MPLS LDP Graceful Restart

When a router is configured with Multiprotocol Label Switching (MPLS) Label Distribution Protocol (LDP) Graceful Restart (GR), it assists a neighboring router that has MPLS LDP Stateful Switchover/Nonstop Forwarding (SSO/NSF) Support and Graceful Restart to recover gracefully from an interruption in service. In this Cisco IOS release, MPLS LDP GR functions strictly in helper mode, which means it can only help other routers that are enabled with MPLS SSO/NSF and GR to recover. If the router with LDP GR fails, its peer routers cannot help it recover.

Notes:

- MPLS LDP SSO/NSF Support and Graceful Restart is supported in Cisco IOS Release 12.2(25)S. For brevity, this feature is called LDP SSO/NSF in this document.
- The MPLS LDP GR feature described in this document refers to helper mode.

When you enable MPLS LDP GR on a router that peers with an MPLS LDP SSO/NSF-enabled router, the SSO/NSF-enabled router can maintain its forwarding state when the LDP session between them is interrupted. While the SSO/NSF-enabled router recovers, the peer router forwards packets using stale information. This enables the SSO/NSF-enabled router to become operational more quickly.

Feature History for MPLS LDP Graceful Restart

Release	Modification
12.0(29)S	The MPLS LDP Graceful Restart feature (in helper mode) was introduced.
12.3(14)T	This feature was integrated into Cisco IOS Release 12.3(14)T.
12.2(33)SRA	This feature was integrated into Cisco IOS Release 12.2(33)SRA.

Finding Support Information for Platforms and Cisco IOS Software Images

Use Cisco Feature Navigator to find information about platform support and Cisco IOS software image support. Access Cisco Feature Navigator at http://www.cisco.com/go/fn. You must have an account on Cisco.com. If you do not have an account or have forgotten your username or password, click **Cancel** at the login dialog box and follow the instructions that appear.

CISCO SYSTEMS

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Contents

Information About MPLS LDP Graceful Restart

To configure MPLS LDP GR, you need to understand the following concepts:

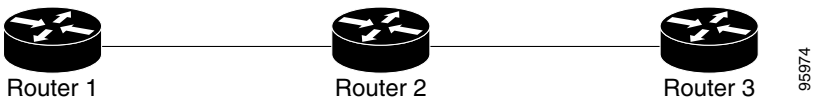
How MPLS LDP Graceful Restart Works

MPLS LDP GR works in strict helper mode, which means it helps a neighboring route processor that has MPLS LDP SSO/NSF to recover from disruption in service without losing its MPLS forwarding state. The disruption in service could be the result of a TCP or UDP event or the stateful switchover of a route processor. When the neighboring router establishes a new session, the LDP bindings and MPLS forwarding states are recovered.

In the topology shown in Figure 1, the following elements have been configured:

- LDP sessions are established between Router 1 and Router 2, as well as between Router 2 and Router 3.
- Router 2 has been configured with MPLS LDP SSO/NSF. Routers 1 and 3 have been configured with MPLS LDP GR.
- A label switched path (LSP) has been established between Router 1 and Router 3.

Figure 1 Example of a Network Using LDP Graceful Restart



The following process shows how Routers 1 and 3, which have been configured with LDP GR help Router 2, which has been configured with LDP SSO/NSF recover from a disruption in service:

1. Router 1 notices an interruption in service with Router 2. (Router 3 also performs the same actions in this process.)
2. Router 1 marks all the label bindings from Router 2 as stale, but it continues to use the bindings for MPLS forwarding.

Router 1 reestablishes an LDP session with Router 2, but keeps its stale label bindings. If you issue a **show mpls ldp neighbor** command with the **graceful-restart** keyword, the command output displays the recovering LDP sessions.

3. Both routers readvertise their label binding information. If Router 1 relearns a label from Router 2 after the session has been established, the stale flags are removed. The **show mpls forwarding-table** command displays the information in the MPLS forwarding table, including the local label, outgoing label or VC, prefix, label-switched bytes, outgoing interface, and next hop.

You can set various graceful restart timers. See the following commands for more information:

- **mpls ldp graceful-restart timers neighbor-liveness**
- **mpls ldp graceful-restart timers max-recovery**

How a Route Processor Advertises That It Supports MPLS LDP Graceful Restart

A route processor that is configured to perform MPLS LDP GR includes the Fault Tolerant (FT) Type Length Value (TLV) in the LDP initialization message. The route processor sends the LDP initialization message to a neighbor to establish an LDP session.

The FT session TLV includes the following information:

- The Learn from Network (L) flag is set to 1, which indicates that the route processor is configured to perform MPLS LDP GR.
- The Reconnect Timeout field shows the time (in milliseconds) that the neighbor should wait for a reconnection if the LDP session is lost. In this release, the timer is set to 0, which indicates that if the local router fails, its peers should not wait for it to recover. The timer setting indicates that the local router is working in helper mode.
- The Recovery Time field shows the time (in milliseconds) that the neighbor should retain the MPLS forwarding state during a recovery. If a neighbor did not preserve the MPLS forwarding state before the restart of the control plane, the neighbor sets the recovery time to 0.

What Happens If a Route Processor Does Not Have LDP Graceful Restart

If two route processors establish an LDP session and one route processor is not configured for MPLS LDP GR, the two route processors create a normal LDP session but do not have the ability to perform MPLS LDP GR. Both route processors must be configured for MPLS LDP GR.

How to Configure MPLS LDP Graceful Restart

This section contains the following procedures:

- Configuring MPLS LDP Graceful Restart, page 3 (required)
- Verifying the Configuration, page 5 (optional)

Configuring MPLS LDP Graceful Restart

You must enable MPLS LDP GR on all route processors for an LDP session to be preserved during an interruption in service.

MPLS LDP GR is enabled globally. When you enable MPLS LDP GR, it has no effect on existing LDP sessions. New LDP sessions that are established can perform MPLS LDP GR.

Restrictions

- MPLS LDP GR is supported in strict helper mode.
- Tag Distribution Protocol (TDP) sessions are not supported. Only LDP sessions are supported.
- MPLS LDP GR cannot be configured on label-controlled ATM (LC-ATM) interfaces.
- MPLS LDP SSO/NSF is supported in IOS Release 12.2(25)S. It is not supported in this release.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **ip cef** [**distributed**]
4. **mpls ldp graceful-restart**
5. **interface** *type slot/port*
6. **mpls ip**
7. **mpls label protocol** {**ldp | tdp | both**}

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** `Router> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Router# configure terminal`	Enters global configuration mode.
Step 3	**ip cef** [**distributed**] **Example:** `Router(config)# ip cef distributed`	Enables Cisco Express Forwarding (CEF).
Step 4	**mpls ldp graceful-restart** **Example:** `Router(config)# mpls ldp graceful-restart`	Enables the router to protect the LDP bindings and MPLS forwarding state during a disruption in service.
Step 5	**interface** *type slot/port* **Example:** `Router(config)# interface pos 3/0`	Specifies an interface and enters interface configuration mode.

	Command or Action	Purpose
Step 6	**mpls ip** **Example:** `Router(config-if)# mpls ip`	Configures MPLS hop-by-hop forwarding for an interface.
Step 7	**mpls label protocol** {**ldp** | **tdp** | **both**} **Example:** `Router(config-if)# mpls label protocol ldp`	Configures the use of LDP for an interface. You must use LDP.

Note You can also issue the **mpls label protocol ldp** command in global configuration mode, which enables LDP on all interfaces configured for MPLS.

Verifying the Configuration

The following commands help verify that MPLS LDP GR has been configured correctly:

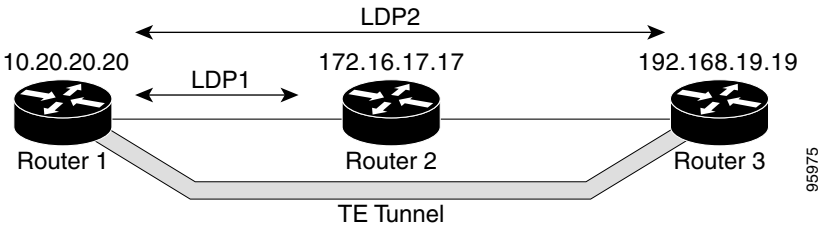
show mpls ldp neighbor with the **graceful-restart** keyword	Displays the Graceful Restart information for LDP sessions.
show mpls ldp graceful-restart	Displays Graceful Restart sessions and session parameters.

Configuration Example for MPLS LDP Graceful Restart

Figure 2 shows a configuration where MPLS LDP GR is enabled on Router 1 and MPLS LDP SSO/NSF is enabled on Routers 2 and 3. In this configuration example, Router 1 creates an LDP session with Router 2. Router 1 also creates a targeted session with Router 3 through a traffic engineering tunnel using Router 2.

Note MPLS LDP SSO/NSF is supported in Cisco IOS Release 12.2(25)S. It is not supported in this release.

