MPLS Forwarding Commands

This module describes the commands used to configure and use Multiprotocol Label Switching (MPLS) forwarding.

For detailed information about MPLS concepts, configuration tasks, and examples, see *MPLS Configuration Guide for the Cisco CRS Routers*.

clear mpls forwarding counters

To clear (set to zero) the MPLS forwarding counters, use the **clear mpls forwarding counters** command in EXEC mode.

clear mpls forwarding counters

Syntax Description

This command has no arguments or keywords.

Command Default

No default behavior or values

Command Modes

EXEC

Command History

Release	Modification
Release 2.0	This command was introduced .
Release 3.0	No modification.
Release 3.2	No modification.
Release 3.3.0	No modification.
Release 3.4.0	No modification.
Release 3.5.0	No modification.
Release 3.6.0	No modification.
Release 3.7.0	No modification.
Release 3.8.0	No modification.
Release 3.9.0	No modification.

Usage Guidelines

Use the **clear mpls forwarding counters** command to set all MPLS forwarding counters to zero so that you can easily see the future changes.

Task ID

Task ID	Operations
mpls-te	read, write
mpls-ldp	read, write
mpls-static	read, write

Examples

The following example shows sample output before and after clearing all counters:

```
RP/0/RP0/CPU0:router# show mpls forwarding

  Local  Outgoing    Prefix            Outgoing     Next Hop        Bytes       T
  Label  Label       or ID             Interface                    Switched    O
  ------ --------- ------------- ---------- ------------ --------- -
  18     Exp-Null-v4 33.33.33.33/32    PO0/2/0/0    10.1.2.3        16762

RP/0/RP0/CPU0:router# clear mpls forwarding counters

RP/0/RP0/CPU0:router# show mpls forwarding

  Local  Outgoing    Prefix            Outgoing     Next Hop        Bytes       T
  Label  Label       or ID             Interface                    Switched    O
  ------ --------- ------------- ---------- ------------ --------- -
  18     Exp-Null-v4 33.33.33.33/32    PO0/2/0/0    10.1.2.3        17000
```

Related Commands

Command	Description
show mpls forwarding, on page 8	Displays the contents of MPLS forwarding table.

mpls ip-ttl-propagate

To configure the behavior controlling the propagation of the IP Time-To-Live (TTL) field to and from the MPLS header, use the **mpls ip-ttl-propagate** command in Global Configuration mode.

mpls ip-ttl-propagate disable [**forwarded** | **local**]

Syntax Description

disable	Disables the propagation of IP TTL to and from the MPLS header for both forwarded and local packets.
forwarded	(Optional) Disables the propagation of IP TTL to and from the MPLS headed for only the forwarded packets. This prevents the **traceroute** command from displaying the MPLS-enabled nodes beyond the device under the configuration.
local	(Optional) Disables the propagation of IP TTL to the MPLS header for only locally generated packets. This prevents the **traceroute** command from displaying the MPLS-enabled nodes beyond the device under the configuration.

Command Default

Enabled

Command Modes

Global Configuration

Command History

Release	Modification
Release 2.0	This command was introduced.
Release 3.0	No modification.
Release 3.3.0	No modification.
Release 3.4.0	No modification.
Release 3.5.0	No modification.
Release 3.6.0	No modification.
Release 3.7.0	No modification.
Release 3.8.0	No modification.
Release 3.9.0	Both **forwarded** and **local** keywords were added as optional.

Usage Guidelines

By default, the IP TTL is propagated to the MPLS header when IP packets enter the MPLS domain. Within the MPLS domain, the MPLS TTL is decremented at each MPLS hop. When an MPLS encapsulated IP packet exits the MPLS domain, the MPLS TTL is propagated to the IP header. When propagation is disabled, the MPLS TTL is set to 255 during the label imposition phase and the IP TTL is not altered.

Task ID

Task ID	Operations
mpls-te	read, write
mpls-ldp	read, write

Examples

The following example shows how to disable IP TTL propagation:

```
RP/0/RP0/CPU0:router(config)# mpls ip-ttl-propagate disable
```

The following example shows how to disable IP TTL propagation for forwarded MPLS packets:

```
RP/0/RP0/CPU0:router(config)# mpls ip-ttl-propagate disable forwarded
```

The following example shows how to disable IP TTL propagation for locally generated MPLS packets:

```
RP/0/RP0/CPU0:router(config)# mpls ip-ttl-propagate disable local
```

mpls label range

To configure the dynamic range of local labels available for use on packet interfaces, use the **mpls label range** command in Global Configuration mode.

mpls label range table *table-id minimum maximum*

Syntax Description

table *table-id*	Identifies a specific label table; the global label table has table-id = 0. If no table is specified, the global table is assumed. Currently, you can specify table 0 only.
minimum	Smallest allowed label in the label space. Default is 16000.
maximum	Largest allowed label in the label space. Default is 1048575.

Command Default

table-id: 0

minimum: 16000

maximum: 1048575

Command Modes

Global Configuration

Command History

Release	Modification
Release 2.0	This command was introduced.
Release 3.0	No modification.
Release 3.3.0	No modification.
Release 3.4.0	No modification.
Release 3.5.0	No modification.
Release 3.6.0	No modification.
Release 3.7.0	No modification.
Release 3.8.0	No modification.

Usage Guidelines

After configuring the **mpls label range** command, restart the router for the configuration to take effect.

The label range defined by the **mpls label range** command is used by all MPLS applications that allocate local labels (for dynamic label switching Label Distribution Protocol [LDP], MPLS traffic engineering, and so on).

Labels 0 through 15 are reserved by the Internet Engineering Task Force (IETF) (see the draft-ietf-mpls-label-encaps-07.txt for details) and cannot be included in the range using the **mpls label range** command.

Labels 16 through 15999 are reserved for Layer 2 VPN static pseudowires. You should not configure Layer 2 VPN static pseudowires which fall within the dynamic range. If more Layer 2 VPN static pseudowires are required, restrict the dynamic label range using this configuration.

Note

- Labels outside the current range and which are allocated by MPLS applications remain in circulation until released.
- You must understand the maximum labels that are supported for each platform versus the labels that are supported for the CLI.

