



MPLS

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mpls ip default-route

To enable the distribution of labels associated with the IP default route, use the **mpls ip default-route** command in global configuration mode.

mpls ip default-route

Syntax Description This command has no arguments or keywords.

Command Default No distribution of labels for the IP default route.

Command Modes Global configuration

Command History	Release	Modification
	Cisco IOS XE Denali 16.3.1	This command was introduced.

Usage Guidelines Dynamic label switching (that is, distribution of labels based on routing protocols) must be enabled before you can use the **mpls ip default-route** command.

Examples

The following example shows how to enable the distribution of labels associated with the IP default route:

```
Switch# configure terminal
Switch(config)# mpls ip
Switch(config)# mpls ip default-route
```

Related Commands	Command	Description
	mpls ip (global configuration)	Enables MPLS forwarding of IPv4 packets along normally routed paths for the platform.
	mpls ip (interface configuration)	Enables MPLS forwarding of IPv4 packets along normally routed paths for a particular interface.

mpls ip (global configuration)

To enable Multiprotocol Label Switching (MPLS) forwarding of IPv4 and IPv6 packets along normally routed paths for the platform, use the **mpls ip** command in global configuration mode. To disable this feature, use the **no** form of this command.

mpls ip
no mpls ip

Syntax Description This command has no arguments or keywords.

Command Default Label switching of IPv4 and IPv6 packets along normally routed paths is enabled for the platform.

Command Modes Global configuration

Release	Modification
Cisco IOS XE Denali 16.3.1	This command was introduced.

Usage Guidelines MPLS forwarding of IPv4 and IPv6 packets along normally routed paths (sometimes called dynamic label switching) is enabled by this command. For a given interface to perform dynamic label switching, this switching function must be enabled for the interface and for the platform.

The **no** form of this command stops dynamic label switching for all platform interfaces regardless of the interface configuration; it also stops distribution of labels for dynamic label switching. However, the **no** form of this command does not affect the sending of labeled packets through label switch path (LSP) tunnels.

Examples

The following example shows that dynamic label switching is disabled for the platform, and all label distribution is terminated for the platform:

```
Switch(config)# no mpls ip
```

Command	Description
mpls ip (interface configuration)	Enables MPLS forwarding of IPv4 and IPv6 packets along normally routed paths for the associated interface.

mpls ip (interface configuration)

To enable Multiprotocol Label Switching (MPLS) forwarding of IPv4 and IPv6 packets along normally routed paths for a particular interface, use the **mpls ip** command in interface configuration mode. To disable this configuration, use the **no** form of this command.

mpls ip
no mpls ip

Syntax Description This command has no arguments or keywords.

Command Default MPLS forwarding of IPv4 and IPv6 packets along normally routed paths for the interface is disabled.

Command Modes Interface configuration (config-if)

Release	Modification
Cisco IOS XE Denali 16.3.1	This command was introduced.

Usage Guidelines MPLS forwarding of IPv4 and IPv6 packets along normally routed paths is sometimes called dynamic label switching. If dynamic label switching has been enabled for the platform when this command is issued on an interface, label distribution for the interface begins with the periodic transmission of neighbor discovery Hello messages on the interface. When the outgoing label for a destination routed through the interface is known, packets for the destination are labeled with that outgoing label and forwarded through the interface.

The **no** form of this command causes packets routed out through the interface to be sent unlabeled; this form of the command also terminates label distribution for the interface. However, the no form of the command does not affect the sending of labeled packets through any link-state packet (LSP) tunnels that might use the interface.

Examples

The following example shows how to enable label switching on the specified Ethernet interface:

```
Switch(config)# configure terminal
Switch(config-if)# interface TenGigabitEthernet1/0/3
Switch(config-if)# mpls ip
```

The following example shows that label switching is enabled on the specified vlan interface (SVI) on a Cisco Catalyst switch:

```
Switch(config)# configure terminal
Switch(config-if)# interface vlan 1
Switch(config-if)# mpls ip
```

mpls label protocol (global configuration)

To specify the Label Distribution Protocol (LDP) for a platform, use the **mpls label protocol** command in global configuration mode. To restore the default LDP, use the **no** form of this command.

mpls label protocol ldp
no mpls label protocol ldp

Syntax Description

ldp	Specifies that LDP is the default label distribution protocol.
------------	--

Command Default

LDP is the default label distribution protocol.

Command Modes

Global configuration

Command History

Release	Modification
Cisco IOS XE Denali 16.3.1	This command was introduced.