Figure 2 MPLS LDP Graceful Restart Configuration Example



Router 1 configured with LDP GR:

```
boot system slot0:rsp-pv-mz
hw-module slot 2 image slot0:rsp-pv-mz
hw-module slot 3 image slot0:rsp-pv-mz
!
ip subnet-zero
ip cef
mpls label range 16 10000 static 10001 1048575
mpls label protocol ldp
mpls ldp logging neighbor-changes
mpls ldp graceful-restart
mpls traffic-eng tunnels
no mpls traffic-eng auto-bw timers frequency 0
mpls ldp router-id Loopback0 force
!
interface Loopback0
     ip address 20.20.20.20 255.255.255.255
     no ip directed-broadcast
     no ip mroute-cache
!
interface Tunnel1
     ip unnumbered Loopback0
     no ip directed-broadcast
     mpls label protocol ldp
     mpls ip
     tunnel destination 19.19.19.19
     tunnel mode mpls traffic-eng
     tunnel mpls traffic-eng autoroute announce
     tunnel mpls traffic-eng priority 7 7
     tunnel mpls traffic-eng bandwidth  500
     tunnel mpls traffic-eng path-option 1 dynamic
!
interface ATM5/1/0
     no ip address
     no ip directed-broadcast
     atm clock INTERNAL
```

```
     no atm enable-ilmi-trap
     no atm ilmi-keepalive
!
interface ATM5/1/0.5 point-to-point
     ip address 12.0.0.2 255.0.0.0
     no ip directed-broadcast
     no atm enable-ilmi-trap
     pvc 6/100
          encapsulation aal5snap
    mpls label protocol ldp
    mpls traffic-eng tunnels
    mpls ip
    ip rsvp bandwidth 1000
!
router ospf 100
     log-adjacency-changes
     redistribute connected
     network 12.0.0.0 0.255.255.255 area 100
     network 20.20.20.20 0.0.0.0 area 100
     mpls traffic-eng router-id Loopback0
     mpls traffic-eng area 100
```

Router 2 configured with LDP SSO/NSF:

```
boot system slot0:rsp-pv-mz
hw-module slot 2 image slot0:rsp-pv-mz
hw-module slot 3 image slot0:rsp-pv-mz
!
redundancy
  mode sso
!
ip cef
no ip domain-lookup
mpls label range 17 10000 static 10001 1048575
mpls label protocol ldp
mpls ldp logging neighbor-changes
mpls ldp graceful-restart
mpls traffic-eng tunnels
no mpls traffic-eng auto-bw timers frequency 0
no mpls advertise-labels
mpls ldp router-id Loopback0 force
!
interface Loopback0
     ip address 17.17.17.17 255.255.255.255
     no ip directed-broadcast
!
interface ATM4/0/0
     no ip address
     no ip directed-broadcast
     no ip mroute-cache
     atm clock INTERNAL
     atm sonet stm-1
     no atm enable-ilmi-trap
     no atm ilmi-keepalive
!
interface ATM4/0/0.5 point-to-point
     ip address 12.0.0.1 255.0.0.0
     no ip directed-broadcast
     no atm enable-ilmi-trap
     pvc 6/100
          encapsulation aal5snap
    mpls label protocol ldp
    mpls traffic-eng tunnels
    mpls ip
```

```
    ip rsvp bandwidth 1000
!
interface POS5/1/0
     ip address 11.0.0.1 255.0.0.0
     no ip directed-broadcast
     encapsulation ppp
     mpls label protocol ldp
     mpls traffic-eng tunnels
     mpls ip
     no peer neighbor-route
     clock source internal
     ip rsvp bandwidth 1000
!
router ospf 100
     log-adjacency-changes
     redistribute connected
     nsf enforce global
     network 11.0.0.0 0.255.255.255 area 100
     network 12.0.0.0 0.255.255.255 area 100
     network 17.17.17.17 0.0.0.0 area 100
     mpls traffic-eng router-id Loopback0
     mpls traffic-eng area 100
!
ip classless
```

Router 3 configured with LDP SSO/NSF:

```
boot system slot0:rsp-pv-mz
hw-module slot 2 image slot0:rsp-pv-mz
hw-module slot 3 image slot0:rsp-pv-mz
!
redundancy
  mode sso
!
ip subnet-zero
ip cef
!
no ip finger
no ip domain-lookup
mpls label protocol ldp
mpls ldp neighbor 11.11.11.11 targeted ldp
mpls ldp logging neighbor-changes
mpls ldp graceful-restart
mpls traffic-eng tunnels
no mpls traffic-eng auto-bw timers frequency 0
mpls ldp discovery directed-hello interval 12
mpls ldp discovery directed-hello holdtime 130
mpls ldp discovery directed-hello accept
mpls ldp router-id Loopback0 force
!
interface Loopback0
     ip address 19.19.19.19 255.255.255.255
     no ip directed-broadcast
!
interface POS1/0
     ip address 11.0.0.2 255.0.0.0
     no ip directed-broadcast
     encapsulation ppp
     mpls label protocol ldp
     mpls traffic-eng tunnels
     mpls ip
     no peer neighbor-route
     clock source internal
     ip rsvp bandwidth 1000
```

```
!
router ospf 100
     log-adjacency-changes
     redistribute connected
     nsf enforce global
    network 11.0.0.0 0.255.255.255 area 100
    network 19.19.19.19 0.0.0.0 area 100
    mpls traffic-eng router-id Loopback0
     mpls traffic-eng area 100
!
ip classless
```

Additional References

The following sections provide references related to MPLS LDP GR.

Related Documents

Related Topic	Document Title
MPLS Label Distribution Protocol	*MPLS Label Distribution Protocol (LDP)*

Standards

Standards	Title
None	—

MIBs

MIBs[1]	MIBs Link
• MPLS Label Distribution Protocol MIB Version 8 Upgrade	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

1. Not all supported MIBs are listed.

RFCs

RFCs[1]	Title
RFC 3036	*LDP Specification*
RFC 3478	*Graceful Restart Mechanism for Label Distribution*

1. Not all supported RFCs are listed.

Technical Assistance

Description	Link
The Cisco Technical Support & Documentation website contains thousands of pages of searchable technical content, including links to products, technologies, solutions, technical tips, and tools. Registered Cisco.com users can log in from this page to access even more content.	http://www.cisco.com/techsupport

Command Reference

This section documents modified commands.

New Commands

- **debug mpls ldp graceful-restart**
- **mpls ldp graceful-restart**
- **mpls ldp graceful-restart timers max-recovery**
- **mpls ldp graceful-restart timers neighbor-liveness**

Modified Commands

- **show mpls ip binding**
- **show mpls ldp bindings**
- **show mpls ldp graceful-restart**
- **show mpls ldp neighbor**

debug mpls ldp graceful-restart

To display debugging information for Multiprotocol (MPLS) Label Distribution Protocol (LDP) Stateful Switchover (SSO) Nonstop Forwarding (NSF) Support and Graceful Restart, use the **debug mpls ldp graceful-restart** command in privileged EXEC mode. To disable the display of this debugging information, use the **no** form of this command.

debug mpls ldp graceful-restart

no debug mpls ldp graceful-restart

Syntax Description

This command has no arguments or keywords.

Defaults

The display of debugging information is not enabled.

Command Modes

Privileged EXEC

Command History

Release	Modification
12.0(29)S	This command was introduced.
12.3(14)T	This command was integrated into Cisco IOS Release 12.3(14)T.
12.2(25)S	This command was introduced.
12.2(28)SB	This command was integrated into Cisco IOS Release 12.2(28)SB and implemented on the Cisco 10000 series routers.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.

Usage Guidelines

This command shows events and errors related to LDP Graceful Restart.

