MPLS Forwarding Commands

Note All commands applicable for the Cisco NCS 5500 Series Router are also supported on the Cisco NCS 540 Series Router that is introduced from Cisco IOS XR Release 6.3.2. References to earlier releases in Command History tables apply to only the Cisco NCS 5500 Series Router.

Note

- Starting with Cisco IOS XR Release 6.6.25, all commands applicable for the Cisco NCS 5500 Series Router are also supported on the Cisco NCS 560 Series Routers.
- Starting with Cisco IOS XR Release 6.3.2, all commands applicable for the Cisco NCS 5500 Series Router are also supported on the Cisco NCS 540 Series Router.
- References to releases before Cisco IOS XR Release 6.3.2 apply to only the Cisco NCS 5500 Series Router.
- Cisco IOS XR Software Release 7.0.1 specific updates are not applicable for the following variants of Cisco NCS 540 Series Routers:
  - N540-28Z4C-SYS-A
  - N540-28Z4C-SYS-D
  - N540X-16Z4G8Q2C-A
  - N540X-16Z4G8Q2C-D
  - N540X-16Z8Q2C-D
  - N540-12Z20G-SYS-A
  - N540-12Z20G-SYS-D
  - N540X-12Z16G-SYS-A
  - N540X-12Z16G-SYS-D

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 Cisco NCS 5500 Series RoutersMPLS Configuration Guide for Cisco NCS 540 Series RoutersMPLS Configuration Guide*.

clear mpls forwarding counters

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

clear mpls forwarding counters

Syntax Description

This command has no arguments or keywords.

Command Default

No default behavior or values

Command Modes

XR EXEC mode

Command History

Release	Modification
Release 6.0	This command was introduced.

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-ldp	read, write
mpls-static	read, write

Example:

This a test.

Examples

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

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

LLocal Outgoing    Prefix             Outgoing     Next Hop        Bytes
Label  Label       or ID              Interface                    Switched
------ ----------- ------------------ ------------ --------------- ------------
10001  10002       No ID              BE262        10.1.1.62       0
10003  10004       No ID              BE264        10.1.1.70       0
10005  10006       No ID              BE266        10.1.1.78       0
10007  10008       No ID              BE268        10.1.1.86       0
10009  10010       No ID              BE270        10.1.1.94       0
10011  10012       No ID              BE272        10.1.1.102      0
10013  10014       No ID              BE274        10.1.1.110      0
10015  10016       No ID              BE276        10.1.1.118      0
10017  10018       No ID              BE141        10.13.1.42       0
10022  10023       No ID              BE73         10.17.1.10       0
10026  20001       No ID              Te0/4/0/0/1  10.11.106.2      0
24000  Pop         SR Adj (idx 1)     Hu0/7/0/35   10.11.150.2      0
```

```
24001  Pop         SR Adj (idx 3)     Hu0/7/0/35   10.11.150.2      0
24002  Pop         SR Adj (idx 1)     BE206        10.11.1.58       0
24003  Pop         SR Adj (idx 3)     BE206        10.11.1.58       0
```

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

Local  Outgoing    Prefix             Outgoing     Next Hop        Bytes
Label  Label       or ID              Interface                    Switched
------ ----------- ------------------ ------------ --------------- ------------
24000  Pop         TE: 65000          BE12         10.0.14.2       0
24001  Pop         TE: 128            BE12         10.0.14.2       0
       Pop         TE: 128            tt65001      10.0.14.2       0            (!)
24002  Pop         TE: 3174           BE12         10.0.14.2       0
       Pop         TE: 3174           tt65001      10.0.14.2       0            (!)
24003  Pop         TE: 1443           BE12         10.0.14.2       0
       Pop         TE: 1443           tt65001      10.0.14.2       0            (!)
24005  Pop         TE: 3009           BE12         10.0.14.2       0
       Pop         TE: 3009           tt65001      10.0.14.2       0            (!)
24006  Pop         TE: 10             BE12         10.0.14.2       0
       Pop         TE: 10             tt65001      10.0.14.2       0            (!)
24007  Pop         TE: 63             BE12         10.0.14.2       0
       Pop         TE: 63             tt65001      10.0.14.2       0            (!)
24010  Pop         TE: 4848           BE12         10.0.14.2       0
       Pop         TE: 4848           tt65001      10.0.14.2       0            (!)
24012  Pop         TE: 1455           BE12         10.0.14.2       0
       Pop         TE: 1455           tt65001      10.0.14.2       0            (!)
24013  Pop         TE: 2932           BE12         10.0.14.2       0
       Pop         TE: 2932           tt65001      10.0.14.2       0            (!)
24014  Pop         TE: 2967           BE12         10.0.14.2       0
       Pop         TE: 2967           tt65001      10.0.14.2       0            (!)
```

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

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 XR Config mode. To return to the default behavior, use the **no** form of this command.

mpls ip-ttl-propagate disable [**forwarded** | **local**]
no mpls ip-ttl-propagate

Syntax Description

disable	Disables the IP Time to Live (TTL) propagation 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

XR Config mode

Command History

Release	Modification
Release 6.0	This command was introduced.

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

This example shows how to disable IP TTL propagation.

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

This example shows how to disable IP TTL propagation for forwarded MPLS packets.

