MPLS Label Distribution Protocol Configuration Guide, Cisco IOS XE 16 (Cisco ASR 920 Series)

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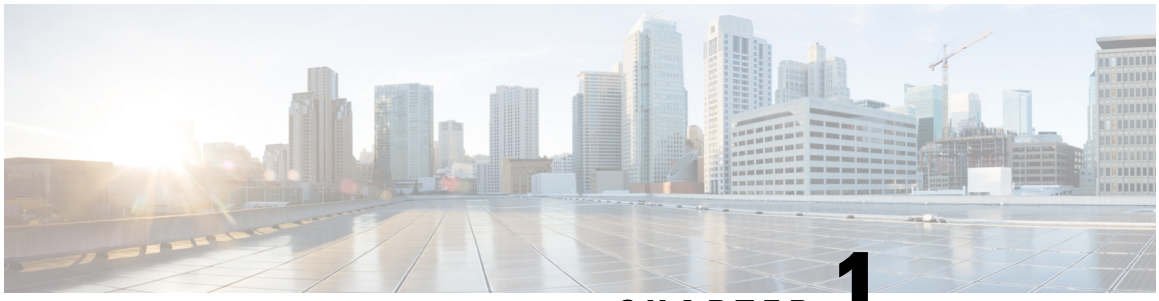

CHAPTER 1

MPLS LDP Autoconfiguration

The MPLS LDP Autoconfiguration feature enables you to globally configure Label Distribution Protocol (LDP) on every interface associated with a specified Interior Gateway Protocol (IGP) instance.

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Restrictions for MPLS LDP Autoconfiguration

- In Cisco IOS Release 12.0(32)SY, the **mpls ldp autoconfig** command is supported only with Open Shortest Path First (OSPF). Other Interior Gateway Protocols (IGPs) are not supported.
- If the Label Distribution Protocol (LDP) is disabled globally, the **mpls ldp autoconfig** command fails and generates a console message explaining that LDP must first be enabled globally by using the **mpls ip** global configuration command.
- If the **mpls ldp autoconfig** command is configured for an IGP instance, you cannot enter the **no mpls ip** global configuration command. To disable LDP, you must first issue the **no mpls ldp autoconfig** command.
- For interfaces running Intermediate System-to-Intermediate System (IS-IS) processes, you can enable Multiprotocol Label Switching (MPLS) for each interface, using the router mode command **mpls ldp autoconfig** or the **mpls ldp igp autoconfig** interface configuration command.
- You specify that the default label distribution protocol is LDP for a device or for an interface. Tag Distribution Protocol (TDP) is not supported.
- The MPLS LDP Autoconfiguration feature is not supported on traffic engineering tunnel interfaces.

Information About MPLS LDP Autoconfiguration

MPLS LDP Autoconfiguration on OSPF and IS-IS Interfaces

The MPLS LDP Autoconfiguration feature enables you to globally enable Label Distribution Protocol (LDP) on every interface associated with an Interior Gateway Protocol (IGP) instance. This feature is supported on Open Shortest Path First (OSPF) and Intermediate System-to-Intermediate System (IS-IS) IGPs. It provides a means to block LDP from being enabled on interfaces that you do not want enabled. The goal of the MPLS LDP Autoconfiguration feature is to make configuration easier, faster, and error free.

You issue the **mpls ldp autoconfig** command to enable LDP on each interface that is running an OSPF or IS-IS process. If you do not want some of the interfaces to have LDP enabled, you can issue the **no mpls ldp igp autoconfig** command on those interfaces.

How to Configure MPLS LDP Autoconfiguration

Configuring MPLS LDP Autoconfiguration with OSPF Interfaces

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **mpls ip**
4. **mpls label protocol ldp**
5. **interface** *type number*
6. **ip address** *prefix mask*
7. **mpls ip**
8. **exit**
9. **router ospf** *process-id*
10. **network** *ip-address wildcard-mask* **area** *area-id*
11. **mpls ldp autoconfig** [**area** *area-id*]
12. **end**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** `Device> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:**	Enters global configuration mode.