Usage Guidelines

If neither the global **mpls label protocol ldp** command nor the interface **mpls label protocol ldp** command is used, all label distribution sessions use LDP.

Examples

The following command establishes LDP as the label distribution protocol for the platform:

```
Switch(config)# mpls label protocol ldp
```

mpls label protocol (interface configuration)

To specify the label distribution protocol for an interface, use the **mpls label protocol** command in interface configuration mode. To remove the label distribution protocol from the interface, use the **no** form of this command.

mpls label protocol ldp
no mpls label protocol ldp

Syntax Description

ldp	Specifies that the label distribution protocol (LDP) is to be used on the interface.
------------	--

Command Default

If no protocol is explicitly configured for an interface, the label distribution protocol that was configured for the platform is used. To set the platform label distribution protocol, use the global **mpls label protocol** command.

Command Modes

Interface configuration (config-if)

Command History

Release	Modification
Cisco IOS XE Denali 16.3.1	This command was introduced.

Usage Guidelines

To successfully establish a session for label distribution for a link connecting two label switch routers (LSRs), the link interfaces on the LSRs must be configured to use the same label distribution protocol. If there are multiple links connecting two LSRs, all of the link interfaces connecting the two LSRs must be configured to use the same protocol.

Examples

The following example shows how to establish LDP as the label distribution protocol for the interface:

```
Switch(config-if)# mpls label protocol ldp
```

mpls label range

To configure the range of local labels available for use with Multiprotocol Label Switching (MPLS) applications on packet interfaces, use the **mpls label range** command in global configuration mode. To revert to the platform defaults, use the **no** form of this command.

mpls label range *minimum-value maximum-value* [**static** *minimum-static-value maximum-static-value*]
no mpls label range

Syntax Description		
<i>minimum-value</i>		The value of the smallest label allowed in the label space. The default is 16.
<i>maximum-value</i>		The value of the largest label allowed in the label space. The default is platform-dependent.
static		(Optional) Reserves a block of local labels for static label assignments. If you omit the static keyword and the <i>minimum-static-value maximum-static-value</i> arguments, no labels are reserved for static assignment.
<i>minimum-static-value</i>		(Optional) The minimum value for static label assignments. There is no default value.
<i>maximum-static-value</i>		(Optional) The maximum value for static label assignments. There is no default value.

Command Default The platform's default values are used.

Command Modes Global configuration

Command History	Release	Modification
	Cisco IOS XE Denali 16.3.1	This command was introduced.

Usage Guidelines The labels 0 through 15 are reserved by the IETF (see RFC 3032, MPLS Label Stack Encoding, for details) and cannot be included in the range specified in the **mpls label range** command. If you enter a 0 in the command, you will get a message that indicates that the command is an unrecognized command.

The label range defined by the **mpls label range** command is used by all MPLS applications that allocate local labels (for dynamic label switching, MPLS traffic engineering, MPLS Virtual Private Networks (VPNs), and so on).

You can use label distribution protocols, such as Label Distribution Protocol (LDP), to reserve a generic range of labels from 16 through 1048575 for dynamic assignment.

You specify the optional **static** keyword, to reserve labels for static assignment. The MPLS Static Labels feature requires that you configure a range of labels for static assignment. You can configure static bindings only from the current static range. If the static range is not configured or is exhausted, then you cannot configure static bindings.

The range of label values is 16 to 4096. The maximum value defaults to 4096. You can split for static label space between say 16 to 100 and for dynamic label space between 101 to 4096.

The upper and lower minimum static label values are displayed in the help line. For example, if you configure the dynamic label with a minimum value of 16 and a maximum value of 100, the help lines display as follows:

```
Switch(config)# mpls label range 16 100 static ?
<100> Upper Minimum static label value
<16> Lower Minimum static label value
Reserved Label Range --> 0 to 15
Available Label Range --> 16 to 4096
Static Label Range --> 16 to 100
Dynamic Label Range --> 101 to 4096
```

In this example, you can configure a static range from 16 to 100.

If the lower minimum static label space is not available, the lower minimum is not displayed in the help line. For example:

```
Switch(config)# mpls label range 16 100 static ?
<16-100> static label value range
```

Examples

The following example shows how to configure the size of the local label space. In this example, the minimum static value is set to 200, and the maximum static value is set to 4000.

```
Switch# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)# mpls label range 200 4000
Switch(config)#
```

If you had specified a new range that overlaps the current range (for example, the new range of the minimum static value set to 16 and the maximum static value set to 1000), then the new range takes effect immediately.

