
<tr>
<th>Command History</th>
<th>Version 8.3.1.0</th>
<th>Introduced</th>
</tr>
</thead>
</table>
tunnel mpls traffic-eng backup-bw

Configure the amount of bandwidth allocated to send bypass traffic when this tunnel acts as a bypass tunnel. This available bandwidth is used to select the bypass tunnel when multiple bypass tunnels are available for the same physical interface.

**Syntax**

```plaintext
[no] tunnel mpls traffic-eng backup-bw {unlimited | bandwidth}
```

**Parameters**

- **unlimited**: Enter this keyword to unlimit the amount of bypass traffic that can be sent on the tunnel.
- **bandwidth**: Enter the amount of bandwidth for bypass traffic on the tunnel. Range: 0-34000000 kbps

**Defaults**

The default is unlimited bandwidth.

**Command Mode**

INTERFACE TUNNEL

**Command History**

- **Version 8.3.1.0**: Introduced

---

tunnel mpls traffic-eng fast-reroute

Enable a tunnel to request fast-reroute protection at ingress and transit routers through which the tunnel LSP passes.

**Syntax**

```plaintext
[no] tunnel mpls traffic-eng fast-reroute [node-protect || bw-protect]
```

**Parameters**

- **node-protect**: Enter this keyword to request node protection at PLR nodes.
- **bw-protect**: Enter this keyword to request bandwidth protection at PLR nodes.

**Defaults**

Fast-reroute is disabled by default.

**Command Mode**

INTERFACE TUNNEL

**Command History**

- **Version 8.3.1.0**: Introduced
**show mpls traffic-eng tunnels backup**

Display backup tunnel details and the links protected by them.

**Syntax**

show mpls traffic-eng tunnels backup

**Command Mode**

EXEC Privilege

**Command History**

<table>
<thead>
<tr>
<th>Version 8.3.1.0</th>
<th>Introduced</th>
</tr>
</thead>
</table>

**Example**

When backup tunnels is in ready state:

```
Force10#show mpls traffic-eng tunnels backup
Tu 16383
 Admin: up, Oper: up
 Src 100.1.1.1, Dest 100.1.1.2, Instance 0
 Fast Reroute Backup Provided:
  Protected i/fs: Gi 0/60
  Protected lsps: 100 Active lsps: 0
 Backup BW: global unlimited; inuse: 0 kbps
```

When backup tunnels is in Active state:

```
Force10#show mpls traffic-eng tunnels backup
Tu 16383
 Admin: up, Oper: up
 Src 100.1.1.1, Dest 100.1.1.2, Instance 0
 Fast Reroute Backup Provided:
  Protected i/fs: Gi 0/60
  Protected lsps: 100 Active lsps: 100
 Backup BW: global unlimited; inuse: 0 kbps
```

**show mpls rsvp fast-reroute**

Display information about fast-reroute enabled tunnels in RSVP.

**Syntax**

show mpls rsvp fast-reroute [bw-protect]

**Parameters**

| bw-protect | Enter this keyword to display the RSVP FRR database entries with the bandwidth-protected flag. |

**Command Mode**

EXEC Privilege

**Command History**

<table>
<thead>
<tr>
<th>Version 8.3.1.0</th>
<th>Introduced</th>
</tr>
</thead>
</table>

**Example**

```
Force10#show mpls rsvp fast-reroute
Primary Protect BW Backup
Tunnel I/F BPS:Type Tunnel:Label State Level Type
------- ------- -------- ------------- ------ ----- ----- ----- ----- ----- ----- ----- --------
Force10_T1 Gi 0/60 OK:G Tu 5000:3016 Ready any-unl Nhop
```

```
Force10#show mpls rsvp fast-reroute bw-protect
Primary Protect BW Backup
Tunnel I/F BPS:Type Tunnel:Label State BW-P Type
------- ------- -------- ------------- ------ ------ ----- ----- ----- ----- ----- ----- --------
Force10_T1 Gi 0/60 OK:G Tu 5000:3016 Ready OFF Nhop
```
**show mpls traffic-eng fast-reroute**

Display information about fast-reroute enabled tunnels. This command also displays the status of the selected backup tunnel [ready/active]. The output differs slightly on the ingress and transit router.

**Syntax**

`show mpls traffic-eng fast-reroute database`

**Command Mode**

EXEC Privilege

**Command History**

Version 8.3.1.0 Introduced

**Example**

The following example is from an ingress router when the backup tunnel also originates at the ingress router (Ingress FRR).

```
Force10#show mpls traffic-eng fast-reroute database
Tunnel head end item frr information:
Protected tunnel              In-label Out intf/label   FRR intf/label   Status
----------------              -------- --------------   --------------   ------
Tunnel1                       Tun hd   Gi 0/60:3016     Tu 5000:3016     Ready
```

The following example is from a transit router when the backup tunnel also originates at the transit router (Transit FRR):

```
Force10#show mpls traffic-eng fast-reroute database
Tunnel head end item frr information:
Protected tunnel              In-label Out intf/label   FRR intf/label   Status
----------------              -------- --------------   --------------   ------
LSP midpoint item frr information:
LSP identifier                In-label Out intf/label   FRR intf/label   Status
----------------              -------- --------------   --------------   ------
100.1.1.1 1 [3]               3016     Gi 0/66:3        Tu 2:3           Ready
```

### RSVP Graceful Restart Commands

The RSVP graceful restart commands are:

- `debug mpls rsvp graceful-restart` on page 31
- `mpls rsvp signalling hello graceful-restart` on page 32
- `show mpls rsvp hello graceful-restart` on page 32

**debug mpls rsvp graceful-restart**

Display RSVP graceful-restart messages.

**Syntax**

`debug mpls rsvp graceful-restart`

**Command Mode**

EXEC Privilege

**Command History**

Version 8.3.1.0 Introduced
mpls rsvp signalling hello graceful-restart

Enable RSVP Graceful Restart and configure the restart time/recovery time intervals.

Syntax

[no] mpls rsvp signaling hello graceful-restart {enable | restart-time interval | recovery-time interval}

Parameters

<table>
<thead>
<tr>
<th>enable</th>
<th>Enter this keyword to enable RSVP Graceful Restart.</th>
</tr>
</thead>
<tbody>
<tr>
<td>restart-time interval</td>
<td>Enter the keyword followed by a restart interval in milliseconds. The restart time is the time the upstream neighbor waits after a hello lost condition is detected before deciding if the downstream router will come up with retained forwarding information. Range: 60000-3600000 milliseconds</td>
</tr>
<tr>
<td>recovery-time interval</td>
<td>Enter the keyword followed by the recovery time interval in milliseconds. The recovery time is the period after a restart that all labels must be recovered and the labels that are not recovered must be deleted from the forwarding plane. Range: 60000-480000 milliseconds</td>
</tr>
</tbody>
</table>

Defaults

Graceful Restart is disabled by default in the router. Default restart interval is 60000 milliseconds. Default recovery interval is 120000 milliseconds.

Command Mode

CONFIGURATION

Command History

Version 8.3.1.0 Introduced

Usage Information

Helper mode is enabled when Graceful Restart is enabled.

show mpls rsvp hello graceful-restart

Display information about configured RSVP Graceful Restart parameters.