	Command or Action	Purpose
	`Device# configure terminal`	
Step 3	**mpls ip** **Example:** `Device(config)# mpls ip`	Globally enables hop-by-hop forwarding.
Step 4	**mpls label protocol ldp** **Example:** `Device(config)# mpls label protocol ldp`	Specifies the Label Distribution Protocol (LDP) as the default protocol.
Step 5	**interface** *type number* **Example:** `Device(config)# interface gigabitethernet 0/0/0`	Specifies the interface to configure, and enters interface configuration mode.
Step 6	**ip address** *prefix mask* **Example:** `Device(config-if)# ip address 10.25.0.11 255.255.255.255`	Assigns an IP address to the interface.
Step 7	**mpls ip** **Example:** `Device(config-if)# mpls ip`	Enables hop-by-hop forwarding on the interface.
Step 8	**exit** **Example:** `Device(config-if)# exit`	Returns to global configuration mode.
Step 9	**router ospf** *process-id* **Example:** `Device(config)# router ospf 1`	Enables Open Shortest Path First (OSPF) routing, and enters router configuration mode.
Step 10	**network** *ip-address wildcard-mask* **area** *area-id* **Example:** `Device(config-router)# network 10.0.0.0 0.255.255.255 area 3`	Defines an interface on which OSPF runs and defines the area ID for that interface.
Step 11	**mpls ldp autoconfig** [**area** *area-id*] **Example:**	Enables the MPLS LDP Autoconfiguration feature to enable LDP on interfaces belonging to the OSPF process.

	Command or Action	Purpose
	`Device(config-router)# mpls ldp autoconfig area 3`	• If no area is specified, the command applies to all interfaces associated with the OSPF process. If an area ID is specified, then only interfaces associated with that OSPF area are enabled with LDP.
Step 12	**end** **Example:** `Device(config-router)# end`	Returns to privileged EXEC mode.

Disabling MPLS LDP Autoconfiguration from Selected OSPF Interfaces

When you issue the **mpls ldp autoconfig** command, all the interfaces that belong to an Open Shortest Path First (OSPF) area are enabled for the Label Distribution Protocol (LDP). To remove LDP from some interfaces, use the **no mpls ldp igp autoconfig** command on those interfaces. The following configuration steps show how to disable LDP from some of the interfaces after they were configured with the MPLS LDP Autoconfiguration feature with the **mpls ldp autoconfig** command.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **interface** *type number*
4. **no mpls ldp igp autoconfig**
5. **end**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** `Device> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Device# configure terminal`	Enters global configuration mode.
Step 3	**interface** *type number* **Example:** `Device(config)# interface POS 3/0`	Specifies the interface to configure and enters interface configuration mode.
Step 4	**no mpls ldp igp autoconfig** **Example:**	Disables LDP for that interface.

	Command or Action	Purpose
	`Device(config-if)# no mpls ldp igp autoconfig`	
Step 5	**end** **Example:** `Device(config-if)# end`	Returns to privileged EXEC mode.

Verifying MPLS LDP Autoconfiguration with OSPF

SUMMARY STEPS

1. **enable**
2. **show mpls interfaces** [*type number* | **vrf** *vpn-name*] [**all**] [**detail**] [**internal**]
3. **show mpls ldp discovery** [**vrf** *vpn-name* | **all**] [**detail**]

DETAILED STEPS

Step 1 **enable**

Enables privileged EXEC mode. Enter your password if prompted.

Step 2 **show mpls interfaces** [*type number* | **vrf** *vpn-name*] [**all**] [**detail**] [**internal**]

Displays the method used to enable the Label Distribution Protocol (LDP) on an interface:

- If LDP is enabled by the **mpls ldp autoconfig** command, the output displays:

Example:

```
IP labeling enabled (ldp):
   IGP config
```

- If LDP is enabled by the **mpls ip** command, the output displays:

Example:

```
IP labeling enabled (ldp):
  Interface config
```

- If LDP is enabled by the **mpls ip** command and the **mpls ldp autoconfig** command, the output displays:

Example:

```
IP labeling enabled (ldp):
  Interface config
  IGP config
```

The following example shows that LDP was enabled on the interface by both the **mpls ip** and **mpls ldp autoconfig** commands:

Example:

```
Device# show mpls interfaces Serial 2/0 detail

Interface Serial2/0:
        IP labeling enabled (ldp):
          Interface config
          IGP config
        LSP Tunnel labeling enabled
        BGP labeling not enabled
        MPLS operational
        Fast Switching Vectors:
          IP to MPLS Fast Switching Vector
          MPLS Turbo Vector
        MTU = 1500
```

Step 3 **show mpls ldp discovery** [**vrf** *vpn-name* | **all**] [**detail**]

Displays how LDP was enabled on the interface. In the following example, LDP was enabled by both the **mpls ip** and **mpls ldp autoconfig** commands:

Example:

```
Device# show mpls ldp discovery detail

Local LDP Identifier:
    10.11.11.11:0
    Discovery Sources:
    Interfaces:
        Serial2/0 (ldp): xmit/recv
            Enabled: Interface config, IGP config;
            Hello interval: 5000 ms; Transport IP addr: 10.11.11.11
            LDP Id: 10.10.10.10:0
              Src IP addr: 10.0.0.1; Transport IP addr: 10.10.10.10
              Hold time: 15 sec; Proposed local/peer: 15/15 sec
```

Configuring MPLS LDP Autoconfiguration with IS-IS Interfaces

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **interface** *type number*
4. **ip address** *prefix mask*
5. **ip router isis**
6. **exit**
7. **mpls ip**
8. **mpls label protocol ldp**
9. **router isis**
10. **mpls ldp autoconfig** [**level-1** | **level-2**]
11. **end**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** `Device> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Device# configure terminal`	Enters global configuration mode.
Step 3	**interface** *type number* **Example:** `Device(config)# interface POS 0/2`	Specifies the interface to configure and enters interface configuration mode.
Step 4	**ip address** *prefix mask* **Example:** `Device(config-if)# ip address 10.50.72.4 255.0.0.0`	Assigns an IP address to the interface.
Step 5	**ip router isis** **Example:** `Device(config-if)# ip router isis`	Enables the Intermediate System-to-Intermediate System (IS-IS) for IP on the interface.
Step 6	**exit** **Example:** `Device(config-if)# exit`	Returns to global configuration mode.
Step 7	**mpls ip** **Example:** `Device(config)# mpls ip`	Globally enables hop-by-hop forwarding.
Step 8	**mpls label protocol ldp** **Example:** `Device(config)# mpls label protocol ldp`	Specifies the Label Distribution Protocol (LDP) as the default protocol.
Step 9	**router isis** **Example:** `Device(config)# router isis`	Enables an IS-IS process on the device and enters router configuration mode.

	Command or Action	Purpose
Step 10	**mpls ldp autoconfig** [**level-1** | **level-2**] **Example:** `Device(config-router)# mpls ldp autoconfig`	Enables the LDP for interfaces that belong to an IS-IS process.
Step 11	**end** **Example:** `Device(config-router)# end`	Returns to privileged EXEC mode.

Disabling MPLS LDP Autoconfiguration from Selected IS-IS Interfaces

When you issue the **mpls ldp autoconfig** command, all the interfaces that belong to an Intermediate System-to-Intermediate System (IS-IS) process are enabled for the Label Distribution Protocol (LDP). To remove LDP from some interfaces, use the **no mpls ldp igp autoconfig** command on those interfaces. The following configuration steps show how to disable LDP from some of the interfaces after they were configured with the MPLS LDP Autoconfiguration feature with the **mpls ldp autoconfig** command.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **interface** *type number*
4. **no mpls ldp igp autoconfig**
5. **end**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** `Device> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Device# configure terminal`	Enters global configuration mode.
Step 3	**interface** *type number* **Example:** `Device(config)# interface POS 3/0`	Specifies the interface to configure and enters interface configuration mode.

	Command or Action	Purpose
Step 4	**no mpls ldp igp autoconfig** **Example:** `Device(config-if)# no mpls ldp igp autoconfig`	Disables LDP for that interface.
Step 5	**end** **Example:** `Device(config-if)# end`	Returns to privileged EXEC mode.

Verifying MPLS LDP Autoconfiguration with IS-IS

SUMMARY STEPS

1. **enable**
2. **show isis mpls ldp**

DETAILED STEPS

Step 1 **enable**

Enables privileged EXEC mode.

Step 2 **show isis mpls ldp**

Shows that the Intermediate System-to-Intermediate System (IS-IS) is configured on the interface and that the Label Distribution Protocol (LDP) is enabled:

Example:

```
Device# show isis mpls ldp

Interface: POS0/2; ISIS tag null enabled
 ISIS is UP on interface
 AUTOCONFIG Information :
   LDP enabled: YES
 SYNC Information :
   Required: NO
```

The output shows:

- IS-IS is up.
- LDP is enabled.

If the MPLS LDP Autoconfiguration feature is not enabled on an interface, the output looks like the following:

Example:

```
Interface: Ethernet0; ISIS tag null enabled
 ISIS is UP on interface
 AUTOCONFIG Information :
```

```
  LDP enabled: NO
SYNC Information :
  Required: NO
```

Troubleshooting Tips

You can use the **debug mpls ldp autoconfig** command to display events that are related to the MPLS LDP Autoconfiguration feature.