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

This 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
```

hw-module fib mpls ip-ttl-propagate-disable exclude

To exclude the propagation of the IP Time-To-Live (TTL) and QoS capability to and from the MPLS header using the MPLS Push, Pop, and Penultimate Hop operations in the **mpls ip-ttl-propagate disable** configuration, use the **hw-module fib mpls ip-ttl-propagate-disable exclude** command in XR Config mode. This configuration either changes the IP TTL and QoS DSCP propagation to Uniform mode or retains one of these propagation in Pipe mode based on the existing traffic flow behavior.

hw-module fib mpls ip-ttl-propagate-disable exclude { **mpls-pop** | **mpls-pop-penultimate-hop** | **mpls-push** } { **cos** | **ttl** | **ttl-and-cos** }

Syntax Description

exclude mpls-pop ttl-and-cos	Changes the IP TTL and QoS DSCP propagation to Uniform mode on the MPLS Pop (disposition) node.
exclude mpls-pop-penultimate-hop ttl	Changes the IP TTL propagation to Uniform mode with the QoS propagation preserved in the Pipe mode on the MPLS Penultimate Hop Pop (PHP) node.
exclude mpls-pop-penultimate-hop cos	Changes the QoS DSCP propagation to Uniform mode whereas the IP TTL propagation remains in the Pipe mode on the MPLS PHP node.
exclude mpls-pop-penultimate-hop ttl-and-cos	Changes the IP TTL and QoS DSCP propagation to Uniform mode on the MPLS PHP node.
exclude mpls-push ttl	Changes the IP TTL propagation on the MPLS Push (imposition) node to Uniform mode.

Command Default

None

Command Modes

XR Config mode

Command History

Release	Modification
Release 24.4.1	This command was introduced.

Usage Guidelines

The **hw-module fib mpls ip-ttl-propagate-disable exclude {mpls pop | mpls pop-penultimate-hop | mpls push}{ttl | cos | ttl-and-cos}** configuration works only if the **mpls ip-ttl-propagate disable** command is configured.

After you have configured the **hw-module fib mpls ip-ttl-propagate-disable exclude {mpls pop | mpls pop-penultimate-hop | mpls push}{ttl | cos | ttl-and-cos}** command, reload the chassis or all the line cards for the configuration to take effect.

Task ID

Task ID	Operations
config-services	read, write
root-lr	read, write

Examples

These examples shows how to configure the **hw-module fib mpls ip-ttl-propagate-disable exclude** command:

Example 1: To change the IP TTL and QoS DSCP propagation to Uniform mode on the MPLS Pop node.

```
RP/0/RP0/CPU0:router(config)# hw-module fib mpls ip-ttl-propagate-disable exclude mpls-pop
 ttl-and-cos
```

Example 2: To change the IP TTL propagation to Uniform mode with the QoS propagation preserved in the Pipe mode on the MPLS Penultimate Hop Pop (PHP) node.

```
RP/0/RP0/CPU0:router(config)# hw-module fib mpls ip-ttl-propagate-disable exclude
mpls-pop-penultimate-hop ttl
```

Example 3: To change the QoS propagation to Uniform mode whereas the IP TTL propagation remains in the Pipe mode on the MPLS PHP node.

```
RP/0/RP0/CPU0:router(config)# hw-module fib mpls ip-ttl-propagate-disable exclude
mpls-pop-penultimate-hop cos
```

Example 4: To change the IP TTL and QoS DSCP propagation to Uniform mode on the MPLS PHP node.

```
RP/0/RP0/CPU0:router(config)# hw-module fib mpls ip-ttl-propagate-disable exclude
mpls-pop-penultimate-hop ttl-and-cos
```

Example 5: To change the IP TTL propagation to Uniform mode on the MPLS Push (imposition) node.

```
RP/0/RP0/CPU0:router(config)# hw-module fib mpls ip-ttl-propagate-disable exclude mpls-push
 ttl
```

mpls label range

To configure the dynamic range of local labels available for use on packet interfaces, use the **mpls label range** command in XR Config mode. To return to the default behavior, use the **no** form of this command.

mpls label range table *table-id minimum maximum*
no 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

XR Config mode

Command History

Release	Modification
Release 6.0	This command was introduced.

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 RFC 3032 reference for details)and cannot be included in the range using the **mpls label range** command.

The maximum allowed label limit is 1000000 when Enhanced Ethernet Line Card is used.

Note

- Labels outside the current range and which are allocated by MPLS applications remain in circulation until released.
- The maximum labels that are available are 144K.

Task ID

Task ID	Operations
mpls-te	read, write

Task ID	Operations
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
```

mpls label-security

To configure the MPLS label security for the interface, use the **mpls label-security** command in interface configuration mode.

mpls label-security multi-label-packet [drop] rpf

Syntax Description

multi-label-packet	Handles incoming packets with multiple labels on the stack.
drop	Drops packets with multiple labels on the stack.
rpf	Checks for RPF label on incoming packets.

Command Modes

Interface configuration.

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

The optional keywords and arguments described allow display of an MPLS label security information.