The following example show how to configure a dynamic local label space with a minimum static value set to 100 and the maximum static value set to 1000 and a static label space with a minimum static value set to 16 and a maximum static value set to 99:

```
Switch(config)# mpls label range 100 1000 static 16 99
Switch(config)#
```

In the following output, the **show mpls label range** command, executed after a reload, shows that the configured range is now in effect:

```
Switch# show mpls label range
Downstream label pool: Min/Max label: 100/1000
Range for static labels: Min/Max/Number: 16/99
```

The following example shows how to restore the label range to its default value:

```
Switch# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)# no mpls label range
Switch(config)# end
```

Related Commands

Command	Description
show mpls label range	Displays the range of the MPLS local label space.

mpls static binding ipv4

To bind a prefix to a local or remote label, use the **mpls static binding ipv4** command in global configuration mode. To remove the binding between the prefix and label, use the **no** form of this command.

```
mpls static binding ipv4 prefix mask {label | input label | output nextHop {explicit-null | implicit-nulllabel}}
```

```
no mpls static binding ipv4 prefix mask {label | input label | output nextHop {explicit-null | implicit-nulllabel}}
```

<i>prefix mask</i>	Specifies the prefix and mask to bind to a label. (When you do not use the input or output keyword, the specified label is an incoming label.) Note Without the arguments, the no form of the command removes all static bindings.
<i>label</i>	Binds a prefix or a mask to a local (incoming) label. (When you do not use the input or output keyword, the specified label is an incoming label.)
input <i>label</i>	Binds the specified label to the prefix and mask as a local (incoming) label.
output <i>nextHop</i> explicit-null	Binds the Internet Engineering Task Force (IETF) Multiprotocol Label Switching (MPLS) IPv4 explicit null label (0) as a remote (outgoing) label.
output <i>nextHop</i> implicit-null	Binds the IETF MPLS implicit null label (3) as a remote (outgoing) label.
output <i>nextHop</i> <i>label</i>	Binds the specified label to the prefix/mask as a remote (outgoing) label.

Command Default

Prefixes are not bound to local or remote labels.

Command Modes

Global configuration (config)

Command History

Release	Modification
Cisco IOS XE Everest 16.5.1a	This command was introduced.

Usage Guidelines

The **mpls static binding ipv4** command pushes bindings into Label Distribution Protocol (LDP). LDP then needs to match the binding with a route in the Routing Information Base (RIB) or Forwarding Information Base (FIB) before installing forwarding information.

The **mpls static binding ipv4** command installs the specified bindings into the LDP Label Information Base (LIB). LDP will install the binding labels for forwarding use if or when the binding prefix or mask matches a known route.

Static label bindings are not supported for local prefixes, which are connected networks, summarized routes, default routes, and supernets. These prefixes use **implicit-null** or **explicit-null** as the local label.

If you do not specify the **input** or the **output** keyword, **input** (local label) is assumed.

For the **no** form of the command:

- If you specify the command name without any keywords or arguments, all static bindings are removed.
- Specifying the prefix and mask but no label parameters removes all static bindings for that prefix or mask.

Examples

In the following example, the **mpls static binding ipv4** command configures a static prefix and label binding before the label range is reconfigured to define a range for static assignment. The output of the command indicates that the binding has been accepted, but cannot be used for MPLS forwarding until you configure a range of labels for static assignment that includes that label.

```
Device# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)# mpls static binding ipv4 10.0.0.0 255.0.0.0 55
% Specified label 55 for 10.0.0.0/8 out of configured
% range for static labels. Cannot be used for forwarding until
% range is extended.
Router(config)# end
```

The following **mpls static binding ipv4** commands configure input and output labels for several prefixes:

```
Device(config)# mpls static binding ipv4 10.0.0.0 255.0.0.0 55
Device(config)# mpls static binding ipv4 10.0.0.0 255.0.0.0 output 10.0.0.66 2607
Device(config)# mpls static binding ipv4 10.66.0.0 255.255.0.0 input 17
Device(config)# mpls static binding ipv4 10.66.0.0 255.255.0.0 output 10.13.0.8 explicit-null
Device(config)# end
```

The following **show mpls static binding ipv4** command displays the configured bindings:

```
Device# show mpls static binding ipv4

10.0.0.0/8: Incoming label: 55
    Outgoing labels:
        10.0.0.66 2607
10.66.0.0/24: Incoming label: 17
    Outgoing labels:
        10.13.0.8 explicit-null
```

Related Commands

Command	Description
show mpls forwarding-table	Displays labels currently being used for MPLS forwarding.
show mpls label range	Displays statically configured label bindings.

show mpls forwarding-table

To display the contents of the Multiprotocol Label Switching (MPLS) Label Forwarding Information Base (LFIB), use the **show mpls forwarding-table** command in user EXEC or privileged EXEC mode.



