



MPLS Static Labels

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This document describes the Cisco MPLS Static Labels feature. The MPLS Static Labels feature provides the means to configure statically:

- The binding between a label and an IPv4 prefix
- The contents of an LFIB crossconnect entry

Finding Feature Information

Your software release may not support all the features documented in this module. For the latest feature information and caveats, see the release notes for your platform and software release. To find information about the features documented in this module, and to see a list of the releases in which each feature is supported, see the [“Feature Information for MPLS Static Labels” section on page 10](#).

Use Cisco Feature Navigator to find information about platform support and Cisco software image support. To access Cisco Feature Navigator, go to <http://www.cisco.com/go/cfn>. An account on Cisco.com is not required.

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Restrictions for MPLS Static Labels

- The trouble shooting process for MPLS static labels is complex.
- On a provider edge (PE) router for MPLS VPNs, there is no mechanism for statically binding a label to a customer network prefix (VPN IPv4 prefix).
- MPLS static crossconnect labels remain in the LFIB even if the router to which the entry points goes down.
- MPLS static crossconnect mappings remain in effect even with topology changes.
- MPLS static labels are not supported for label-controlled Asynchronous Transfer Mode (lc-atm).
- MPLS static bindings are not supported for local prefixes.

Prerequisites for MPLS Static Labels

The network must support the following Cisco IOS features before you enable MPLS static labels:

- Multiprotocol Label Switching (MPLS)
- Cisco Express Forwarding

Information About MPLS Static Labels

MPLS Static Labels Overview

Generally, label switching routers (LSRs) dynamically learn the labels they should use to label-switch packets by means of label distribution protocols that include:

- Label Distribution Protocol (LDP), the Internet Engineering Task Force (IETF) standard, used to bind labels to network addresses
- Resource Reservation Protocol (RSVP) used to distribute labels for traffic engineering (TE)
- Border Gateway Protocol (BGP) used to distribute labels for Multiprotocol Label Switching (MPLS) Virtual Private Networks (VPNs)

To use a learned label to label-switch packets, an LSR installs the label into its Label Forwarding Information Base (LFIB).

The MPLS Static Labels feature provides the means to configure statically:

- The binding between a label and an IPv4 prefix
- The contents of an LFIB crossconnect entry

Benefits of MPLS Static Labels

Static Bindings Between Labels and IPv4 Prefixes

Static bindings between labels and IPv4 prefixes can be configured to support MPLS hop-by-hop forwarding through neighbor routers that do not implement LDP label distribution.

Static Crossconnects

Static crossconnects can be configured to support MPLS Label Switched Path (LSP) midpoints when neighbor routers do not implement either the LDP or RSVP label distribution, but do implement an MPLS forwarding path.

How to Configure MPLS Static Labels

- [Configuring MPLS Static Prefix/Label Bindings, page 3](#) (required)
- [Verifying MPLS Static Prefix/Label Bindings, page 4](#) (optional)
- [Configuring MPLS Static Crossconnects, page 5](#) (required)
- [Verifying MPLS Static Crossconnect Configuration, page 5](#) (optional)
- [Monitoring and Maintaining MPLS Static Labels, page 6](#) (optional)

Configuring MPLS Static Prefix/Label Bindings

To configure MPLS static prefix/label bindings, use the following commands beginning in global configuration mode:

DETAILED STEPS

	Command or Action	Purpose
Step 1	<code>enable</code> Example: Router> enable	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	<code>configure terminal</code> Example: Router# configure terminal	Enters global configuration mode.

	Command or Action	Purpose
Step 3	<pre>mpls label range min-label max-label [static min-static-label max-static-label]</pre> <p>Example: Router(config)# mpls label range 200 100000 static 16 199</p>	<p>Specifies a range of labels for use with MPLS Static Labels feature.</p> <p>(Default is no labels reserved for static assignment.)</p>
Step 4	<pre>mpls static binding ipv4 prefix mask [input output nexthop] label</pre> <p>Example: Router(config)# mpls static binding ipv4 10.0.0.0 255.0.0.0 55</p>	<p>Specifies static binding of labels to IPv4 prefixes.</p> <p>Bindings specified are installed automatically in the MPLS forwarding table as routing demands.</p>

Verifying MPLS Static Prefix/Label Bindings

To verify the configuration for MPLS static prefix/label bindings, use this procedure:

- Step 1** Enter **show mpls label range** command. The output shows that the new label ranges do not take effect until a reload occurs:

```
Router# show mpls label range

Downstream label pool: Min/Max label: 16/100000
  [Configured range for next reload: Min/Max label: 200/100000]
Range for static labels: Min/Max/Number: 16/199
```

The following output from the **show mpls label range** command, executed after a reload, indicates that the new label ranges are in effect:

```
Router# show mpls label range

Downstream label pool: Min/Max label: 200/100000
Range for static labels: Min/Max/Number: 16/199
```