Examples

The following example shows sample output from the **debug mpls ldp graceful-restart** command. The output shows that a session was lost. The status message show the events that happen during recovery of the bindings.

```
Router# debug mpls ldp graceful-restart

LDP GR: GR session 10.110.0.10:0:: lost
LDP GR: down nbr 10.110.0.10:0:: created [1 total]
LDP GR: GR session 10.110.0.10:0:: bindings retained
LDP GR: down nbr 10.110.0.10:0:: added all 7 addresses [7 total]
LDP GR: down nbr 10.110.0.10:0:: state change (None -> Reconnect-Wait)
LDP GR: down nbr 10.110.0.10:0:: reconnect timer started [120000 msecs]
LDP GR: down nbr 10.110.0.10:0:: added to bindings task queue [1 entries]
LDP GR: searching for down nbr record (10.110.0.10:0, 10.2.0.10)
LDP GR: search for down nbr record (10.110.0.10:0, 10.2.0.10) returned 10.110.0.10:0
LDP GR: Added FT Sess TLV (Rconn 120000, Rcov 120000) to INIT msg to 10.110.0.10:0
LDP GR: Tagcon querying for up to 12 bindings update tasks
LDP GR: down nbr 10.110.0.10:0:: requesting bindings MARK for {10.110.0.10:0, 1}
```

```
LDP GR: down nbr 10.110.0.10:0:: removed from bindings task queue [0 entries]
LDP GR: Requesting 1 bindings update tasks [0 left in queue]
LDP GR: 10.0.0.0/8:: updating binding from 10.110.0.10:0, inst 1:: marking stale;
LDP GR: 10.2.0.0/16:: updating binding from 10.110.0.10:0, inst 1:: marking stale;
LDP GR: 14.0.0.14/32:: updating binding from 10.110.0.10:0, inst 1:: marking stale;
LDP GR: searching for down nbr record (10.110.0.10:0, 10.2.0.10)
LDP GR: search for down nbr record (10.110.0.10:0, 10.2.0.10) returned 10.110.0.10:0
LDP GR: Added FT Sess TLV (Rconn 120000, Rcov 120000) to INIT msg to 10.110.0.10:0
LDP GR: searching for down nbr record (10.110.0.10:0, 10.2.0.10)
LDP GR: search for down nbr record (10.110.0.10:0, 10.2.0.10) returned 10.110.0.10:0
LDP GR: Added FT Sess TLV (Rconn 120000, Rcov 120000) to INIT msg to 10.110.0.10:0
LDP GR: searching for down nbr record (10.110.0.10:0, 10.2.0.10)
LDP GR: search for down nbr record (10.110.0.10:0, 10.2.0.10) returned 10.110.0.10:0
LDP GR: Added FT Sess TLV (Rconn 120000, Rcov 120000) to INIT msg to 10.110.0.10:0
LDP GR: searching for down nbr record (10.110.0.10:0, 10.2.0.10)
LDP GR: search for down nbr record (10.110.0.10:0, 10.2.0.10) returned 10.110.0.10:0
LDP GR: Added FT Sess TLV (Rconn 120000, Rcov 120000) to INIT msg to 10.110.0.10:0
LDP GR: searching for down nbr record (10.110.0.10:0, 10.2.0.10)
LDP GR: search for down nbr record (10.110.0.10:0, 10.2.0.10) returned 10.110.0.10:0
LDP GR: Added FT Sess TLV (Rconn 120000, Rcov 120000) to INIT msg to 10.110.0.10:0
LDP GR: Received FT Sess TLV from 10.110.0.10:0  (fl 0x1, rs 0x0, rconn 120000, rcov
120000)
LDP GR: GR session 10.110.0.10:0:: allocated instance, 2
LDP GR: GR session 10.110.0.10:0:: established
LDP GR: GR session 10.110.0.10:0:: found down nbr 10.110.0.10:0
LDP GR: down nbr 10.110.0.10:0:: reconnect timer stopped
LDP GR: down nbr 10.110.0.10:0:: state change (Reconnect-Wait -> Recovering)
LDP GR: down nbr 10.110.0.10:0:: recovery timer started [120000 msecs]
%LDP-5-GR: GR session 10.110.0.10:0 (inst. 2): starting graceful recovery
%LDP-5-NBRCHG: LDP Neighbor 10.110.0.10:0 is UP
LDP GR: 2.0.0.0//8:: refreshing stale binding from 10.110.0.10:0, inst 1 -> inst 2
LDP GR: 10.43.0.0//16:: refreshing stale binding from 10.110.0.10:0, inst 1 -> inst 2
LDP GR: down nbr 10.110.0.10:0:: recovery timer expired
%LDP-5-GR: GR session 10.110.0.10:0 (inst. 2): completed graceful recovery
LDP GR: down nbr 10.110.0.10:0:: destroying record [0 left]
LDP GR: down nbr 10.110.0.10:0:: state change (Recovering -> Delete-Wait)
LDP GR: down nbr 10.110.0.10:0:: added to bindings task queue [1 entries]
LDP GR: Tagcon querying for up to 12 bindings update tasks
LDP GR: down nbr 10.110.0.10:0:: requesting bindings DEL for {10.110.0.10:0, 1}
LDP GR: down nbr 10.110.0.10:0:: removed from bindings task queue [0 entries]
LDP GR: Requesting 1 bindings update tasks [0 left in queue]
LDP GR: GR session 10.110.0.10:0:: released instance, 1
```

The debug output is formatted in three general ways. Table 1 describes the fields for the debug command output:

:

Table 1 debug mpls ldp graceful-restart Command Field Descriptions

Field	Description
LDP GR: GR session 10.110.0.10:0:: found down nbr 10.110.0.10:0	
LDP GR	Identifies LDP Graceful Restart application
GR session 10.110.0.10:0	ID of the LDP session that is enabled for Graceful Restart.
found down nbr 10.110.0.10:0	Describes the event that is happening to that LDP session.
LDP GR: down nbr 10.110.0.10:0:: removed from bindings task queue [0 entries]	
down nbr 10.110.0.10:0::	Identifies the Down Neighbor record, which logs the state of a recently lost Graceful Restart session.

Table 1 debug mpls ldp graceful-restart Command Field Descriptions (continued)

Field	Description
removed from bindings task queue [0 entries]	Describes the event that is happening to the recently lost Graceful Restart session.
LDP GR: 10.0.0.0/8:: updating binding from 10.110.0.10:0, inst 1:: marking stale;	
10.0.0.0/8::	Identifies the Forwarding Equivalence Class (FEC) associated with the remote label binding being modified. The FEC identifies the Label Information Base (LIB) entry.
updating binding	Lists the operation being performed on the remote label binding.
10.110.0.10:0, inst 1:: marking stale;	Identifies the LDP session during which the remote label binding was learned.

Related Commands

Command	Description
show mpls ldp graceful-restart	Displays a summary of the LDP Graceful Restart status.

mpls ldp graceful-restart

To enable Multiprotocol Label Switching (MPLS) Label Distribution Protocol (LDP) Graceful Restart, use the **mpls ldp graceful-restart** command in global configuration mode. To disable LDP Graceful Restart, use the **no** form of this command.

mpls ldp graceful-restart

no mpls ldp graceful-restart

Syntax Description

This command has no arguments or keywords.

Defaults

LDP Graceful Restart is not enabled.

Command Modes

Global configuration

Command History

Release	Modification
12.0(29)S	This command was introduced.
12.3(14)T	This command was integrated into Cisco IOS Release 12.3(14)T.
12.2(25)S	This command was integrated into Cisco IOS Release 12.2(25)S.
12.2(28)SB	This command was integrated into Cisco IOS Release 12.2(28)SB and implemented on the Cisco 10000 series routers.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.

Usage Guidelines

LDP Graceful Restart must be enabled before an LDP session is established.

Using the **no** form of the command disables the Graceful Restart functionality on all LDP sessions.

Examples

The command in the following example enables LDP Graceful Restart on a router:

```
Router(config)# mpls ldp graceful-restart
```

Related Commands

Command	Description
mpls ldp graceful-restart timers forwarding-holding	Specifies the amount of time the MPLS forwarding state should be preserved after the control plane restarts.
mpls ldp graceful-restart timers neighbor-liveness	Specifies the amount of time a router should wait for an LDP session to be reestablished.
mpls ldp graceful-restart timers max-recovery	Specifies the amount of time a router should hold stale label-FEC bindings after an LDP session has been reestablished.

mpls ldp graceful-restart timers max-recovery

To specify the amount of time a router should hold stale label-Forwarding Equivalence Class (FEC) bindings after a Label Distribution Protocol (LDP) session has been reestablished, use the **mpls ldp graceful-restart timers max-recovery** command in global configuration mode. To revert to the default timer value, use the **no** form of this command.

mpls ldp graceful-restart timers max-recovery *secs*

no mpls ldp graceful-restart timers max-recovery

Syntax Description

secs	The amount of time (in seconds) that the router should hold stale label-FEC bindings after an LDP session has been reestablished. The default is 120 seconds. The acceptable range of values is 15 to 600 seconds.

Defaults

Stale label-FEC bindings are held for 120 seconds after an LDP session has been reestablished.

Command Modes

Global configuration

Command History

Release	Modification
12.0(29)S	This command was introduced.
12.3(14)T	This command was integrated into Cisco IOS Release 12.3(14)T.
12.2(28)SB	This command was integrated into Cisco IOS Release 12.2(28)SB and implemented on the Cisco 10000 series routers.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.

Usage Guidelines

After the timer expires, all stale label-FEC bindings learned from the associated LDP session are removed, which results in the removal of any forwarding table entries that are based on those bindings.

Examples

In the following example, the router should hold stale label-FEC bindings after an LDP session has been reestablished for 180 seconds:

```
Router(config)# mpls ldp graceful-restart timers max-recovery 180
```

Related Commands

Command	Description
mpls ldp graceful-restart timers forwarding-holding	Specifies the amount of time the MPLS forwarding state should be preserved after the control plane restarts.
mpls ldp graceful-restart timers neighbor-liveness	Specifies the amount of time a router should wait for an LDP session to be reestablished.

mpls ldp graceful-restart timers neighbor-liveness

To specify the upper bound on the amount of time a router should wait for a Label Distribution Protocol (LDP) session to be reestablished, use the **mpls ldp graceful-restart timers neighbor-liveness** command in global configuration mode. To revert to the default timer value, use the **no** form of this command.

mpls ldp graceful-restart timers neighbor-liveness *secs*

no mpls ldp graceful-restart timers neighbor-liveness

Syntax Description

secs	The amount of time (in seconds) that the router should wait for an LDP session to be reestablished. The default is 120 seconds. The range is 5 to 300 seconds.

Defaults

The default is a maximum of 120 seconds.

Command Modes

Global configuration

Command History

Release	Modification
12.0(29)S	This command was introduced.
12.3(14)T	This command was integrated into Cisco IOS Release 12.3(14)T.
12.2(28)SB	This command was integrated into Cisco IOS Release 12.2(28)SB and implemented on the Cisco 10000 series routers.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.

Usage Guidelines

The amount of time a router waits for an LDP session to be reestablished is the lesser of the following values:

- The value of the peers Fault Tolerant (FT) Type Length Value (TLV) Reconnect Timeout
- The value of the neighbor liveness timer

If the router cannot reestablish an LDP session with the neighbor in the time allotted, the router deletes the stale label-FEC bindings received from that neighbor.