Configuration Examples for MPLS LDP Autoconfiguration

Example: MPLS LDP Autoconfiguration with OSPF

The following configuration commands enable the Label Distribution Protocol (LDP) for Open Shortest Path First (OSPF) process 1 area 3. The **mpls ldp autoconfig area 3** command and the OSPF **network** commands enable LDP on POS interfaces 0/0, 0/1, and 1/1. The **no mpls ldp igp autoconfig** command on POS interface 1/0 prevents LDP from being enabled on POS interface 1/0, even though OSPF is enabled for that interface.

```
configure terminal
 interface POS 0/0
  ip address 10.0.0.1 255.0.0.0
!
 interface POS 0/1
  ip address 10.0.1.1 255.0.0.1
!
 interface POS 1/1
  ip address 10.1.1.1 255.255.0.0
!
 interface POS 1/0
  ip address 10.1.0.1 0.1.0.255
  exit
!
 router ospf 1
  network 10.0.0.0 0.0.255.255 area 3
  network 10.1.0.0 0.0.255.255 area 3
  mpls ldp autoconfig area 3
  end
 interface POS 1/0
  no mpls ldp igp autoconfig
```

Example: MPLS LDP Autoconfiguration with IS-IS

The following example shows the configuration of the MPLS LDP Autoconfiguration feature on POS0/2 and 0/3 interfaces, which are running Intermediate System-to-Intermediate System (IS-IS) processes:

```
configure terminal
 interface POS 0/2
  ip address 10.0.0.1 255.0.0.1
  ip router isis
!
 interface POS 0/3
  ip address 10.1.1.1 255.0.1.0
```

```
  ip router isis
  exit
mpls ip
mpls label protocol ldp
router isis
mpls ldp autoconfig
```

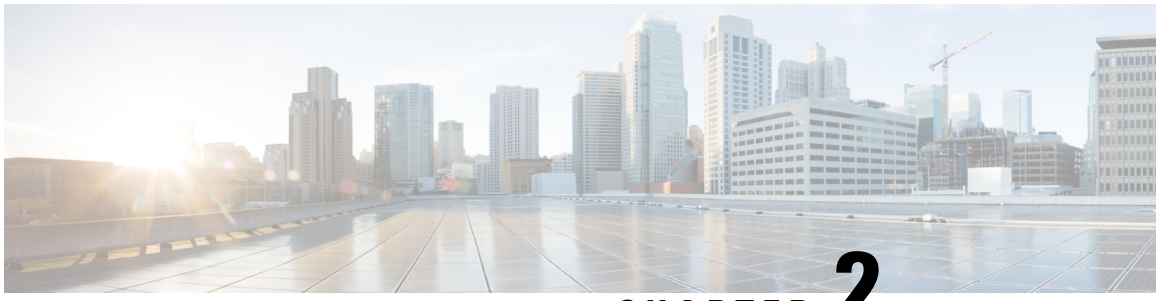
Feature Information for MPLS LDP Autoconfiguration

The following table provides release information about the feature or features described in this module. This table lists only the software release that introduced support for a given feature in a given software release train. Unless noted otherwise, subsequent releases of that software release train also support that feature.

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

Table 1: Feature Information for MPLS LDP Autoconfiguration

Feature Name	Releases	Feature Information
MPLS LDP Autoconfiguration	Cisco IOS XE Release 3.13.0S	This feature was introduced on the Cisco ASR 920 Series Aggregation Services Router (ASR-920-12CZ-A, ASR-920-12CZ-D, ASR-920-4SZ-A, ASR-920-4SZ-D).



CHAPTER 2

MPLS LDP IGP Synchronization

The MPLS LDP IGP Synchronization feature ensures that the Label Distribution Protocol (LDP) is fully established before the Interior Gateway Protocol (IGP) path is used for switching.

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Prerequisites for MPLS LDP IGP Synchronization

- This feature is supported only on interfaces running Open Shortest Path First (OSPF) or Intermediate System-to-System (IS-IS) processes.
- This feature works when LDP is enabled on interfaces with either the **mpls ip** or **mpls ldp autoconfig** command.

Restrictions for MPLS LDP IGP Synchronization

- This feature is not supported on tunnel interfaces or LC-ATM interfaces.
- This feature is not supported with interface-local label space or downstream-on-demand (DoD) requests.
- This feature does not support targeted Label Distribution Protocol (LDP) sessions. Therefore, Any Transport over MPLS (AToM) sessions are not supported.
- The Tag Distribution Protocol (TDP) is not supported. You must specify that the default label distribution protocol is LDP for a device or for an interface.

