



Configuring MPLS Static Label Binding

This chapter describes how to configure Multiprotocol Label Switching (MPLS) static label binding on Cisco NX-OS devices.

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Finding Feature Information

Your software release might not support all the features documented in this module. For the latest caveats and feature information, see the Bug Search Tool at <https://tools.cisco.com/bugsearch/> and the release notes for your 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 “New and Changed Information” chapter or the Feature History table below.

Information About MPLS Static Label Binding

The MPLS static label binding feature enables you to configure:

- MPLS static labels to be used in the core of the MPLS network instead of dynamic labels. Because these labels are exchanged by LDP, they are not VRF-aware as LDP runs only the default VRF on Cisco NX-OS.

- MPLS virtual private network (VPN) static labels to be used at the edge of an MPLS VPN. These labels are VRF-aware because they correspond to a prefix in a particular VRF.



Note Cisco NX-OS does not support the allocation of aggregate MPLS VPN static labels on a per-VRF basis.

The following topics provide information about MPLS static labels:

- [Overview of MPLS Static Labels and LDP VRF-Aware Static Labels, page 8-119](#)
- [Labels Reserved for Static Assignment, page 8-119](#)

Overview of MPLS Static Labels and LDP VRF-Aware Static Labels

Label switch routers (LSRs) dynamically learn the labels that they should use to label-switch packets by using the following label distribution protocols:

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

The LSR installs the dynamically learned label into its label forwarding information base (LFIB).

You can configure static labels for the following purposes:

- To bind labels to IPv4 prefixes to support MPLS hop-by-hop forwarding through neighbor routers that do not implement LDP label distribution. MPLS static labels allow you to configure entries in the MPLS forwarding table and assign label values to forwarding equivalence classes (FECs) that are learned by IGP. You can manually configure an LSP without setting up an LDP session between the endpoints.
- To statically bind a VRF-aware label on a provider edge (PE) router to a customer network prefix (VPN IPv4 prefix). You can use VRF-aware static labels with non-default VRF tables so that you can use the labels at the VPN edge. VRF-aware static labels are advertised by VPNv4 BGP in the backbone.

Labels Reserved for Static Assignment

Before you can manually assign labels, you must reserve a range of labels to be used for the manual assignment. Reserving the labels ensures that the labels are not dynamically assigned.

Licensing Requirements for MPLS Static Label Binding

Product	License Requirement
Cisco NX-OS	MPLS static label binding requires an MPLS license. For a complete explanation of the Cisco NX-OS licensing scheme and how to obtain and apply licenses, see the <i>Cisco NX-OS Licensing Guide</i> .

Prerequisites for MPLS Static Label Binding

MPLS static label binding has the following prerequisites:

- You must enable MPLS LDP.

Guidelines and Limitations for MPLS Static Label Binding

MPLS static label binding has the following configuration guidelines and limitations:

- Static local labels preempt dynamically allocated labels.
- Configuring static local labels for connected routes is not supported.
- LDP-learned remote labels are preferred over locally configured outgoing labels.
- Static outgoing labels should match the next-hop's incoming labels.
- VRF is not supported for static outgoing labels.
- LDP is not supported in non-default VRFs.

Default Settings for MPLS Static Label Binding

Table 8-1 lists the default settings for MPLS static label binding parameters.

Table 8-1 Default MPLS Static Label Binding Parameters

Parameters	Default
MPLS static label binding	Disabled

Configuring MPLS Static Label Binding

This section includes the following topics:

- [Reserving Labels to Use for MPLS Static Labels and LDP VRF-Aware Static Labels, page 8-120](#)
- [Configuring MPLS Static Labels in the MPLS VPN Provider Core, page 8-121](#)
- [Configuring MPLS LDP VRF-Aware Static Labels at the Edge of the VPN, page 8-122](#)

Reserving Labels to Use for MPLS Static Labels and LDP VRF-Aware Static Labels

You can reserve the labels that are to be statically assigned so that they are not dynamically assigned.

Prerequisites

Ensure that you are in the correct VDC (or use the `switchto vdc` command).

Ensure that MPLS LDP is enabled.