Examples

The command in the following example sets the amount of time that the router should wait for an LDP session to be reestablished to 30 seconds:

```
Router(config)# mpls ldp graceful-restart timers neighbor-liveness 30
```

Related Commands

Command	Description
mpls ldp graceful-restart timers forwarding-holding	Specifies the amount of time the MPLS forwarding state should be preserved after the control plane restarts.
mpls ldp graceful-restart timers max-recovery	Specifies the amount of time a router should hold stale label-FEC bindings after an LDP session has been reestablished.

show mpls ip binding

To display specified information about label bindings learned by the Multiprotocol Label Switching (MPLS) Label Distribution Protocol (LDP), use the **show mpls ip binding** command in user EXEC or privileged EXEC mode.

show mpls ip binding [**vrf** *vrf-name* | **all**] [*network* {*mask* | *length*} [**longer-prefixes**]] [**neighbor** *address* | **local**] [**local-label** {**atm** *vpi vci* | *label* [**-** *label*]}] [**remote-label** {**atm** *vpi vci* | *label* [**-** *label*]}] [**interface** *interface*] [**generic** | **atm**]

show mpls ip binding [**vrf** *vrf-name* | **all**] [**detail** | **summary**]

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show mpls ip binding [*network* {*mask* | *length*} [**longer-prefixes**]] [**neighbor** *address* | **local**] [**local-label** *label* [**-** *label*]] [**remote-label** *label* [**-** *label*]] [**generic**]

show mpls ip binding [**detail** | **summary**]

Syntax Description

vrf *vrf-name*	(Optional) Displays the LDP neighbors for the specified Virtual Private Network (VPN) routing and forwarding (VRF) instance (*vrf-name*). **Note** This keyword and argument pair does not apply to the Cisco 10000 series routers.
all	(Optional) Displays binding information for all VRFs. **Note** This keyword does not apply to the Cisco 10000 series routers.
network	(Optional) Defines the destination network number.
mask	(Optional) Defines the network mask, written as A.B.C.D.
length	(Optional) Defines the mask length (1 to 32 characters).
longer-prefixes	(Optional) Selects any prefix that matches the *mask* with a *length* from 1 to 32 characters.
neighbor *address*	(Optional) Displays label bindings assigned by the selected neighbor.
local	(Optional) Displays the local label bindings.
local-label atm *vpi vci*	(Optional) Displays the entry with the locally assigned ATM label that matches the specified ATM label value. The virtual path identifier (VPI) range is 0 to 4095. The virtual channel identifier (VCI) range is 0 to 65535. **Note** These keywords and arguments do not apply to the Cisco 10000 series routers.
local-label *label* **-** *label*	(Optional) Displays entries with locally assigned labels that match the specified label values. Use the *label* **-** *label* arguments and keyword to indicate the label range. The hyphen (**-**) keyword is required for a label range.
remote-label atm *vpi vci*	(Optional) Displays entries with remotely assigned ATM label values learned from neighbor routers that match the specified ATM label value. The VPI range is 0 to 4095. The VCI range is 0 to 65535. **Note** These keywords and arguments do not apply to the Cisco 10000 series routers.

remote-label *label* **-** *label*	(Optional) Displays entries with remotely assigned labels learned from neighbor routers that match the specified label values. Use the *label* **-** *label* arguments and keyword to indicate the label range. The hyphen (**-**) keyword is required for a label range.
interface *interface*	(Optional) Displays label bindings associated with the specified interface (for label-controlled (LC)-ATM only). **Note** This keyword and argument pair does not apply to the Cisco 10000 series routers.
generic	(Optional) Displays only generic (non-LC-ATM) label bindings.
atm	(Optional) Displays only LC-ATM label bindings. **Note** This keyword does not apply to the Cisco 10000 series routers.
detail	(Optional) Displays detailed information about label bindings learned by LDP.
summary	(Optional) Displays summary information about label bindings learned by LDP.

Defaults

All label bindings are displayed when no optional arguments or keywords are specified.

Command Modes

User EXEC
Privileged EXEC

Command History

Release	Modification
12.0(10)ST	This command was introduced.
12.0(14)ST	This command was modified to reflect MPLS VPN support for LDP.
12.1(2)T	This command was integrated into Cisco IOS Release 12.1(2)T.
12.1(8a)E	This command was integrated into Cisco IOS Release 12.1(8a)E.
12.2(2)T	This command was integrated into Cisco IOS Release 12.2(2)T.
12.2(4)T	The VPI range of values was extended to 4095.
12.2(8)T	This command was integrated into Cisco IOS Release 12.2(8)T.
12.0(21)ST	This command was integrated into Cisco IOS Release 12.0(21)ST.
12.0(22)S	This command was integrated into Cisco IOS Release 12.0(22)S.
12.0(23)S	This command was integrated into Cisco IOS Release 12.0(23)S.
12.2(13)T	This command was integrated into Cisco IOS Release 12.2(13)T.
12.2(14)S	This command was integrated into Cisco IOS Release 12.2(14)S.
12.2(25)S	The **detail** keyword was added to display checkpoint status for local label bindings.
12.2(28)SB	This command was integrated into Cisco IOS Release 12.2(28)SB and implemented on the Cisco 10000 series routers.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.

Usage Guidelines

The **show mpls ip binding** command displays label bindings learned by LDP or the Tag Distribution Protocol (TDP).

Note TDP is not supported for LDP features in Cisco IOS 12.0(30)S and later releases, 12.2(27)SBC and later 12.2S releases, and 12.3(14)T and later releases.

To summarize information about label bindings learned by LDP, use the **show mpls ip binding summary** command in user EXEC or privileged EXEC mode.

A request can specify that the entire database be displayed, that a summary of entries from the database be displayed, or that the display be limited to a subset of entries. The subset can be limited according to any of the following:

- Prefix
- Input or output label values or ranges
- Neighbor advertising the label
- Interface for label bindings of interest (LC-ATM only)

  Note LC-ATM label binding interface does not apply to the Cisco 10000 series routers.

- Generic (non-LC-ATM) label bindings
- LC-ATM label bindings

  Note LC-ATM label binding interface does not apply to the Cisco 10000 series routers.

Examples

The following is sample output from the **show mpls ip binding** command. The output shows all the label bindings in the database.

```
Router# show mpls ip binding

  10.0.0.0/8
        in label:     20
        out label:    26        lsr: 10.0.0.55:0
        out vc label: 1/80      lsr: 10.0.7.7:2      ATM1/0.8
                      Active    ingress 3 hops (vcd 49)
  172.16.0.0/8
        in label:     25
        in vc label:  1/36      lsr: 10.0.7.7:2      ATM1/0.8
                      Active    egress (vcd 55)
        out label:    imp-null  lsr: 10.0.0.55:0     inuse
  192.168.0.66/32
        in label:     26
        in vc label:  1/39      lsr: 10.0.7.7:2      ATM1/0.8
                      Active    egress (vcd 58)
        out label:    16        lsr: 10.0.0.55:0     inuse
        .
        .
        .
```

In the following example, a request is made for the display of the label binding information for prefix 192.168.44.0/24:

```
Router# show mpls ip binding 192.168.44.0 24

  192.168.44.0/24
        in label:     24
        in vc label:  1/37      lsr: 10.0.7.7:2      ATM1/0.8
                      Active    egress (vcd 56)
        out label:    imp-null  lsr: 10.0.0.55:0     inuse
Router#
```

In the following example, the **local-label** keyword is used to request that label binding information be displayed for the prefix with local label 58:

```
Router# show mpls ip binding local-label 58

  192.168.0.0/16
        in label:     58
        out label:    imp-null  lsr: 10.0.0.55:0     inuse
Router#
```

The following sample output shows the label bindings for the VPN routing and forwarding instance named vpn1:

```
Router# show mpls ip binding vrf vpn1

  10.3.0.0/16
        in label:    117
        out label:   imp-null  lsr:10.14.14.14:0
  10.13.13.13/32
        in label:    1372
        out label:   268       lsr:10.14.14.14:0
  10.14.14.14/32
        in label:    118
        out label:   imp-null  lsr:10.14.14.14:0
  10.15.15.15/32
        in label:    1370
        out label:   266       lsr:10.14.14.14:0
  10.16.16.16/32
        in label:    8370
        out label:   319       lsr:10.14.14.14:0
  10.18.18.18/32
        in label:    21817
        out label:   571       lsr:10.14.14.14:0
  30.2.0.0/16
        in label:    6943
        out label:   267       lsr:10.14.14.14:0
  10.30.3.0/16
        in label:    2383
        out label:   imp-null  lsr:10.14.14.14:0
  10.30.4.0/16
        in label:    77
        out label:   imp-null  lsr:10.14.14.14:0
  10.30.5.0/16
        in label:    20715
        out label:   504       lsr:10.14.14.14:0
  10.30.7.0/16
        in label:    17
        out label:   imp-null  lsr:10.14.14.14:0
  10.30.10.0/16
        in label:    5016
        out label:   269       lsr:10.14.14.14:0
  10.30.13.0/16
```

```
        in label:    76
        out label:   imp-null  lsr:10.14.14.14:0
```

The following sample output shows label binding information for all VRFs:

```
Router# show mpls ip binding all

  10.0.0.0/24
        in label:     imp-null
        out label:    imp-null  lsr: 10.131.0.1:0
  10.11.0.0/24
        in label:     imp-null
        out label:    imp-null  lsr: 10.131.0.1:0
  10.101.0.1/32
        out label:    imp-null  lsr: 10.131.0.1:0
  10.131.0.1/32
        in label:     20
        out label:    imp-null  lsr: 10.131.0.1:0      inuse
  10.134.0.1/32
        in label:     imp-null
        out label:    16        lsr: 10.131.0.1:0
VRF vrf1:
  10.0.0.0/24
        out label:    imp-null  lsr: 10.132.0.1:0
  10.11.0.0/24
        out label:    imp-null  lsr: 10.132.0.1:0
  10.12.0.0/24
        in label:     17
        out label:    imp-null  lsr: 10.132.0.1:0
  10.132.0.1/32
        out label:    imp-null  lsr: 10.132.0.1:0
  10.134.0.2/32
        in label:     18
        out label:    16        lsr: 10.132.0.1:0
  10.134.0.4/32
        in label:     19
        out label:    17        lsr: 10.132.0.1:0
  10.138.0.1/32
        out label:    imp-null  lsr: 10.132.0.1:0
```