Note When a local label is present, the forwarding entry for IP imposition will not be showed; if you want to see the IP imposition information, use **show ip cef**.

show mpls forwarding-table [{*network* {*masklength*} | **interface** *interface* | **labels** *label* [**dash** *label*] | **lcatm atm** *atm-interface-number* | **next-hop** *address* | **lsp-tunnel** [*tunnel-id*]}] [**vrf** *vrf-name*] [**detail** *slot slot-number*]

<i>network</i>	(Optional) Destination network number.
<i>mask</i>	IP address of the destination mask whose entry is to be shown.
<i>length</i>	Number of bits in the mask of the destination.
interface <i>interface</i>	(Optional) Displays entries with the outgoing interface specified.
labels <i>label-label</i>	(Optional) Displays entries with the local labels specified.
lcatm atm <i>atm-interface-number</i>	Displays ATM entries with the specified Label Controlled Asynchronous Transfer Mode (LCATM).
next-hop <i>address</i>	(Optional) Displays only entries with the specified neighbor as the next hop.
lsp-tunnel	(Optional) Displays only entries with the specified label switched path (LSP) tunnel, or with all LSP tunnel entries.
<i>tunnel-id</i>	(Optional) Specifies the LSP tunnel for which to display entries.
vrf <i>vrf-name</i>	(Optional) Displays entries with the specified VPN routing and forwarding (VRF) instance.
detail	(Optional) Displays information in long form (includes length of encapsulation, length of MAC string, maximum transmission unit [MTU], and all labels).
slot <i>slot-number</i>	(Optional) Specifies the slot number, which is always 0.

Command Modes

User EXEC (>)
Privileged EXEC (#)

Command History	Release	Modification
	Cisco IOS XE Everest 16.5.1a	This command was introduced.

Examples

The following is sample output from the **show mpls forwarding-table** command:

```
Device# show mpls forwarding-table
Local Outgoing Prefix Bytes label Outgoing Next Hop
Label Label or VC or Tunnel Id switched interface
26 No Label 10.253.0.0/16 0 Et4/0/0 10.27.32.4
28 1/33 10.15.0.0/16 0 AT0/0.1 point2point
29 Pop Label 10.91.0.0/16 0 Hs5/0 point2point
1/36 10.91.0.0/16 0 AT0/0.1 point2point
30 32 10.250.0.97/32 0 Et4/0/2 10.92.0.7
32 10.250.0.97/32 0 Hs5/0 point2point
34 26 10.77.0.0/24 0 Et4/0/2 10.92.0.7
26 10.77.0.0/24 0 Hs5/0 point2point
35 No Label[T] 10.100.100.101/32 0 Tu301 point2point
36 Pop Label 10.1.0.0/16 0 Hs5/0 point2point
1/37 10.1.0.0/16 0 AT0/0.1 point2point
[T] Forwarding through a TSP tunnel.
View additional labeling info with the 'detail' option
```

The following is sample output from the **show mpls forwarding-table** command when the IPv6 Provider Edge Router over MPLS feature is configured to allow IPv6 traffic to be transported across an IPv4 MPLS backbone. The labels are aggregated because there are several prefixes for one local label, and the prefix column contains “IPv6” instead of a target prefix.

```
Device# show mpls forwarding-table
Local Outgoing Prefix Bytes label Outgoing Next Hop
Label Label or VC or Tunnel Id switched interface
16 Aggregate IPv6 0
17 Aggregate IPv6 0
18 Aggregate IPv6 0
19 Pop Label 192.168.99.64/30 0 Se0/0 point2point
20 Pop Label 192.168.99.70/32 0 Se0/0 point2point
21 Pop Label 192.168.99.200/32 0 Se0/0 point2point
22 Aggregate IPv6 5424
23 Aggregate IPv6 3576
24 Aggregate IPv6 2600
```