Task ID

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

Examples

This example shows how to configure MPLS label RPF check:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)#interface tunnel-te 1
RP/0/RP0/CPU0:router(config-if)#mpls label-security rpf
```

show mpls ea interfaces

To display the interface label security information, use the **show mpls ea interfaces** command in XR EXEC mode.

show mpls ea interface [**location** *node-id*]

Syntax Description

location *node-id*	Displays the interfaces on which MPLS is enabled.

Command Modes

XR EXEC mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

The keywords and arguments described allow display of the interface label security information.

Task ID

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

Examples

The following sample output is from the **show mpls ea interfaces** command and specific interface and location:

```
RP/0/RP0/CPU0:router# show mpls ea interfaces location 0/1/CPU0
Interface      IFH         MTU  Flags      Type
-------------- ---------- ----- ---------- ----------
Interface        IFH         MTU
-------------- ----------   -----
Te0/0/0/1     0x08000040     1500
Te0/0/0/1.2   0x08001d90     1500
Te0/0/0/1.3   0x08001d98     1500
Te0/0/0/1.4   0x08001da0     1500
Te0/0/0/1.5   0x08001da8     1500
Te0/0/0/1.6   0x08001db0     1500
Te0/0/0/1.7   0x08001db8     1500
Te0/0/0/1.8   0x08001dc0     1500
Te0/0/0/1.9   0x08001dc8     1500
Te0/0/0/1.10  0x08001dd0     1500
Te0/0/0/1.11  0x08001dd8     1500
Te0/0/0/1.12  0x08001de0     1500
Te0/0/0/1.13  0x08001de8     1500
Te0/0/0/1.14  0x08001df0     1500
Te0/0/0/1.15  0x08001df8     1500
Te0/0/0/1.16  0x08001e00     1500
```

show mpls forwarding

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

show mpls forwarding [**detail**] [**hardware** {**ingress** | **egress**}] [**interface** *type interface-path-id*] [**location** *node-id*] [**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.
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

XR EXEC mode

Command History

Release	Modification
Release 6.0	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 **Bytes Switched** counter is not supported in the **show mpls forwarding** command, so the counter remains at 0.
- When the **show mpls forwarding detail** command is executed with the **location** keyword (for example, with the address, 0/1/cpu0), it displays the forwarding information available on this node. If this node hosts a displayed interface, then the FIB displays a configured MTU; otherwise, it displays the default value of 1500. This is because in Cisco IOS XR software, interface information is available only on nodes hosting the interface. Note that for bundle interfaces, the information is available in line cards with bundle-member links. If the location is not specified, the FIB displays the data from the node where the interface is created. For physical interfaces, this **location** keyword value would match the actual address; therefore, FIB displays correct information. It is different in the case of bundles--bundles are created on RP, but located on LC(s); therefore, you would see default values. This is also applicable to any per-interface data; for example, adjacencies.
- 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 0/6/CPU0
Local  Outgoing    Prefix            Outgoing     Next Hop        Bytes
Label  Label       or ID             Interface                    Switched
------ ----------- ----------------- ------------ --------------- ------------
24000  Pop         TE: 65000         BE12         10.0.14.2       0
24001  Pop         TE: 128           BE12         10.0.14.2       0
       Pop         TE: 128           tt65001      10.0.14.2       0           (!)
24002  Pop         TE: 3174          BE12         10.0.14.2       0
       Pop         TE: 3174          tt65001      10.0.14.2       0           (!)
24003  Pop         TE: 1443          BE12         10.0.14.2       0
```

```
       Pop         TE: 1443           tt65001      10.0.14.2       0            (!)
24005  Pop         TE: 3009           BE12         10.0.14.2       0
       Pop         TE: 3009           tt65001      10.0.14.2       0            (!)
24006  Pop         TE: 10             BE12         10.0.14.2       0
       Pop         TE: 10             tt65001      10.0.14.2       0            (!)
24007  Pop         TE: 63             BE12         10.0.14.2       0
       Pop         TE: 63             tt65001      10.0.14.2       0            (!)
24010  Pop         TE: 4848           BE12         10.0.14.2       0
       Pop         TE: 4848           tt65001      10.0.14.2       0            (!)
24012  Pop         TE: 1455           BE12         10.0.14.2       0
       Pop         TE: 1455           tt65001      10.0.14.2       0            (!)
24013  Pop         TE: 2932           BE12         10.0.14.2       0
       Pop         TE: 2932           tt65001      10.0.14.2       0            (!)
24014  Pop         TE: 2967           BE12         10.0.14.2       0
       Pop         TE: 2967           tt65001      10.0.14.2       0            (!)
```

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

```
RP/0/RP0/CPU0:router#  show mpls forwarding prefix  10.0.143.0/24 detail

Local  Outgoing    Prefix             Outgoing     Next Hop        Bytes
Label  Label       or ID              Interface                    Switched
------ ----------- ------------------ ------------ --------------- ------------
25156  24715       10.0.143.0/24      BE1          10.1.1.1        0
     Updated: Feb  1 11:30:20.150
     Version: 84285, Priority: 3
     Label Stack (Top -> Bottom): { 24715 }
     NHID: 0x0, Encap-ID: 0xe3a, Path idx: 0, Backup path idx: 0, Weight: 0
     MAC/Encaps: 14/18, MTU: 1500
     Packets Switched: 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.

Field	Description
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.
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.

show mpls forwarding tunnels

To display the contents of the **MPLS** forwarding tunnel, use the **show mpls forwarding tunnel** command in XR 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

XR EXEC mode

Command History

Release	Modification
Release 6.0	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.

Note When the **show mpls forwarding tunnels detail** command is executed with the **location** keyword

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
```

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 XR EXEC mode.

show mpls forwarding exact-route label *label-number* {**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 Label Number. Range is 0 to 1048575.
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

XR EXEC mode

Command History

Release	Modification
Release 6.0	This command was introduced.