Cisco 10000 Series Examples Only

The following sample shows binding information for a Cisco 10000 series router:

```
Router# show mpls ip binding

  0.0.0.0/0
        in label:     imp-null
  10.29.0.0/16
        in label:     imp-null
        out label:    imp-null  lsr: 10.66.66.66:0
        out label:    imp-null  lsr: 10.44.44.44:0
  10.20.0.0/24
        in label:     imp-null
        out label:    26        lsr: 10.66.66.66:0
        out label:    imp-null  lsr: 10.44.44.44:0
  10.30.0.0/24
        in label:     imp-null
        out label:    imp-null  lsr: 10.66.66.66:0
        out label:    18        lsr: 10.44.44.44:0
  10.44.44.44/32
        in label:     21
        out label:    19        lsr: 10.66.66.66:0
```

```
        in label:     imp-null
        out label:    26        lsr: 10.66.66.66:0
        out label:    imp-null  lsr: 10.44.44.44:0
  10.30.0.0/24
        in label:     imp-null
        out label:    imp-null  lsr: 10.66.66.66:0
        out label:    18        lsr: 10.44.44.44:0
  10.44.44.44/32
        in label:     21
        out label:    19        lsr: 10.66.66.66:0
        out label:    imp-null  lsr: 10.44.44.44:0    inuse
  10.55.55.55/32
        in label:     imp-null
        out label:    25        lsr: 10.66.66.66:0
        out label:    55        lsr: 10.44.44.44:0
  10.66.66.66/32
        in label:     18
        out label:    imp-null  lsr: 10.66.66.66:0    inuse
        out label:    16        lsr: 10.44.44.44:0
  10.255.254.244/32
        in label:     24
        out label:    16        lsr: 10.66.66.66:0
        out label:    59        lsr: 10.44.44.44:0
```

In the following example on a Cisco 10000 series router, a request is made for the display of the label binding information for prefix 172.16.44.44/32:

```
Router# show mpls ip binding 172.16.44.44 32

  172.16.44.44/32
        in label:     21
        out label:    19        lsr: 10.66.66.66:0
        out label:    imp-null  lsr: 10.44.44.44:0    inuse
```

In the following example on a Cisco 10000 series router, the **local-label** keyword is used to request that label binding information be displayed for the prefix with local label 21:

```
Router# show mpls ip binding local-label 21

  10.44.44.44/32
        in label:     21
```

Table 2 describes the significant fields shown in the displays.

Table 2 show mpls ip binding Field Descriptions

Field	Description
172.16.44.44/32	Destination prefix. Indicates that the following lines are for a particular destination (network/mask).
in label	Incoming label. This is the local label assigned by the label switch router (LSR) and advertised to other LSRs. The label value imp-null indicates the well-known Implicit NULL label.
out label	Outgoing label. This is a remote label learned from an LDP neighbor. The neighbor is identified by its LDP ID in the lsr field.
inuse	Indicates that the outgoing label is in use for Multiprotocol Label Switching (MPLS) forwarding, that is, it is installed in the MPLS forwarding table (the Label Forwarding Information Base [LFIB]).

Table 2 show mpls ip binding Field Descriptions (continued)

Field	Description
in vc label	Incoming MPLS ATM label. This is the local VPI/VCI assigned by the LSR as the incoming label for the destination and advertised to the upstream LSRs. **Note** This field applies to the Cisco 7000 series routers only.
out vc label	Outgoing MPLS ATM label. This is the VPI/VCI learned from the destination next hop as its label for the destination and advertised to this LSR. **Note** This field applies to the Cisco 7000 series routers only.
ATM1/0.8	The ATM interface with which the MPLS ATM label is associated. **Note** This field applies to the Cisco 7000 series routers only.
Active	State of the label VC (LVC) associated with the destination prefix. **Note** This field applies to the Cisco 7000 series routers only. States are the following: • Active. Established and operational. • Bindwait. Waiting for a response from the destination next hop. • Remote Resource Wait. Waiting for resources (VPI/VCI) to become available on the destination next hop. • Parent Wait. Transit LVC upstream side waiting for downstream side to become active. • AbortAckWait. Waiting for response to a Label Abort message sent to the destination next hop. • ReleaseWait. Waiting for response to a Label Withdraw message sent to an upstream neighbor.
vcd 49	Virtual circuit descriptor number for the LVC. **Note** This field applies to the Cisco 7000 series routers only.
ingress 3 hops	Indicates whether the LSR is an ingress, transit, or egress node for the destination. **Note** This field applies to the Cisco 7000 series routers only. Options include the following: • Ingress 3 hops. The LSR is an ingress edge router for the MPLS ATM cloud for the destination. • Egress. The LSR is an egress edge router for the MPLS ATM cloud for the destination. • Transit. The LSR is a transit LSR within the MPLS ATM cloud for the destination.

The following sample output displays detailed information about the label bindings:

```
Router# show mpls ip binding detail

  10.0.0.0/8, rev 2, chkpt: add-skipped
        in label:     imp-null   (owner LDP)
          Advertised to:
          10.60.60.60:0          10.30.30.30:0
        out label:    imp-null  lsr: 10.60.60.60:0
        out label:    imp-null  lsr: 10.30.30.30:0
  10.10.10.10/32, rev 18, chkpt: added
        in label:     17         (owner LDP)
          Advertised to:
          10.60.60.60:0          10.30.30.30:0
        out label:    142       lsr: 10.60.60.60:0
        out label:    19        lsr: 10.30.30.30:0    inuse
  10.0.0.1/32, rev 10, chkpt: add-skipped
        in label:     imp-null   (owner LDP)
          Advertised to:
          10.60.60.60:0          10.30.30.30:0
        out label:    21        lsr: 10.60.60.60:0
        out label:    17        lsr: 10.30.30.30:0
  10.30.30.30/32, rev 20, chkpt: added
        in label:     18         (owner LDP)
          Advertised to:
          10.60.60.60:0          10.30.30.30:0
        out label:    22        lsr: 10.60.60.60:0
```

Table 3 describes the significant fields shown in the display.

Table 3 show mpls ip binding detail Field Descriptions

Field	Description
chkpt	The status of the checkpointed entry. • add-skipped—Means that the local label is a null label and does not need to be checkpointed. • added— Means that the checkpoints entry was copied to the backup Route Processor (RP)
owner	The application that created the binding. • owner LDP—Means that LDP created the binding. • owner other—Means that another application created the binding, possibly Border Gateway protocol (BGP).
Advertised to	The LSRs that received the local label binding.
inuse or stale	The status of the label. • inuse—Indicates that the outgoing label is in use for MPLS forwarding, that is, it is installed in the MPLS forwarding table (LFIB). • stale—Indicates a label that is no longer in use. This happens when an LDP session is lost and the routers begin a graceful restart. Then the remote label bindings are marked stale.

Cisco 7000 Series Example Only

The following sample output shows summary information about the label bindings learned by LDP:

```
Router# show mpls ip binding summary

Total number of prefixes: 53

Generic label bindings
                     assigned        learned
       prefixes      in labels     out labels
             53             53             51

ATM label bindings summary
      interface   total  active   local  remote   Bwait   Rwait  IFwait
       ATM1/0.8      47      47      40       7       0       0       0
Router#
```

Table 4 describes the significant fields shown in the display.

Table 4 show mpls ip binding summary Field Descriptions (Cisco 7000 Series Example)

Field	Description
Total number of prefixes	Number of destinations for which the LSR has label bindings.
Generic label bindings	Indicates the start of summary information for “generic” label bindings. Generic labels are used for MPLS forwarding on all interface types except MPLS ATM interfaces.
prefixes	Number of destinations for which the LSR has a generic label binding.
assigned in labels	Number of prefixes for which the LSR has assigned an incoming (local) label.
learned out labels	Number of prefixes for which the LSR has learned an outgoing (remote) label from an LDP neighbor.
ATM label bindings summary	Indicates the start of summary information for MPLS ATM label bindings. An ATM label is a VPI/VCI.
interface	Indicates a row in the ATM label bindings summary table. The summary information in the row is for ATM labels associated with this interface.
total	Total number of ATM labels associated with the interface.
active	Number of ATM labels (LVCs) in the active (operational) state.
local	Number of ATM labels assigned by this LSR for the interfaces. These are incoming labels.
remote	Number of ATM labels learned from the neighbor LSR for this interface. These are outgoing labels.
Bwait	Number of bindings (LVCs) waiting for a label assignment from the neighbor LSR for the interface.
Rwait	Number of bindings (LVCs) waiting for resources (VPI/VCIs) to become available on the neighbor LSR for the interface.
IFwait	Number of bindings (LVCs) waiting for labels to be installed for switching use.

Cisco 10000 Series Example Only

The following sample output displays summary information about the label bindings learned by LDP:

```
Router# show mpls ip binding summary

Total number of prefixes: 53

Generic label bindings
                     assigned        learned
       prefixes      in labels     out labels
             53             53             51
```

Table 5 describes the significant fields shown in the display.

Table 5 show mpls ip binding summary Field Descriptions (Cisco 10000 Series Example)

Field	Description
Total number of prefixes	Number of destinations for which the LSR has label bindings.
Generic label bindings	Indicates the start of summary information for "generic" label bindings. Generic labels are used for MPLS forwarding on all interface types except MPLS ATM interfaces.
prefixes	Number of destinations for which the LSR has a generic label binding.
assigned in labels	Number of prefixes for which the LSR has assigned an incoming (local) label.
learned out labels	Number of prefixes for which the LSR has learned an outgoing (remote) label from an LDP neighbor.