The following is sample output from the **show mpls forwarding-table detail** command. If the MPLS EXP level is used as a selection criterion for packet forwarding, a bundle adjacency exp (vcd) field is included in the display. This field includes the EXP value and the corresponding virtual circuit descriptor (VCD) in parentheses. The line in the output that reads “No output feature configured” indicates that the MPLS egress NetFlow accounting feature is not enabled on the outgoing interface for this prefix.

```
Device# show mpls forwarding-table detail
Local Outgoing Prefix Bytes label Outgoing Next Hop
label label or VC or Tunnel Id switched interface
16 Pop label 10.0.0.6/32 0 AT1/0.1 point2point
Bundle adjacency exp(vcd)
0(1) 1(1) 2(1) 3(1) 4(1) 5(1) 6(1) 7(1)
MAC/Encaps=12/12, MTU=4474, label Stack{}
00010000AAAA0300000008847
No output feature configured
```

```

17 18 10.0.0.9/32 0 AT1/0.1 point2point
Bundle adjacency exp(vcd)
0(1) 1(1) 2(1) 3(1) 4(1) 5(1) 6(1) 7(1)
MAC/Encaps=12/16, MTU=4470, label Stack{18}
00010000AAAA030000008847 00012000
No output feature configured
18 19 10.0.0.10/32 0 AT1/0.1 point2point
Bundle adjacency exp(vcd)
0(1) 1(1) 2(1) 3(1) 4(1) 5(1) 6(1) 7(1)
MAC/Encaps=12/16, MTU=4470, label Stack{19}
00010000AAAA030000008847 00013000
No output feature configured
19 17 10.0.0.0/8 0 AT1/0.1 point2point
Bundle adjacency exp(vcd)
0(1) 1(1) 2(1) 3(1) 4(1) 5(1) 6(1) 7(1)
MAC/Encaps=12/16, MTU=4470, label Stack{17}
00010000AAAA030000008847 00011000
No output feature configured
20 20 10.0.0.0/8 0 AT1/0.1 point2point
Bundle adjacency exp(vcd)
0(1) 1(1) 2(1) 3(1) 4(1) 5(1) 6(1) 7(1)
MAC/Encaps=12/16, MTU=4470, label Stack{20}
00010000AAAA030000008847 00014000
No output feature configured
21 Pop label 10.0.0.0/24 0 AT1/0.1 point2point
Bundle adjacency exp(vcd)
0(1) 1(1) 2(1) 3(1) 4(1) 5(1) 6(1) 7(1)
MAC/Encaps=12/12, MTU=4474, label Stack{}
00010000AAAA030000008847
No output feature configured
22 Pop label 10.0.0.4/32 0 Et2/3 10.0.0.4
MAC/Encaps=14/14, MTU=1504, label Stack{}
000427AD10430005DDFE043B8847
No output feature configured

```

The following is sample output from the **show mpls forwarding-table detail** command. In this example, the MPLS egress NetFlow accounting feature is enabled on the first three prefixes, as indicated by the line in the output that reads “Feature Quick flag set.”

```

Device# show mpls forwarding-table detail
Local  Outgoing  Prefix          Bytes label  Outgoing  Next Hop
label  label or VC  or Tunnel Id   switched     interface
16  Aggregate  10.0.0.0/8[V]  0
MAC/Encaps=0/0, MTU=0, label Stack{}
VPN route: vpn1
Feature Quick flag set
Per-packet load-sharing, slots: 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
17  No label   10.0.0.0/8[V]  0           Et0/0/2    10.0.0.1
MAC/Encaps=0/0, MTU=1500, label Stack{}
VPN route: vpn1
Feature Quick flag set
Per-packet load-sharing, slots: 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
18  No label   10.42.42.42/32[V]  4185       Et0/0/2    10.0.0.1
MAC/Encaps=0/0, MTU=1500, label Stack{}
VPN route: vpn1
Feature Quick flag set
Per-packet load-sharing, slots: 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
19  2/33      10.41.41.41/32  0           AT1/0/0.1  point2point
MAC/Encaps=4/8, MTU=4470, label Stack{2/33(vcd=2)}
00028847 00002000
No output feature configured

```

The table below describes the significant fields shown in the displays.