Note Restart the router after changing the mpls label range.

Task ID

Task ID	Operations
mpls-te	read, write
mpls-ldp	read, write

Examples

The following example shows how to configure the size of the local label space using a *minimum* of 16200 and a *maximum* of 120000:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# mpls label range 16200 120000
```

Related Commands

Command	Description
show mpls label range, on page 24	Displays the range of the MPLS local label space.

show mpls forwarding

To display the contents of the MPLS Label Forwarding Information Base (LFIB), use the **show mpls forwarding**command in EXEC mode.

show mpls forwarding [**detail**] [**hardwareingress** | **egress**] [**interface** *type interface-path-id*] [**location** *node-id*] [**p2mp** [**local** | **unresolved** | [**leafs**]]] [**labels** *low-value* [*high-value*]] [**prefix***network/mask* | **ipv4 unicast** *network/mask*] [**private**] [**summary**] [**tunnels** *tunnel-id*] [**vrf** *vrf-name*]

Syntax Description

detail	(Optional) Displays information in long form (includes length of encapsulation, length of Media Access Control [MAC] string, maximum transmission unit [MTU], Packet switched, and label stack).
hardware	(Optional) Displays the hardware location entry.
ingress	(Optional) Reads information from the ingress PSE.
egress	(Optional) Reads information from the egress PSE.
interface	(Optional) Displays information for the specified interface.
type	Interface type. For more information, use the question mark (?) online help function.
interface-path-id	Physical interface or a virtual interface. **Note** Use the **show interfaces** command to see a list of all possible interfaces currently configured on the router. For more information about the syntax for the router, use the question mark (?) online help function.
labels *low-value* [*high-value*]	(Optional) Entries with a local labels range. Ranges for both *low-value* and *high-value* are 0 to 1048575.
location *node-id*	(Optional) Displays hardware resource counters on the designated node.
p2mp	(Optional) Displays only P2MP LSPs.
local	(Optional) Displays only P2MP LSP MPLS output paths that are local to a line card.
unresolved	(Optional) Displays P2MP LSPs that have failures. For example, one or more MPLS output paths are unresolved or have platform failures.
leafs	(Optional) Displays P2MP LSPs that have failures on the leaf such as platform failures.
prefix *network/mask /length*	(Optional) Displays the destination address and mask/prefix length. **Note** The forward slash (/) between *network* and *mask* is required.
ipv4 unicast	(Optional) Displays the IPv4 unicast address.

private	(Optional) Displays private information.
summary	(Optional) Displays summarized information.
tunnels *tunnel-id*	(Optional) Displays entries either for a specified label switch path (LSP) tunnel or all LSP tunnel entries.
vrf *vrf-name*	(Optional) Displays entries for VPN routing and forwarding (VRF).

Command Modes

EXEC

Command History

Release	Modification
Release 2.0	This command was introduced.
Release 3.0	No modification.
Release 3.3.0	No modification.
Release 3.4.0	No modification.
Release 3.5.0	No modification.
Release 3.6.0	No modification.
Release 3.7.0	No modification.
Release 3.8.0	No modification.
Release 3.9.0	The **p2mp**, **local**, **unresolved**, and **leafs** keywords were added to support the P2MP feature. The **hardware**, **egress**, and **ingress** keywords were added. The **ipv4** and **unicast** keywords were added.

Usage Guidelines

The optional keywords and arguments described allow specification of a subset of the entire MPLS forwarding table. This router does not support label accounting for vrf labels. Instead, it supports accounting for the IGP and LDP labels. As a result, the Bytes Switched counter is 0 for the **show mpls forwarding vrf** command.

The *node-id* argument is entered in the *rack/slot/module* notation.

Task ID

Task ID	Operations
mpls-te	read, write
mpls-ldp	read, write
mpls-static	read, write

Examples

The following sample output is from the **show mpls forwarding** command using the **location** keyword and a specific node ID:

```
RP/0/RP0/CPU0:router# show mpls forwarding location 0/2/CPU0

  Local  Outgoing    Outgoing     Next Hop                        Bytes
  Label  Label       Interface                                    Switched
  ------ ----------- ------------ --------------- ---------------------------
  16000  Unlabelled  ce01::ce01/128[V]  Gi0/1/0/0    ce01:10::2      0
  16001  Aggregate   router: Per-VRF Aggr[V]   \
                                    router 0
  16021  16020       P2MP TE:10     Gi0/2/0/3    172.99.1.2      13912344
         16040       P2MP TE:10     Gi0/2/0/3    172.99.2.2      13912344
         16045       P2MP TE:10     PO0/1/0/4    172.16.1.2      13912344
```

The following sample output displays only P2MP LSPs:

```
RP/0/RP0/CPU0:router# show mpls forwarding p2mp

16000  16000       P2MP TE:10         Te0/0/0/1    192.168.140.2   0
       16000       P2MP TE:10         Te0/0/0/2    192.168.170.1   0
```

The following sample output shows P2MP LSP MPLS output paths which are local to a line card:

```
RP/0/RP0/CPU0:router# show mpls forwarding p2mp local location 0/1/CPU0

  Local  Outgoing    Prefix       Outgoing     Next Hop        Bytes
  Label  Label       or ID        Interface                    Switched
  ------ ----------- ------------ ------------ ------------    ---------
  16021  16045       P2MP TE:10    PO0/1/0/4   172.16.1.2      13912344
```

The following sample output shows P2MP LSP that have failures, for example, one or more MPLS output paths are unresolved or have platform failures:

```
RP/0/RP0/CPU0:router# show mpls forwarding p2mp unresolved location 0/2/CPU0

  Local  Outgoing    Prefix       Outgoing     Next Hop        Bytes
  Label  Label       or ID        Interface                    Switched
  ------ ----------- ------------ ------------ ------------    ---------
  16021  16020       P2MP TE:10   Gi0/2/0/3    172.99.1.2      13912344
         16040       P2MP TE:10   Gi0/2/0/3    172.99.2.2      13912344
```

The following sample output shows the P2MP LSP that have failures on the leaf for platform failures:

```
RP/0/RP0/CPU0:router# show mpls forwarding p2mp unresolved leaf location 0/2/CPU0

  Local  Outgoing    Prefix       Outgoing     Next Hop        Bytes
  Label  Label       or ID        Interface                    Switched
  ------ ----------- ------------ ------------ ------------    ---------
  16022  16021       P2MP TE:10   Gi0/2/0/3    172.99.1.2      13912344
```

The following sample output shows detailed information for the P2MP LSP:

```
RP/0/RP0/CPU0:router# show mpls forwarding p2mp detail
```

```
Local  Outgoing    Prefix             Outgoing     Next Hop        Bytes
Label  Label       or ID              Interface                    Switched

------ ----------- ------------------ ------------ --------------- ----------
16000       P2MP TE:10
        Updated Sep 28 16:37:01.736
        Tunnel Mid/Tail, tunnel ID:10
        Flags:IP Lookup:set, Expnullv4:not-set, Expnullv6:set,
              Payload Type v4:set, Payload Type v6:not-set
        Platform Data:{0xb000, 0xb002, 0x0, 0x1}, RPF-ID:0xa000001
        mpls paths: 2, local mpls paths: 0, protected mpls paths: 0

16000       P2MP TE:10         Te0/0/0/1    192.168.140.2   0
        Updated Sep 28 16:37:01.736
        My Nodeid:513, Interface Nodeid:1, Backup Interface
        Nodeid:invalid
        Packets Switched: 0

16000       P2MP TE:10         Te0/0/0/2    192.168.170.1   0
        Updated Sep 28 16:37:01.731
        My Nodeid:513, Interface Nodeid:1, Backup Interface
        Nodeid:invalid
        Packets Switched: 0
```

The following sample output shows detailed information for the LSP tunnels:

```
RP/0/RP0/CPU0:router#  show mpls forwarding prefix 10.241.4.0/24 detail

Local  Outgoing    Prefix             Outgoing     Next Hop        Bytes
Label  Label       or ID              Interface                    Switched
------ ----------- ------------------ ------------ --------------- ------------
16057  16058       10.241.4.0/24      Gi0/1/0/23   10.114.4.11     0
     Updated May 10 20:00:15.983
     MAC/Encaps: 14/18, MTU: 9202
     Label Stack (Top -> Bottom): { 16058 }
     Packets Switched: 0

       16058       10.241.4.0/24      Te0/4/0/0    10.114.8.11     0
     Updated May 10 20:00:15.983
     MAC/Encaps: 14/18, MTU: 9086
     Label Stack (Top -> Bottom): { 16058 }
     Packets Switched: 0
```

The following sample output shows the number of P2MP TE heads and midpoints and the number of P2MP route updates that are received from the MRIB from the **summary** keyword:

```
RP/0/RP0/CPU0:router# show mpls forwarding summary

 Forwarding entries:
   Label switching: 91647
   MPLS TE tunnel head: 1351, protected: 1
   MPLS TE midpoint: 0, protected: 0
   MPLS TE internal: 1351, protected: 1
   MPLS P2MP TE tunnel head: 499
   MPLS P2MP TE tunnel midpoint/tail: 999 Forwarding updates:
   messages: 3925
      p2p updates: 229115
      p2mp updates: 13519
         add/modify:12020, deletes:1499,
         dropped:0 (iir trigger drops:0)) Labels in use:
   Reserved: 3
```

```
Lowest: 0
Highest: 112979
Deleted stale label entries: 0
```

This table describes the significant fields shown in the display.

Table 1: show mpls forwarding Field Descriptions

Field	Description
Local Label	Label assigned by this router.
Outgoing Label	Label assigned by the next hop or downstream peer. Some of the entries that display in this column are: **Unlabeled** No label for the destination from the next hop, or label switching is not enabled on the outgoing interface. **Pop Label** Next hop advertised an implicit-null label for the destination.
Prefix or Tunnel ID	Address or tunnel to which packets with this label are going.
Outgoing Interface	Interface through which packets with this label are sent.
Next Hop	IP address of neighbor that assigned the outgoing label.
Bytes Switched	Number of bytes switched with this incoming label.
TO	Timeout: Indicated by an "*" if entry is being timed out in forwarding.
Mac/Encaps	Length in bytes of Layer 2 header, and length in bytes of packet encapsulation, including Layer 2 header and label header.
MTU	MTU[1] of labeled packet.
Label Stack	All the outgoing labels on the forwarded packet.
Packets Switched	Number of packets switched with this incoming label.
Label switching	Number of Label switching LFIB[2] forwarding entries.
IPv4 label imposition	Number of IPv4 label imposition forwarding entries (installed at ingress LSR).
MPLS TE tunnel head	Number of forwarding entries (installed at ingress LSR) on MPLS TE tunnel head.
MPLS TE fast-reroute	Number of forwarding entries (installed at PLR) for MPLS-TE fast reroute.
Forwarding updates	Number of forwarding updates sent from LSD (RP/DRP) to LFIB/MPLS (RP/DRP/LC) using BCDL mechanism, indicating the total number of updates and total number of BCDL messages.

Field	Description
Labels in use	Local labels in use (installed in LFIB). These usually indicate the lowest and highest label in use (allocated by applications). Furthermore, some reserved labels, such as explicit-nullv4, explicit-nullv6, are installed in the forwarding plane. The label range is 0 to 15.

[1] MTU = Maximum Transmission Unit.
[2] LFIB = Label Forwarding Information Base.

Related Commands

Command	Description
show mpls forwarding exact-route, on page 17	Displays the exact path for the source and destination address pair.

show mpls forwarding tunnels

To display the contents of the **MPLS** forwarding tunnel, use the **show mpls forwarding tunnel** command in EXEC mode.

show mpls forwarding tunnels [**detail**][**tunnels** *tunnel-id*] [**vrf** *vrf-name*]

Syntax Description

detail	(Optional) Displays information in long form (includes length of encapsulation, length of Media Access Control [MAC] string, maximum transmission unit [MTU], Packet switched, and label stack).
tunnels *tunnel-id*	(Optional) Displays entries either for a specified label switch path (LSP) tunnel or all LSP tunnel entries.
vrf *vrf-name*	(Optional) Displays entries for VPN routing and forwarding (VRF).

Command Modes

EXEC

Command History

Release	Modification
Release 2.0	This command was introduced.
Release 3.0	No modification.
Release 3.3.0	No modification.
Release 3.4.0	No modification.
Release 3.5.0	No modification.
Release 3.6.0	No modification.
Release 3.7.0	No modification.
Release 3.8.0	No modification.
Release 3.9.0	The **p2mp**, **local**, **unresolved**, and **leafs** keywords were added to support the P2MP feature. The **hardware**, **egress**, and **ingress** keywords were added. The **ipv4** and **unicast** keywords were added.
Release 5.3.2	This command was introduced.

Usage Guidelines

The optional keywords and arguments described allow specification of a subset of the entire MPLS forwarding table. This router does not support label accounting for vrf labels. Instead, it supports accounting for the IGP and LDP labels. As a result, the Bytes Switched counter is 0 for the **show mpls forwarding vrf** command.

The *node-id* argument is entered in the *rack/slot/module* notation.

Task ID

Task ID	Operations
mpls-te	read, write
mpls-ldp	read, write
mpls-static	read, write

Examples

The following sample output is from the **show mpls forwarding tunnels** command using the **location** keyword and a specific node ID:

```
show mpls forwarding tunnels

RP/0/RSP0/CPU0:PE1#sh mpls forwarding tunnels 1999 detail
Thu Jul 23 22:56:09.726 PDT
Tunnel        Outgoing    Outgoing     Next Hop        Bytes
Name          Label       Interface                    Switched
------------- ----------- ------------ --------------- ------------
tt1999        50045       BE10         point2point     0
     Updated: Jul 23 20:04:57.416
     Version: 82681, Priority: 2
     Label Stack (Top -> Bottom): { 50045 }
     Local Label: 27972
     NHID: 0x0, Path idx: 0, Backup path idx: 0, Weight: 0
     MAC/Encaps: 14/18, MTU: 1500
     Packets Switched: 0

  Interface Handle: 0x0801f4a0, Local Label: 27972
  Forwarding Class: 0, Weight: 0
  Packets/Bytes Switched: 7045837/7116295370

RP/0/RSP0/CPU0:PE1#sh mpls forwarding tunnels 1999 detail location 0/0/CPU0
Thu Jul 23 22:56:14.526 PDT
Tunnel        Outgoing    Outgoing     Next Hop        Bytes
Name          Label       Interface                    Switched
------------- ----------- ------------ --------------- ------------
tt1999        50045       BE10         point2point     0
     Updated: Jul 23 20:04:57.640
     Version: 82681, Priority: 2
     Label Stack (Top -> Bottom): { 50045 }
     Local Label: 27972
     NHID: 0x0, Path idx: 0, Backup path idx: 0, Weight: 0
     MAC/Encaps: 14/18, MTU: 1500
     Packets Switched: 0

  Interface Handle: 0x0801f4a0, Local Label: 27972
  Forwarding Class: 0, Weight: 0
 Packets/Bytes Switched: 7045837/7116295370

RP/0/RSP0/CPU0:PE1#sh mpls forwarding tunnels 1999
Thu Jul 23 22:56:19.717 PDT
Tunnel        Outgoing    Outgoing     Next Hop        Bytes
Name          Label       Interface                    Switched
------------- ----------- ------------ --------------- ------------
tt1999        50045       BE10         point2point     0
```

Related Commands

Command	Description
show mpls forwarding exact-route, on page 17	Displays the exact path for the source and destination address pair.

show mpls forwarding exact-route

To display the exact path for the source and destination address pair, use the **show mpls forwarding exact-route** command in EXEC mode.

show mpls forwarding exact-route label *label-number* **entropy label** *entropy-label-value***bottom-label** *value* | **ipv4** *source-address destination-address* | **ipv6***source-addressdestination-address* [**detail**] [**protocol** *protocol* **source-port** *source-port* **destination-port** *destination-port* **ingress-interface** *type interface-path-id*] [**location** *node-id*] [**policy-class** *value*] [**hardware ingress** | **egress**]

Syntax Description

label *label-number*	Displays the exact path for a source and destination address pair.
bottom-label *value*	Displays the bottom label value. Range is 0 to 1048575.
ipv4 *source-address destination-address*	Displays the exact path for IPv4 payload. The IPv4 source address in x.x.x.x format. The IPv4 destination address in x.x.x.x format.
ipv6 *source-address destination-address*	Displays the exact path for IPv6 payload. The IPv6 source address in x:x::x format. The IPv6 destination address in x:x::x format.
detail	(Optional) Displays detailed information.
protocol *protocol*	(Optional) Displays the specified protocol for the route.
source-port *source-port*	Sets the UDP source port. The range is from 0 to 65535.
destination-port *destination-port*	Sets the UDP destination port. The range is from 0 to 65535.
ingress-interface	Sets the ingress interface.
type	Interface type. For more information, use the question mark (?) online help function.
interface-path-id	Physical interface or a virtual interface. **Note** Use the **show interfaces** command to see a list of all possible interfaces currently configured on the router. For more information about the syntax for the router, use the question mark (?) online help function.
location *node-id*	(Optional) Displays hardware resource counters on the designated node.
policy-class *value*	(Optional) Displays the policy-based tunnel selection (PBTS) to direct traffic into specific TE tunnels. The policy-class attribute maps the correct traffic class to this policy. The range for the policy-class value is from 1 to 7.
hardware	(Optional) Displays the hardware location entry.
ingress	(Optional) Reads information from the ingress PSE.
egress	(Optional) Reads information from the egress PSE.

Command Default No default behavior or values

Command Modes EXEC

Command History

Release	Modification
Release 2.0	This command was introduced.
Release 3.0	No modification.
Release 3.2	No modification.
Release 3.3.0	No modification.
Release 3.4.0	No modification.
Release 3.5.0	No modification.
Release 3.6.0	Added command parameters for 7-tuple.
Release 3.7.0	No modification.
Release 3.8.0	No modification.
Release 3.9.0	The following keywords and arguments were added: • **detail** keyword • **location** keyword and *node-id* argument • **policy-class** keyword and *value* argument • **hardware**, **ingress**, and **egress** keywords

Usage Guidelines The **show mpls forwarding exact-route** command displays information in long form and includes the following information:

- Encapsulation length
- Media Access Control (MAC) string length
- Maximum transmission unit (MTU)
- Packet switching information
- Label stacking information

Task ID

Task ID	Operations
mpls-te	read, write
mpls-ldp	read, write
mpls-static	read, write

Examples The following shows a sample output from the **show mpls forwarding exact-route** command:

```
RP/0/RP0/CPU0:router# show mpls forwarding exact-route label 16000 ipv4 10.74.1.6 127.0.0.15
 protocol tcp source-port 3503 destination-port 3503 ingress-interface pos 0/3/4/3


  Local  Outgoing    Prefix            Outgoing     Next Hop        Bytes
  Label  Label       or ID             Interface                    Switched
  ------ ----------- ----------------- ------------ --------------- ------------
  16000  16001       5.5.5.5/32        PO0/1/5/1    1.24.1.192      N/A
       Via: PO0/1/5/1, Next Hop: point2point
       MAC/Encaps: 4/8, MTU: 1500
       Label Stack (Top -> Bottom): { 16001 }
```

This table describes the significant fields shown in the display.

Table 2: show mpls forwarding exact-route Field Descriptions

Field	Description
Local Label	Label assigned by this router.
Outgoing Label	Label assigned by the next hop or downstream peer. Some of the entries that display in this column are: **Unlabeled** No label for the destination from the next hop, or label switching is not enabled on the outgoing interface. **Pop Label** Next hop advertised an implicit-null label for the destination.
Prefix or Tunnel ID	Address or tunnel to which packets with this label are going.
Outgoing Interface	Interface through which packets with this label are sent.
Next Hop	IP address of neighbor that assigned the outgoing label.
Bytes Switched	Number of bytes switched with this incoming label.
TO	Timeout: Indicated by an "*" if entry is being timed out in forwarding.
MAC/Encaps	Length in bytes of Layer 2 header, and length in bytes of packet encapsulation, including Layer 2 header and label header.
MTU	MTU[3] of labeled packet.
Label Stack	All the outgoing labels on the forwarded packet.
Packets Switched	Number of packets switched with this incoming label.
Label switching	Number of Label switching LFIB[4] forwarding entries.
IPv4 label imposition	Number of IPv4 label imposition forwarding entries (installed at ingress LSR).
MPLS TE tunnel head	Number of forwarding entries (installed at ingress LSR) on MPLS TE tunnel head.

Field	Description
MPLS TE fast-reroute	Number of forwarding entries (installed at PLR) for MPLS-TE fast reroute.
Forwarding updates	Number of forwarding updates sent from LSD (RP/DRP) to LFIB/MPLS (RP/DRP/LC) using BCDL mechanism, indicating the total number of updates and total number of BCDL messages.
Labels in use	Local labels in use (installed in LFIB). These usually indicate the lowest and highest label in use (allocated by applications). Furthermore, some reserved labels, such as explicit-nullv4, explicit-nullv6, are installed in the forwarding plane. The label range is 0 to 15.

[3] MTU = Maximum Transmission Unit.
[4] LFIB = Label Forwarding Information Base.

Related Commands

Command	Description
show mpls forwarding, on page 8	Displays the contents of the MPLS LFIB.

show mpls interfaces

To display information about one or more interfaces that have been configured for MPLS, use the **show mpls interfaces** command in EXEC mode.

show mpls interfaces [*type interface-path-id*] [**location** *node-id*] [**detail**]

Syntax Description

type	(Optional) Interface type. For more information, use the question mark (?) online help function.
interface-path-id	Physical interface or a virtual interface. **Note** Use the **show interfaces** command to see a list of all possible interfaces currently configured on the router. For more information about the syntax for the router, use the question mark (?) online help function.
location *node-id*	(Optional) Displays hardware resource counters on the designated node.
detail	(Optional) Displays detailed information for the designated node.

Command Default

No default behavior or values

Command Modes

EXEC

Command History

Release	Modification
Release 2.0	This command was introduced.
Release 3.0	No modification.
Release 3.3.0	No modification.
Release 3.4.0	No modification.
Release 3.5.0	No modification.
Release 3.6.0	No modification.
Release 3.7.0	No modification.
Release 3.8.0	No modification.

Usage Guidelines

This command displays MPLS information about a specific interface or about all interfaces where MPLS is configured.

Task ID

Task ID	Operations
mpls-te	read, write
mpls-ldp	read, write
mpls-static	read, write

Examples

The following shows a sample output from the **show mpls interfaces** command:

```
RP/0/RP0/CPU0:router# show mpls interfaces

  Interface                  LDP      Tunnel   Enabled
  -------------------------- -------- -------- --------
  POS0/4/0/0                 Yes       Yes      Yes
  POS0/4/0/1                 Yes       Yes      Yes
  POS0/4/0/2                 Yes       Yes      Yes
```

The following shows a sample output from the **show mpls interfaces** command using the **detail** keyword:

```
RP/0/RP0/CPU0:router# show mpls interfaces detail

  Interface POS0/4/0/0:
          LDP labelling enabled
          LSP labelling enabled (TE-Control)
          MPLS enabled
          MTU = 4474
  Interface POS0/4/0/1:
          LDP labelling enabled
          LSP labelling enabled (TE-Control)
          MPLS enabled
          MTU = 4474
  Interface POS0/4/0/2:
          LDP labelling enabled
          LSP labelling enabled (TE-Control)
          MPLS enabled
          MTU = 4474
```

The following shows a sample output from the **show mpls interfaces** command using the **location** keyword:

```
RP/0/RP0/CPU0:router# show mpls interfaces location pos 0/4/0/0

  Interface                  LDP      Tunnel   Enabled
  -------------------------- -------- -------- --------
  POS0/4/0/0                 Yes      Yes      Yes