- Step 2** Enter the **show mpls static binding ipv4** command to show the configured static prefix/label bindings:

```
Router# show mpls static binding ipv4

10.17.17.17/32: Incoming label: 251 (in LIB)
  Outgoing labels:
    10.0.0.1          18
10.18.18.18/32: Incoming label: 201 (in LIB)
  Outgoing labels:
    10.0.0.1implicit-null
```

- Step 3** Use the **show mpls forwarding-table** command to determine which static prefix/label bindings are currently in use for MPLS forwarding.

```
Router# show mpls forwarding-table

Local   Outgoing   Prefix           Bytes tag   Outgoing     Next Hop
tag     tag or VC  or Tunnel Id    switched   interface
201     Pop tag    10.18.18.18/32  0          PO1/1/0      point2point
        2/35      10.18.18.18/32  0          AT4/1/0.1    point2point
```

```
251 18 10.17.17.17/32 0 PO1/1/0 point2point
```

Configuring MPLS Static Crossconnects

To configure MPLS static crossconnects, use the following command beginning in global configuration mode:

DETAILED STEPS

	Command or Action	Purpose
Step 1	enable Example: Router> enable	Enables privileged EXEC mode. <ul style="list-style-type: none">Enter your password if prompted.
Step 2	configure terminal Example: Router# configure terminal	Enters global configuration mode.
Step 3	mpls label range <i>min-label max-label</i> [static <i>min-static-label max-static-label</i>] Example: Router(config)# mpls label range 200 100000 static 16 199	Specifies a range of labels for use with MPLS Static Labels feature. (Default is no labels reserved for static assignment.)
Step 4	mpls static binding ipv4 <i>prefix mask</i> [input output <i>nexthop</i>] <i>label</i> Example: Router(config)# Router(config)# mpls static binding ipv4 10.0.0.0 255.0.0.0 55	Specifies static binding of labels to IPv4 prefixes. Bindings specified are installed automatically in the MPLS forwarding table as routing demands.

Verifying MPLS Static Crossconnect Configuration

To verify the configuration for MPLS static crossconnects, use this procedure:

- Step 1** Use the **show mpls static crossconnect** command to display information about crossconnects that have been configured:

```
Router# show mpls static crossconnect

Local  Outgoing  Outgoing  Next Hop
label  label      interface
34     22         pos3/0/0  point2point (in LFIB)
```

Monitoring and Maintaining MPLS Static Labels

To monitor and maintain MPLS static labels, use one or more of the following commands:

DETAILED STEPS

	Command or Action	Purpose
Step 1	enable Example: Router> enable	Enables privileged EXEC mode. <ul style="list-style-type: none">Enter your password if prompted.
Step 2	show mpls forwarding-table Example: Router# show mpls forwarding-table	Displays the contents of the MPLS LFIB.
Step 3	show mpls label range Example: Router# show mpls label range	Displays information about the static label range.
Step 4	show mpls static binding ipv4 Example: Router# show mpls static binding ipv4	Displays information about the configured static prefix/label bindings.
Step 5	show mpls static crossconnect Example: Router# show mpls static crossconnect	Displays information about the configured crossconnects.

Configuration Examples for MPLS Static Labels

- [Example: Configuring MPLS Static Prefixes/Labels, page 6](#)
- [Example: Configuring MPLS Static Crossconnects, page 7](#)

Example: Configuring MPLS Static Prefixes/Labels

In the following output, the **mpls label range** command reconfigures the range used for dynamically assigned labels from 16 to 100000 to 200 to 100000 and configures a static label range of 16 to 199.

```
Router# configure terminal
```

```
Enter configuration commands, one per line. End with CNTL/Z.
```

```
Router(config)# mpls label range 200 100000 static 16 199
```

```
% Label range changes take effect at the next reload.
```

```
Router(config)# end
```

In the following output, the **show mpls label range** command indicates that the new label ranges do not take effect until a reload occurs:

```
Router# show mpls label range

Downstream label pool: Min/Max label: 16/100000
 [Configured range for next reload: Min/Max label: 200/100000]
Range for static labels: Min/Max/Number: 16/199
```

In the following output, the **show mpls label range** command, executed after a reload, indicates that the new label ranges are in effect:

```
Router# show mpls label range

Downstream label pool: Min/Max label: 200/100000
Range for static labels: Min/Max/Number: 16/199
```

In the following output, the **mpls static binding ipv4** commands configure static prefix/label bindings. They also configure input (local) and output (remote) labels for various prefixes:

```
Router# 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

Router(config)# mpls static binding ipv4 10.0.0.0 255.0.0.0 output 10.0.0.66 2607

Router(config)# mpls static binding ipv4 10.6.0.0 255.255.0.0 input 17

Router(config)# mpls static binding ipv4 10.0.0.0 255.0.0.0 output 10.13.0.8 explicit-null

Router(config)# end
```

In the following output, the **show mpls static binding ipv4** command displays the configured static prefix/label bindings:

```
Router# 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
```