Table 1: show mpls forwarding-table Field Descriptions

Field	Description
Local label	Label assigned by this device.
Outgoing Label or VC Note This field is not supported on the Cisco 10000 series routers.	Label assigned by the next hop or the virtual path identifier (VPI)/virtual channel identifier (VCI) used to get to next hop. The entries in this column are the following: <ul style="list-style-type: none"> • [T]--Forwarding is through an LSP tunnel. • No Label--There is no label for the destination from the next hop or label switching is not enabled on the outgoing interface. • Pop Label--The next hop advertised an implicit NULL label for the destination and the device removed the top label. • Aggregate--There are several prefixes for one local label. This entry is used when IPv6 is configured on edge devices to transport IPv6 traffic over an IPv4 MPLS network.
Prefix or Tunnel Id	Address or tunnel to which packets with this label are sent. Note If IPv6 is configured on edge devices to transport IPv6 traffic over an IPv4 MPLS network, "IPv6" is displayed here. <ul style="list-style-type: none"> • [V]--The corresponding prefix is in a VRF.
Bytes label switched	Number of bytes switched with this incoming label. This includes the outgoing label and Layer 2 header.
Outgoing interface	Interface through which packets with this label are sent.
Next Hop	IP address of the neighbor that assigned the outgoing label.
Bundle adjacency exp(vcd)	Bundle adjacency information. Includes the MPLS EXP value and the corresponding VCD.
MAC/Encaps	Length in bytes of the Layer 2 header and length in bytes of the packet encapsulation, including the Layer 2 header and label header.
MTU	MTU of the labeled packet.
label Stack	All the outgoing labels. If the outgoing interface is transmission convergence (TC)-ATM, the VCD is also shown. Note TC-ATM is not supported on Cisco 10000 series routers.
00010000AAAA030000008847 00013000	The actual encapsulation in hexadecimal form. A space is shown between Layer 2 and the label header.

Explicit-Null Label Example

The following is sample output, including the explicit-null label = 0 (commented in bold), for the `show mpls forwarding-table` command on a CSC-PE device:

```
Device# show mpls forwarding-table
Local  Outgoing  Prefix          Bytes label  Outgoing  Next Hop
label  label or VC or Tunnel Id    switched     interface
17     Pop label  10.10.0.0/32    0            Et2/0     10.10.0.1
18     Pop label  10.10.10.0/24   0            Et2/0     10.10.0.1
19     Aggregate 10.10.20.0/24[V] 0
20     Pop label  10.10.200.1/32[V] 0           Et2/1     10.10.10.1
21     Aggregate 10.10.1.1/32[V]  0
22     0          192.168.101.101/32[V] \
                                0
                                Et2/1     192.168.101.101
23     0          192.168.101.100/32[V] \
                                0
                                Et2/1     192.168.101.100
25     0          192.168.102.125/32[V] 0           Et2/1     192.168.102.125 !outlabel
value 0
```

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

Table 2: show mpls forwarding-table Field Descriptions

Field	Description
Local label	Label assigned by this device.
Outgoing label or VC	Label assigned by the next hop or VPI/VCI used to get to the next hop. The entries in this column are the following: <ul style="list-style-type: none"> • [T]--Forwarding is through an LSP tunnel. • No label--There is no label for the destination from the next hop or that label switching is not enabled on the outgoing interface. • Pop label--The next hop advertised an implicit NULL label for the destination and that this device popped the top label. • Aggregate--There are several prefixes for one local label. This entry is used when IPv6 is configured on edge devices to transport IPv6 traffic over an IPv4 MPLS network. • 0--The explicit null label value = 0.
Prefix or Tunnel Id	Address or tunnel to which packets with this label are sent. <p>Note If IPv6 is configured on edge devices to transport IPv6 traffic over an IPv4 MPLS network, IPv6 is displayed here.</p> <ul style="list-style-type: none"> • [V]--Means that the corresponding prefix is in a VRF.
Bytes label switched	Number of bytes switched with this incoming label. This includes the outgoing label and Layer 2 header.
Outgoing interface	Interface through which packets with this label are sent.

Field	Description
Next Hop	IP address of the neighbor that assigned the outgoing label.