Information About MPLS LDP IGP Synchronization

How MPLS LDP IGP Synchronization Works

Packet loss can occur because the actions of the Interior Gateway Protocol (IGP) and the Label Distribution Protocol (LDP) are not synchronized. Packet loss can occur in the following situations:

- When an IGP adjacency is established, the device begins forwarding packets using the new adjacency before the LDP label exchange completes between the peers on that link.
- If an LDP session closes, the device continues to forward traffic using the link associated with the LDP peer rather than an alternate pathway with a fully synchronized LDP session.

The MPLS LDP IGP Synchronization feature does the following:

- Provides a means to synchronize LDP and IGPs to minimize Multiprotocol Label Switching (MPLS) packet loss.
- Enables you to globally enable LDP IGP synchronization on each interface associated with an IGP Open Shortest Path First (OSPF) or Intermediate System-to-Intermediate System (IS-IS) process.
- Provides a means to disable LDP IGP synchronization on interfaces that you do not want enabled.
- Prevents MPLS packet loss due to synchronization conflicts.
- Works when LDP is enabled on interfaces using either the **mpls ip** or **mpls ldp autoconfig** command.

To enable LDP IGP synchronization on each interface that belongs to an OSPF or IS-IS process, enter the **mpls ldp sync** command. If you do not want some of the interfaces to have LDP IGP synchronization enabled, issue the **no mpls ldp igp sync** command on those interfaces.

If the LDP peer is reachable, the IGP waits indefinitely (by default) for synchronization to be achieved. To limit the length of time the IGP session must wait, enter the **no mpls ldp igp sync holddown** command. If the LDP peer is not reachable, the IGP establishes the adjacency to enable the LDP session to be established.

When an IGP adjacency is established on a link but LDP IGP synchronization is not yet achieved or is lost, the IGP advertises the max-metric on that link.

MPLS LDP IGP Synchronization with Peers

When the MPLS LDP IGP Synchronization feature is enabled on an interface, the Label Distribution Protocol (LDP) determines if any peer connected by the interface is reachable by looking up the peer's transport address in the routing table. If a routing entry (including longest match or default routing entry) for the peer exists, LDP assumes that LDP Interior Gateway Protocol (IGP) synchronization is required for the interface and notifies the IGP to wait for LDP convergence.

LDP IGP synchronization with peers requires that the routing table be accurate for the peer's transport address. If the routing table shows there is a route for the peer's transport address, that route must be able to reach the peer's transport address. However, if the route is a summary route, a default route, or a statically configured route, it may not the correct route for the peer. You must verify that the route in the routing table can reach the peer’s transport address.

When the routing table has an inaccurate route for the peer's transport address, LDP cannot set up a session with the peer, which causes the IGP to wait for LDP convergence unnecessarily for the sync hold-down time.

MPLS LDP IGP Synchronization Delay Timer

The MPLS LDP IGP Synchronization feature provide the option to configure a delay time for Multiprotocol Label Switching (MPLS) Label Distribution Protocol (LDP) and Interior Gateway Protocol (IGP) synchronization on an interface-by-interface basis. If you want to configure a delay time on an interface, use the **mpls ldp igp sync delay** *delay-time* command in interface configuration mode. To remove the delay timer from a specified interface, enter the **no mpls ldp igp sync delay** command. This command sets the delay time to 0 seconds, but leaves MPLS LDP IGP synchronization enabled.

When LDP is fully established and synchronized, LDP checks the delay timer:

- If you configured a delay time, LDP starts the timer. When the timer expires, LDP checks that synchronization is still valid and notifies the Open Shortest Path First (OSPF) process.
- If you did not configure a delay time, if synchronization is disabled or down, or if an interface was removed from an IGP process, LDP stops the timer and immediately notifies the OSPF process.

If you configure a new delay time while a timer is running, LDP saves the new delay time but does not reconfigure the running timer.

MPLS LDP IGP Synchronization Incompatibility with IGP Nonstop Forwarding

The MPLS LDP IGP Synchronization feature is not supported during the startup period if the Interior Gateway Protocol (IGP) nonstop forwarding (NSF) is configured. The MPLS LDP IGP Synchronization feature conflicts with IGP NSF when the IGP is performing NSF during startup. After the NSF startup is complete, the MPLS LDP IGP Synchronization feature is supported.