SUMMARY STEPS

1. **configure terminal**
2. `mpls label range min-value max-value [static min-static-value max-static-value]`
3. (Optional) **show mpls label range**
4. (Optional) **copy running-config startup-config**

DETAILED STEPS

	Command	Purpose
Step 1	configure terminal Example: switch# configure terminal switch(config)#	Enters global configuration mode.
Step 2	mpls label range <i>min-value max-value</i> [static <i>min-static-value max-static-value</i>] Example: switch(config)# mpls label range 200 100000 static 16 199	Reserves a range of labels for static label assignment. For Cisco NX-OS releases prior to 6.1, the range for the minimum and maximum values is from 16 to 492286. Beginning with Cisco NX-OS Release 6.1, the range is from 16 to 471804.
Step 3	show mpls label range Example: switch(config)# show mpls label range	(Optional) Displays information about the range of values for local labels, including those labels that are available for static assignments.
Step 4	copy running-config startup-config Example: switch(config)# copy running-config startup-config	(Optional) Copies the running configuration to the startup configuration.

Configuring MPLS Static Labels in the MPLS VPN Provider Core

You can configure MPLS static labels in order to configure entries in the MPLS forwarding table and assign label values to FECs learned by routing protocols or static routes. You can manually configure an LSP without setting up LDP sessions between the endpoints.

**Note**

In MPLS VPN networks, you can use static labels only in the MPLS VPN provider core.

Prerequisites

- Ensure that you are in the correct VDC (or use the **switchto vdc** command).
- Ensure that MPLS LDP is enabled on each LSR.

SUMMARY STEPS

1. **configure terminal**
2. `mpls ldp configuration`

3. **mpls static binding ipv4** *prefix mask {label | input label | output nexthop {explicit-null | implicit-null | label}}*
4. (Optional) **show mpls static binding ipv4**
5. (Optional) **copy running-config startup-config**

DETAILED STEPS

	Command	Purpose
Step 1	configure terminal Example: switch# configure terminal switch(config)#	Enters global configuration mode.
Step 2	mpls ldp configuration Example: switch(config)# mpls ldp configuration switch(config-ldp)#	Enters LDP configuration mode.
Step 3	mpls static binding ipv4 <i>prefix mask {label input label output nexthop {explicit-null implicit-null label}}</i> Example: switch(config-ldp)# mpls static binding ipv4 10.2.2.0 255.255.255.255 input 17	Specifies the static binding of labels to IPv4 prefixes. Specified bindings are installed automatically in the MPLS forwarding table as routing demands.
Step 4	show mpls static binding ipv4 Example: switch(config-ldp)# show mpls static binding ipv4	(Optional) Displays the configured static labels.
Step 5	copy running-config startup-config Example: switch(config-ldp)# copy running-config startup-config	(Optional) Copies the running configuration to the startup configuration.

Configuring MPLS LDP VRF-Aware Static Labels at the Edge of the VPN

You can statically bind a VRF-aware label on a PE router to a customer network prefix (VPN IPv4 prefix). You can use VRF-aware static labels with non-default VRF tables so the labels can be used at the VPN edge.

Prerequisites

Ensure that you are in the correct VDC (or use the **switchto vdc** command).

Ensure that MPLS LDP is enabled on each LSR.

Ensure that MPLS VPN is configured.

Ensure that the provider network has MPLS LDP installed and running.

SUMMARY STEPS

1. **configure terminal**

2. `mpls ldp configuration`
3. `mpls static binding ipv4 vrf vrf_name prefix mask {input label | label}`
4. (Optional) `show mpls static binding ipv4 vrf vrf_name`
5. (Optional) `show running-config vrf vrf_name`
6. (Optional) `copy running-config startup-config`

DETAILED STEPS

	Command	Purpose
Step 1	<code>configure terminal</code> Example: <code>switch# configure terminal</code> <code>switch(config)#</code>	Enters global configuration mode.
Step 2	<code>mpls ldp configuration</code> Example: <code>switch(config)# mpls ldp configuration</code> <code>switch(config-ldp)#</code>	Enters LDP configuration mode.
Step 3	<code>mpls static binding ipv4 vrf vrf_name prefix mask {input label label}</code> Example: <code>switch(config-ldp)# mpls static binding ipv4 vrf vrf1 10.2.0.0 255.255.0.0 input 17</code>	Binds a prefix to a local label. Specified bindings are installed automatically in the MPLS forwarding table as routing demands. Note You must configure the MPLS VPN and VRFs before creating VRF-aware static labels.
Step 4	<code>show mpls static binding ipv4 vrf vrf_name</code> Example: <code>switch(config-ldp)# show mpls static binding ipv4 vrf vrf1</code>	(Optional) Displays the configured MPLS static bindings.
Step 5	<code>show running-config vrf vrf_name</code> Example: <code>switch(config-ldp)# show running-config vrf vrf1</code>	(Optional) Displays the VRF running configuration.
Step 6	<code>copy running-config startup-config</code> Example: <code>switch(config-ldp)# copy running-config startup-config</code>	(Optional) Copies the running configuration to the startup configuration.