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

Note

- If you use the show mpls forwarding exact-route command for a GRE MPLS packet, it shows incorrect egress locations.
- If you use the show mpls forwarding exact-route command for a GRE MPLS packet, it shows incorrect egress locations.

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  24075 ipv4 11.255.255.1
12.0.14.1 protocol tcp sou$

Local  Outgoing    Prefix             Outgoing     Next Hop        Bytes
Label  Label       or ID              Interface                    Switched
------ ----------- ------------------ ------------ --------------- ------------
24075  Pop         TE: 4131           BE12         12.0.14.2       N/A
     Via: BE12, Next Hop: 12.0.14.2
     Label Stack (Top -> Bottom): { Imp-Null }
     NHID: 0x0, Encap-ID: 0xab8, Path idx: 0, Backup path idx: 0, Weight: 0
```

```
MAC/Encaps: 14/14, MTU: 1500
```

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.
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.

show mpls forwarding label-security interface

To display the contents of the MPLS label interface security information, use the **show mpls forwarding label-security interface** command in XR EXEC mode.

show mpls forwarding label-security[**interface** *type* *interface-path-id*] [**location** *node-id*]

Syntax Description

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.
location *node-id*	(Optional) Displays hardware resource counters on the designated node.

Command Modes

XR EXEC mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

The optional keywords and arguments described allow display of an MPLS label security information.

Task ID

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

Examples

The following sample output is from the **show mpls forwarding label-security interface** command and specific interface and location:

```
RP/0/RP0/CPU0:router# show mpls forwarding label-security interface HundredGigE location
0/1/CPU0
```

show mpls forwarding label-security summary location

To display the contents of the MPLS label security information summary, use the **show mpls forwarding label-security summary location**command in XR EXEC mode.

show mpls forwarding label-security summary location *node-id*

Syntax Description

location *node-id*	Displays label security information on the designated node.

Command Modes

XR EXEC mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

The optional keywords and arguments described allow display of an MPLS label security information.

Task ID

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

Examples

The following sample output is from the **show mpls forwarding label-security summary location** command and a specific location:

```
RP/0/RP0/CPU0:router# show mpls forwarding label-security summary location 0/1/CPU0
```

show mpls forwarding labels

To display the contents of the MPLS label information, use the **show mpls forwarding labels** command in XR EXEC mode.

show mpls forwarding [**labels** *low-value high-value*] **hardware egress** [**detail**] [**npu location** *node-id*] **[rpf]**

Syntax Description

labels *low-value high-value*	(Optional) Entries with a local labels range. Ranges for *low-value* is 0 and *high-value*is 0 1048575.
hardware	(Optional) Displays the hardware location entry.
egress	(Optional) Reads information from the egress PSE.
detail	(Optional) Displays detailed information for the designated node.
npu	(Optional) Displays CEF entries that are processed by the egress NPU.
location*node-id*	(Optional) Displays hardware resource counters on the designated node.
rpf	(Optional) Displays label RPF information. **Note** This will be supported in a future release of Cisco IOS XR software.

Command Modes

XR EXEC mode

Command History

Release	Modification
Release 24.2.1	This command was modified. The **npu** keyword was introduced.
Release 6.6.1	The command displays statistics information.
Release 6.0	This command was introduced.

Usage Guidelines

- The optional keywords and arguments described allow display of MPLS label security and RPF information.

- The **show mpls forwarding labels** command displays per-label statistics at "ingress" for Segment Routing labels only if it's enabled using the **hw-module profile stats ingress-sr** command.
- For NCS 560 series routers, the command output doesn't include the per-label statistics information even after enabling the **hw-module profile stats ingress-sr** command.
- The **Bytes Switched** counter is not supported in the **show mpls forwarding** command, so the counter remains at 0.

Task ID

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

Examples

The following sample output is from the **show mpls forwarding labels** command using the **rpf**:

```
RP/0/RP0/CPU0:router# show mpls forwarding labels rpf
Forwarding entries:
   Label switching: 0, protected: 0
   MPLS TE tunnel head: 0, protected: 0
   MPLS TE midpoint: 0, protected: 0
   MPLS TE internal: 0, protected: 0
   MPLS P2MP TE tunnel head: 0
   MPLS P2MP TE tunnel midpoint/tail: 0
   MPLS P2MP MLDP tunnel head: 0
   MPLS P2MP MLDP tunnel midpoint/tail: 0
Forwarding updates:
   messages: 2
      p2p updates: 4
Labels in use:
   Reserved: 4
   Lowest: 0
   Highest: 13
   Deleted stale label entries: 0

Pkts dropped:    0
Pkts fragmented: 0
Failed lookups:  0
```

The following sample output is from the **show mpls forwarding labels** command using **hardware egress detail location**:

```
Router-PE1#show mpls forwarding labels 24001 hardware egress detail location 0/0/CPU0
Wed Jul 26 21:24:26.953 UTC
Local  Outgoing    Prefix             Outgoing     Next Hop        Bytes
Label  Label       or ID              Interface                    Switched
------ ----------- ------------------ ------------ --------------- ------------
24001              mLDP/IR: 0x00002 (0x00002)
       Updated Jul 26 21:06:08.921
       mLDP/IR LSM-ID: 0x00002, MDT: 0x2000802c, Head LSM-ID: 0x00002
       IPv4 Tableid: 0xe0000001, IPv6 Tableid: 0xe0800001
       Flags:IP Lookup:set, Expnullv4:not-set, Expnullv6:not-set
             Payload Type v4:not-set, Payload Type v6:not-set, l2vpn:not-set
             Head:set, Tail:not-set, Bud:not-set, Peek:set, inclusive:not-set
             Ingress Drop:not-set, Egress Drop:not-set
```

```
            RPF-ID:0, Encap-ID:0
            Disp-Tun:[ifh:0x0, label:-]
            Platform Data [32]:
             { 0 0 36 10 0 0 36 10
               0 0 0 0 0 0 0 0
               0 0 0 0 0 14 52 154
               255 255 255 255 255 255 255 255
               }
       mpls paths: 1, local mpls paths: 1, protected mpls paths: 1

       24008       mLDP/IR: 0x00002 (0x00002)   \
                                  Te0/0/0/4    10.2.0.2        N/A
         Updated: Jul 26 21:06:08.935
         My Nodeid:0x0
         Interface Nodeids:
           [ 0x0 - - - - - - - - -  ]
         Interface Handles:
           [ 0xe0 - - - - - - - - -  ]
         Backup Interface Nodeids:
           [ 0x0 - - - - - - - - - ]
         Backup Interface Handles:
           [ 0x48 - - - - - - - - - ]
         Packets Switched: 0


 LEAF - HAL pd context :
 sub-type : MPLS_P2MP, ecd_marked:0, has_collapsed_ldi:0
 collapse_bwalk_required:0, ecdv2_marked:0,
HW Walk:
LEAF:
    PI:0x308e3ead68 PD:0x308e3eae10 rev:285 type: MPLS_P2MP (12) TBL: 0
    LEAF location: UNKNOWN
    FEC key: 00
    label action: MPLS_NOP, dpa handle: 0x308e50f740
mplslabel HW:
    npu:0x0 mcid:0xa00240a

    MOL:
        PD: 0x308e892350 rev: 483 dpa-rev: 20058
        fgid: 9226 (0x240a) LSM id: 2 ipmcolist DPA hdl: 0x308ee5f098
        is head: 1 is tail: 0 is bud: 0 drop_flag: 0
        num MPIs: 1
    ipmcolist HW:
        npu:0x0 status:0x0 replications:0x0

        MPI:
            PD: 0x308e9f51d0 rev: 481 p-rev: 478 479 254
            flags: 0x213 in-label: 24001 out-label: 24008 neighbor: 21.21.21.21
            PRIMARY:
            mpls encap id: 0x40011852 mplsnh DPA handle: 0x308ec7b748 dpa-rev: 20056
            LDP local lbl: 24002 out lbl: 1048580
            nh: 10.2.0.2 nh encap hdl: 0x308e78e298 nh ifh: 0xe0 ul ifh: 0
            incomplete: 0 NPU mask: 0x1 sysport: 28
        mplsnh HW:
            npu:0x0 label1:0x5dc8 action:0x2 failover_id:0x80000004 next_encap:0x0
            BACKUP:
            mpls encap id: 0x40011853 mplsnh DPA handle: 0x308ec7baa0 dpa-rev: 20057
            LDP backup out lbl: 24005 pq lbl: 1048577
            nh: 10.0.0.1 nh encap hdl: 0x308e78e5f8 nh ifh: 0x48 ul ifh: 0
            incomplete: 0 NPU mask: 0x1 sysport: 9
        mplsnh HW:
          npu:0x0 label1:0x5dc8 action:0x2 label2:0x5dc5 action:0x2 failover_id:0x80000005
 next_encap:0x0
```

```
                BKUP-FRR-P2MP:
                PI:0x308ee1f048 PD:0x308ee1f138 Rev: 479 parent-rev: 478 356  dpa-rev:
20055
                DPA Handle: 0x308ee0f260, HW Id: 0x80000005, Status: BLK, npu_mask: 0x1,
 Bkup IFH: 0x48
                  lsmprotect HW:
                      npu:0x0 failover_id:0x80000005 state:0x1

                PROT-FRR-P2MP:
                PI:0x308edcf048 PD:0x308edcf160 Rev: 478 parent-rev: 254  dpa-rev: 20054

                FRR Active: 0, DPA Handle: 0x308ee0f0e8, HW Id: 0x80000004, Status: FWD,
 npu_mask: 0x1, Prot IFH: 0xe0
                  lsmprotect HW:
                      npu:0x0 failover_id:0x80000004 state:0x0

            TX-NHINFO:
              PI: 0x308e6e6340 PD: 0x308e6e63d0 rev:254 dpa-rev:2303 Encap hdl: 0x308e78e298