RP/0/RP0/CPU0:router# show mpls interfaces pos 0/4/0/0 detail


  Interface POS0/4/0/0:
          LDP labelling enabled
```

```
LSP labelling enabled (TE-Control)
MPLS enabled
MTU = 4474
```

This table describes the significant fields in the sample display.

Table 3: show mpls interfaces Command Field Descriptions

Field	Description
LDP	State of LDP labelling.
Tunnel	State of LSP Tunnel labelling.
MTU	MTU[5] of labeled packet.
Caps	Capsulation switching chains installed on an interface.
M	MPLS switching capsulation/switching chains are installed on the interface and are ready to switch MPLS traffic.

[5] MTU = Maximum Transmission Unit.

show mpls label range

To display the range of local labels available for use on packet interfaces, use the**show mpls label range** command in EXEC mode.

show mpls label range

Syntax Description

This command has no arguments or keywords.

Command Default

No default behavior or values

Command Modes

EXEC

Command History

Release	Modification
Release 2.0	This command was introduced.
Release 3.0	No modification.
Release 3.3.0	No modification.
Release 3.4.0	No modification.
Release 3.5.0	No modification.
Release 3.6.0	No modification.
Release 3.7.0	No modification.
Release 3.8.0	No modification.

Usage Guidelines

You can use the **show mpls label range** command to configure a range for local labels that is different from the default range.

Task ID

Task ID	Operations
mpls-te	read, write
mpls-ldp	read, write
mpls-static	read, write

Examples

The following shows a sample output from the **show mpls label range** command:

```
RP/0/RP0/CPU0:router# show mpls label range
```

```
Range for dynamic labels: Min/Max: 16000/144000
```

This table describes the significant fields shown in the display.

Table 4: show mpls label range Command Field Descriptions

Field	Description
Range for dynamic labels	Minimum and maximum allowable range for local labels (which differs from the default range).

Related Commands

Command	Description
mpls label range, on page 6	Configures a range of values for use as local labels.

show mpls label table

To display the local labels contained in the MPLS label table, use the **show mpls label table** command in EXEC mode.

show mpls label table *table-index* [**application** *application*] [**label** *label-value*] [**summary**] [**detail**]

Syntax Description

table-index	Index of the label table to display. The global label table is 0. Currently, you can specify table 0 only.
application *application*	(Optional) Displays all labels owned by the selected application. Options are: **bgp-ipv4**, **bgp-spkr**, **bgp-vpn-ipv4**, **internal**, **ldp**, **none**, **l2vpn**, **static**, **te-control**, **te-link**, and **test**.
label *label-value*	(Optional) Displays a selected label based on the label value. Range is 0 to 1048575.
summary	(Optional) Displays a summary of local labels.
detail	(Optional) Displays detailed information for the MPLS label table.

Command Default

No default behavior or values

Command Modes

EXEC

Command History

Release	Modification
Release 2.0	This command was introduced.
Release 3.0	No modification.
Release 3.3.0	No modification.
Release 3.4.0	No modification.
Release 3.5.0	No modification.
Release 3.6.0	No modification.
Release 3.7.0	No modification.
Release 3.8.0	No modification.
Release 3.9.0	The **detail** keyword was added.

Usage Guidelines

Note Labels 16 to 15999 are reserved for static Layer 2 VPN pseudowires.

Task ID

Task ID	Operations
mpls-te	read, write
mpls-ldp	read, write
mpls-static	read, write

Examples

The following shows a sample output from the **show mpls label table** command:

```
RP/0/RP0/CPU0:router# show mpls label table 0

  Table Label   Owner      State  Rewrite
  ----- ------- ---------- ------ -------
  0     0       LSD        InUse  Yes
  0     1       LSD        InUse  Yes
  0     2       LSD        InUse  Yes
  0     3       LSD        InUse  Yes
  0     16      TE-Link    InUse  Yes
```

This table describes the significant fields shown in the display.

Table 5: show mpls label table Command Field Descriptions

Field	Description
Table	Table ID.
Label	Label index.
Owner	Application that allocated the label. All labels displaying “InUse” state have an owner.
State	**InUse** Label allocated and in use by an application. **Alloc** Label allocated but is not yet in use by an application. **Pend** Label was in use by an application that has terminated unexpectedly, and the application has not reclaimed the label. **Pend-S** Label was in use by an application, but the MPLS LSD (Label Switching Database) server has recently restarted and the application has not reclaimed the label.
Rewrite	Number of initiated rewrites.

Related Commands

Command	Description
show mpls forwarding, on page 8	Displays entries in the MPLS forwarding table. Label switching entries are indexed by their local label.
show mpls lsd applications, on page 29	Displays MPLS applications that are registered with the MPLS LSD server.

show mpls lsd applications

To display the MPLS applications registered with the MPLS Label Switching Database (LSD) server, use the **show mpls lsd applications** command in EXEC mode.

show mpls lsd applications [**application** *application*]

Syntax Description

application *application*	(Optional) Displays all labels owned by the selected application. Options are: **bgp-ipv4**, **bgp-spkr**, **bgp-vpn-ipv4**, **internal**, **ldp**, **none**, **l2vpn**, **static**, **te-control**, **te-link**, and **test**.

Command Default

No default behavior or values

Command Modes

EXEC

Command History

Release	Modification
Release 2.0	This command was introduced.
Release 3.0	No modification.
Release 3.3.0	No modification.
Release 3.4.0	No modification.
Release 3.5.0	No modification.
Release 3.6.0	No modification.
Release 3.7.0	No modification.
Release 3.9.0	The **application** keyword was added.

Usage Guidelines

MPLS applications include Traffic Engineering (TE) control, TE Link Management, and label distribution protocol (LDP). The application must be registered with MPLS LSD for its features to operate correctly. All applications are clients (see the show mpls lsd clients, on page 31 command), but not all clients are applications.

Task ID

Task ID	Operations
mpls-te	read, write
mpls-ldp	read, write
mpls-static	read, write

Examples

The following shows a sample output from the **show mpls lsd applications** command:

```
RP/0/RP0/CPU0:router# show mpls lsd applications

  Type         State    RecoveryTime Node
  ------------ -------- ------------ ------------
  LDP          Active   300          0/0/CPU0
  TE-Control   Active   100          0/0/CPU0
  TE-Link      Active   600          0/0/CPU0
```

This table describes the significant fields shown in the display.

Table 6: show mpls lsd applications Command Field Descriptions

Field	Description
Type	LSD application type.
State	**Active** Application registered with MPLS LSD and is functioning correctly. **Recover** Application registered with MPLS LSD and is recovering after recently restarting. In this state, the RecoveryTime value indicates how many seconds are left before the application becomes active. **Zombie** Application not reregistered after an unexpected termination. In this case, RecoveryTime indicates how many seconds are left before MPLS LSD gives up on the application.
RecoveryTime	Seconds remaining before MPLS LSD gives up or resumes the application.
Node	Node expressed in standard *rack*/*slot*/*module* notation.

Related Commands

Command	Description
show mpls lsd clients, on page 31	Displays MPLS clients connected to the MPLS LSD server.

show mpls lsd clients

To display the MPLS clients connected to the MPLS Label Switching Database (LSD) server, use the **show mpls lsd clients** command in EXEC mode.

show mpls lsd clients

Syntax Description

This command has no arguments or keywords.

Command Default

No default behavior or values

Command Modes

EXEC

Command History

Release	Modification
Release 2.0	This command was introduced.
Release 3.0	No modification.
Release 3.3.0	No modification.
Release 3.4.0	No modification.
Release 3.5.0	No modification.
Release 3.6.0	No modification.
Release 3.7.0	No modification.
Release 3.8.0	No modification.
Release 3.9.0	No modification.

Usage Guidelines

MPLS clients include Traffic Engineering (TE) Control, TE Link Management, Label Distribution Protocol (LDP), and Bulk Content Downloader (BCDL) Agent. Not all clients are applications (see the **show mpls lsd applications** command), but all applications are clients.

Task ID

Task ID	Operations
mpls-te	read, write
mpls-ldp	read, write
mpls-static	read, write

Examples

The following shows a sample output from the **show mpls lsd clients** command:

```
RP/0/RP0/CPU0:router# show mpls lsd clients

  Id Services             Node
  -- -------------------- ------------
  0  BA(p=none)           0/0/CPU0
  1  A(TE-Link)           0/0/CPU0
  2  A(LDP)               0/0/CPU0
  3  A(TE-Control)        0/0/CPU0
```

The following table describes the significant fields shown in the display.

Table 7: show mpls lsd clients Command Field Descriptions

Field	Description
Id	Client identification number.
Services	A(xxx) means that this client is an application and xxx is the application name, BA(yyy) means that this client is a BCDL Agent and yyy is expert data. Depending on system conditions, there can be multiple BCDL Agent clients (this is normal).
Node	Node expressed in standard rack/slot/module notation.

Related Commands

Command	Description
show mpls lsd applications	Displays MPLS applications registered with the MPLS LSD server.

show mpls traffic-eng fast-reroute database

To display the contents of the fast reroute (FRR) database, use the **show mpls traffic-eng fast-reroute database** command in EXEC mode.

show mpls traffic-eng fast-reroute database [*ip-address*] [*ip-address /length*] [**afi-all safi-all** | **unicast***ip-address ip-address/length*] [**backup-interface**] [**tunnel** *tunnel -id*] [**unresolved**] [**interface** *type interface-path-id*] [**ipv4 safi-all** | **unicast***ip-address ip-address/length*] [**labels** *low-number high-number*] [**state active** | **complete** | **partial** | **ready**] [**role head** | **midpoint**] [**summary**] [**location** *node-id*]

Syntax Description

ip-address	(Optional) IP address of the destination network.
ip-address/length	(Optional) Bit combination indicating the portion of the IP address that is being used for the subnet address.
afi-all	(Optional) Returns data for all specified address family identifiers.
safi-all	(Optional) Returns data for all sub-address family identifiers.
unicast	(Optional) Returns unicast data only.
backup-interface	(Optional) Displays entries with the specified backup interface.
tunnel *tunnel-id*	(Optional) Tunnel and tunnel ID to which packets with this label are going. The **summary** suboption is available.
unresolved	(Optional) Displays entries whose backup interface has not yet been fully resolved.
interface	(Optional) Displays entries with this primary outgoing interface. The **summary** keyword is available.
type	(Optional) Interface type. For more information, use the question mark (?) online help function.
interface-path-id	Physical interface or a virtual interface. **Note** Use the **show interfaces** command to see a list of all possible interfaces currently configured on the router. For more information about the syntax for the router, use the question mark (?) online help function.
ipv4	(Optional) Displays only IPv4 data.
labels	(Optional) Displays database entries that possess in-labels assigned by this router (local labels). Specify either a starting value or a range of values. The **state** suboption is available.

state	(Optional) Filters the database according to the state of the entry: **active** FRR rewrite is in the forwarding active database (where it can be placed onto appropriate incoming packets). **complete** FRR rewrite is assembled, ready or active. **partial** FRR rewrite is fully created; its backup routing information is still incomplete. **ready** FRR rewrite was created but is not in the forwarding active state.
role	(Optional) Displays entries associated either with the tunnel **head** or tunnel **midpoint**. The **summary** suboption is available.
summary	(Optional) Displays summarized information about the FRR database.
location *node-id*	(Optional) Displays hardware resource counters on the designated node.

Command Default

No default behavior or values

Command Modes

EXEC

Command History

Release	Modification
Release 2.0	This command was introduced.
Release 3.0	No modification.
Release 3.3.0	No modification.
Release 3.4.0	No modification.
Release 3.5.0	No modification.
Release 3.6.0	No modification.
Release 3.7.0	No modification.
Release 3.8.0	No modification.
Release 3.9.0	No modification.
Release 3.9.0	Sample output was modified to support the Point-to-Multipoint (P2MP) feature.

Usage Guidelines

The P2MP tunnel carries multicast traffic. For fast reroute (FRR) information in regards to multicast label forwarding, see *Cisco IOS XR Software Multicast Command Reference for the Cisco CRS-1 Router*.

If the location is specified, Fast-Reroute (FRR) entries for both Point-to-Point (P2P) and P2MP tunnels are available. If the location is not specified, only P2P tunnel entries are available.

Task ID

Task ID	Operations
mpls-te	read

Examples

The following shows a sample output from the **show mpls traffic-eng fast-reroute database** command:

```
RP/0/RP0/CPU0:router# show mpls traffic-eng fast-reroute database

Tunnel head FRR information:
Tunnel      Out intf/label    FRR intf/label   Status
----------  ---------------- ---------------- -------
tt4000       PO0/3/0/0:34     tt1000:34        Ready
tt4001       PO0/3/0/0:35     tt1001:35        Ready
tt4002       PO0/3/0/0:36     tt1001:36        Ready
```

Note The Prefix field indicates the IP address where packets with this label are headed.

The following sample output displays filtering of the FRR database using the **backup-interface** keyword:

```
RP/0/RP0/CPU0:router# show mpls traffic-eng fast database backup-interface

LSP midpoint FRR information:
LSP Identifier                  Out Intf/        FRR Intf/        Status
                                Label            Label
-----------------------------  ---------------- ---------------- -------
10.10.10.10 1006 [54]           Gi0/6/5/2:Pop    tt1060:Pop       Ready
```

The following sample output displays the FRR database filtered by the primary outgoing interface:

```
RP/0/RP0/CPU0:router# show mpls traffic-eng fast-reroute database interface pos0/3/0/0

  Tunnel head FRR information:
  Tunnel      Out intf/label   FRR intf/label   Status
  ----------  ---------------- ---------------- -------
  tt4000       PO0/3/0/0:34     tt1000:34        Ready
  tt4001       PO0/3/0/0:35     tt1001:35        Ready
  tt4002       PO0/3/0/0:36     tt1001:36        Ready
```

The following sample output displays a summary of the FRR database with the role as head:

```
RP/0/RP0/CPU0:router# show mpls traffic-eng fast-reroute database role head summary

  Status     Count
  ---------- ----------
  Active     0
  Ready      3
  Partial    0
```

The following sample output displays summarized information for the FRR database with the role as midpoint:

```
RP/0/RP0/CPU0:routerr# show mpls traffic-eng fast-reroute database role midpoint summary

  Status     Count
  -------    -----
  Active     0
  Ready      2
  Partial    0
```

The following sample output displays the summary for the P2MP tunnel:

```
RP/0/RP0/CPU0:router# show mpls traffic-eng fast-reroute database location 0/0/CPU0

Tunnel head FRR information:
Tunnel     Out intf/label   FRR intf/label   Status
---------- ---------------- ---------------- -------
tt3010     BP64:Pop         tt3001:Pop       Ready
tm3000     BP64:19444       tt3001:19444     Ready
tm3001     BP64:19445       tt3001:19445     Ready
```

This table describes the significant fields shown in the display.

Table 8: show mpls traffic-eng fast-reroute database Command Field Descriptions

Field	Description
Tunnel	Short form of tunnel interface name.
Out intf/label	**Out interface** Short name of the physical interface through which traffic goes to the protected link. **Out label** At a tunnel head, this is the label that the tunnel destination device advertises. The value “Unlabeled” indicates that no such label is advertised. At a tunnel midpoint, this is the label selected by the next hop device. The value “Pop Label” indicates that the next hop is the final hop for the tunnel.

Field	Description
FRR intf/label	**Fast reroute interface** Backup tunnel interface. **Fast reroute label** At a tunnel head, this is the label that the tunnel tail selected to indicate the destination network. The value "Unlabeled" indicates that no label is advertised. At a tunnel midpoint, this has the same value as the Out label.
Status	State of the rewrite: partial, ready, or active.

Related Commands

Command	Description
#unique_99	Displays the contents of the FRR event log.

show mpls traffic-eng fast-reroute log

To display a history of fast reroute (FRR) events, use the **show mpls traffic-eng fast-reroute log** command in EXEC mode.

show mpls traffic-eng fast-reroute log [**interface** *type interface-path-id* | **location** *node-id*]

Syntax Description

interface	(Optional) Displays all FRR events for the selected protected interface.
type	(Optional) Interface type. For more information, use the question mark (?) online help function.
interface-path-id	Physical interface or virtual interface. **Note** Use the **show interfaces** command to see a list of all possible interfaces currently configured on the router. For more information about the syntax for the router, use the question mark (?) online help function.
location *node-id*	(Optional) Displays all FRR events that occurred on the selected node.

Command Default

No default behavior or values

Command Modes

EXEC

Command History

Release	Modification
Release 2.0	This command was introduced.
Release 3.0	No modification.
Release 3.3.0	No modification.
Release 3.4.0	No modification.
Release 3.5.0	No modification.
Release 3.6.0	No modification.
Release 3.7.0	No modification.
Release 3.8.0	No modification.
Release 3.9.0	Sample output was modified.

Task ID

Task ID	Operations
mpls-te	read

Examples

The following shows a sample output from the **show mpls traffic-eng fast-reroute log** command:

```
RP/0/RP0/CPU0:router# show mpls traffic-eng fast-reroute log

  Node      Protected LSPs  Rewrites When                    Switching Time
            Interface                                           (usec)
  --------  --------- -----  -------- ----------------------  --------------
  0/0/CPU0  PO0/1/0/1 1      1        Feb 27 19:12:29.064000       147
```

This table describes the significant fields shown in the display.

Table 9: show mpls traffic-eng fast-reroute log Field Descriptions

Field	Description
Node	Node address.
Protected Interface	Type and interface-path-id that is being protected.
LSPs	LSP[6] associated with each interface being protected.
Rewrites	Number of rewrites initiated on the LSP.
When	Date the interface was protected.
Switching Time	Time required to switch the protected interface in microseconds.

[6] LSP = Link-state Packet.

Related Commands

Command	Description
show mpls traffic-eng fast-reroute database, on page 33	Displays the contents of the FRR database.