

Multiprotocol Label Switching Feature Guide

Cisco Services



Multiprotocol Label Switching Feature Guide

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INTRODUCTION

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Introduction

Multiprotocol label switching (MPLS) combines the performance and capabilities of Layer 2 (data link layer) switching with the proven scalability of Layer 3 (network layer) routing. MPLS enables you to meet the challenges of explosive growth in network utilization while providing the opportunity to differentiate services without sacrificing the existing network infrastructure.

The MPLS architecture is flexible and can be employed in any combination of Layer 2 technologies. MPLS support is offered for all Layer 3 protocols, and scaling is possible well beyond what is typically offered in today's networks.

Key Benefits

Multiprotocol label switching (MPLS) is a high-performance packet forwarding technology that integrates the performance and traffic management capabilities of data link layer (Layer 2) switching with the scalability, flexibility, and performance of network layer (Layer 3) routing.

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Planning for Deployment

Distribution of Label Bindings

Each label switching router (LSR) in the network makes an independent, local decision as to which label value to use to represent a forwarding equivalence class. This association is known as a label binding. Each LSR informs its neighbors of the label bindings it has made. This awareness of label bindings by neighboring switches is facilitated by the following protocols:

- Label Distribution Protocol (LDP)—Enables peer LSRs in an MPLS network to exchange label binding information for supporting hop-by-hop forwarding in an MPLS network.
- Border Gateway Protocol (BGP)—Supports MPLS virtual private networks (VPNs).

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Configuring Multiprotocol Label Switching on Cisco Switches

This section explains how to perform the basic configuration required to prepare a switch for MPLS switching and forwarding.

Configuring a Switch for MPLS Switching

Cisco Express Forwarding be enabled on the switch before configuring MPLS switching.

Beginning in privileged EXEC mode, perform the following steps:

	Command	Purpose
Step 1	configure terminal	Enters global configuration mode.
Step 2	ip cef distributed	Enables Cisco Express Forwarding on the switch.
Step 3	mpls label range <i>minimum-value maximum-value</i>	Configure the range of local labels available for use with MPLS applications on packet interfaces.
Step 4	mpls label protocol ldp	Specifies the label distribution protocol for the platform.
Step 5	end	Exits configuration mode.

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Configuring a Switch for MPLS Forwarding

Forwarding of IPv4 packets must be enabled on the switch before configuring MPLS forwarding.

Beginning in privileged EXEC mode, perform the following steps:

	Command	Purpose
Step 1	<code>configure terminal</code>	Enters global configuration mode.
Step 2	<code>interface type slot/subslot /port</code> <code>interface vlan 1000</code>	Specifies the Gigabit Ethernet interface and enters interface configuration mode. Use this command for Switch Virtual Interface (SVI).
Step 3	<code>mpls ip</code>	Enables MPLS forwarding of IPv4 packets along routed physical interfaces (Gigabit Ethernet), Switch Virtual Interface (SVI), or port channels.
Step 4	<code>mpls label protocol ldp</code>	Specifies the label distribution protocol for an interface. Note: MPLS LDP cannot be enabled on a Virtual Routing and Forwarding (VRF)
Step 5	<code>end</code>	Exits interface configuration mode and returns to the privileged EXEC mode.

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Configuration Example for MPLS Switching

The following example shows how to configure MPLS switching on a Cisco switch.

```
Switch> enable
Switch# configure terminal
Switch(config)# ip cef distributed
Switch(config)# mpls label range 16 4096
Switch(config)# mpls label protocol ldp
Switch(config)# end
```

Configuration Example for MPLS Forwarding

The following example shows how to configure MPLS forwarding on a Cisco switch.

```
Switch> enable
Switch# configure terminal
Switch(config)# interface gigabitethernet 1/0/0
Switch(config-if)# mpls ip
Switch(config-if)# mpls label protocol ldp
Switch(config-if)# end
```

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Verifying Multiprotocol Label Switching on Cisco Switches

Verifying Configuration of MPLS Switching

To verify that MPLS switching has been configured properly, run the **show ip cef summary** command, which generates an output similar to that shown below.

show ip cef summary

Example:

```
Switch# show ip cef summary
```

```
IPv4 CEF is enabled for distributed and running
VRF Default
 150 prefixes (149/1 fwd/non-fwd)
  Table id 0x0
  Database epoch:      4 (150 entries at this epoch)
Switch#
```


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Verifying Configuration of MPLS Forwarding

To verify that MPLS forwarding has been configured properly, run the following commands, which generates an output similar to that shown below.

Step 1 show mpls interfaces detail

Example:

```
For physical (Gigabit Ethernet) interface:  
Switch# show mpls interfaces detail interface GigabitEthernet  
1/0/0
```

```
Type Unknown  
IP labeling enabled  
LSP Tunnel labeling not enabled  
IP FRR labeling not enabled  
BGP labeling not enabled  
MPLS not operational  
MTU = 1500
```

```
For Switch Virtual Interface (SVI):  
Switch# show mpls interfaces detail interface Vlan1000
```

```
Type Unknown  
IP labeling enabled (ldp) :  
  Interface config  
LSP Tunnel labeling not enabled  
IP FRR labeling not enabled  
BGP labeling not enabled  
MPLS operational  
MTU = 1500
```

Step 2 show running-config interface

Example:

```
For physical (Gigabit Ethernet) interface:  
Switch# show running-config interface interface GigabitEthernet  
1/0/0
```

Building configuration...

```
Current configuration : 307 bytes  
!  
interface TenGigabitEthernet1/0/0  
no switchport  
ip address xx.xx.x.x xxx.xxx.xxx.x  
mpls ip  
mpls label protocol ldp  
end
```

```
For Switch Virtual Interface (SVI):  
Switch# show running-config interface interface Vlan1000
```

Building configuration...

```
Current configuration : 187 bytes  
!  
interface Vlan1000  
ip address xx.xx.x.x xxx.xxx.xxx.x  
mpls ip  
mpls label protocol ldp  
end.
```

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Resources and Support Information

Obtaining Documentation, Obtaining Support, and Security Guidelines

For information on obtaining documentation, submitting a service request, and gathering additional information, see the monthly *What's New in Cisco Product Documentation*, which also lists all new and revised Cisco technical documentation, at:

<http://www.cisco.com/en/US/docs/general/whatsnew/whatsnew.html>

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