Syntax

show mpls rsvp hello graceful-restart

Command Mode

EXEC Privilege

Command History

Version 8.3.1.0 Introduced

Example

Force10# show mpls rsvp hello graceful-restart
RSVP Graceful Restart: Disabled
RestartTime: 60000
RecoveryTime: 1200000

Related Commands

mpls rsvp signalling hello graceful-restart on page 32
Tunnel Management Commands

The tunnel management commands are:

- debug mpls traffic-eng tunnels on page 33
- exclude-address on page 34
- interface tunnel on page 34
- ip explicit-path name on page 34
- next-address on page 35
- ping mpls on page 35
- traceroute mpls on page 36
- tunnel destination on page 36
- tunnel mode mpls on page 36
- tunnel mpls traffic-eng admin-group on page 37
- tunnel mpls traffic-eng bandwidth on page 37
- tunnel mpls traffic-eng path-option on page 38
- tunnel mpls traffic-eng record-route on page 38
- tunnel mpls traffic-eng retries on page 39
- tunnel mpls traffic-eng setup-priority on page 39
- show interface tunnel on page 40
- show ip explicit-path on page 40
- show ip interface tunnel on page 41
- show mpls traffic-eng tunnels on page 41
- show mpls traffic-eng tunnels brief on page 42
- show mpls traffic-eng tunnels protection on page 43
- show mpls traffic-eng tunnels statistics on page 43
- show mpls traffic-eng tunnels summary on page 44
- show running-config interface tunnel on page 44

**debug mpls traffic-eng tunnels**

Display tunnel management related events.

**Syntax**

```
debug mpls traffic-eng tunnels {all | detail | events | errors | reoptimize | timers}
```

**Parameter**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>all</td>
<td>Enter this keyword to enable all tunnel messages.</td>
</tr>
<tr>
<td>detail</td>
<td>Enter this keyword to enable detailed tunnel messages.</td>
</tr>
<tr>
<td>events</td>
<td>Enter this keyword to enable display tunnel events.</td>
</tr>
<tr>
<td>errors</td>
<td>Enter this keyword to display tunnel-related errors.</td>
</tr>
<tr>
<td>reoptimize</td>
<td>Enter this keyword to display reoptimization messages.</td>
</tr>
<tr>
<td>timers</td>
<td>Enter this keyword to display tunnel timer-related events.</td>
</tr>
</tbody>
</table>

**Command Mode**

EXEC Privilege
exclude-address

Exclude an IP address from paths chosen by CSPF. This command can only be used when there are no other types of hops specified in the explicit path list. You may exclude more than one address.

Syntax

```
[no] exclude-address ip-address
```

Parameter

- `ip-address`: Enter the IP address of a hop that must be avoided from computed paths.

Defaults

None

Command Mode

EXPLICIT PATH

Command History

Version 8.3.1.0 Introduced

interface tunnel

Create a tunnel. The tunnel is added as a logical interface with no default configuration.

Syntax

```
[no] interface tunnel tunnel-id
```

Parameter

- `tunnel-id tunnel-id`: Enter the keyword followed by a number that will be the tunnel interface number.
  Range: 1-16383

Defaults

None

Command Mode

CONFIGURATION

Command History

Version 8.3.1.0 Introduced

ip explicit-path name

Create an explicit path of strict and loose hops that can be associated with the MPLS tunnel path option.

Syntax

```
[no] ip explicit-path name path-name
```
next-address

Add an IP address to the list of hops at the end of the list; the address may be strict or loose. The sequence number for the entry is generated by default and increments in steps of 5.

Syntax

[no] [seq number] next-address ip-address {strict | loose}

Parameter

- **seq number**: Enter the keyword followed by a number to assign a sequence number to an address entry. Use this option to insert IP address hops in between existing hops. An existing sequence number cannot be overwritten; delete it before configuring the same sequence number again. Range: 0-255
- **ip-address**: Enter the IP address of the next hop.
- **strict**: Enter this keyword to configure the IP address as a strict hop.
- **loose**: Enter this keyword to configure the IP address as a loose hop.

Default

Strict hop; sequence numbers increment in steps of 5.

Command Mode

EXPLICIT PATH

Command History

Version 8.3.1.0 Introduced

ping mpls

Ping RSVP tunnels or LSPs.

Syntax

ping mpls {ldp ip-address/mask | traffic-eng tunnel number}

Parameter

- **ldp ip-address**: Enter the keyword followed by the destination IP address and mask to ping an LSP.
- **traffic-eng tunnel number**: Enter the keywords followed by the tunnel number to ping a tunnel interface.

Command Mode

EXEC Privilege
traceroute mpls

Traceroute an RSVP tunnel.

Syntax

```
traceroute mpls traffic-eng tunnel number
```

Parameters

- `traffic-eng tunnel number` Enter the keywords followed by the tunnel number to traceroute a tunnel.

Command Mode

EXEC Privilege

Command History

Version 8.3.1.0 Introduced

tunnel destination

Set a destination endpoint for the tunnel. This destination address is used by tunnel signaling protocols to establish a logical tunnel to the particular destination address.

Syntax

```
[tunnel destination ip-address]
```

Parameters

- `ip-address` Enter the destination IP address for the tunnel.

Defaults

None

Command Mode

INTERFACE TUNNEL

Command History

Version 8.3.1.0 Introduced

tunnel mode mpls

Configure a tunnel to operate in MPLS-TE mode. This command is mandatory for a tunnel to be signalled using RSVP-TE.

Syntax

```
[tunnel mode mpls]
```

Defaults

None

Command Mode

INTERFACE TUNNEL
tunnel mpls traffic-eng admin-group

Assign a tunnel to one or more admin groups.

Syntax

```
[no] tunnel mpls traffic-eng admin-group [include-any | exclude] group-name
```

Parameters

- **include-any**: Enter this keyword to add the tunnel to a group.
- **exclude**: Enter this keyword to exclude tunnel from a group.
- **group-name**: Enter a group name.

Defaults

None

Command Mode

INTERFACE TUNNEL

Example

```
Force10(conf)#inter tun 1
Force10(conf-if-tu-1)#tunnel destination 100.1.1.4
Force10(conf-if-tu-1)#tunnel mode mpls
Force10(conf-if-tu-1)#tunnel mpls traffic-eng path-option 10 dynamic
Force10(conf-if-tu-1)#tunnel mpls traffic-eng admin-group include premium
Force10(conf-if-tu-1)#tunnel mpls traffic-eng admin-group exclude leased
Force10(conf-if-tu-1)#no shut
Force10(conf-if-tu-1)#show conf
!
tunnel mpls traffic-eng bandwidth
```

`tunnel mpls traffic-eng bandwidth`

Configure a tunnel bandwidth requirement. If none is configured, then the tunnel is assumed to have no specific bandwidth requirement.

Syntax

```
[no] tunnel mpls traffic-eng bandwidth bandwidth
```

Parameters

- **bandwidth**: Enter the keyword followed by the bandwidth requirement for the tunnel in kbps.
  - Range: 0-34000000 kbps

Defaults

The default bandwidth for a tunnel is 0.

Command Mode

INTERFACE TUNNEL
tunnel mpls traffic-eng path-option

Configure the tunnel traffic-engineering option with sequence number. While setting up a tunnel, path options with the lowest sequence numbers are preferred. path options skip the CSPF computation. Standby path options are used in MPLS LSP establishment only if the corresponding primary path option is already established.