MPLS LDP IGP Synchronization Compatibility with LDP Graceful Restart

LDP Graceful Restart protects traffic when a Label Distribution Protocol (LDP) session is lost. If an interface that supports a Graceful Restart-enabled LDP session fails, MPLS LDP IGP synchronization is still achieved on the interface while it is protected by Graceful Restart. MPLS LDP IGP synchronization is eventually lost under the following circumstances:

- If LDP fails to restart before the LDP Graceful Restart reconnect timer expires.
- If an LDP session restarts through other interfaces, but the LDP session on the protected interface fails to recover when the LDP Graceful Restart recovery timer expires.

How to Configure MPLS LDP IGP Synchronization

Configuring MPLS LDP IGP Synchronization with OSPF Interfaces

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **mpls ip**
4. **mpls label protocol ldp**
5. **interface** *type number*
6. **ip address** *prefix mask*
7. **mpls ip**
8. **exit**
9. **router ospf** *process-id*
10. **network** *ip-address wildcard-mask* **area** *area-id*
11. **mpls ldp sync**
12. **end**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** `Device> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Device# configure terminal`	Enters global configuration mode.
Step 3	**mpls ip** **Example:** `Device(config)# mpls ip`	Globally enables hop-by-hop forwarding.
Step 4	**mpls label protocol ldp** **Example:** `Device(config)# mpls label protocol ldp`	Specifies the Label Distribution Protocol (LDP) as the default protocol.
Step 5	**interface** *type number* **Example:**	Specifies the interface to configure, and enters interface configuration mode.

	Command or Action	Purpose
	`Device(config)# interface POS 3/0`	
Step 6	**ip address** *prefix mask* **Example:** `Device(config-if)# ip address 10.0.0.11 255.255.255.255`	Assigns an IP address to the interface.
Step 7	**mpls ip** **Example:** `Device(config-if)# mpls ip`	Enables hop-by-hop forwarding on the interface.
Step 8	**exit** **Example:** `Device(config-if)# exit`	Returns to global configuration mode.
Step 9	**router ospf** *process-id* **Example:** `Device(config)# router ospf 1`	Enables Open Shortest Path First (OSPF) routing, and enters router configuration mode.
Step 10	**network** *ip-address wildcard-mask* **area** *area-id* **Example:** `Device(config-router)# network 10.0.0.0 0.0.255.255 area 3`	Specifies the interface on which OSPF runs and defines the area ID for that interface.
Step 11	**mpls ldp sync** **Example:** `Device(config-router)# mpls ldp sync`	Enables the Multiprotocol Label Switching (MPLS) Interior Gateway Protocol (IGP) synchronization for interfaces belonging for an OSPF or an Intermediate System-to-Intermediate System (IS-IS) process.
Step 12	**end** **Example:** `Device(config-router)# end`	Returns to privileged EXEC mode.

Disabling MPLS LDP IGP Synchronization from Some OSPF Interfaces

When you issue the **mpls ldp sync** command, all of the interfaces that belong to an Open Shortest Path First (OSPF) process are enabled for Label Distribution Protocol (LDP) Interior Gateway Protocol (IGP) synchronization. To remove LDP IGP synchronization from some interfaces, use the **no mpls ldp igp sync** command on those interfaces.

Perform the following task to disable LDP IGP synchronization from some OSPF interfaces after they are configured with LDP IGP synchronization through the **mpls ldp sync** command.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **interface** *type number*
4. **no mpls ldp igp sync**
5. **end**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** `Device> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Device# configure terminal`	Enters global configuration mode.
Step 3	**interface** *type number* **Example:** `Device(config)# interface POS 0/3/0`	Specifies the interface to configure, and enters interface configuration mode.
Step 4	**no mpls ldp igp sync** **Example:** `Device(config-if)# no mpls ldp igp sync`	Disables MPLS LDP IGP synchronization for that interface.
Step 5	**end** **Example:** `Device(config-if)# end`	Returns to privileged EXEC mode.

Verifying MPLS LDP IGP Synchronization with OSPF

After you configure the interfaces for the Label Distribution Protocol (LDP), Open Shortest Path First (OSPF), and LDP Interior Gateway Protocol (IGP) synchronization, verify that the configuration is working correctly by using the **show mpls ldp igp sync** and **show ip ospf mpls ldp interface** commands.

SUMMARY STEPS

1. **enable**

2. **show mpls ldp igp sync**
3. **show ip ospf mpls ldp interface**
4. **exit**

DETAILED STEPS

Step 1 enable

Enables privileged EXEC mode. Enter your password if prompted.

Example:

```
Device> enable
Device#
```

Step 2 show mpls ldp igp sync

Shows that the Multiprotocol Label Switching (MPLS) LDP IGP synchronization is configured correctly because LDP is configured and the SYNC status shows that synchronization is enabled.