Cisco IOS Software Modularity: MPLS Layer 3 VPNs Example

The following is sample output from the **show mpls forwarding-table** command:

```

Device# show mpls forwarding-table
Local      Outgoing  Prefix      Bytes Label  Outgoing  Next Hop
Label      Label     or Tunnel Id  Switched     interface
16         Pop Label IPv4 VRF[V]  62951000    aggregate/v1
17   [H]   No Label   10.1.1.0/24  0           AT1/0/0.1 point2point
          No Label   10.1.1.0/24  0           PO3/1/0 point2point
          [T]   No Label   10.1.1.0/24  0           Tu1 point2point
18   [HT]  Pop Label  10.0.0.3/32  0           Tu1 point2point
19   [H]   No Label   10.0.0.0/8   0           AT1/0/0.1 point2point
          No Label   10.0.0.0/8   0           PO3/1/0 point2point
20   [H]   No Label   10.0.0.0/8   0           AT1/0/0.1 point2point
          No Label   10.0.0.0/8   0           PO3/1/0 point2point
21   [H]   No Label   10.0.0.1/32  812        AT1/0/0.1 point2point
          No Label   10.0.0.1/32  0           PO3/1/0 point2point
22   [H]   No Label   10.1.14.0/24 0           AT1/0/0.1 point2point
          No Label   10.1.14.0/24 0           PO3/1/0 point2point
23   [HT]  16        172.1.1.0/24[V] 0           Tu1 point2point
24   [HT]  24        10.0.0.1/32[V] 0           Tu1 point2point
25   [H]   No Label   10.0.0.0/8[V] 0           AT1/1/0.1 point2point
26   [HT]  16        10.0.0.3/32[V] 0           Tu1 point2point
27   [H]   No Label   10.0.0.1/32[V] 0           AT1/1/0.1 point2point
[T]        Forwarding through a TSP tunnel.
          View additional labelling info with the 'detail' option
[H]        Local label is being held down temporarily.

```

The table below describes the Local Label fields relating to the Cisco IOS Software Modularity: MPLS Layer 3 VPNs feature.

Table 3: show mpls forwarding-table Field Descriptions

Field	Description
Local Label	<p>Label assigned by this device.</p> <ul style="list-style-type: none"> • [H]--Local labels are in holddown, which means that the application that requested the labels no longer needs them and stops advertising them to its labeling peers. <p>The label's forwarding-table entry is deleted after a short, application-specific time.</p> <p>If any application starts advertising a held-down label to its labeling peers, the label could come out of holddown.</p> <p>Note [H] is not shown if labels are held down globally.</p> <p>A label enters global holddown after a stateful switchover or a restart of certain processes in a Cisco IOS modularity environment.</p> <ul style="list-style-type: none"> • [T]--The label is forwarded through an LSP tunnel. <p>Note Although [T] is still a property of the outgoing interface, it is shown in the Local Label column.</p> <ul style="list-style-type: none"> • [HT]--Both conditions apply.

L2VPN Inter-AS Option B: Example

The following is sample output from the **show mpls forwarding-table interface** command. In this example, the pseudowire identifier (that is, 4096) is displayed in the Prefix or Tunnel Id column. The **show mpls l2transport vc detail** command can be used to obtain more information about the specific pseudowire displayed.

```
Device# show mpls forwarding-table
Local      Outgoing  Prefix          Bytes Label    Outgoing  Next Hop
Label      Label     or Tunnel Id    Switched       interface
1011      No Label  l2ckt(4096)     0              none       point2point
```

The table below describes the fields shown in the display.

Table 4: show mpls forwarding-table interface Field Descriptions

Field	Description
Local Label	Label assigned by this device.
Outgoing Label	Label assigned by the next hop or virtual path identifier (VPI)/virtual channel identifier (VCI) used to get to the next hop.
Prefix or Tunnel Id	Address or tunnel to which packets with this label are going.
Bytes Label Switched	Number of bytes switched with this incoming label. This includes the outgoing label and Layer 2 header.

Field	Description
Outgoing interface	Interface through which packets with this label are sent.
Next Hop	IP address of the neighbor that assigned the outgoing label.

show mpls label range

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

show mpls label range

Syntax Description

This command has no arguments or keywords.

Command Modes

Privileged EXEC

Command History

Release	Modification
Cisco IOS XE Denali 16.3.1	This command was introduced.

Usage Guidelines

You can use the **mpls label range** command to configure a range for local labels that is different from the default range. The **show mpls label range** command displays both the label range currently in use and the label range that will be in use following the next switch reload.

Examples

In the following example, the use of the **show mpls label range** command is shown before and after the **mpls label range** command is used to configure a label range that does not overlap the starting label range:

```
Switch# show mpls label range
Downstream label pool: Min/Max label: 16/100
Switch# configure terminal
Switch(config)# mpls label range 101 4000
Switch(config)# exit
Switch# show mpls label range
Downstream label pool: Min/Max label: 101/4000
```

Related Commands

Command	Description
mpls label range	Configures a range of values for use as local labels.

show mpls static binding

To display Multiprotocol Label Switching (MPLS) static label bindings, use the **show mpls static binding** command in privileged EXEC mode.

show mpls static binding [{**ipv4** [{**vrf** *vrf-name*]}] [{*prefix* {*mask-length* *mask*}}] [{**local** | **remote**}] [{**nexthop** *address*}]

Syntax Description

ipv4	(Optional) Displays IPv4 static label bindings.
vrf <i>vrf-name</i>	(Optional) The static label bindings for a specified VPN routing and forwarding instance.
<i>prefix</i> { <i>mask-length</i> <i>mask</i> }	(Optional) Labels for a specific prefix.
local	(Optional) Displays the incoming (local) static label bindings.
remote	(Optional) Displays the outgoing (remote) static label bindings.
nexthop <i>address</i>	(Optional) Displays the label bindings for prefixes with outgoing labels for which the specified next hop is to be displayed.