Related Commands

Command	Description
show mpls atm-ldp bindings	Displays specified entries from the ATM label binding database.
show mpls ldp bindings	Displays the contents of the LIB.

show mpls ldp bindings

To display the contents of the Label Information Base (LIB), use the **show mpls ldp bindings** command in user EXEC or privileged EXEC mode:

show mpls ldp bindings [**vrf** *vrf-name* | **all**] [*network* {*mask* | *length*} [**longer-prefixes**]] [**local-label** *label* [**-** *label*]] [**remote-label** *label* [**-** *label*]] [**neighbor** *address* | **local**] [**detail**]

Syntax Description

vrf *vrf-name*	(Optional) Displays the label bindings for the specified Virtual Private Network (VPN) routing and forwarding (VRF) instance (*vrf-name*).
all	(Optional) Displays LIB information for all VPNs.
network	(Optional) Defines the destination network number.
mask	(Optional) Specifies the network mask, written as A.B.C.D.
length	(Optional) Specifies the mask length (1 to 32 characters).
longer-prefixes	(Optional) Selects any prefix that matches *mask* with a *length* from 1 to 32 characters.
local-label *label* **-** *label*	(Optional) Display entries matching local label values. Use the *label* **-** *label* arguments and keyword to indicate the label range. The hyphen (**-**) keyword is required for a label range.
remote-label *label* **-** *label*	(Optional) Displays entries matching the label values assigned by a neighbor router. Use the *label* **-** *label* arguments and keyword to indicate the label range. The hyphen (**-**) keyword is required for a label range.
neighbor *address*	(Optional) Displays the label bindings assigned by the selected neighbor.
local	(Optional) Displays the local label bindings.
detail	(Optional) Displays the checkpoint status of the local label bindings.

Defaults

If no optional keywords or arguments are supplied, the command displays the LIB for the default routing domain only.

Command Modes

User EXEC
Privileged EXEC

Command History

Release	Modification
11.1CT	This command was introduced.
12.0(10)ST	This command was modified to reflect Multiprotocol Label Switching (MPLS) Internet Engineering Task Force (IETF) command syntax and terminology.
12.0(14)ST	This command was modified to reflect MPLS Virtual Private Network (VPN) support for Label Distribution Protocol (LDP).
12.1(2)T	This command was integrated into Cisco IOS Release 12.1(2)T.
12.1(8a)E	This command was integrated into Cisco IOS Release 12.1(8a)E.
12.2(2)T	This command was integrated into Cisco IOS Release 12.2(2)T.

Release	Modification
12.2(4)T	This command was integrated into Cisco IOS Release 12.2(4)T.
12.2(8)T	This command was integrated into Cisco IOS Release 12.2(8)T.
12.0(21)ST	This command was integrated into Cisco IOS Release 12.0(21)ST.
12.0(22)S	This command was integrated into Cisco IOS Release 12.0(22)S.
12.0(23)S	This command was integrated into Cisco IOS Release 12.0(23)S.
12.2(13)T	This command was integrated into Cisco IOS Release 12.2(13)T.
12.2(14)S	This command was integrated into Cisco IOS Release 12.2(14)S.
12.2(25)S	The **detail** keyword was added.
12.2(28)SB	This command was integrated into Cisco IOS Release 12.2(28)SB and implemented on the Cisco 10000 series routers.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.

Usage Guidelines

The **show mpls ldp bindings** command displays label bindings learned by the LDP or Tag Distribution Protocol (TDP).

Note TDP is not supported for LDP features in Cisco IOS 12.0(30)S and later releases, 12.2(27)SBC and later 12.2S releases, and 12.3(14)T and later releases.

A request can specify that the entire database be displayed, or that the display be limited to a subset of entries according to the following:

- Prefix
- Input or output label values or ranges
- Neighbor advertising the label

Note The **show mpls ip binding** command includes the output generated by the **show mpls ldp bindings** command. On the Cisco 7000 series router, this command displays information about label bindings for LC-ATM interfaces.

Examples

The following is sample output from the **show mpls ldp bindings** command. This form of the command displays the contents of the LIB for the default routing domain.

```
Router# show mpls ldp bindings

  10.0.0.0/8, rev 9
        local binding:  label: imp-null
        remote binding: lsr: 10.10.0.55:0, label: 17
        remote binding: lsr: 10.66.0.66:0, label: 18
        remote binding: lsr: 10.0.0.44:0, label: imp-null
  172.16.0.0/8, rev 17
        local binding:  label: 19
        remote binding: lsr: 10.0.0.55:0, label: imp-null
        remote binding: lsr: 10.66.0.66:0, label: 16
        remote binding: lsr: 10.0.0.44:0, label: imp-null
  192.168.0.66/32, rev 19
        local binding:  label: 20
```

```
        remote binding: lsr: 10.0.0.55:0, label: 19
        remote binding: lsr: 10.66.0.66:0, label: imp-null
        remote binding: lsr: 10.0.0.44:0, label: 18
        .
        .
        .
```

The following is sample output from the **show mpls ldp bindings** *network length* **longer-prefixes neighbor** *address* variant of the command; it displays labels learned from label switch router (LSR) 10.144.0.44 for network 10.166.0.0 and any of its subnets. The use of the **neighbor** keyword suppresses the output of local labels and labels learned from other neighbors.

```
Router# show mpls ldp bindings 10.166.0.0 8 longer-prefixes neighbor 10.144.0.44

  10.166.44.0/16, rev 31
        remote binding: lsr: 10.144.0.44:0, label: 25
  10.166.45.0/16, rev 33
        remote binding: lsr: 10.144.0.44:0, label: 26
  10.166.245.0/16, rev 71
        remote binding: lsr: 10.144.0.44:0, label: 45
  10.166.246.0/16, rev 73
        remote binding: lsr: 10.144.0.44:0, label: 46
.
.
.
```

The following is sample output from the **show mpls ldp bindings vrf vpn1** command, which displays the label bindings for the specified VPN routing and forwarding instance named vpn1:

```
Router# show mpls ldp bindings vrf vpn1

  10.3.3.0/16, rev 164
        local binding: label:117
        remote binding:lsr:10.14.14.14:0, label:imp-null
  10.13.13.13/32, rev 1650
        local binding: label:1372
        remote binding:lsr:10.14.14.14:0, label:268
  10.14.14.14/32, rev 165
        local binding: label:118
        remote binding:lsr:10.14.14.14:0, label:imp-null
  10.15.15.15/32, rev 1683
        local binding: label:1370
        remote binding:lsr:10.14.14.14:0, label:266
  10.16.16.16/32, rev 775
        local binding: label:8370
        remote binding:lsr:10.14.14.14:0, label:319
  10.18.18.18/32, rev 1655
        local binding: label:21817
        remote binding:lsr:10.14.14.14:0, label:571
  10.30.2.0/16, rev 1653
        local binding: label:6943
        remote binding:lsr:10.14.14.14:0, label:267
  10.30.3.0/16, rev 413
        local binding: label:2383
        remote binding:lsr:10.14.14.14:0, label:imp-null
  10.30.4.0/16, rev 166
        local binding: label:77
        remote binding:lsr:10.14.14.14:0, label:imp-null
  10.30.5.0/16, rev 1429
        local binding: label:20715
        remote binding:lsr:10.14.14.14:0, label:504
  10.30.7.0/16, rev 4
        local binding: label:17
```

```
        remote binding:lsr:10.14.14.14:0, label:imp-null
  10.30.10.0/16, rev 422
        local binding: label:5016
        remote binding:lsr:10.14.14.14:0, label:269
.
.
.
```

The following is sample output from the **show mpls ldp bindings all** command, which displays the label bindings for all VRFs:

```
Router# show mpls ldp bindings all

  lib entry: 10.0.0.0/24, rev 4
        local binding:  label: imp-null
        remote binding: lsr: 10.131.0.1:0, label: imp-null
  lib entry: 10.11.0.0/24, rev 15
        local binding:  label: imp-null
        remote binding: lsr: 10.131.0.1:0, label: imp-null
  lib entry: 10.101.0.1/32, rev 18
        remote binding: lsr: 10.131.0.1:0, label: imp-null
  lib entry: 10.131.0.1/32, rev 17
        local binding:  label: 20
        remote binding: lsr: 10.131.0.1:0, label: imp-null
  lib entry: 10.134.0.1/32, rev 6
        local binding:  label: imp-null
        remote binding: lsr: 10.131.0.1:0, label: 16
VRF vrf1:
  lib entry: 10.0.0.0/24, rev 6
        remote binding: lsr: 10.132.0.1:0, label: imp-null
  lib entry: 10.11.0.0/24, rev 7
        remote binding: lsr: 10.132.0.1:0, label: imp-null
  lib entry: 10.12.0.0/24, rev 8
        local binding:  label: 17
        remote binding: lsr: 10.132.0.1:0, label: imp-null
  lib entry: 10.132.0.1/32, rev 4
        remote binding: lsr: 10.132.0.1:0, label: imp-null
  lib entry: 10.134.0.2/32, rev 9
        local binding:  label: 18
        remote binding: lsr: 10.132.0.1:0, label: 16
  lib entry: 10.134.0.4/32, rev 10
        local binding:  label: 19
        remote binding: lsr: 10.132.0.1:0, label: 17
  lib entry: 10.138.0.1/32, rev 5
        remote binding: lsr: 10.132.0.1:0, label: imp-null
```

The following is sample output from the **show mpls ldp bindings detail** command:

```
Router# show mpls ldp bindings detail

lib entry: 10.3.3.0/16, rev 2,
        local binding:  label: imp-null
          Advertised to:
          10.20.20.20:0          10.25.25.25:0
        remote binding: lsr: 10.20.20.20:0, label: imp-null  stale
        remote binding: lsr: 10.25.25.25:0, label: imp-null  stale
  lib entry: 10.13.1.0/24, rev 4,
        local binding:  label: imp-null
          Advertised to:
          10.20.20.20:0          10.25.25.25:0
        remote binding: lsr: 10.20.20.20:0, label: imp-null  stale
        remote binding: lsr: 10.25.25.25:0, label: 16  stale
  lib entry: 10.13.2.0/24, rev 6,
        local binding:  label: imp-null
```

```
        Advertised to:
        10.20.20.20:0          10.25.25.25:0
      remote binding: lsr: 10.20.20.20:0, label: 16  stale
      remote binding: lsr: 10.25.25.25:0, label: imp-null  stale
lib entry: 10.6.1.0/24, rev 22,
      local binding:  label: 21
        Advertised to:
        10.20.20.20:0          10.25.25.25:0
      remote binding: lsr: 10.20.20.20:0, label: 19  stale
      remote binding: lsr: 10.25.25.25:0, label: imp-null  stale
```

Table 6 describes the significant fields shown in the display.