Syntax

[no] tunnel mpls traffic-eng path-option [protect] path-num {dynamic | explicit name path-name [verbatim]} [lockdown] [bandwidth bandwidth]

Parameters

- **path-num**: Enter a sequence number for the path option.
  Range: 1-100
- **explicit name path-name**: Enter the keywords followed by a path option name.
- **protect**: Enter this keyword to reference a standby LSP for the corresponding same numbered primary path option.
- **verbatim**: Enter this keyword so that even if CSPF cannot find a path to the tunnel destination using the explicit path, the first hop in the explicit path list is resolved using a routing table lookup and RSVP signaling is performed.
- **lockdown**: Enter this keyword so that once a path is computed for the tunnel, it is not reoptimized until it is torn down and re-established. Any event that triggers a possible recomputation of the tunnel path is ignored until the tunnel is explicitly brought down administratively by the user, or is torn down due to other RSVP signaling mechanisms.
- **bandwidth bandwidth**: Enter the keyword followed by a path-option specific bandwidth requirement.
  Range: 0-100000000 kbps

Defaults

None

Command Mode

INTERFACE TUNNEL

Version 8.3.1.0 Introduced

Command History

- **Command**: tunnel mpls traffic-eng path-option
- **History**: Version 8.3.1.0 Introduced

---

tunnel mpls traffic-eng record-route

Configure the RSVP record route option for the tunnel. Configuring this after the tunnel is already up does not re-establish the tunnel.

Syntax

[no] tunnel mpls traffic-eng record-route

Defaults

None
tunnel mpls traffic-eng retries

Configure a retry interval for a particular tunnel.

Syntax

```
[no] tunnel mpls traffic-eng retries {interval seconds | disable}
```

Parameters

- `interval seconds` Enter the keyword followed by the time interval between retries for LSP establishment in the range. Range: 1 - 65535 seconds
- `disable` Enter this keyword to disable retries for LSP establishment for a particular tunnel.

Defaults

The LSP retry mechanism is enabled by default; the default interval is 30 seconds.

Command Mode

**INTERFACE TUNNEL**

**CONFIGURATION**

Command History

- **Version 8.3.1.0** Introduced

Usage Information

The retry time is used in cases when the primary LSP of a tunnel could not be established, the primary LSP is up, but its corresponding standby LSP is not up, or a make-before-break LSP is attempted due to a resource change or reoptimization. This command is available from INTERFACE TUNNEL and CONFIGURATION mode. Interface level configurations override the global configuration. Note that a small value can create unnecessary burden on the system when tunnel is in retry mode.

---

tunnel mpls traffic-eng setup-priority

Configure tunnel traffic-engineering setup and hold priorities. These are used when determining whether a particular tunnel can receive or hold on to a bandwidth reservation.

Syntax

```
[no] tunnel mpls traffic-eng setup-priority spriority hold-priority hpriority
```

Parameters

- `setup-priority spriority` Enter this keyword followed by a value for setup-priority. Range: 0-7
- `hold-priority hpriority` Enter this keyword followed by a value for hold-priority. Range: 0-7

Defaults

The default tunnel setup and hold priorities are set to 7.
show interface tunnel

Display information about a tunnel interface.

Syntax

```
show interface tunnel number
```

Parameters

- **tunnel number**: Enter this keyword followed by a tunnel number to display information for a particular tunnel.
  
  ```
  Range: 1-16383
  ```

Command Mode

EXEC Privilege

Command History

- **Version 8.3.1.0** Introduced

Example

```
Force10#show int tunnel 1
Tunnel 1 is up, line protocol is up
Interface index is 1107738625
Last clearing of "show interface" counters 14:57:23
0 bytes input
Time since last interface status change: 00:00:30
```

Usage Information

The output statistics counters do increment when packets are received except for single hop tunnels. The output statistics do not increment when the outbound label is an implicit or explicit null.

show ip explicit-path

This command can be used to display the contents of an explicit path.

Syntax

```
show ip explicit-path [name name]
```

Parameters

- **name name**: Enter the keyword followed by the path name.

Command Mode

EXEC Privilege

Command History

- **Version 8.3.1.0** Introduced

Example

```
Force10#show ip explicit-paths
Explicit path name Service_Provide_1
  5:   next-address 1.1.1.1 strict
 10:   next-address 2.2.2.2 strict
 15:   next-address 3.3.3.3 strict
```
show ip interface tunnel

Display IP protocol specific information about tunnel interface.

Syntax

```
show ip interface tunnel number
```

Parameters

- **tunnel number**: Enter the keyword followed by the tunnel number to display information for a particular tunnel.
  
  Range: 1-16383

Command Mode

- EXEC Privilege

Command History

- Version 8.3.1.0 Introduced

Example

```
Force10#show ip interface tunnel 1
Tunnel 1 is up, line protocol is up
Internet address is not set
Directed broadcast forwarding is disabled
Proxy ARP is enabled
Split Horizon is enabled
Poison Reverse is disabled
ICMP redirects are not sent
ICMP unreachables are not sent
```

show mpls traffic-eng tunnels

Display the current status of configured MPLS mode tunnels. The tunnel mode must be set to MPLS to display information using this command.

Syntax

```
show mpls traffic-eng tunnels [tunnel [number] [backup | protection] | role {head | transit | tail} | interface name]
```

Parameters

- **tunnels**: Enter this keyword to display tunnel status.
- **tunnel number**: Enter this keyword followed by a tunnel number to display information for a particular tunnel.
- **backup | protection**: Enter the keyword backup to display the backup status of a tunnel or protection to display the protection status of a tunnel.
- **role {head | transit | tail}**: Display tunnels according to their position in the LSP. Enter the keyword head for tunnels originating from this router, transit for LSPs that pass through this router, and tail for LSPs that terminate at this router.
- **interface name**: Enter the interface through which the tunnel exits out of the router.

Command Mode

- EXEC Privilege

Command History

- Version 8.3.1.0 Introduced
Example

```
Force10#show mpls traffic-eng tunnels tunnel 1
```

```
Tunnel name Force10_T1                      (Tunnel1) Destination 100.1.2.2
Status:
  Admin: up     Oper: up    Path: valid    Signalling: connected
  Path protection is configured and available for use, path weight: 1

Config Parameters:
  Configured path options:
    path option 5, type explicit strict1
    path option 10, type dynamic
    path protect option 5, type explicit strict2
  Tunnel level config:
    Bandwidth: 100000  kbps (Global) Priority: 7 7
    Include admin-group: affinity0, affinity1
    Exclude admin-group: affinity2
    Retry Timer: 30 seconds
    Fast reroute: disabled
  Active path option parameters:
    State: path option 5 is active
    Bandwidth override: disabled Lockdown: disabled Verbatim: disabled

In  Label: -
Out Label: GigabitEthernet 0/0, Implicit-null
RSVP Signalling Information:
  Src 100.1.2.1, Dst 100.1.2.2, Tunnel Id 1, Instance 7
RSVP Path Info:
  Local IP: 192.168.20.1
  Explicit Route: 192.168.20.1 192.168.20.2
  Record Route: 192.168.20.1
RSVP Resv Info:
  Record Route: 192.168.20.2
  Fspec: ave rate 100000 kbits, burst 1000 bytes, peak rate 100000 kbits

History:
  Time since tunnel created 03:12:13, last config change 00:00:12
  Number of tunnel instances used 8
  Current active LSP up time is 00:00:12
  Previous active LSP:
    Path option 5, instance 5
    Removal reason: Configuration change
  Previous failed LSP:
    Path option 3005, instance 4
    Failure reason: Route query to destination 100.1.2.2 failed
```

show mpls traffic-eng tunnels brief

Display a brief status of all tunnels or of a particular type.

