



MPLS Static Labels

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This document describes the Cisco MPLS Static Labels feature. It identifies the supported platforms, provides configuration examples, and lists related Cisco IOS command-line interface (CLI) commands.

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

History for the MPLS Static Labels feature

Release	Modification
12.0(23)S	This feature was introduced.
12.2(33)SRA	This feature was integrated into Cisco IOS Release 12.2(33)SRA.
12.2(33)SXH	This feature was integrated into Cisco IOS Release 12.2(33)SXH.

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Feature 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

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.

Restrictions

- 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

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

- Multiprotocol Label Switching (MPLS)
- IP Cisco Express Forwarding

Configuration Tasks

See the following sections for the configuration tasks for the this feature:

- [Configuring MPLS Static Prefix/Label Bindings, page 3](#) (required)
- [Verifying MPLS Static Prefix/Label Bindings, page 3](#) (optional)
- [Configuring MPLS Static Crossconnects, page 4](#) (required)
- [Verifying MPLS Static Crossconnect Configuration, page 4](#) (optional)

Configuring MPLS Static Prefix/Label Bindings

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

	Command	Purpose
Step 1	Router# configure terminal	Enters global configuration mode.
Step 2	Router(config)# mpls label range <i>min-label max-label [static</i> <i>min-static-label max-static-label]</i>	Specifies a range of labels for use with MPLS Static Labels feature. (Default is no labels reserved for static assignment.)
Step 3	Router(config)# mpls static binding ipv4 <i>prefix mask [input output nexthop]</i> <i>label</i>	Specifies static binding of labels to IPv4 prefixes. Bindings specified are installed automatically in the MPLS forwarding table as routing demands.

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

	Command	Purpose
Step 1	Router# configure terminal	Enters global configuration mode.
Step 2	Router(config)# mpls label range <i>min-label max-label [static</i> <i>min-static-label max-static-label]</i>	Specifies a range of labels for use with MPLS Static Labels feature. (Default is no labels reserved for static assignment.)
Step 3	Router(config)# mpls static binding ipv4 <i>prefix mask [input output nexthop]</i> <i>label</i>	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 label	Outgoing label	Outgoing interface	Next Hop
34	22	pos3/0	point2point (in LFIB)

Monitoring and Maintaining MPLS Static Labels

Refer to the following Table to monitor and maintain MPLS Static Labels.

Command	Purpose
Router# show mpls forwarding-table	Displays the contents of the MPLS LFIB.
Router# show mpls label range	Displays information about the static label range.
Router# show mpls static binding ipv4	Displays information about the configured static prefix/label bindings.
Router# show mpls static crossconnect	Displays information about the configured crossconnects.

Configuration Examples

This section provides the following configuration examples for the MPLS Static Labels feature:

- [Configuring MPLS Static Prefixes/Labels Example, page 5](#)
- [Configuring MPLS Static Crossconnects Example, page 6](#)

Configuring MPLS Static Prefixes/Labels Example

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

```

Configuring MPLS Static Crossconnects Example

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

```

Router# configure terminal

Enter configuration commands, one per line. End with CNTL/Z.
Router(config)# mpls static crossconnect 34 pos3/0 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    point2point (in LFIB)

```

Additional References

The following sections provide references related to the MPLS Static Labels feature.

Related Documents

Related Topic	Document Title
MPLS commands	<i>Multiprotocol Label Switching Command Reference</i>

Standards

Standard	Title
None	—

MIBs

MIB	MIBs Link
None	To locate and download MIBs for selected platforms, Cisco IOS releases, and feature sets, use Cisco MIB Locator found at the following URL: http://www.cisco.com/go/mibs

RFCs

RFC	Title
None	—

Technical Assistance

Description	Link
<p>The Cisco Support website provides extensive online resources, including documentation and tools for troubleshooting and resolving technical issues with Cisco products and technologies.</p> <p>To receive security and technical information about your products, you can subscribe to various services, such as the Product Alert Tool (accessed from Field Notices), the Cisco Technical Services Newsletter, and Really Simple Syndication (RSS) Feeds.</p> <p>Access to most tools on the Cisco Support website requires a Cisco.com user ID and password.</p>	http://www.cisco.com/techsupport

Command Reference

The following commands are introduced or modified in the feature or features documented in this

module. For information about these commands, see the *Cisco IOS Multiprotocol Label Switching Command Reference* at http://www.cisco.com/en/US/docs/ios/mpls/command/reference/mp_book.html. For information about all Cisco IOS commands, go to the Command Lookup Tool at <http://tools.cisco.com/Support/CLILookup> or to the *Cisco IOS Master Commands List*.

- **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**

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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