Table 6 show mpls ldp bindings Field Descriptions

Field	Description
10.3.3.0/16	IP prefix and mask for a particular destination (network/mask).
rev 9	Revision number that is used internally to manage label distribution for this destination.
Advertised to	The LSRs that received the label binding.
local binding	Labels assigned by the local LSR.
remote binding	List of outgoing labels for this destination learned from other LSRs. Each item in this list identifies the LSR from which the outgoing label was learned and the label itself. The LSR is identified by its LDP identifier.
stale	After an LDP session is lost and the routers begin a graceful restart, the remote label bindings are marked stale.

Related Commands

Command	Description
show mpls ip binding	Displays specified information about label bindings learned by the MPLS LDP.
show mpls ldp neighbor	Displays the status of LDP sessions.

show mpls ldp graceful-restart

To display a summary of the Label Distribution Protocol (LDP) Graceful Restart status, use the **show mpls ldp graceful-restart** command in user EXEC or privileged EXEC mode.

show mpls ldp graceful-restart

Syntax Description

This command has no arguments or keywords.

Command Modes

User EXEC
Privileged EXEC

Command History

Release	Modification
12.0(29)S	This command was introduced.
12.2(25)S	This command was integrated into Cisco IOS Release 12.2(25)S.
12.3(14)T	This command was integrated into Cisco IOS Release 12.3(14)T.
12.2(28)SB	This command was integrated into Cisco IOS Release 12.2(28)SB and implemented on the Cisco 10000 series routers.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.

Usage Guidelines

This command shows the following information about LDP sessions:

- Configured parameters.
- The state of the LDP sessions (for which Graceful Restart was negotiated during initialization).
- The list of LDP sessions for which graceful recovery is pending. However, the router has retained the state information from those neighbors.

Examples

The following example shows a summary of the LDP Graceful Restart settings and configuration:

```
Router# show mpls ldp graceful-restart

LDP Graceful Restart is enabled
Neighbor Liveness Timer: 5 seconds
Max Recovery Time: 200 seconds
Down Neighbor Database (0 records):
Graceful Restart-enabled Sessions:
VRF default:
    Peer LDP Ident: 10.18.18.18:0, State: estab
    Peer LDP Ident: 10.17.17.17:0, State: estab
```

Table 7 describes the significant fields shown in the display.

Table 7 show mpls ldp graceful-restart Field Descriptions

Field	Description
Neighbor Liveness Timer	The number of seconds the neighbor liveness timer is set for.
Max Recovery Time	The number of seconds the maximum recovery timer is set for.
Down Neighbor Database	Information about the down (failed or restarting) LDP neighbor.
Graceful Restart-enabled Sessions	Information about the LDP sessions that are enabled for Graceful Restart.
Peer LDP Ident	The LDP ID of the provider edge (PE) neighbor.
State	The state of the session with the neighbor.

Related Commands

Command	Description
show mpls ldp neighbor	Displays the status of LDP sessions.

show mpls ldp neighbor

To display the status of Label Distribution Protocol (LDP) sessions, use the **show mpls ldp neighbor** command in user EXEC or privileged EXEC mode.

show mpls ldp neighbor [**all** | **vrf** *vrf-name*] [*address* | *interface*] [**detail**] [**graceful-restart**]

Syntax Description

all	(Optional) Displays LDP neighbor information for all VPNs, including those in the default routing domain.
vrf *vrf-name*	(Optional) Displays the LDP neighbors for the specified Virtual Private Network (VPN) routing and forwarding (VRF) instance (*vrf-name*).
address	(Optional) Identifies the neighbor with this IP address.
interface	(Optional) Defines the LDP neighbors accessible over this interface.
detail	(Optional) Displays information in long form.
graceful-restart	(Optional) Displays per-neighbor graceful restart information.

Defaults

This command displays information about LDP neighbors for the default routing domain if an optional **vrf** keyword is not specified.

Command Modes

User EXEC
Privileged EXEC

Command History

Release	Modification
11.1CT	This command was introduced.
12.0(10)ST	This command was integrated into Cisco IOS Release 12.0(10)ST. The command was modified to reflect Multiprotocol Label Switching (MPLS) Internet Engineering Task Force (IETF) command syntax and terminology.
12.0(14)ST	This command was modified to reflect MPLS VPN support for LDP. The **vrf** and **all** keywords were added.
12.1(8a)E	This command was integrated into Cisco IOS Release 12.1(8a)E.
12.2(2)T	This command was integrated into Cisco IOS Release 12.2(2)T.
12.2(8)T	This command was modified to reflect MPLS VPN support for LDP. The **vrf** and **all** keywords were added.
12.0(22)S	This command was integrated into Cisco IOS Release 12.0(22)S.
12.2(13)T	This command was integrated into Cisco IOS Release 12.2(13)T.
12.2(14)S	This command was integrated into Cisco IOS Release 12.2(14)S.
12.0(26)S	The **detail** keyword was updated to display information about inbound filtering.
12.2(25)S	The **graceful-restart** keyword was added.
12.3(14)T	The command output was updated so that the **detail** keyword displays information about MPLS LDP Session Protection.

Release	Modification
12.2(18)SXE	This command was integrated into the Cisco IOS Release 12.2(18)SXE.
12.2(28)SB	The **detail** keyword was updated to include Message Digest 5 (MD5) password information and the command was implemented on the Cisco 10000 series routers for Cisco IOS Release 12.2(28)SB.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.

Usage Guidelines

The **show mpls ldp neighbor** command can provide information about all LDP neighbors, or the information can be limited to the following:

- Neighbor with specific IP address
- LDP neighbors known to be accessible over a specific interface

Note This command displays information about LDP and Tag Distribution Protocol (TDP) neighbor sessions.

Examples

The following is sample output from the **show mpls ldp neighbor** command:

```
Router# show mpls ldp neighbor

Peer LDP Ident: 10.0.7.7:2; Local LDP Ident 10.1.1.1:1
        TCP connection: 10.0.7.7.11032 - 10.1.1.1.646
        State: Oper; Msgs sent/rcvd: 5855/6371; Downstream on demand
        Up time: 13:15:09
        LDP discovery sources:
          ATM3/0.1
Peer LDP Ident: 10.1.1.1:0; Local LDP Ident 10.1.1.1:0
        TCP connection: 10.1.1.1.646 - 10.1.1.1.11006
        State: Oper; Msgs sent/rcvd: 4/411; Downstream
        Up time: 00:00:52
        LDP discovery sources:
          Ethernet1/0/0
        Addresses bound to peer LDP Ident:
          10.0.0.29       10.1.1.1        10.0.0.199      10.10.1.1
          10.205.0.9
```

The following is sample output from the **show mpls ldp neighbor vrf vpn10** command, which displays the LDP neighbor information for the specified VPN routing and forwarding instance named vpn10:

```
Router# show mpls ldp neighbor vrf vpn10

Peer LDP Ident:10.14.14.14:0; Local LDP Ident 10.29.0.2:0
        TCP connection:10.14.14.14.646 - 10.29.0.2.11384
        State:Oper; Msgs sent/rcvd:1423/800; Downstream
        Up time:02:38:11
        LDP discovery sources:
          ATM3/0/0.10
        Addresses bound to peer LDP Ident:
          10.3.36.9       10.7.0.1        10.14.14.14     10.13.0.1
          10.15.0.1       10.17.0.1       10.19.0.1       10.21.0.1
          10.23.0.1       10.25.0.1       10.27.0.1       10.29.0.1
          10.31.0.1       10.33.0.1       10.35.0.1       10.37.0.1
          10.39.0.1       10.41.0.1       10.43.0.1       10.45.0.1
          10.47.0.1       10.49.0.1       10.51.0.1       10.53.0.1
          10.55.0.1       10.57.0.1       10.59.0.1       10.61.0.1
          10.63.0.1       10.65.0.1       10.67.0.1       10.69.0.1
```

```
          10.71.0.1       10.73.0.1       10.75.0.1       10.77.0.1
          10.79.0.1       10.81.0.1       10.83.0.1       10.85.0.1
          10.87.0.1       10.89.0.1       10.91.0.1       10.93.0.1
          10.95.0.1       10.97.0.1       10.99.0.1       10.101.0.1
          10.103.0.1      10.105.0.1      10.107.0.1      10.109.0.1
          10.4.0.2        10.3.0.2
Router#
```