Example:

```
Device# show mpls ldp igp sync

FastEthernet0/0/0:
 LDP configured;  SYNC enabled.
 SYNC status: sync achieved; peer reachable.
 IGP holddown time: infinite.
 Peer LDP Ident: 10.0.0.1:0
 IGP enabled: OSPF 1
```

If MPLS LDP IGP synchronization is not enabled on an interface, the output appears as follows:

Example:

```
FastEthernet0/3/1:
 LDP configured; LDP-IGP Synchronization not enabled.
```

Step 3 show ip ospf mpls ldp interface

Shows that the interfaces are properly configured.

Example:

```
Device# show ip ospf mpls ldp interface

FastEthernet0/3/1
  Process ID 1, Area 0
  LDP is configured through LDP autoconfig
  LDP-IGP Synchronization: Yes
  Holddown timer is not configured
  Timer is not running
FastEthernet0/0/2
  Process ID 1, Area 0
  LDP is configured through LDP autoconfig
  LDP-IGP Synchronization: Yes
  Holddown timer is not configured
  Timer is not running
```

Step 4 **exit**

Returns to user EXEC mode.

Example:

```
Device# exit
Device>
```

Configuring MPLS LDP IGP Synchronization with IS-IS Interfaces

Configuring MPLS LDP IGP Synchronization on All IS-IS Interfaces

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **mpls ip**
4. **mpls label protocol ldp**
5. **router isis** *process-name*
6. **mpls ldp sync**
7. **interface** *type number*
8. **ip address** *prefix mask*
9. **ip router isis** *process-name*
10. **end**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** `Device> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Device# configure terminal`	Enters global configuration mode.
Step 3	**mpls ip** **Example:** `Device(config)# mpls ip`	Globally enables hop-by-hop forwarding.
Step 4	**mpls label protocol ldp** **Example:**	Specifies the Label Distribution Protocol (LDP) as the default label distribution protocol.

	Command or Action	Purpose
	`Device(config)# mpls label protocol ldp`	
Step 5	**router isis** *process-name* **Example:** `Device(config)# router isis ISIS`	Enables the Intermediate System-to-Intermediate System (IS-IS) protocol on the device, specifies an IS-IS process, and enters router configuration mode.
Step 6	**mpls ldp sync** **Example:** `Device(config-router)# mpls ldp sync`	Enables Multiprotocol Label Switching (MPLS) LDP Interior Gateway Protocol (IGP) synchronization on interfaces belonging to an IS-IS process.
Step 7	**interface** *type number* **Example:** `Device(config-router)# interface POS 0/3/0`	Specifies the interface to configure, and enters interface configuration mode.
Step 8	**ip address** *prefix mask* **Example:** `Device(config-if)# ip address 10.25.25.11 255.255.255.0`	Assigns an IP address to the interface.
Step 9	**ip router isis** *process-name* **Example:** `Device(config-if)# ip router isis ISIS`	Enables IS-IS.
Step 10	**end** **Example:** `Device(config-if)# end`	Returns to privileged EXEC mode.

Configuring MPLS LDP IGP Synchronization on an IS-IS Interface

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **interface** *type number*
4. **ip address** *prefix mask*
5. **ip router isis**
6. **exit**
7. **router isis**
8. **mpls ldp sync**
9. **end**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** `Device> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Device# configure terminal`	Enters global configuration mode.
Step 3	**interface** *type number* **Example:** `Device(config)# interface POS 0/2/0`	Specifies the interface to configure, and enters interface configuration mode.
Step 4	**ip address** *prefix mask* **Example:** `Device(config-if)# ip address 10.50.72.4 255.0.0.0`	Assigns an IP address to the interface.
Step 5	**ip router isis** **Example:** `Device(config-if)# ip router isis`	Enables the Intermediate System-to-Intermediate System (IS-IS) protocol for IP on the interface.
Step 6	**exit** **Example:** `Device(config-if)# exit`	Returns to global configuration mode.
Step 7	**router isis** **Example:** `Device(config)# router isis`	Enters router configuration mode, and enables an IS-IS process on the device.
Step 8	**mpls ldp sync** **Example:** `Device(config-router)# mpls ldp sync`	Enables Label Distribution Protocol (LDP) Interior Gateway Protocol (IGP) synchronization for interfaces belonging to an IS-IS process.
Step 9	**end** **Example:** `Device(config-router)# end`	Returns to privileged EXEC mode.