**Syntax**

```
show mpls traffic-eng tunnels role brief {head | transit | tail}
```

**Parameters**

<table>
<thead>
<tr>
<th>head</th>
<th>transit</th>
<th>tail</th>
</tr>
</thead>
<tbody>
<tr>
<td>Display tunnels according to their position in the LSP. Enter the keyword <strong>head</strong> for tunnels originating from this router, <strong>transit</strong> for LSPs that pass through this router, and <strong>tail</strong> for LSPs that terminate at this router.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Command Mode**

EXEC Privilege

**Command History**

<table>
<thead>
<tr>
<th>Version</th>
<th>Introduced</th>
</tr>
</thead>
<tbody>
<tr>
<td>8.3.1.0</td>
<td></td>
</tr>
</tbody>
</table>
show mpls traffic-eng tunnels protection

Display the current status of the standby LSP for all tunnels for which a standby path option has been configured.

Syntax

show mpls traffic-eng tunnels protection

Command Mode

EXEC Privilege

Command History

Version 8.3.1.0 Introduced

Example

force10#show mpls traffic-eng tunnels protection

Tunnel name Force10_T1 (Tunnel1) Destination 100.1.2.2
Status:
Admin: up Oper: up Path: valid Signalling: connected
Primary lsp path: 192.168.20.1 192.168.20.2
Protect lsp path: 192.168.20.5 192.168.20.6
Path Protect Parameters:
Bandwidth: 100000 kbps Priority: 7 7
Include admin-group: affinity0, affinity1
Exclude admin-group: affinity2
In  Label: -
Out Label: GigabitEthernet 0/48, Implicit-null
RSVP Signalling Information:
Src 100.1.2.1, Dst 100.1.2.2, Tunnel Id 1, Instance 8
RSVP Path Info:
Local IP: 100.1.2.1
Explicit Route: 192.168.20.5 192.168.20.6
Record Route: None
Tspsc: ave rate 100000 kbits, burst 1000 bytes peak rate 100000 kbits
RSVP Resv Info:
Record Route: None
Fspec: ave rate 100000 kbits, burst 1000 bytes, peak rate 100000 kbits
force10#
show mpls traffic-eng tunnels summary

Display the current status of RSVP and traffic-engineering processes and a summary of tunnels configured. The tunnel mode must be set to MPLS to display information using this command.

Syntax
show mpls traffic-eng tunnels summary

Command Mode
EXEC Privilege

Command History
Version 8.3.1.0 Introduced

Example
Force10#show mpls traffic-eng tunnels statistics
Tunnel 1, destination 60.60.60.60
  Administratively up, operationally down
  Tunnel establishment failed attempts 0
    Invalid explicit path 0, no path options 0
    Destination address not configured 0
  State transitions 4
    Administrative down 0, operational down 2
  LSP establishment errors
    Activation timeout 0, protocol errors 0
  Route query failed 34
  Active primary LSP tear down 2 times
  Protocol error received 2, administrative down 0
  Tunnel since created 08:37:40, admin up for 08:37:40
  Time elapsed since last path option list change 00:22:16

show running-config interface tunnel

Display the user configured commands for a tunnel interface. Without the number option, all tunnel configurations are displayed.

Syntax
show running-config interface tunnel [number]

Parameters
- **tunnel number**: Enter the keyword followed by the tunnel number to display information for a particular tunnel.
Tunnel Re-optimization Commands

The tunnel re-optimization commands are:

- `debug mpls traffic-eng tunnels reoptimize` on page 45
- `mpls traffic-eng reoptimize` on page 45
- `mpls traffic-eng tunnels reoptimize disable` on page 46
- `mpls traffic-eng tunnels reoptimize frequency` on page 46
- `mpls traffic-eng tunnels reoptimize events` on page 46

**debug mpls traffic-eng tunnels reoptimize**

Syntax: `debug mpls traffic-eng tunnels reoptimize`

Command Mode: EXEC Privilege

**mpls traffic-eng reoptimize**

Syntax: `[no] mpls traffic-eng reoptimize [all | tunnel number]`

Parameters:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>all</td>
<td>Enter this keyword to reoptimize all tunnels.</td>
</tr>
<tr>
<td>tunnel number</td>
<td>Enter the keyword followed by the tunnel number to reoptimize the specified tunnel.</td>
</tr>
</tbody>
</table>

Defaults: None

Example:
```
Force10#show running-config interface tunnel 1
!interface Tunnel 1
tunnel destination 60.60.60.60
tunnel mode mpls
tunnel mpls traffic-eng path-option 1 dynamic
tunnel mpls traffic-eng path-option protect 1 dynamic
no shutdown
```
## mpls traffic-eng tunnels reoptimize disable

Disables periodic reoptimization for all tunnels. A non-default frequency configuration is retained even though reoptimization is disabled.

### Syntax

```plaintext
[no] mpls traffic-eng tunnels reoptimize disable
```

### Defaults

Periodic reoptimization is enabled by default.

### Command Mode

CONFIGURATION

### Command History

Version 8.3.1.0 Introduced

## mpls traffic-eng tunnels reoptimize frequency

Choose a reoptimization interval for tunnels. The frequency should not be too low as it affects other functionality because of frequent CSPF database queries.

### Parameters

- **frequency**
  - **interval**
    - Enter the keyword followed by an interval in seconds.
    - Range: 10 to 604800 seconds

### Defaults

Default tunnel reoptimization frequency is 3600 seconds.

### Command Mode

CONFIGURATION

### Command History

Version 8.3.1.0 Introduced

## mpls traffic-eng tunnels reoptimize events

Enable tunnel reoptimization on receiving a link up notification from one of the IGPs for a TE-enabled area.

### Syntax

```plaintext
[no] mpls traffic-eng tunnels reoptimize events link-up
```
ip unnumbered

Configure a source IP address for the tunnel. This is required for the tunnel to be considered for any data forwarding.

**Syntax**

```
[no] ip unnumbered interface-name
```

**Parameters**

- `interface-name`: Select an interface from which a tunnel can borrow its source address.

**Defaults**

Tunnels do not have an IP address by default.

**Command Mode**

INTERFACE TUNNEL

**Command History**

Version 8.3.1.0 Introduced

---

Tunnel Auto-route Commands

The tunnel auto-route commands are:

- ip unnumbered on page 47
- tunnel mpls traffic-eng autoroute announce on page 47
- tunnel mpls traffic-eng autoroute metric on page 48
- show mpls traffic-eng autoroute on page 48

---

tunnel mpls traffic-eng autoroute announce

Enable the tunnel to participate in the autoroute mechanism of IGPs such as OSPF or IS-IS.

**Syntax**

```
[no] tunnel mpls traffic-eng autoroute announce
```

**Defaults**

Tunnels do not participate in autoroute by default.

**Command Mode**

INTERFACE TUNNEL
tunnel mpls traffic-eng autoroute metric

Configure an implicit metric for the tunnel when it is used in SPF calculations of IGPs such as OSPF and IS-IS. All destinations beyond the tunnel have a metric based on the tunnel cost plus the link cost from the tunnel destination.

**Syntax**

```plaintext
[tunnel mpls traffic-eng autoroute metric {value | absolute absolute-metric | relative relative-metric}]
```

**Parameters**

- **value**
  - Enter a tunnel metric for autoroutes.
  - Range: 1-4294967295
- **absolute metric**
  - Enter the keyword followed by an absolute tunnel metric for autoroutes.
  - Range: 1-4294967295
- **relative metric**
  - Enter the keyword followed by a relative tunnel metric for autoroutes.
  - Range: -10 to 10

**Defaults**

Tunnels use the IGP cost to the tunnel destination as the cost for SPF calculations by default.