Verifying the MPLS Static Label Binding Configuration

To display the MPLS static label binding configuration, perform one of the following tasks:

Command	Purpose
<code>show mpls label range</code>	Displays information about the range of values for local labels, including those labels that are available for static assignments.
<code>show mpls ldp bindings</code>	Displays the MPLS LDP label information base (LIB).
<code>show mpls static binding</code>	Displays the configured static label bindings.
<code>show mpls switching</code>	Displays the MPLS label switching database.
<code>show running-config vrf vrf_name</code>	Displays the VRF running configuration.

For detailed information about the fields in the output from these commands, see the *Cisco Nexus 7000 Series NX-OS MPLS Command Reference*.

Configuration Examples for MPLS Static Label Binding

This section provides configuration examples for MPLS static label binding and includes the following topics:

- [Examples: Reserving Labels to Use for MPLS Static Labels and MPLS LDP VRF-Aware Static Labels, page 8-124](#)
- [Examples: Configuring MPLS Static Labels in the MPLS VPN Provider Core, page 8-124](#)
- [Examples: Configuring MPLS LDP VRF-Aware Static Labels at the VPN Edge, page 8-125](#)

Examples: Reserving Labels to Use for MPLS Static Labels and MPLS LDP VRF-Aware Static Labels

The following example shows how to reserve a generic range of labels from 200 to 100000 and configure a static label range of 16 to 199:

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

In this example, the output from the `show mpls label range` command displays the new label range:

```
switch# show mpls label range
Downstream Generic label region: Min/Max label: 200/100000
Range for static labels: Min/Max/Number: 16/199
```

Examples: Configuring MPLS Static Labels in the MPLS VPN Provider Core

The following example shows how to configure input and output labels for several prefixes:

```
switch(config)# mpls ldp configuration
switch(config-ldp)# mpls static binding ipv4 10.0.0.0 255.0.0.0 55
switch(config-ldp)# mpls static binding ipv4 10.0.0.0 255.0.0.0 output 10.0.0.66 167
switch(config-ldp)# mpls static binding ipv4 10.66.0.0 255.255.0.0 input 17
switch(config-ldp)# mpls static binding ipv4 10.66.0.0 255.255.0.0 output 10.13.0.8
explicit-null
```

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

```
switch# show mpls static binding ipv4
10.0.0.0/8: (vrf: default) Incoming label: 55
  Outgoing labels:
    10.0.0.66 167
10.66.0.0/16: (vrf: default) Incoming label: 17
  Outgoing labels:
    10.13.0.8.0
```

Examples: Configuring MPLS LDP VRF-Aware Static Labels at the VPN Edge

The following example shows how to configure static label bindings and input (local) labels for various prefixes:

```
switch(config)# mpls ldp configuration
switch(config-ldp)# mpls static binding ipv4 vrf vpn100 10.0.0.0 255.0.0.0 55
switch(config-ldp)# mpls static binding ipv4 vrf vpn100 10.66.0.0 255.255.0.0 input 17
```

In the following output, the **show mpls static binding ipv4 vrf** command displays the configured VRF-aware static bindings:

```
switch# show mpls static binding ipv4 vrf vpn100
10.0.0.0/8: (vrf: vpn100) Incoming label: 55
  Outgoing labels: None
10.66.0.0/16: (vrf: vpn100) Incoming label: 17
  Outgoing labels: None
```

Additional References for MPLS Static Label Binding

For additional information related to implementing MPLS static label binding, see the following sections:

- [Related Documents, page 8-126](#)
- [MIBs, page 8-126](#)

Related Documents

Related Topic	Document Title
CLI commands	<i>Cisco Nexus 7000 Series NX-OS MPLS Command Reference</i>
Cisco IOS MPLS static label binding	MPLS LDP—VRF-Aware Static Labels

MIBs

MIB	MIBs Link
MPLS-LDP-STD-MIB	To locate and download MIBs, go to the following URL: https://cfngng.cisco.com/mibs

Feature History for MPLS Static Label Binding

[Table 8-2](#) lists the release history for this feature.

Table 8-2 Feature History for MPLS Static Label Binding

Feature Name	Releases	Feature Information
MPLS static label binding	6.1(1)	Changed the maximum value for the MPLS static label range to 471804.
MPLS static label binding	5.2(1)	This feature was introduced.