The following is sample output from the **show mpls ldp neighbor all** command, which displays the LDP neighbor information for all VPN routing and forwarding instances, including those in the default routing domain. In this example, note that the same neighbor LDP ID (10.14.14.14) appears in all the listed VRF interfaces, highlighting the fact that the same IP address can coexist in different VPN routing and forwarding instances.

```
Router# show mpls ldp neighbor all

Peer TDP Ident:10.11.11.11:0; Local TDP Ident 10.12.12.12:0
        TCP connection:10.11.11.11.711 - 10.12.12.12.11003
        State:Oper; PIEs sent/rcvd:185/187; Downstream
        Up time:02:40:02
        TDP discovery sources:
          ATM1/1/0.1
        Addresses bound to peer TDP Ident:
          10.3.38.3        10.1.0.2        10.11.11.11
VRF vpn1:
    Peer LDP Ident:10.14.14.14:0; Local LDP Ident 10.7.0.2:0
        TCP connection:10.14.14.14.646 - 10.7.0.2.11359
        State:Oper; Msgs sent/rcvd:952/801; Downstream
        Up time:02:38:49
        LDP discovery sources:
          ATM3/0/0.1
        Addresses bound to peer LDP Ident:
          10.3.36.9       10.7.0.1        10.14.14.14     10.13.0.1
          10.15.0.1       10.17.0.1       10.19.0.1       10.21.0.1
          10.23.0.1       10.25.0.1       10.27.0.1       10.29.0.1
          10.31.0.1       10.33.0.1       10.35.0.1       10.37.0.1
          10.39.0.1       10.41.0.1       10.43.0.1       10.45.0.1
          10.47.0.1       10.49.0.1       10.51.0.1       10.53.0.1
          10.55.0.1       10.57.0.1       10.59.0.1       10.61.0.1
          10.63.0.1       10.65.0.1       10.67.0.1       10.69.0.1
          10.71.0.1       10.73.0.1       10.75.0.1       10.77.0.1
          10.79.0.1       10.81.0.1       10.83.0.1       10.85.0.1
          10.87.0.1       10.89.0.1       10.91.0.1       10.93.0.1
          10.95.0.1       10.97.0.1       10.99.0.1       10.101.0.1
          10.103.0.1      10.105.0.1      10.107.0.1      10.109.0.1
          10.4.0.2        10.3.0.2
VRF vpn2:
    Peer LDP Ident:10.14.14.14:0; Local LDP Ident 10.13.0.2:0
        TCP connection:10.14.14.14.646 - 10.13.0.2.11361
        State:Oper; Msgs sent/rcvd:964/803; Downstream
        Up time:02:38:50
        LDP discovery sources:
          ATM3/0/0.2
        Addresses bound to peer LDP Ident:
          10.3.36.9       10.7.0.1        10.14.14.14     10.13.0.1
          10.15.0.1       10.17.0.1       10.19.0.1       10.21.0.1
          10.23.0.1       10.25.0.1       10.27.0.1       10.29.0.1
          10.31.0.1       10.33.0.1       10.35.0.1       10.37.0.1
          10.39.0.1       10.41.0.1       10.43.0.1       10.45.0.1
          10.47.0.1       10.49.0.1       10.51.0.1       10.53.0.1
          10.55.0.1       10.57.0.1       10.59.0.1       10.61.0.1
          10.63.0.1       10.65.0.1       10.67.0.1       10.69.0.1
          10.71.0.1       10.73.0.1       10.75.0.1       10.77.0.1
```

```
          10.79.0.1       10.81.0.1       10.83.0.1       10.85.0.1
          10.87.0.1       10.89.0.1       10.91.0.1       10.93.0.1
          10.95.0.1       10.97.0.1       10.99.0.1       10.101.0.1
          10.103.0.1      10.105.0.1      10.107.0.1      10.109.0.1
          10.4.0.2        10.3.0.2
VRF vpn3:
    Peer LDP Ident:10.14.14.14:0; Local LDP Ident 10.15.0.2:0
        TCP connection:10.14.14.14.646 - 10.15.0.2.11364
        State:Oper; Msgs sent/rcvd:1069/800; Downstream
        Up time:02:38:52
        LDP discovery sources:
          ATM3/0/0.3
        Addresses bound to peer LDP Ident:
          10.3.36.9       10.17.0.1       10.14.14.14     10.13.0.1
          10.15.0.1       10.17.0.1       10.19.0.1       10.21.0.1
          10.23.0.1       10.25.0.1       10.27.0.1       10.29.0.1
          10.31.0.1       10.33.0.1       10.35.0.1       10.37.0.1
          10.39.0.1       10.41.0.1       10.43.0.1       10.45.0.1
          10.47.0.1       10.49.0.1       10.51.0.1       10.53.0.1
          10.55.0.1       10.57.0.1       10.59.0.1       10.61.0.1
          10.63.0.1       10.65.0.1       10.67.0.1       10.69.0.1
          10.71.0.1       10.73.0.1       10.75.0.1       10.77.0.1
          10.79.0.1       10.81.0.1       10.83.0.1       10.85.0.1
          10.87.0.1       10.89.0.1       10.91.0.1       10.93.0.1
          10.95.0.1       10.97.0.1       10.99.0.1       10.101.0.1
          10.103.0.1      10.105.0.1      10.107.0.1      10.109.0.1
          10.4.0.2        10.3.0.2
VRF vpn4:
    Peer LDP Ident:10.14.14.14:0; Local LDP Ident 10.17.0.2:0
        TCP connection:10.14.14.14.646 - 10.17.0.2.11366
        State:Oper; Msgs sent/rcvd:1199/802; Downstream

Router#
```

The following example shows the Graceful Restart status of the LDP neighbors:

```
Router# show mpls ldp neighbor graceful-restart

Peer LDP Ident: 10.20.20.20:0; Local LDP Ident 10.17.17.17:0
   TCP connection: 10.20.20.20.16510 - 10.17.17.17.646
    State: Oper; Msgs sent/rcvd: 8/18; Downstream
    Up time: 00:04:39
    Graceful Restart enabled; Peer reconnect time (msecs): 120000
Peer LDP Ident: 10.19.19.19:0; Local LDP Ident 10.17.17.17:0
    TCP connection: 10.19.19.19.11007 - 10.17.17.17.646
    State: Oper; Msgs sent/rcvd: 8/38; Downstream
    Up time: 00:04:30
    Graceful Restart enabled; Peer reconnect time (msecs): 120000
```

The following sample output from the **show mpls ldp neighbor detail** command displays information about the MD5 password configuration:

```
Router# show mpls ldp neighbor detail

    Peer LDP Ident: 10.3.3:0; Local LDP Ident 10.1.1.1:0
        TCP connection: 10.3.3.3.11018 - 10.1.1.1.646
        Password: required, neighbor, in use
        State: Oper; Msgs sent/rcvd: 167/167; Downstream; Last TIB rev sent 9
        Up time: 02:24:02; UID: 5; Peer Id 3;
        LDP discovery sources:
          Targeted Hello 10.1.1.1 -> 10.3.3.3, passive;
            holdtime: 90000 ms, hello interval: 10000 ms
        Addresses bound to peer LDP Ident:
          10.3.3.3        10.0.30.3
```

```
    Peer holdtime: 180000 ms; KA interval: 60000 ms; Peer state: estab
Peer LDP Ident: 10.4.4.4:0; Local LDP Ident 10.1.1.1:0
    TCP connection: 10.4.4.4.11017 - 10.1.1.1.646
    Password: not required, none, stale
    State: Oper; Msgs sent/rcvd: 9/9; Downstream; Last TIB rev sent 9
    Up time: 00:05:35; UID: 6; Peer Id 1;
    LDP discovery sources:
      Ethernet1/0; Src IP addr: 10.0.20.4
        holdtime: 15000 ms, hello interval: 5000 ms
    Addresses bound to peer LDP Ident:
      10.0.40.4       10.4.4.4        10.0.20.4
    Peer holdtime: 180000 ms; KA interval: 60000 ms; Peer state: estab
```

Table 8 describes the significant fields shown in the displays.

Table 8 show mpls ldp neighbor Field Descriptions

Field	Description
Peer LDP Ident	LDP identifier of the neighbor (peer) for this session.
Local LDP Ident	LDP identifier for the local label switch router (LSR) for this session.
TCP connection	TCP connection used to support the LDP session, shown in the following format: • peer IP address.peer port • local IP address.local port
State	State of the LDP session. Generally this is Oper (operational), but transient is another possible state.
Msgs sent/rcvd	Number of LDP messages sent to and received from the session peer. The count includes the transmission and receipt of periodic keepalive messages, which are required for maintenance of the LDP session.
Downstream on demand	Indicates that the Downstream on Demand method of label distribution is being used for this LDP session. When the Downstream on Demand method is used, an LSR advertises its locally assigned (incoming) labels to its LDP peer only when the peer requests them.
Downstream	Indicates that the downstream method of label distribution is being used for this LDP session. When the downstream method is used, an LSR advertises all of its locally assigned (incoming) labels to its LDP peer (subject to any configured access list restrictions).
Up time	Length of time (in hours, minutes, seconds) the LDP session has existed.
LDP discovery sources	Sources of LDP discovery activity that led to the establishment of this LDP session.
Addresses bound to peer LDP Ident	Known interface addresses of the LDP session peer. These are addresses that might appear as “next hop” addresses in the local routing table. They are used to maintain the Label Forwarding Information Base (LFIB).

Related Commands

Command	Description
show mpls ldp discovery	Displays the status of the LDP discovery process.