**Command Mode**

INTERFACE TUNNEL

**Command History**

- Version 8.3.1.0 Introduced

show mpls traffic-eng autoroute

Display information about tunnels that are currently enabled for autoroute.

**Syntax**

```plaintext
show mpls traffic-eng autoroute [area number | destination ip-address]
```

**Parameters**

- **area number**
  - Enter the keyword followed by the area number to display autoroute information for tunnels in an OSPF area.
- **destination ip-address**
  - Enter the keyword followed by the destination address to display autoroute information for tunnels terminating at the specified destination IP address.

**Command Mode**

EXEC Privilege

**Command History**

- Version 8.3.1.0 Introduced
show mpls traffic-eng forwarding-adjacency

Example

```
Force10#show mpls traffic-eng autoroute
MPLS TE autoroute is enabled
area ospf 0  area 0, has 3 tunnels
  Tu 3 destination 60.60.60.60 (load balancing metric 0, nexthop 60.60.60.60)
    (flags: Announce)
  Tu 2 destination 60.60.60.60 (load balancing metric 0, nexthop 60.60.60.60)
    (flags: Announce)
  Tu 1 destination 60.60.60.60 (load balancing metric 0, nexthop 60.60.60.60)
    (flags: Announce)
```

Related Commands

- `tunnel mpls traffic-eng autoroute announce` on page 47

Tunnel Forwarding Adjacency Commands

The tunnel forwarding-adjacency commands are:

- `show mpls traffic-eng forwarding-adjacency` on page 49
- `tunnel mpls traffic-eng forwarding-adjacency` on page 49
- `tunnel mpls traffic-eng forwarding-adjacency holdtime` on page 50

show mpls traffic-eng forwarding-adjacency

Syntax

```
show mpls traffic-eng forwarding-adjacency [area number | destination ip-address]
```

Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>area number</td>
<td>Enter the keyword followed by the area number to display forwarding adjacency information for tunnels in an OSPF area.</td>
</tr>
<tr>
<td>destination</td>
<td>ip-address Enter the keyword followed by the destination address to display forwarding adjacency information for tunnels terminating at a destination IP address.</td>
</tr>
</tbody>
</table>

Command Mode

EXEC Privilege

Command History

- Version 8.3.1.0 Introduced

Related Commands

- `show mpls traffic-eng forwarding-adjacency` on page 49

`tunnel mpls traffic-eng forwarding-adjacency`

Syntax

```
[tunnel mpls traffic-eng forwarding-adjacency
```

Set up a forwarding adjacency.

Parameters

- `[no]` tunnel mpls traffic-eng forwarding-adjacency
tunnel mpls traffic-eng forwarding-adjacency holdtime

Configure a hold time for advertising a tunnel-down event to IGP neighbors. A hold time avoids frequent updates to IGP databases in all routers in an area, in case of tunnel flapping.

**Syntax**

[n] tunnel mpls traffic-eng forwarding-adjacency holdtime *interval*

**Parameters**

| **holdtime interval** | Enter the keyword followed by a hold time in seconds. Range: 0-4294967295 |

**Defaults**

There is no default hold time.

**Command Mode**

INTERFACE TUNNEL

**Command History**

Version 8.3.1.0 Introduced

---

**Data Forwarding Commands**

The data forwarding commands are:

- `debug mpls lfib` on page 50
- `debug mpls process` on page 51
- `ip route tunnel` on page 51
- `show mpls forwarding table` on page 52
- `show mpls forwarding entries` on page 52
- `show mpls process` on page 54

**debug mpls lfib**

Display MPLS controller related activities.

`debug mpls lfib {all | detail | download | events | errors | graceful-restart}`

**Parameters**

| **all** | Enter this keyword to display all MPLS controller debugging. |
| **detail** | Enter this keyword to display detailed MPLS controller events. |
debug mpls process

Display internal MPLS task activities.

Syntax

```
debug mpls process {rsvp | ldp | cspf | controller} {cli | clients | internal | internal-msg}
```

Parameters

- **download**: Enter this keyword to display MPLS controller information downloaded to linecard agents.
- **events**: Enter this keyword to display MPLS controller events.
- **errors**: Enter this keyword to display MPLS controller errors.
- **graceful-restart**: Enter this keyword to display MPLS controller graceful-restart messages.

Command Mode

EXEC Privilege

Command History

- **Version 8.3.1.0** Introduced

ip route tunnel

Create a static route to push data traffic into a tunnel.

Syntax

```
[no] ip route ip-address/mask tunnel number [metric | permanent | tag number]
```

Parameters

- **ip-address/mask**: Enter the IP address followed by the subnet mask.
- **tunnel number**: Enter the keyword tunnel followed by the tunnel number.
show mpls forwarding entries

Display the MPLS forwarding table maintained in linecards.

Syntax

show mpls forwarding entries linecard number [summary] [tunnel [tunnel number]] [detail]

Parameters

- **linecard number**: Enter the keyword followed by a line card number to display information from a particular linecard.
- **summary**: Enter this keyword to display summary information.
- **tunnel**: Enter the keyword to display label information for all tunnels.
- **[tunnel number]**: Enter the keyword followed by the tunnel number to display label information for an ingress tunnel.
- **detail**: Enter this keyword to display detailed information.

Command Mode

EXEC Privilege

Command History

Version 8.3.1.0 Introduced

Example

```
Force10#show mpls forwarding entries
Flags:  H - entry in hardware,  F - fast FRR is enabled,  T - FRR triggered
TunnelID  OutLabel  Out-If     Packets-Out            Bytes-Out           Flags
1         216       Gi 0/60     23242                212312               HF
2         217       Gi 0/60     0                    0                    HF
3         218       Gi 0/60     124556               16678                HF
4         219       Gi 0/60     0                    0                    HF
5         220       Gi 0/60     0                    0                    HF
6         407       Gi 0/60     365733               24869844
```

show mpls forwarding table

Display the MPLS forwarding table maintained by the MPLS controller.

```
metric
Enter a distance metric for the route.
Range: 1-255

permanent
Enter this keyword to make the route a permanent route.

tag number
Enter this keyword followed by a tag number.
Range: 1-4294967295

Defaults
None

Command Mode

CONFIGURATION

Command History

Version 8.3.1.0 Introduced
### Syntax

```
show mpls forwarding table [ip-address | ldp-ingress | tunnel [tunnel number]] [detail]
```

### Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ip-address</td>
<td>Enter an IP address in the form A.B.C.D.</td>
</tr>
<tr>
<td>ldp-ingress</td>
<td>Enter the keyword to display LDP ingress entries.</td>
</tr>
<tr>
<td>tunnel</td>
<td>Enter the keyword to display RSVP information for ingress tunnels.</td>
</tr>
<tr>
<td>tunnel number</td>
<td>Enter the keyword to display RSVP information for a particular ingress tunnel.</td>
</tr>
<tr>
<td>detail</td>
<td>Enter this keyword to display additional information.</td>
</tr>
</tbody>
</table>

### Command Mode

EXEC Privilege

### Command History

Version 8.3.1.0 Introduced

### Example

The following example is from an ingress router:

```plaintext
Force10#show mpls forwarding table tunnel
Local    Outgoing    Prefix                       Outgoing   Next Hop
tag      tag or VC   or Tunnel Id                 interface
-        230         100.1.1.4 11 [5]             Gi 0/60    1.1.2.2
-        231         100.1.1.4 12 [5]             Gi 0/60    1.1.2.2
```

The following example is from a transit router:

```plaintext
Force10#show mpls forwarding table
Local    Outgoing    Prefix                       Outgoing   Next Hop
tag      tag or VC   or Tunnel Id                 interface
230      410         100.1.1.4 11 [5]             Gi 0/66    1.1.3.2
231      411         100.1.1.4 12 [5]             Gi 0/66    1.1.3.2
```

### Example

The following example is from an ingress router:

```plaintext
Force10#show mpls forwarding table ldp-ingress
Local    Outgoing    Prefix                       Outgoing   Next Hop
tag      tag or VC   or Tunnel Id                 interface
0        Imp-Null    100.1.1.2/32                 Gi 0/49    192.168.20.6
Imp-Null                                   Gi 0/48    192.168.20.2
0        100353      100.1.1.3/32                 Gi 0/49    192.168.20.6
100353                                   Gi 0/48    192.168.20.2
0        100351      172.16.30.0/30               Gi 0/49    192.168.20.6
100351                                   Gi 0/48    192.168.20.2
0        100352      172.16.30.4/30               Gi 0/49    192.168.20.6
100352                                   Gi 0/48    192.168.20.2
```

### show mpls hardware table ilm

Display the MPLS hardware forwarding table on the RPM.

#### Syntax

```
show mpls hardware table ilm linecard slot port-set port-pipe [detail || index]
```

#### Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>linecard slot</td>
<td>Enter the keyword followed by the line card slot.</td>
</tr>
<tr>
<td>port-set port-pipe</td>
<td>Enter the keyword followed by the port-pipe number.</td>
</tr>
</tbody>
</table>
**show mpls process**

Display status of FTOS MPLS tasks with task internal data or task memory data.

**Syntax**

`show mpls process {rsvp | cspf | controller} {status | memory}`

**Parameters**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>`rsvp</td>
<td>cspf</td>
</tr>
<tr>
<td><code>status</code></td>
<td>Enter this keyword to display the status of the selected task with task internal data.</td>
</tr>
<tr>
<td><code>memory</code></td>
<td>Enter this keyword to display the status of the selected task with task memory data.</td>
</tr>
</tbody>
</table>

**Command Mode**

EXEC Privilege

**Command History**

<table>
<thead>
<tr>
<th>Version</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>8.3.1.0</td>
<td>Introduced</td>
</tr>
</tbody>
</table>

**Usage Information**

The FTOS Incoming Label Manager (ILM) task runs on the RPM. It communicates with the ILM Agent task running on the line cards. ILM is responsible for programming the MPLS forwarding tables in hardware.
show mpls process

Example

Force10#show mpls process rsvp status
Keys: Process 10097, event 20061, IPC 74
IDs: Service 132, instance 0

Management thread parameters:
Queues: Request 16897, response 16898
FD: request 174, response 175, timer 0, SWP 13

Protocol thread parameters:
IPC Key 0
FD: request 0, response 0, timer 0

RSVP parameters:
Retry: Global frequency enabled, interval 30
Reoptimization: Status enabled, interval 3600
Ingress affinity check: disabled

Debugs:
Flags: External 0x0, MPLS-TE 0
Filter name: RSVP MPLS-TE

Management thread queue information:

<table>
<thead>
<tr>
<th>Client</th>
<th>SWF Q</th>
<th>Seq No High</th>
<th>Low</th>
<th>Msgs Rcvd</th>
</tr>
</thead>
<tbody>
<tr>
<td>IFM</td>
<td>94</td>
<td>0</td>
<td>40</td>
<td>40</td>
</tr>
<tr>
<td>MPLS Controller</td>
<td>95</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>MPLS-TE Management</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>3373</td>
</tr>
<tr>
<td>MPLS-TE Protocol</td>
<td>100</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Protocol thread queue information:

<table>
<thead>
<tr>
<th>Client</th>
<th>SWF Q</th>
<th>Seq No High</th>
<th>Low</th>
<th>Msgs Rcvd</th>
</tr>
</thead>
<tbody>
<tr>
<td>MPLS Controller</td>
<td>95</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>MPLS-TE Management</td>
<td>101</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>MPLS-TE Protocol</td>
<td>102</td>
<td>0</td>
<td>3373</td>
<td>0</td>
</tr>
</tbody>
</table>

Example

Force10#show mpls process cspf status
Keys: Process 10095, event 0, IPC 75
IDs: Service 244, instance 0

Management thread parameters:
Queues: Request 31233, response 31234
FD: request 176, response 177, timer 0, SWP 13

Protocol thread parameters:
IPC Key 76
FD: request 178, response 179, timer 0

Management thread queue information:

<table>
<thead>
<tr>
<th>Client</th>
<th>SWF Q</th>
<th>Seq No High</th>
<th>Low</th>
<th>Msgs Rcvd</th>
</tr>
</thead>
<tbody>
<tr>
<td>RSVP Mgmt</td>
<td>104</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>RSVP Protocol</td>
<td>0</td>
<td>0</td>
<td>5</td>
<td>0</td>
</tr>
</tbody>
</table>

Protocol thread queue information:

<table>
<thead>
<tr>
<th>Client</th>
<th>SWF Q</th>
<th>Seq No High</th>
<th>Low</th>
<th>Msgs Rcvd</th>
</tr>
</thead>
<tbody>
<tr>
<td>RSVP Mgmt</td>
<td>105</td>
<td>0</td>
<td>8</td>
<td>0</td>
</tr>
<tr>
<td>RSVP Protocol</td>
<td>106</td>
<td>0</td>
<td>3993</td>
<td>0</td>
</tr>
</tbody>
</table>

IGP Clients registration information:

Protocol: ospf, Service: 63
Router ID length 4, Network ID length 4

IGP process ID 100
Instance 0, SWP Queue Handle 103
SWP sequence number high 0 low 19

Area 0
CSPF Instance 1, FIPO FD 25 Count 0
RPM ready, PID 17846272
clear mpls ldp neighbor

Example

```
Force10#show mpls process controller memory pool
Pool name                  Count     Alloc       Count     Alloc
------------------------------- ------- ------- -------- -------
MPLSCTRL_OUTSEG_POOL        0        0        3        96       0
MPLSCTRL_INSEG_POOL         0        0        0        0       0
MPLSCTRL_XC_POOL            0        0        3       360       0
MPLSCTRL_TUNNEL_POOL        2        96        2        96       0
MPLSCTRL_IFINFO_POOL        2       288        2       288       0
MPLSCTRL_ARP_POOL           0        0        1        96       0
MPLSCTRL_CLIENT_POOL        6       1488       6       1488       0
MPLSCTRL_NHLFE_POOL         0        0        3       168       0
```

LDP Commands

The LDP commands are:

- clear mpls ldp neighbor on page 56
- clear mpls ldp statistics on page 57
- debug mpls ldp on page 57
- debug mpls ldp dump on page 57
- debug mpls ldp messages on page 58
- mpls ldp advertise-labels on page 58
- mpls ldp discovery hello on page 59
- mpls ldp enable on page 59
- mpls ldp holdtime on page 59
- mpls ldp independent-control on page 60
- mpls ldp log-neighbor-changes on page 60
- mpls ldp neighbor labels on page 61
- mpls ldp neighbor password on page 61
- mpls ldp router-id on page 62
- show mpls forwarding table ldp-ingress on page 62
- show mpls ldp bindings on page 63
- show mpls ldp discovery on page 64
- show mpls ldp interfaces on page 64
- show mpls ldp neighbor on page 65
- show mpls ldp parameters on page 66

clear mpls ldp neighbor

Clear LDP sessions for a specified neighbor or all neighbors.

**Syntax**

clear mpls ldp neighbor \{ip-address | *\}

**Parameters**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ip-address</td>
<td>Enter the neighbor IP address to tear down sessions for the specified neighbor.</td>
</tr>
<tr>
<td>*</td>
<td>Enter this keyword to tear down all sessions.</td>
</tr>
</tbody>
</table>
clear mpls ldp statistics

Clear LDP statistics for a specified neighbor or all neighbors. This command clears the statistics displayed in show mpls ldp neighbor.

Syntax