                Encap id: 0x40010001 Remote: 0 L3 int: 16 flags: 0x3 transport_encap_id:0x0

                 npu_mask: 0x1 DMAC: c4:b2:39:dc:02:08
```

The following sample output is from the **show mpls forwarding labels** command with **npu** keyword:

```
Router#show mpls forwarding labels 24000 hardware egress npu location 0/0/CPU0   <<<<<<<<<<<<
 Show output with NPU keyword showing additional data from NPU hardware

Using NPU option is resource intensive and may result in system
instability and possibly result in traffic loss.
Do you really want to continue[confirm with only 'y' or 'n'] [y/n] :Local  Outgoing
Prefix             Outgoing     Next Hop        Bytes
Label  Label       or ID              Interface                  Switched
------ ----------- ------------------ ------------ --------------- ------------
24000  24002       3.3.3.3/32         Hu0/0/0/10   10.1.1.2        N/A


 LEAF - HAL pd context :
 sub-type : MPLS, ecd_marked:0, has_collapsed_ldi:0
 collapse_bwalk_required:0, ecdv2_marked:0,
HW Walk:
LEAF:
    PI:0x308e342928 PD:0x308e3429d0 rev:2014 type: MPLS (2) TBL: 0
    LEAF location: LEM
    FEC key: 0x1440000f7d0
    label action: MPLS_SWAP, dpa handle: 0x308e4672d8
    mplslabel HW:
    npu:0x0 out_label:0x5dc2 fec:0x2001ffd6  <<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<
    npu:0x1 out_label:0x5dc2 fec:0x2001ffd6
    npu:0x2 out_label:0x5dc2 fec:0x2001ffd6
    npu:0x3 out_label:0x5dc2 fec:0x2001ffd6

    LWLDI:
        PI:0x308d252a08 PD:0x308d252a50 rev:2011 p-rev:2010  ldi type:IMP_EOS0_EOS1
        FEC key: 0x1540000f7d0 fec index: 0x2001ffd5(131029) num paths: 1 bkup paths: 0
        IMP pattern:3
        PI:0x308d252a08 PD:0x308d252a50 rev:2011 p-rev:2010  dpa-rev:4269924
        FEC key: 0x1540000f7d0 fec index: 0x2001ffd5(131029) num paths: 1 bkup paths: 0
        Path:0  fec index: 0x2001ffd5(131029) DSP: 0x9f
                MPLS encap key: 0xf1b0000040011841 MPLS encap id: 0x40011841 Remote: 0
                Label Stack(Top -> Bottom): { 24002 } dpa-rev: 4269923
        FEC:
        npu:0x0 fec:0x2001ffd5 port:0x8001811 encap:0x40011841
```

```
        npu:0x1 fec:0x2001ffd5 port:0x8001811 encap:0x40011841
<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<
        npu:0x2 fec:0x2001ffd5 port:0x8001811 encap:0x40011841
        npu:0x3 fec:0x2001ffd5 port:0x8001811 encap:0x40011841
        mplsnh HW:
            npu:0x1 mpls_encap_id:0x40011841 label1:0x5dc2 action:0x2

        SHLDI:
            PI:0x308bec3698 PD:0x308bec37a8 rev:2010 dpa-rev:4269922 cbf_enabled:0
pbts_enabled:0 surpf_enable:0 flag:0x0
            FEC key: 0x1440000f7d0 fec index: 0x2001ffd6(131030) num paths: 1 bkup paths:
0
            p-rev:1973
            Path:0 fec index: 0x2001ffd6(131030) DSP:0x9f Dest fec index: 0x0(0)
            FEC:
            npu:0x0 fec:0x2001ffd6 port:0x8001811 encap:0x40010001
            npu:0x1 fec:0x2001ffd6 port:0x8001811 encap:0x40010001
<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<
            npu:0x2 fec:0x2001ffd6 port:0x8001811 encap:0x40010001
            npu:0x3 fec:0x2001ffd6 port:0x8001811 encap:0x40010001

            TX-NHINFO:
                PI: 0x308ea81340 PD: 0x308ea813d0 rev:1973 dpa-rev:4269323 Encap hdl:
0x308eb21298
               Encap id: 0x40010001 Remote: 0 L3 int: 17 flags: 0x3 transport_encap_id:0x0

                npu_mask: 0x2 DMAC: ba:d6:11:de:61:d8
                ENCAP:
                npu:0x1 mac:0xd861de11d6ba vlan:0x11  <<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<
```

show mpls forwarding summary

To display the summary of the MPLS label table, use the **show mpls forwarding summary** command in XR EXEC mode.

show mpls forwarding summary [**debug**] [**location** *node-id*] **no-counters** **private**

Syntax Description

debug	(Optional) Displays the information for internal debugging in the command output.
location *node-id*	(Optional) Displays the interfaces on which MPLS is enabled.
no-counters	(Optional) Skips displaying counters.
private	(Optional) Displays private information.

Command Modes

XR EXEC mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

The optional keywords and arguments described allow display of an MPLS label security information.

Task ID

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

Examples

The following sample output is from the **show mpls forwarding summary** command using the **debug** keyword:

```
RP/0/RP0/CPU0:router# show mpls forwarding summary debug
Forwarding entries:
   Label switching: 0, protected: 0
   MPLS TE tunnel head: 0, protected: 0
   MPLS TE midpoint: 0, protected: 0
   MPLS TE internal: 0, protected: 0
   MPLS P2MP TE tunnel head: 0
   MPLS P2MP TE tunnel midpoint/tail: 0
   MPLS P2MP MLDP tunnel head: 0
   MPLS P2MP MLDP tunnel midpoint/tail: 0
Forwarding updates:
   messages: 2
      p2p updates: 4
Labels in use:
   Reserved: 4
   Lowest: 0
```

```
   Highest: 13
   Deleted stale label entries: 0

Pkts dropped:    0
Pkts fragmented: 0
Failed lookups:  0
```

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

```
RP/0/RP0/CPU0:router# show mpls forwarding summary location 0/1/CPU0
Forwarding entries:
   Label switching: 0, protected: 0
   MPLS TE tunnel head: 0, protected: 0
   MPLS TE midpoint: 0, protected: 0
   MPLS TE internal: 0, protected: 0
   MPLS P2MP TE tunnel head: 0
   MPLS P2MP TE tunnel midpoint/tail: 0
   MPLS P2MP MLDP tunnel head: 0
   MPLS P2MP MLDP tunnel midpoint/tail: 0
Forwarding updates:
   messages: 2
      p2p updates: 4
Labels in use:
   Reserved: 4
   Lowest: 0
   Highest: 13
   Deleted stale label entries: 0

Pkts dropped:    0
Pkts fragmented: 0
Failed lookups:  0
```

The following sample output is from the **show mpls forwarding summary** command using the **no-counters**:

```
RP/0/RP0/CPU0:router# show mpls forwarding summary no-counters
Forwarding entries:
   Label switching: 0, protected: 0
   MPLS TE tunnel head: 0, protected: 0
   MPLS TE midpoint: 0, protected: 0
   MPLS TE internal: 0, protected: 0
   MPLS P2MP TE tunnel head: 0
   MPLS P2MP TE tunnel midpoint/tail: 0
   MPLS P2MP MLDP tunnel head: 0
   MPLS P2MP MLDP tunnel midpoint/tail: 0
Forwarding updates:
   messages: 2
      p2p updates: 4
Labels in use:
   Reserved: 4
   Lowest: 0
   Highest: 13
   Deleted stale label entries: 0
```

The following sample output is from the **show mpls forwarding summary** command using the **private**:

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

```
Forwarding entries:
   Label switching: 0, protected: 0
   MPLS TE tunnel head: 0, protected: 0
   MPLS TE midpoint: 0, protected: 0
   MPLS TE internal: 0, protected: 0
   MPLS P2MP TE tunnel head: 0
   MPLS P2MP TE tunnel midpoint/tail: 0
   MPLS P2MP MLDP tunnel head: 0
   MPLS P2MP MLDP tunnel midpoint/tail: 0
Forwarding updates:
   messages: 2
      p2p updates: 4
Labels in use:
   Reserved: 4
   Lowest: 0
   Highest: 13
   Deleted stale label entries: 0
Path count:
   Unicast: 0

Pkts dropped:    0
Pkts fragmented: 0
Failed lookups:  0
fwd-flags: 0x5, ttl-expire-pop-cnt: 0
```

This table describes the significant fields shown in the display.

Table 3: show mpls forwarding summary Field Descriptions

Field	Description
Label switching	Number of Label switching Label Forwarding Information Base (LFIB) forwarding entries.
MPLS TE tunnel head	Number of forwarding entries (installed at ingress LSR) on MPLS TE tunnel head.
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.

show mpls interfaces

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

XR EXEC mode

Command History

Release	Modification
Release 6.0	This command was introduced.

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   Static   Enabled
                                     ------------------------- -------- -------- --------
--------
HundredGigE0/2/0/0         No       No       No       Yes
                                    HundredGigE0/2/0/3        No       No       No       Yes
HundredGigE0/2/0/10        No       No       No       Yes
                                    TenGigE0/2/0/2/3          No       No       No       Yes
TenGigE0/2/0/2/2           No       No       No       Yes
                                    TenGigE0/2/0/2/1          No       No       No       Yes
TenGigE0/2/0/2/0           Yes      No       No       Yes
                                    TenGigE0/4/0/0/0          No       No       No       Yes
TenGigE0/4/0/16/0          No       No       No       Yes
                                    TenGigE0/4/0/12/3         No       No       No       Yes
TenGigE0/4/0/12/2          No       No       No       Yes
                                    TenGigE0/4/0/12/1         No       No       No       Yes
TenGigE0/4/0/12/0          Yes      No       Yes      Yes
                                    TenGigE0/4/0/0/3          No       No       No       Yes
TenGigE0/4/0/0/2           No       No       No       Yes
                                    TenGigE0/4/0/0/1          Yes      No       Yes      Yes
HundredGigE0/7/0/29        No       No       No       Yes
                                    HundredGigE0/7/0/35       No       No       No       Yes
Bundle-Ether1              Yes      No       No       Yes
                                    Bundle-Ether2             No       No       No       Yes
Bundle-Ether3              No       No       No       Yes
                                    Bundle-Ether4             No       No       No       Yes
Bundle-Ether5              No       No       No       Yes
                                    Bundle-Ether6             Yes      No       No       Yes
Bundle-Ether7              No       No       No       Yes
                                    Bundle-Ether8             Yes      No       No       Yes
```

This table describes the significant fields in the sample display.