Disabling MPLS LDP IGP Synchronization from Some IS-IS Interfaces

When you issue the **mpls ldp sync** command, all of the interfaces that belong to an Intermediate System-to-Intermediate System (IS-IS) process are enabled for Label Distribution Protocol (LDP) Interior Gateway Protocol (IGP) synchronization. To remove LDP IGP synchronization from some interfaces, use the **no mpls ldp igp sync** command on those interfaces.

Perform the following task to disable LDP IGP synchronization from some IS-IS interfaces after they are configured with LDP IGP synchronization through the **mpls ldp sync** command.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **interface** *type number*
4. **no mpls ldp igp sync**
5. **end**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** `Device> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Device# configure terminal`	Enters global configuration mode.
Step 3	**interface** *type number* **Example:** `Device(config)# interface POS 0/3/0`	Specifies the interface to configure, and enters interface configuration mode.
Step 4	**no mpls ldp igp sync** **Example:** `Device(config-if)# no mpls ldp igp sync`	Disables Multiprotocol Label Switching (MPLS) LDP IGP synchronization for that interface.
Step 5	**end** **Example:** `Device(config-if)# end`	Returns to privileged EXEC mode.

Troubleshooting Tips

Use the **debug mpls ldp igp sync** command to display events related to MPLS LDP IGP synchronization.

Configuration Examples for MPLS LDP IGP Synchronization

Example: MPLS LDP IGP Synchronization with OSPF

The following task shows how to enable the Label Distribution Protocol (LDP) for Open Shortest Path First (OSPF) process 1. The **mpls ldp sync** and the OSPF **network** commands enable LDP on interfaces POS0/0/0, POS0/1/0, and POS1/1/0, respectively. The **no mpls ldp igp sync** command on interface POS1/0/0 prevents LDP from being enabled on interface POS1/0/0, even though OSPF is enabled for that interface.

```
Device# configure terminal
Device(config)# interface POS0/0/0
Device(config-if)# ip address 10.0.0.1
Device(config-if)# mpls ip
!
Device(config)# interface POS0/1/0
Device(config-if)# ip address 10.0.1.1
Device(config-if)# mpls ip
!
Device(config)# interface POS1/1/0
Device(config-if)# ip address 10.1.1.1
Device(config-if)# mpls ip
!
Device(config)# interface POS1/0/0
Device(config-if)# ip address 10.1.0.1
Device(config-if)# mpls ip
!
Device(config)# router ospf 1
Device(config-router)# network 10.0.0.0 0.0.255.255 area 3
Device(config-router)# network 10.1.0.0 0.0.255.255 area 3
Device(config-router)# mpls ldp sync
Device(config-router)# exit
Device(config)# interface POS1/0/0
Device(config-if)# no mpls ldp igp sync
```

Example: MPLS LDP IGP Synchronization with IS-IS

The following examples show the configuration commands you can use to configure MPLS LDP IGP synchronization on interfaces POS0/2 /0 and POS0/3/0, which are running IS-IS processes:

```
Device# configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Device(config)# interface POS0/2/0
Device(config-if)# ip router isis
Device(config-if)# exit
Device(config)# router isis
Device(config-router)# mpls ldp sync
Device(config-router)# exit
.
.
.
Device(config)# interface POS0/3/0
Device(config-if)# ip router isis
Device(config-if)# exit
```

```
Device(config)# router isis
Device(config-router)# mpls ldp sync
Device(config-router)# exit
Device(config) exit
Device#
```

Additional References

Related Documents

Related Topic	Document Title
Cisco IOS commands	Cisco IOS Master Command List, All Releases
MPLS LDP commands	Cisco IOS Multiprotocol Label Switching Command Reference
LDP autoconfiguration	"MPLS LDP Autoconfiguration" module in the *MPLS Label Distribution Protocol Configuration Guide*

Standards and RFCs

Standard/RFC	Title
RFC 3037	LDP Applicability
RFC 5036	LDP Specification

MIBs

MIBs	MIBs Link
MPLS LDP MIB	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

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 LDP IGP Synchronization

The following table provides release information about the feature or features described in this module. This table lists only the software release that introduced support for a given feature in a given software release train. Unless noted otherwise, subsequent releases of that software release train also support that feature.

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

Table 2: Feature Information for MPLS LDP IGP Synchronization

Feature Name	Releases	Feature Information
MPLS LDP IGP Synchronization	Cisco IOS XE Release 3.13.0S	This feature was introduced on the Cisco ASR 920 Series Aggregation Services Router (ASR-920-12CZ-A, ASR-920-12CZ-D, ASR-920-4SZ-A, ASR-920-4SZ-D).