```
clear mpls ldp statistics neighbor {ip-address | *}
```

Parameters

- **ip-address**: Enter the neighbor IP address to clear statistics for the specified neighbor.
- *****: Enter this keyword to clear statistics for all neighbors.

debug mpls ldp

Display LDP label errors and events.

Syntax

```
d debug mpls ldp {binding | error | events | routing}
```

Parameters

- **binding**: Enter this keyword to display LIB changes.
- **errors**: Enter this keyword to display LDP errors.
- **events**: Enter this keyword to display LDP events.
- **routing**: Enter this keyword to display protocol FEC changes.

debug mpls ldp dump

Display LDP protocol messages in hexadecimal format.
debug mpls ldp messages

Syntax:  
`debug mpls ldp messages [in | out | [address | hello | init | keepalive | label | notification] [in | out]]`

Parameters:
- `address | hello | init | keepalive | label | notification` Enter one of these keywords to select the type of message to display.
- `in` Enter this keyword to display incoming messages.
- `out` Enter this keyword to display outgoing messages.

Command Mode: EXEC Privilege

Command History:
- Version 8.3.1.0 Introduced

mpls ldp advertise-labels

Syntax:  
`[no] mpls ldp advertise-labels [interface interface | for prefix-list [to peer-list]]`

Parameters:
- `interface interface` Enter the keyword followed by the interface to advertise the specified interface IP address.
- `for prefix-list` Enter the keyword followed by a prefix list that filters based on the prefixes that are present in the label binding.
- `to peer-list` Enter the keyword followed by a peer list that filters based on the LDP peer LSR ID.

Defaults: Always advertise all label bindings to all peers.
mpls ldp discovery hello

Select a non-default holdtime.

Syntax

[no] mpls ldp discovery hello holdtime seconds

Parameters

seconds

Choose a hold time in seconds.
Range: 3-65535 seconds

Defaults

The default holdtime is 5 seconds.

Command Mode

CONFIGURATION

Command History

Version 8.3.1.0 Introduced

mpls ldp enable

Enable LDP globally or on an individual interface.

Syntax

[no] mpls ldp enable

Defaults

Disabled

Command Mode

CONFIGURATION

INTERFACE

Command History

Version 8.3.1.0 Introduced

mpls ldp holdtime

Choose a non-default session holdtime. The keepalive interval is 1/3 of the session holdtime.
mpls ldp independent-control

Change the label distribution mode from Ordered Control to Independent Control.

Syntax

[no] mpls ldp independent-control

Defaults

Ordered Control

Command Mode

CONFIGURATION

Command History

Version 8.3.1.0 Introduced

Usage Information

Force10 recommends configuring Independent Control mode before enabling LDP. If LDP is already enabled, you must disable LDP globally from CONFIGURATION mode, and then re-enable LDP globally for the mpls ldp independent-control configuration to take effect. After you enter this command, FTOS prompts you to execute the disable/re-enable with the following message:

%% Configuration change will be in effect after LDP is disabled and enabled globally.

mpls ldp log-neighbor-changes

Generate log messages when an LDP FSM for a neighbor changes state changes state from/to operational.

Syntax

[no] mpls ldp log-neighbor-changes

Defaults

Enabled

Command Mode

EXEC Privilege

Command History

Version 8.3.1.0 Introduced
**mpls ldp neighbor labels**

Filter incoming label bindings from an LDP neighbor.

**Syntax**

```
[no] mpls ldp neighbor ip-address labels accept prefix-list
```

**Parameters**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>ip-address</code></td>
<td>Enter the IP address of the LDP neighbor.</td>
</tr>
<tr>
<td><code>prefix-list</code></td>
<td>Enter the prefix list used to filter the prefix FEC in the incoming label bindings.</td>
</tr>
</tbody>
</table>

**Defaults**

All incoming label bindings are accepted by default.

**Command Mode**

CONFIGURATION

**Command History**

Version 8.3.1.0 Introduced

---

**mpls ldp neighbor password**

Filter incoming label bindings from an LDP neighbor.

**Syntax**

```
[no] mpls ldp neighbor ip-address password [7 encrypted-pass | clear-pass]
```

**Parameters**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>ip-address</code></td>
<td>Enter the IP address of the LDP neighbor.</td>
</tr>
<tr>
<td><code>7 encrypted-pass</code></td>
<td>Enter the keyword followed by an MD5 encrypted password.</td>
</tr>
<tr>
<td><code>clear-pass</code></td>
<td>Enter a password string.</td>
</tr>
</tbody>
</table>

**Defaults**

All incoming label bindings are accepted by default.

**Command Mode**

CONFIGURATION

**Command History**

Version 8.3.1.0 Introduced

---

**Example**

```
Force10#show mpls ldp neighbor
Peer LDP Ident: 101.1.1.10:0; Local LDP Ident: 101.1.1.2:0
TCP connection: 101.1.1.2.646 - 101.1.1.10.35749
LDP session is MD5 authenticated
State: Oper; Msgs sent/rcvd: 4/20; Downstream
Up/Down Time: 00:00:12
Keepalive holdtime: sent/rcvd/neg 40/300/40 sec
Max PDU length: 4096 bytes
LDP discovery sources:
    GigabitEthernet 8/6
Addresses bound to peer LDP Ident:
    100.200.200.1
    101.1.1.10
    10.11.205.240
```

**Usage Information**
The password is always stored in encrypted form in the running-configuration unless `no service password-encryption` is configured.
Whenever the MD5 password is updated (added/deleted/modified), the LDP session is reinitialized, and FTOS displays:

Jun 23 15:22:07: %RPM0-P:RP1 %LDP-5-NBRCHG: Connection with LDP neighbor 101.1.1.10:0 closed. (Password Changed)

If the MD5 passwords do not match, FTOS displays:

Jun 21 15:39:11: %RPM0-P:RP1 %KERN-6-INT: LDP MD5 password mismatch from 101.1.1.10:11082 to 101.1.1.2:646

If the MD5 password is not configured on one LSR, FTOS displays:

Jun 21 11:25:09: %RPM0-P:RP1 %KERN-6-INT: No LDP MD5 from 101.1.1.10:57045 to 101.1.1.2:646

**mpls ldp router-id**

Change the LDP ID. LDP Router ID is a 6-byte field that consists of first 4 bytes identifying the LSR uniquely and the latter 2 bytes identifying the label space that the LSR is using. For a global label space, last 2 bytes are 0. For a per-interface label space, they are non-zero. FTOS currently only supports global label space.

**Syntax**