Command Modes

Privileged EXEC (#)

Command History

Command History

Release	Modification
Cisco IOS XE Everest 16.5.1a	This command was introduced.

Usage Guidelines

If you do not specify any optional arguments, the **show mpls static binding** command displays information about all static label bindings. Or the information can be limited to any of the following:

- Bindings for a specific prefix or mask
- Local (incoming) labels
- Remote (outgoing) labels
- Outgoing labels for a specific next hop router

Examples

In the following output, the **show mpls static binding ipv4** command with no optional arguments displays all static label bindings:

```
Device# show mpls static binding ipv4
10.0.0.0/8: Incoming label: none;
  Outgoing labels:
    10.13.0.8          explicit-null
10.0.0.0/8: Incoming label: 55 (in LIB)
  Outgoing labels:
```

```

10.0.0.66          2607
10.66.0.0/16: Incoming label: 17 (in LIB)
Outgoing labels: None

```

In the following output, the **show mpls static binding ipv4** command displays remote (outgoing) statically assigned labels only:

```

Device# show mpls static binding ipv4 remote
10.0.0.0/8:
Outgoing labels:
  10.13.0.8          explicit-null
10.0.0.0/8:
Outgoing labels:
  10.0.0.66          2607

```

In the following output, the **show mpls static binding ipv4** command displays local (incoming) statically assigned labels only:

```

Device# show mpls static binding ipv4 local
10.0.0.0/8: Incoming label: 55 (in LIB)
10.66.0.0/16: Incoming label: 17 (in LIB)

```

In the following output, the **show mpls static binding ipv4** command displays statically assigned labels for prefix 10.0.0.0 / 8 only:

```

Device# show mpls static binding ipv4 10.0.0.0/8
10.0.0.0/8: Incoming label: 55 (in LIB)
Outgoing labels:
  10.0.0.66          2607

```

In the following output, the **show mpls static binding ipv4** command displays prefixes with statically assigned outgoing labels for next hop 10.0.0.66:

```

Device# show mpls static binding ipv4 10.0.0.0 8 nexthop 10.0.0.66
10.0.0.0/8: Incoming label: 55 (in LIB)
Outgoing labels:
  10.0.0.66          2607

```

The following output, the **show mpls static binding ipv4 vrf** command displays static label bindings for a VPN routing and forwarding instance vpn100:

```

Device# show mpls static binding ipv4 vrf vpn100
192.168.2.2/32: (vrf: vpn100) Incoming label: 100020
Outgoing labels: None
192.168.0.29/32: Incoming label: 100003 (in LIB)
Outgoing labels: None

```

Related Commands

Command	Description
mpls static binding ipv4	Binds an IPv4 prefix or mask to a local or remote label.

show mpls static crossconnect

To display statically configured Label Forwarding Information Database (LFIB) entries, use the **show mpls static crossconnect** command in privileged EXEC mode.

show mpls static crossconnect [*low label* [*high label*]]

Syntax Description

<i>low label high label</i>	(Optional) The statically configured LFIB entries.
-----------------------------	--

Command Modes

Privileged EXEC (#)

Command History

Command History

Release	Modification
Cisco IOS XE Everest 16.5.1a	This command was introduced.

Usage Guidelines

If you do not specify any label arguments, then all the configured static cross-connects are displayed.

Examples

The following sample output from the **show mpls static crossconnect** command shows the local and remote labels:

```
Device# show mpls static crossconnect
Local  Outgoing  Outgoing  Next Hop
label  label      interface
45     46         pos5/0    point2point
```

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

Table 5: show mpls static crossconnect Field Descriptions

Field	Description
Local label	Label assigned by this router.
Outgoing label	Label assigned by the next hop.
Outgoing interface	Interface through which packets with this label are sent.
Next Hop	IP address of the next hop router's interface that is connected to this router's outgoing interface.

Related Commands

Command	Description
mpls static crossconnect	Configures an LFIB entry for the specified incoming label and outgoing interface.