Example: Configuring MPLS Static Crossconnects

In the following output, the **mpls static crossconnect** command configures a crossconnect from incoming label 34 to outgoing label 22 out interface pos3/0/0:

```
Router# configure terminal

Enter configuration commands, one per line. End with CNTL/Z.
Router(config)# mpls static crossconnect 34 pos3/0/0 22

Router(config)# end
```

In the following output, the **show mpls static crossconnect** command displays the configured crossconnect:

```
Router# show mpls static crossconnect
```

Local	Outgoing	Outgoing	Next Hop
label	label	interface	
34	22	pos3/0/0	point2point (in LFIB)

Additional References

Related Documents

Related Topic	Document Title
Cisco IOS commands	Cisco IOS Master Commands List, All Releases
MPLS commands	Multiprotocol Label Switching Command Reference

Standards

Standard	Title
No new or modified standards are supported by this feature, and support for existing standards has not been modified by this feature.	—

MIBs

MIB	MIBs Link
No new or modified MIBs are supported by this feature, and support for existing MIBs has not been modified by this feature.	To locate and download MIBs for selected platforms, Cisco software releases, and feature sets, use Cisco MIB Locator found at the following URL: http://www.cisco.com/go/mibs

RFCs

RFC	Title
No new or modified RFCs are supported by this feature, and support for existing RFCs has not been modified by this feature.	—

Technical Assistance

Description	Link
The Cisco Support and Documentation website provides online resources to download documentation, software, and tools. Use these resources to install and configure the software and to troubleshoot and resolve technical issues with Cisco products and technologies. Access to most tools on the Cisco Support and Documentation website requires a Cisco.com user ID and password.	http://www.cisco.com/cisco/web/support/index.html

Feature Information for MPLS Static Labels

Table 1 lists the release history for this feature and provides links to specific configuration information.

Use Cisco Feature Navigator to find information about platform support and software image support. Cisco Feature Navigator enables you to determine which Cisco IOS XE software images support a specific software release, feature set, or platform. To access Cisco Feature Navigator, go to <http://www.cisco.com/go/cfn>. An account on Cisco.com is not required.



Note

Table 1 lists only the Cisco IOS XE software release that introduced support for a given feature in a given Cisco IOS XE software release train. Unless noted otherwise, subsequent releases of that Cisco IOS XE software release train also support that feature.

Table 1 Feature Information for MPLS Static Labels

Feature Name	Releases	Feature Information
MPLS Static Labels	Cisco IOS XE Release 2.1	<p>The MPLS Static Labels feature provides the means to configure the following items statically:</p> <ul style="list-style-type: none"> The binding between a label and an IPv4 prefix The contents of an LFIB crossconnect entry <p>The following sections provide information about this feature:</p> <ul style="list-style-type: none"> Information About MPLS Static Labels, page 2 How to Configure MPLS Static Labels, page 3 <p>The following commands were introduced or modified: debug mpls static binding, mpls label range, mpls static binding ipv4, mpls static crossconnect, show mpls label range, show mpls static binding ipv4, show mpls static crossconnect.</p>

Glossary

- BGP**—Border Gateway Protocol. The predominant interdomain routing protocol used in IP networks.
- Border Gateway Protocol**—See BGP.
- FIB**—Forwarding Information Base. A table that contains a copy of the forwarding information in the IP routing table.
- Forwarding Information Base**—See FIB.
- label**—A short, fixed-length identifier that tells switching nodes how the data (packets or cells) should be forwarded.
- label binding**—An association between a label and a set of packets, which can be advertised to neighbors so that a label switched path can be established.
- Label Distribution Protocol**—See LDP.
- Label Forwarding Information Base**—See LFIB.
- label imposition**—The act of putting the first label on a packet.
- label switching router**—See LSR.
- LDP**—Label Distribution Protocol. The protocol that supports MPLS hop-by-hop forwarding by distributing bindings between labels and network prefixes.
- LFIB**—Label Forwarding Information Base. A data structure in which destinations and incoming labels are associated with outgoing interfaces and labels.
- LSR**—label switching router. A Layer 3 router that forwards a packet based on the value of an identifier encapsulated in the packet.
- MPLS**—Multiprotocol Label Switching. An industry standard on which label switching is based.
- MPLS hop-by-hop forwarding**—The forwarding of packets along normally routed paths using MPLS forwarding mechanisms.
- Multiprotocol Label Switching**—See MPLS.
- Resource Reservation Protocol**—See RSVP.
- RIB**—Routing Information Base. A common database containing all the routing protocols running on a router.
- Routing Information Base**—See RIB.
- RSVP**—Resource Reservation Protocol. A protocol for reserving network resources to provide quality of service guarantees to application flows.
- traffic engineering**—Techniques and processes used to cause routed traffic to travel through the network on a path other than the one that would have been chosen if standard routing methods were used.
- Virtual Private Network**—See VPN.
- VPN**—Virtual Private Network. A network that enables IP traffic to use tunneling to travel securely over a public TCP/IP network.

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