```
[no] mpls ldp router-id  interface
```

**Parameters**

- **interface**
  
  Enter the interface for determining the LDP router ID.

**Defaults**

The highest interface IP address configured on the LSR, or the loopback address with highest IP address is selected as LDP router-id; loopback interfaces are preferred.

**Command Mode**

CONFIGURATION

**Command History**

| Version 8.3.1.0 | Introduced |

**show mpls forwarding table ldp-ingress**

Display LDP LSPs at an edge router

**Syntax**

```
show mpls forwarding table ldp-ingress
```

**Command Mode**

EXEC Privilege

**Command History**

| Version 8.3.1.0 | Introduced |
show mpls ldp bindings

Display the LDP Label Information Base (LIB).

**Syntax**

```
show mpls ldp bindings [ip-address/mask] [[local-label | remote-label] label] [neighbor ip-address] [local]
```

**Parameters**

- **ip-address/mask**
Enter the destination address and subnet mask.

- **local-label label**
Enter the keyword followed by a label to match locally assigned label values. Range: 1-2147483647

- **remote-label label**
Enter the keyword followed by a label to match remotely assigned label values. Range: 1-4294967295

- **neighbor ip-address**
Enter the keyword followed by the neighbor address to display labels from the specified neighbor.

- **local**
Enter this keyword to display only locally assigned labels.

**Command Mode**

EXEC Privilege

**Command History**

Version 8.3.1.0 Introduced

**Example**

```
Force10#show mpls ldp bindings
172.16.30.0/30
 Local binding: label Implicit-Null
 Remote binding: None
172.16.30.4/30
 Local binding: label Implicit-Null
 Remote binding: None
192.168.20.0/30
 Local binding: label Not-Assigned
 Remote binding: lsr: 100.1.1.2, label: Implicit-Null
192.168.20.4/30
 Local binding: label Not-Assigned
 Remote binding: lsr: 100.1.1.2, label: Implicit-Null
192.168.20.12/30
 Local binding: label Not-Assigned
 Remote binding: lsr: 100.1.1.2, label: Implicit-Null
192.168.20.20/30
 Local binding: label Not-Assigned
 Remote binding: lsr: 100.1.1.2, label: Implicit-Null
192.168.30.0/30
 Local binding: label Implicit-Null
 Remote binding: lsr: 100.1.1.2, label: Implicit-Null
```

Example

```
Force10#show mpls forwarding table ldp-ingress
Local    Outgoing    Prefix                       Outgoing   Next Hop
 tag      tag or VC   or Tunnel Id                 interface
 0        Imp-Null    100.1.1.2/32                 Gi 0/49    192.168.20.6
 Imp-Null                                 Gi 0/48    192.168.20.2
 0        100353      100.1.1.3/32                 Gi 0/49    192.168.20.6
 100353                                   Gi 0/48    192.168.20.2
 0        100351      172.16.30.0/30               Gi 0/49    192.168.20.6
 100351                                   Gi 0/48    192.168.20.2
 0        100352      172.16.30.4/30               Gi 0/49    192.168.20.6
 100352                                   Gi 0/48    192.168.20.2
```
show mpls ldp discovery

Display sources for locally generated discovery hello PDUs.

Syntax

show mpls ldp discovery [detail]

Parameters

detail

Enter the keyword to display extended information.

Command Mode

EXEC Privilege

Command History

Version 8.3.1.0 Introduced

Example

Force10#show mpls ldp discovery
Local LDP Identifier:
100.1.1.1:0
Discovery Sources:
Interfaces:
  GigabitEthernet 0/48: xmit/recv
  LDP Id: 100.1.1.2:0; Direct
  Hello holdtime (configured/neg): 15/15 sec
  Source address: 192.168.20.2; Transport address 100.1.1.2
  Last rcvd config seq number: 0
  GigabitEthernet 0/49: xmit/recv
  LDP Id: 100.1.1.2:0; Direct
  Hello holdtime (configured/rcvd/neg): 15/15/15 sec
  Source address: 192.168.20.6; Transport address 100.1.1.2
  Last rcvd config seq number: 0

Force10#show mpls ldp discovery detail
Local LDP Identifier:
100.1.1.1:0
Discovery Sources:
Interfaces:
  GigabitEthernet 0/48: xmit/recv
  Hello holdtime (configured/neg): 15/15 sec
  LDP Id: 100.1.1.2:0; Direct
  Hello holdtime (configured/rcvd/neg): 15/15/15 sec
  Source address: 192.168.20.2; Transport address 100.1.1.2
  Last rcvd config seq number: 0
  GigabitEthernet 0/49: xmit/recv
  Hello holdtime (configured/neg): 15/15 sec
  LDP Id: 100.1.1.2:0; Direct
  Hello holdtime (configured/rcvd/neg): 15/15/15 sec
  Source address: 192.168.20.6; Transport address 100.1.1.2
  Last rcvd config seq number: 0

show mpls ldp interfaces

Display MPLS interfaces.

Syntax

show mpls ldp interfaces {interface | brief | advertise-label}

Parameters

interface

Enter the interface type followed by slot/port.

advertise-label

Enter the keyword to display interfaces that are enabled for address advertisement.

brief

Enter the keyword to display brief information.

Command Mode

EXEC Privilege

Command History

Version 8.3.1.0 Introduced
show mpls ldp neighbor

Display LDP neighbor information.

**Syntax**

```
show mpls ldp neighbor [ip-address [detail] | brief]
```

**Parameters**

- `ip-address [detail]` Enter the IP address of the neighbor, optionally followed by the keyword `detail` to display extended information.
- `brief` Enter this keyword to display brief information.

**Command Mode**

EXEC Privilege

**Command History**

- **Version 8.3.1.0** Introduced

**Example**

```
Force10#show mpls ldp neighbor detail
Peer LDP Ident: 100.1.1.2:0; Local LDP Ident: 100.1.1.1:0
TCP connection: 100.1.1.1.646 - 100.1.1.2.65190
State: Oper; Mags sent/rcvd: 637/1135; Downstream
Message Type    sent/rcvd counters
Notification:    0/0
Initialization:  1/0
KeepAlive:       586/586
Address:         1/1
Address Withdraw: 8/2
Label Map:       21/526
Label Request:   0/0
Label Withdraw:  16/4
Label Release:   0/4
Label Abort:     0/0
Up/Down Time:    02:10:14
Keepalive holdtime: sent/rcvd/neg 40/40/40 sec
Max PDU length:  4096 bytes
LDP discovery sources:
    GigabitEthernet 0/49
    GigabitEthernet 0/48
Addresses bound to peer LDP Ident:
    192.168.20.2
    192.168.20.6
    192.168.20.14
    192.168.20.22
    192.168.30.1
    192.168.30.5
    192.168.30.9
    192.168.30.13
    192.168.30.17
```
show mpls ldp parameters

Display LDP configuration parameters.

**Syntax**

```
show mpls ldp parameters
```

**Command Mode**

EXEC Privilege

**Command History**

<table>
<thead>
<tr>
<th>Version</th>
<th>Introduced</th>
</tr>
</thead>
<tbody>
<tr>
<td>8.3.1.0</td>
<td>Introduced</td>
</tr>
</tbody>
</table>

**Example**

```
Force10#show mpls ldp parameters
Protocol version: 1
Session hold time: 40 sec; keep alive interval: 13 sec
Discovery hello: holdtime: 15 sec; interval: 5 sec
Downstream on Demand max hop count: 255
Downstream on Downstream Path Vector Limit: 255
LDP for targeted sessions
LSP Control mode: Ordered
Label Retention mode: Liberal
Label Distribution mode: Unsolicited
LDP loop detection: off
```