Table 4: 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 XR EXEC mode.

show mpls label range

Syntax Description

This command has no arguments or keywords.

Command Default

No default behavior or values

Command Modes

XR EXEC mode

Command History

Release	Modification
Release 6.0	This command was introduced.

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 5: 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).

show mpls label table

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

XR EXEC mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

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 6: 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.

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 XR 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**, , **internal**, **ldp**, **none**, , **static**, **te-control**, **te-link**, and **test**.

Command Default

No default behavior or values

Command Modes

XR EXEC mode

Command History

Release	Modification
Release 6.0	This command was introduced.

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 40command), 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 7: 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 re-registered 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.

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 XR EXEC mode.

show mpls lsd clients

Syntax Description

This command has no arguments or keywords.

Command Default

No default behavior or values

Command Modes

XR EXEC mode

Command History

Release	Modification
Release 6.0	This command was introduced.

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 8: 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.

show mpls lsd forwarding labels

To display the LSD label RPF information, use the **show mpls lsd forwarding labels** command in XR EXEC mode.

show mpls lsd forwarding [**labels** *low-value high-value*] [**location** *node-id*]

Syntax Description

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*	Displays hardware resource counters on the designated node.

Command Modes

XR EXEC mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

The optional keywords and arguments described allow display of an MPLS label security information.

Task ID

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

Examples

The following sample output is from the **show mpls lsd forwarding labels** command using a specific location:

```
RP/0/RP0/CPU0:router# show mpls lsd forwarding labels 1 13 detail location 0/1/CPU0
```

show mpls lsd forwarding summary

To display the LSD label RPF information, use the **show mpls lsd forwarding summary** command in XR EXEC mode.

show mpls lsd forwarding summary [**location** *node-id*]

Syntax Description

location *node-id*	Displays hardware resource counters on the designated node.

Command Modes

XR EXEC mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

The optional keywords and arguments described allow display of the interface label security information.

Task ID

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

Examples

The following sample output is from the **show mpls lsd forwarding summary** command and a specific location:

```
RP/0/RP0/CPU0:router# show mpls lsd forwarding summary location 0/1/CPU0
Interface      IFH         MTU  Flags      Type
-------------- ----------- ----- ---------- ----------
FI0/1/CPU0     0x02000080  8000 0x01000000 0x0000001b
tt1            0x08000320  1500 0x01000000 0x00000024
```

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 XR 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

XR EXEC mode

Command History

Release	Modification
Release 6.0	This command was introduced.

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

Status     Count
---------- ----------
Active     0
Ready      10000
Partial    0
IGP        0
```

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  bundle-ether
12

  LSP midpoint FRR information:
LSP Identifier                Local  Out Intf/        FRR Intf/        Status
                              Label  Label            Label
----------------------------- ------ ---------------- ---------------- -------
11.255.255.1 128 [145]        24001  BE12:Pop         tt65001:Pop      Ready
11.255.255.1 3174 [112]       24002  BE12:Pop         tt65001:Pop      Ready
11.255.255.1 1443 [121]       24003  BE12:Pop         tt65001:Pop      Ready
11.255.255.1 3009 [121]       24005  BE12:Pop         tt65001:Pop      Ready
11.255.255.1 10 [157]         24006  BE12:Pop         tt65001:Pop      Ready
11.255.255.1 63 [147]         24007  BE12:Pop         tt65001:Pop      Ready
11.255.255.1 4848 [120]       24010  BE12:Pop         tt65001:Pop      Ready
11.255.255.1 292 [144]        24011  BE12:Pop         tt65001:Pop      Ready
11.255.255.1 1455 [131]       24012  BE12:Pop         tt65001:Pop      Ready
11.255.255.1 2932 [116]       24013  BE12:Pop         tt65001:Pop      Ready
11.255.255.1 2967 [146]       24014  BE12:Pop         tt65001:Pop      Ready
11.255.255.1 6 [167]          24016  BE12:Pop         tt65001:Pop      Ready
11.255.255.1 98 [159]         24017  BE12:Pop         tt65001:Pop      Ready
11.255.255.1 2985 [131]       24018  BE12:Pop         tt65001:Pop      Ready
11.255.255.1 334 [132]        24019  BE12:Pop         tt65001:Pop      Ready
11.255.255.1 160 [140]        24020  BE12:Pop         tt65001:Pop      Ready
11.255.255.1 4935 [123]       24021  BE12:Pop         tt65001:Pop      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
```

This table describes the significant fields shown in the display.

Table 9: 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.
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.

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 XR EXEC mode.

show mpls traffic-eng fast-reroute log [**interface***typeinterface-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

XR EXEC mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

No specific guidelines impact the use of this command.

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

 Location Protected              When                    Switching Time
         Interface                                          (usec)
-------- ---------------------- ---------------------- --------------
0/RP0/CPU0 BE12                   Jan 31 15:42:12.723782        0
0/RP0/CPU0 BE12                   Jan 31 16:27:32.419837        0
0/RP0/CPU0 BE12                   Jan 31 18:31:55.019120        0
```

This table describes the significant fields shown in the display.

Table 10: 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.